

INVESTIGATION OF CONCENTRATION OF ECONOMIC POWER

HEARINGS

BEFORE THE

TEMPORARY NATIONAL ECONOMIC COMMITTEE

CONGRESS OF THE UNITED STATES

SEVENTY-SIXTH CONGRESS

THIRD SESSION

PURSUANT TO

Public Resolution No. 113

(Seventy-fifth Congress)

AUTHORIZING AND DIRECTING A SELECT COMMITTEE TO
MAKE A FULL AND COMPLETE STUDY AND INVESTIGA-
TION WITH RESPECT TO THE CONCENTRATION OF
ECONOMIC POWER IN, AND FINANCIAL CONTROL
OVER, PRODUCTION AND DISTRIBUTION
OF GOODS AND SERVICES

PART 30

TECHNOLOGY AND CONCENTRATION
OF ECONOMIC POWER

APRIL 8, 9, 10, 11, 12, 15, 16, 17, 18, 19, 22, 23, 24, 25, AND 26, 1940

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INVESTIGATION OF CONCENTRATION OF ECONOMIC POWER

MONDAY, APRIL 8, 1940

UNITED STATES SENATE,
TEMPORARY NATIONAL ECONOMIC COMMITTEE,
Washington, D. C.

The committee met at 10:45 a. m., pursuant to adjournment on Saturday, March 23, 1940, in the Caucus Room, Senate Office Building, Senator Joseph C. O'Mahoney presiding.

Present: Senators O'Mahoney (chairman), and King; Representatives Sumners (vice chairman), Williams, and Reece, Messrs. Pike, Hinrichs, O'Connell, and Brackett.

Present also: Representative Richard J. Welch, of California; Frank H. Elmore, Jr., Department of Justice; Dr. Francis Walker, Federal Trade Commission; George E. Biggs, Social Security Board; and Dr. Dewey Anderson, economic consultant to the committee.

The CHAIRMAN. The committee will please come to order.

Steady improvement in technology has been the distinguishing mark of our time. No generation in history has seen anything to compare with the advance of science and invention accomplished during this generation. More than that, the 10 years since the crash of 1929 have probably seen the establishment of more new industries and greater technological gains in old industries than any decade since the human race first began to measure time.

It was in the midst of the depression that commercial aviation conquered both the Atlantic and the Pacific Oceans. Recovery was still only a dim hope when the railroads began to introduce the streamliner. Communication by telegraph, telephone, and radio was steadily becoming easier and more efficient and more widespread during the same period. The steady advance of chemistry was creating new commodities for the convenience and enjoyment and service of man. Every year saw new and greater improvement in motion pictures, including the altogether remarkable development of technicolor.

The same decade which has been notable for its steady demand upon Congress from the States and the cities of the land for ever larger appropriations to provide work for the unemployed has seen new achievements in every branch of human knowledge and industry. All of these are the gifts of technology to mankind. Yet in the face of them, unemployment of men, unemployment of money, unemployment even of the machine which technology has developed, remains an unsolved problem.

It is clear, therefore, that one of the major tasks to be performed by the use of human intelligence is the adjustment of our wonderful technological civilization to the immediate and pressing needs of human living. So today the Temporary National Economic Com-

mittee begins this hearing to develop the thought of leaders in the world of industry, science, and economics, on this all-important riddle of our time, namely, why it is that in a world of inexhaustible natural resources, inhabited by men who know more about the physical and chemical secrets of nature than all the generations which have preceded them, we still have not learned how to apply the wonders of technology to the abundance of nature in such a fashion as to provide decent jobs for the millions of idle who are able and willing to work.

The leaders who have been invited here to testify are under no direction or restriction of any kind. The committee is only seeking light. We are not trying to prove a case for any remedy or for any approach. We are not seeking to solicit evidence to justify more government, or to justify increased expenditures. We are not trying to prove that men should be regimented by law, limiting their right to work, or that the use of machines should be in any way restricted or made more difficult.

I say this because I want to make it quite clear at the outset that this hearing must not be regarded as in any sense especially designed to implement the bill to reduce unemployment which I recently introduced and which was by many altogether incorrectly described as a tax on machines.

No member of this committee, no employee, no witness, can speak for the committee. In this as in all previous studies, we are pursuing an objective search for facts. Conclusions have not been preconceived, but will take care of themselves when the facts have been developed.

In the preparation of this hearing, the committee has designated Dr. Dewey Anderson, an economic consultant for the committee, who has had broad experience in this general field, to act as counsel and to question the witnesses.

Are you ready to proceed, Dr. Anderson?

Dr. ANDERSON. Mr. Chairman and members of the committee, as has been outlined by your chairman, the hearings that will be conducted in the next 3 weeks will attempt to get at certain of the major problems of technology, unemployment and the concentration of industry. In building these hearings, we have sought to get together and bring before you witnesses who represent large industries, or industries in which technology is a paramount feature and in which employment is large.

We do not propose to offer these witnesses as a whole as representative of all that is occurring in industry, but rather as case studies of various aspects of the technological problem. From day to day, in introducing successive witnesses, we will outline the reason for bringing them before you and the matters they propose to discuss.

In today's hearing we break open the problem with a basic study of technology in relation to the concentration of economic power made by Dr. T. J. Kreps, economic adviser of the committee. Following his testimony today, Mr. Watson Davis, editor of *Science Service*, will outline new and impending technology, and lay out some of the fields of technology that are still to be explored.

Dr. Kreps is prepared to discuss the topic at this time as the witness of the committee.

**STATEMENT OF THEODORE J. KREPS, ECONOMIC ADVISER,
TEMPORARY NATIONAL ECONOMIC COMMITTEE**

Dr. KREPS. Technology, or the science of technique, includes all innovations in the arts of production and trade brought about by science, invention, and scientific management. It has created, and is continually transforming, modern industrialism. Its elemental power caused and will continue to make necessary continuous changes and adjustments in our economic, political, and social order. Harnessed to consumer welfare, it is a most powerful servant, capable of opening up a vast industrial frontier of unexplored abundance.

Without technology the United States would still be a primitive society. There would be few large factories, hardly any concentration of production, few large corporations in production, finance, and trade, a much smaller world-wide interchange of large volumes of goods and services, less controversy over foreign-trade policy, and no serious national problem either of idle men, or idle money, or idle machines. There would also be little, if any, leisure, little release from back-breaking toil, few comforts and fewer luxuries, at least for the masses of the people, and certainly no extensive technological base upon which to build that great democratic civilization which is our goal and dream.

The problems of technology being numerous and complex, I propose to raise only a few of what seem to me to be the most important questions and divide my task into three parts.

I. I am going to take a brief glance at the history and background of technology and ask:

(1) What are some of the important innovations which have changed modern methods of production and trade?

(2) Why is the invention of the art of invention the most important of all inventions?

(3) Do technical innovations come along in haphazard fashion or can they be predicted?

(4) Who introduces them? Why?

(5) Will technology transform all branches of human effort, or is its scope limited?

II. In the second portion, I am going to take a look at some of the more important economic effects and ask:

(1) How can one measure the various changes caused by technology?

(2) What important new industries have been created by technology?

(3) What happens when labor is actually displaced? Where do displaced workers go? How long do they have to hunt for a new job? What sort of job do they get? What happens to their pay?

(4) How has technology affected the productivity of the worker?

(5) What has happened to the occupations of our labor force? How?

(6) What special problems are raised by capital-saving inventions?

(7) Who receives the benefits of technology?

(8) Is technology a basic factor in modern business fluctuations?

III. In the third portion, I intend to try to get some notion of the most important general or social effects, and in particular ask:

(1) Without technology would there be so much large-scale production and such large industrial aggregates as there are today?

(2) Is there any connection between technology and the increase in recent decades of the number and power of pressure groups?

(3) Has technology made the world an economic unit?

(4) If man does not learn to control technology, may its power destroy him?

(5) Can it be harnessed to create an "America unlimited"?

Many of the most important technological innovations occurred before the dawn of human history. About 150 years ago that modern miracle of scientific advance and invention commonly called the Industrial Revolution began to speed through the textile industry of Great Britain. Starting slowly at first, it soon spread not only horizontally to continental Europe and thence to the rest of the civilized world, but also vertically with increasing crescendo through industry after industry, iron and steel, railroads, steamships, agricultural implements, public utilities, automobiles, and the myriad wizardries of chemical enterprise.

Throughout its history technology has required a price for its blessings, and consequently it has been subject to resistance. Even in England 150 years ago there were machine-breaking riots, persecution of inventors, and legal restrictions. John Kay, who invented the flying shuttle in 1733, had to leave England. Hargreaves, the inventor of the spinning jenny, was attacked by a mob in his home and his model destroyed. Crompton, after inventing the spinner's mule in 1779, had to flee into hiding.

Technology for decades has been vigorously attacked as one of the major causes of depression, not only in the United States but throughout the world. I am going to cite but one example from our own history.

After the severe depression of 1873, numerous congressional committees were appointed with special instructions to search for causes. Thirteen years later, in 1886, the search culminated in an interesting volume entitled *Industrial Depressions*, constituting the first annual report of the first Commissioner of Labor, the famous Carroll D. Wright.

This study, full of lugubrious prophecies that have not come true, gives a detailed analysis of labor-saving devices of that day, especially the detrimental effects. In short, complaints about technology are as old as the hills. But it should be pointed out with emphasis, they are no older than certain other complaints that are heard at the present time. And, being old, the complaints are not necessarily groundless.

REPORT ON THE DEPRESSION OF 1873

Dr. KREPS. Now let me just look at some of these other causes which businessmen back in the 1870's asserted made it impossible for business to go ahead any further:

- Undue influence of agitators.
- Disturbed value of gold and silver.
- Class legislation.

Extravagance in government expenses.
 Depreciation of currency.
 National debt.
 Acts that startle money lenders, causing them to withdraw funds
 and refuse loans.
 Low prices for agricultural products.
 Fear of adverse legislation relative to banks.
 Timidity of capital.
 Unfavorable and reckless legislation in Congress.
 Uncertainty of the future monetary standard.
 Democratic Party in power.
 Want of confidence in Government.
 Overproduction.
 Political distrust.
 Want of adjustment between production and consumption.
 Enormous taxation.¹

In this same report are also listed various remedies suggested by business for that depression, some by no means unheard of today, such as—

Good judgment and hard work.
 Confidence.
 Check legislative derangement of the currency.
 Reduce the salaries of officers of the Government.
 Abolish all unnecessary offices of the Government.
 Rigid economy of the Government.
 Local self-government with no Federal interference.
 Enact laws against communistic schemes.
 Abolish taxation.
 Let Government give attention to the individual needs of its citizens.
 Elect men of better judgment to Congress.
 And, finally, restrict the powers of the President.²

Needless to say, the controversies raised by technology have not diminished since 1886, nor are they likely to in the future.

The term "technology" in its narrowest sense refers to changes in technical processes, the machinery, the plant, and equipment used by businessmen to manufacture and distribute their product. In the typical instance such changes increase the product per man-hour of labor or improve the quality. But there have been many increases in productivity due to factors other than changes in mechanical apparatus, notably improvements due to scientific management regularizing the flow of production, lowering costs, and the like. A change in floor plan providing a more even flow of raw materials, standardization of materials, a faster or more even flow of farm, factory, and mining products to markets, reducing inventories and lowering the cost of warehousing, improved factory lay-out and machine assembly, economies in the use of power, better selection of personnel with reduction of labor turn-over, time and motion studies reducing the effort required by labor to do specific tasks—all those come under the general heading of technology.

¹ *The First Annual Report of the Commissioner of Labor, Industrial Depressions*, March 1886, pp. 61-63.

² *Ibid.*, pp. 264-270.

Technology is consequently much broader than invention or even mechanical developments. Its sweep does not depend on the genius of single individuals. Its advance is like that of a tide, where no one wavelet is of more than transitory importance. Technical progress, like the building of a coral island, is the accumulation of the contribution of multitudes of individuals, capitalists, laborers, engineers, technicians, and scientists.

Changes in technical development are not haphazard. They are the results of the fundamental onward march of scientific knowledge. For innovation is a cumulative process, being usually a rearrangement or combination of earlier inventions and scientific discoveries. As the number of inventions increases, the number of possible permutations and combinations multiplies. This can only mean (barring catastrophes) that we are facing not the end of invention but, on the contrary, an acceleration of the rate of invention. It is entirely probable that we are today on the threshold of a greater period of technological advance than ever before in our history.

I have prepared an exhibit of innovations that are of major importance to industry. It by no means comprises a full list of scientific discoveries. For instance, none of the medical discoveries is listed. This exhibit shows in striking fashion the increase in the number of such innovations from before the tenth century on to the present day. For instance, there are only 3 items listed in the tenth century, four in the eleventh. But by the time we get to the eighteenth and nineteenth centuries the list of these innovations runs into pages.

I would like to offer this exhibit for the record.

The CHAIRMAN. Without objection, the exhibit may be received.

(The document referred to was marked "Exhibit No. 2428" and is included in the appendix on p. 17269.)

INVENTION OF THE ART OF INVENTION

Dr. KREPS. By far the most significant invention made in the nineteenth century was, as Dr. Alfred North Whitehead, the noted philosopher at Harvard University, has so well stated in his book, *Science and the Modern World*, the invention of the art of invention. Laymen who have no knowledge of the way in which inventions are made frequently labor under the delusion that inventions are happened upon by some lucky break, by some peculiar feat of genius, by some peculiar aptitude for contrivance or manipulation. And indeed this is the manner in which previous to the nineteenth century most inventions were actually made.

But after 1850 the progress of science, particularly of the physical sciences, became so systematized that the invention of a product was first blueprinted before realized by processes of deduction and synthesis in the industrial plant. Just as astronomers, by mathematical computations of the most complicated sort, insisted that there must be another planet in the heavens and later found Uranus, so chemistry, particularly after the promulgation by Kekule of his famous ring theory of the structure of carbon, developed the ability to produce almost any desired color and property simply by a knowledge of the architecture of matter. Thus the contact process for sulfuric acid started with elaborate mathematical computations because that was

the only practical way in which to find the one best set of conditions under which the synthesis of sulfuric acid by the contact process could be achieved. The most highly theoretical in modern times is in many cases the most eminently practical.

It is this technique of scientific blue printing by means of involved chemical and mathematical formulas which has made the industrial research laboratory the creator of new processes and new products, the critic of existing techniques; in short, the industrial and commercial intelligence section of a modern business. Industrial research laboratories today aren't places in which so-called contriving geniuses work. They are, rather, clusters of workers completely familiar with the most advanced scientific techniques of analysis who cooperatively explore the terrain which their theoretical compilations have shown to be most likely to produce results. Thus, in honoring the inventors of Nylon recently, the du Pont Co. asked that a group of 11 of their men share the award. Invention, in short, is a cooperative product, whether by international collaboration of scientists or by a program of industrial research financed by large corporations.

WHY ARE INNOVATIONS INTRODUCED?

Dr. KREPS. The primary purpose of businessmen in introducing new machinery or new methods is, of course, to reduce costs of production. That is first. The displacement of labor, while often a result, is seldom a motive or cause.

Labor cost is, of course, a highly important item, particularly so in the less-mechanized industries. But employers are interested in anything that will reduce any other expense on their books. In an article entitled *Invention and Discoveries*, Dr. S. C. Gilfillan examined a typical sample of inventions and found only a third to be labor-saving devices; 8 percent were land-saving, 14 percent were capital-saving, and 45 percent created new kinds of consumers' goods. Business welcomes new machines which economize fuel, power, and floor space more than those which reduce the expense of labor and of direct supervision. New machines may reduce one or more of any number of costs—costs of raw material, maintenance, repair, inventory. If so, they will in time be adopted.

But reduction in costs is not the only reason. New machines arouse pride and loyalty and efficiency in their workers. New machines promote cleanliness and safety in the shop, often make it fireproof. New machines may change the design or processing or precision of the product, making it more acceptable to the market. Machines are tireless, accurate, powerful, obedient, never talk back, and never go on strike.

Numerous as are the advantages offered by machine, they will never supplant human effort entirely. Machines may take over back-breaking, simple, repetitive work. But there are definite limitations. Even at the present time by far the larger proportion of American labor is not occupied with machines, nor is it likely to be displaced by them. There is a vast range of personal and professional services in which the machine assists the laborer but does not supplant him—barbering, medicine, and so forth. Even in the industries that are sometimes thought to be dominated by the machine, a careful survey made by Dr. Harry Jerome of the National Bureau of Economic

Research established the fact that in a representative group of plants embracing a variety of manufacturing industries 44 percent of the workers were hand workers even as late as 1925, 52 percent being machine workers, 3 percent being supervisors, and 1 percent being teamsters. The figures for individual industries are given in detail in this exhibit, which I submit herewith.

The CHAIRMAN. The exhibit may be received.

(The table referred to was marked "Exhibit No. 2429" and is included in the appendix on p. 17276.)

Dr. KREPS. Note that at that time, even in bituminous coal mining, 82 percent of the workers were hand workers.

New machines easily arouse popular interest and attention. Hence, their importance is often exaggerated. But the process of mechanization is neither automatic nor inevitable. It depends on size and weight of the product, on the uniformity of raw materials, and on the degree of standardization possible, and the like. Adaptability to use of power and mechanical and chemical engineering processes is fundamental. The industry, the firm, the management, the technical labor force, and, above all, the customers, all vary in willingness to accept and ability profitably to employ technological advance.

Coming now to the second part of the testimony, the Economic Effects of Technology, some of the more important economic effects are given in the outline below. This outline, it should be observed, is in no way complete or exhaustive. It greatly oversimplifies the problem because there are so many currents and crosscurrents interacting simultaneously. There are short-run effects and long-run effects, interindustry and intraindustry repercussions. But the outline does indicate the important types of technological change. Mr. Chairman, I would like to put the outline directly into the record without reading it in detail.

The CHAIRMAN. You want it to appear as a part of your testimony at this point?

Dr. KREPS. Yes, sir.

The CHAIRMAN. Very well; it may be so ordered.

(The matter referred to follows:)

IMPORTANT TYPES OF TECHNOLOGICAL CHANGE

- | | |
|--|---|
| I. Inventions of a new product or service involving investment in new plant and new enterprise: | Representative Problems Raised. |
| A. If making a product or doing a job that would otherwise not exist: | |
| 1. Buoyancy of exploring a new market may enlarge business borrowing and with a "multiplier" effect increase the volume of production, consumption and employment: | Credit expansion.
Cyclical mal-investment. |
| (a) Rapidity and extent of success depends on economic conditions, on market resistance, on industrial controls, etc. | |
| (b) Often increases inter-industry and inter-commodity competition. | |
| 2. May cause fight for share in consumer dollar. | Mass persuasion. |

I--Continued.

B. If partly displacing an existing product or service:

1. Gives outlet for spirit of gain with new investment, employment and production, sometimes in new areas. Migration of industry.
2. Those making old product intensify efforts to survive. Abandoned plants.
Ghost towns.

II. Labor saving devices, especially those substituting machinery and mechanical power for labor:

A. Manifold effects will depend on whether, and the extent to which, net savings are passed on in one or more or all of the following ways:

1. To consumers in lower prices: a positive stimulus to increased consumption, production and higher standards of living:
 - (a) Dollar volume of sales as large or larger:
 - (i). All the workers attached to the industry reabsorbed, e. g., lithographing. Occupational obsolescence.
Frictional unemployment.
Vocational retraining.
 - (ii). Consumers get more of same product; the economy gets stimulus of increased demand for raw materials, expanding output, etc.
 - (aa) Changes in consumer expenditure patterns.
 - (b) Dollar volume of sales less: Price disturbances.
 - (i). Consumers have more to spend on other things.
 - (ii). More volume, higher efficiency, more workers not only in other industries but in raw material, transport and distributive trades.
2. To labor in:
 - (a) Lighter work and better conditions:
 - (i). No change in number employed but wages may be lower. Women in industry.
 - (b) Fewer hours per day or per week. Child labor.
 - (i). If output per worker per day or per week remains the same, prices and production remain the same.
 - (aa) Fewer man-hours per unit of product—increased leisure. Education for leisure.
 - (bb) Shift of demand to some extent—home furnishings to automobiles and moving pictures. "Caprice" consumption.
Greater cyclical instability.

II—Continued.

- (ii). If output per worker per day rises—lower costs may mean lower prices with further results, same as under (a) above:
- (c) Higher money wages per hour:
 - (i) Shift in pattern of income distribution, if unemployed without income are included.
 - (ii) Larger proportion of productive resources absorbed in making comforts.
 - (iii) More vivid contrast between scale of living of laborers in low-wage, non-industrialized areas and high-wage areas.
- 3. To capital in higher profits on capital: Increased funds available for further expansion:
 - (a) If plowed back may increase:
 - (i) Concentration of production in few firms. Wastes of monopolistic competition.
 - (ii) Temptation to unwise expansion. Excessive capacity.
 - (iii) Importance in competition of length of purse. Inefficient financial Goliaths.
 - (b) If not re-invested may increase size of stagnant pools of savings to point where portion of income stream buying output of industry is too small at current prices. Restricted markets.
 - (c) Consumption of the "luxury" type.
 - (d) Investment decisions in few hands—problem of outlets. Idle money in banks and other lending institutions.
- III. Capital-saving inventions.
 - A. Rationalization measures, i. e., changes in organization of production or labor, e. g., scientific management, Taylor system, Bedaux system, standardization, etc.
 - 1. Existing firms may produce more without any rise in investment or employment.
 - 2. Capital-labor ratio may rise, e. g., automatic looms, speeding up of spindles, higher speed of transport due to better roads and engines.
 - B. Labor- and cost-saving inventions in capital goods industries.
 - 1. Not so much labor absorbed in industries producing machines. Men out of work.
 - 2. Without change in volume of savings, problem of finding outlets for idle money is made more difficult. Low interest rates.
 - 3. Usually old capital must be revalued by large write-downs or increased depreciation and obsolescence charges. Temptation to resist technological change.

Dr. KREPS. I intend merely then to call attention to the fact that there are three types of innovations here dealt with—I, those innovations which result in a new product or service involving investment in new plant or new enterprise; II, labor-saving innovations, especially those substituting machinery and mechanical power for labor; and finally, III, capital-saving innovations.

The CHAIRMAN. As I recall, earlier in your statement you quoted some student of technology as endeavoring to classify these various inventions as to percentages of each. Perhaps it would be well for you to repeat that statement here.

Dr. KREPS. In his sample he found only one-third to be labor-saving devices; that is, coming under II.

LABOR-SAVING DEVICES

The CHAIRMAN. That is, only one-third of all of the inventions or improvements of technology are labor-saving in character.

Dr. KREPS. In their direct operation.

The CHAIRMAN. And what percentage had the effect of establishing new industries or new plants, new enterprises or new products?

Dr. KREPS. Forty-five percent, as he listed them, created new kinds of consumer goods, some difference in the product which made it more salable, and in some cases entirely new products.

The CHAIRMAN. Was any attempt made to determine to what extent those new consumer goods were competitive with existing goods?

Dr. KREPS. He made no such attempt in his sample.

The CHAIRMAN. There is that phase of the problem; is there not?

Dr. KREPS. Yes; as I indicate under I, part 2, such innovations may cause a fight for a share of the consumer dollar, and therefore lead to the use of various devices of mass persuasion.

The CHAIRMAN. In other words, many of these new products are substitutes for old products.

Dr. KREPS. Quite so.

The CHAIRMAN. Rayon is a substitute, at least to some extent, for silk.

Dr. KREPS. Exactly.

The CHAIRMAN. Have you made any catalog of such substitutes?

Dr. KREPS. I have not.

The CHAIRMAN. Is any such catalog available?

Dr. KREPS. I know of none that is available. There have been given for individual products all the competitive commodities in the field, of course. I have, myself, in a book on sulfuric acid, indicated in a chapter the number of substitute commodities, a phenomenon that I call intercommodity competition, that tended to share the market with sulfuric acid.

The CHAIRMAN. Dr. Anderson, will any of the witnesses go into that phase of the subject?

Dr. ANDERSON. Yes, sir; it is a very difficult topic, as you know, sir, to get the interrelationship, but I hope that when we move into automobiles tomorrow we will directly concern ourselves with replacement and substitution of automobiles for other products, and in specific cases in that way we hope to bring them out in each successive day's hearings.

The CHAIRMAN. I was thinking rather of commodities like rayon, plastics, and the like.

Dr. ANDERSON. We have one hearing on textile fibers which will treat of that particular one, rayon, and its effect upon the entire textile market.

The CHAIRMAN. I think it might be very illuminating if some study was made of substitutes as a general subject.

HOW MEASURE THE IMPACT OF TECHNOLOGY?

Dr. KREPS. The first problem to which I want to return is the difficult one of how to measure the various changes caused by technology.

The impact of technology is not a simple one or a direct one. Prof. Frederick C. Mills of Columbia University spent more than 10 years directing a staff at the National Bureau of Economic Research in a study of this problem. He has published 3 large volumes of findings which will be heavily relied upon in these hearings. Yet he regards the job as by no means complete. In the National Research Project, Mr. David Weintraub has published more than 60 volumes, and of course one agency that has been assembling, studying, and publishing practically all the fundamental data that is available on this subject is our own Bureau of Labor Statistics. But as Dr. Mills has pointed out:

Technical change is a many-sided process that affects economic institutions in economic activities in numerous ways. The opportunities open to entrepreneurs; the flow of savings; the kind of capital goods required; the rate of obsolescence; the soundness of existing investments and of the debt structure that rests upon them; the amount of labor needed and the kind of skills required in the working force; costs and prices and the distribution of purchasing power—all these are directly affected by changes in productive technique. Moreover, the problems raised by technical changes may be quite different at different times and in different conjunctural conditions. It is a problem that calls for realistic, first hand study, that is both intensive (in its bearing on the fortunes of single industries and industrial groups) and extensive (in its bearing on the production structure as a whole and on the working of the price and credit systems).¹

Thus, to attempt to measure the amount or economic effects of technological change merely by taking, say, a given manufacturing industry and comparing output with number of men employed or man-hours worked at different times, say in 1870 or 1900 and 1929 or 1937, is not even to scratch the surface of the problem. Many more measurements are required. In addition to knowing (1) what has happened to physical volume of total production of all products and (2) what has happened to the production per worker and per man-hour of labor in all important branches of business, an adequate analysis requires measurements of such things as (3) primary power utilized both in total volume and in amount per employee; (4) number of workers employed; (5) fluctuations in unit prime cost; (6) money spent for industrial research; (7) number and importance of new manufacturing materials or new processes; (8) figures on wastage of manufacturing materials; (9) production of secondary materials such as scrap iron, rubber, copper, tin, and the like; (10) number of industrial accidents; (11) extent, degree, and quality of

¹ Frederick C. Mills, "Industrial Productivity and Prices," in *Journal of the American Statistical Association*, No. 198, Vol. 32, June 1937, pp. 247-248.

lighting and other factors necessary to 24 hour a day operation; (12) improvement in working conditions; (13) wholesale and retail prices of the articles manufactured; (14) percentage of new enterprises started per year; (15) hourly, weekly, and yearly wages, in money and in goods; (16) returns to the proprietorship account in dividends, interest, profits, or managerial salaries, and above all, the effects on other industries in the shape of interprocess, intercommodity, and interindustry competition.

It is obviously impossible to attempt to give even a fraction of the time and space necessary to an exhaustive analysis. One must pick and choose and that is exactly what I propose to do.

NEW INDUSTRIES CREATED BY TECHNOLOGY

Dr. KREPS. I am first going to go into the question of what important new industries have been recently created by technology.

The most startling of all accomplishments of technology is that of creating entirely new products and doing jobs that otherwise would never be done at all. Without technology we would not have such marvels of engineering genius as the Hoover Dam, or Grand Coulee, or the Triborough Bridge. That work would not be done. Nor would we have such products as the radio, the automobile, the telephone, the railroad train, alloy steels, plastics, rayon, nylon, and the like. These and other new industries employ millions of workers.

A tabulation published by the National Industrial Conference Board in its interesting study on *Machinery, Employment, and Purchasing Power*, provides a good case in point. I should like to submit this exhibit for the record.

The CHAIRMAN. The exhibit may be received.

(The table referred to was marked "Exhibit No. 2430" and is included in the appendix on p. 17276.)

Dr. KREPS. It lists 18 industries that have been started in the United States since 1870 and now employ millions of men.

These are, of course, by no means all additional jobs. Even the automobile industry supplanted a large number of little enterprises that used to make wagons, buggies, harnesses, and other such equipment. Livery stables went out of business, and the farmer's market for oats, hay, and the like, in large part, vanished.

Moreover, all new inventions have to be bought and paid for, largely by consumers whose incomes have not been expanded.

Representative REECE. If you don't mind an interruption, do your figures on motor vehicles include the sales force, which would come more nearly being the phase of the industry which replaces livery stables?

Dr. KREPS. This is the manufacturing end of the industry, not the automobile vehicle retailing. That is, this does not include garages, and so forth.

For consumers, the purchase of something new means going without something they formerly used to buy, if they haven't had an increase in income. It is said, for example, that the proportion of income spent for home furnishings and for clothing has been decreased by the demands upon the budget made by the automobile for gasoline, repairs, and the like.

Similar comments could be made on all the industries mentioned in the exhibit. Rayon has, in part, supplanted cotton and woolen fabrics, particularly those of high quality. Manufactured ice or mechanical refrigerators have supplanted the old-fashioned ice plant, and the like.

Now, in discussing the second type of innovation, the labor-saving innovation, one of the most important problems raised is, what happens to the laborers actually displaced?

The easy answer to this question is usually, "They are absorbed elsewhere," or "They are released for easy jobs in the clerical professions or in the service trades." This idea had a good deal of validity when work was plentiful as it was before 1890.

But as Dr. Mills writes in summarizing his studies:¹

A facile dismissal of the problem on the assumption that an automatic adjustment to industrial shifts is effected, with re-employment of all displaced productive factors, is no longer possible.

DISTRESS TO LABORERS CAUSED BY MACHINES

MR. HINRICHS. May I interrupt at that point a moment, Dr. Kreps? You say that reabsorption from the displacement that occurred was relatively simple with rapid expansion. Can you cite evidence to that effect, and how do you reconcile that statement with the character of the machine riots which were possibly commoner in the nineteenth century than they are today?

DR. KREPS. The machine riots owe a good deal of their intensity at that time to the fact that the machine was something absolutely new, and they had a good deal more public support in resisting it than they can get today when we are accustomed to technological changes.

Furthermore, we have made adjustments today which were not made at that time; since the machine was relatively new in Great Britain, they had not yet developed the various devices for facilitating the transfer of labor and its employment in other industries that we have developed in modern times.

My point is simply that when you have, as you did to begin with, an innovation, say, merely in the textile industry, and your economy is still 90 percent agricultural, as even ours was in 1790, the amount of displacement the machine causes is relatively small; but when you have become, as we have in recent years, more than 60 percent industrialized, and you get machine technology, innovations going on in range after range of enterprise, your problem greatly increases.

MR. HINRICHS. Your statement in all events isn't based on any studies that were made in that earlier period, tracing through what did happen to particular groups of displaced workers. For example, one of the major displacements was the displacement of the home weaver by machine weaving, and when we come down to date, we have actually traced through what happens to some of the individuals, as Mr. Weintraub did, for example, with silk weavers displaced, with some knitters that had been displaced in Philadelphia. We don't have any materials that you know of in the nineteenth century that give a contrasting picture of an easy transition at that time as against the difficult transition at this time with the individual worker displaced.

¹ "Industrial Productivity and Prices," *Journal of the American Statistical Association*, June 1937, No. 198, Vol. 32, p. 247.

Dr. KREPS. Coming back again to the United States—and I am talking primarily about the problem here—I think the picture which de Tocqueville gives us of the United States in 1820 indicates rather clearly whatever displacement took place was readily compensated for; there were places, frankly, where laborers could go. It is quite true that in Great Britain such studies as Hammond's *The Village Labourer* and *The Town Labourer*.¹ Thomas Hood's famous poem, *The Song of the Shirt*, and others, indicate that there was localized distress of a very acute sort. Nonetheless, so far as the economy as a whole is concerned, I don't believe the problem had nearly the magnitude, certainly in the United States, at that time that it has now.

Mr. HINRICHS. I don't want to push the point further, but there is a difference between the effect on the economy as a whole and the effect on particular workers. We may want to develop that somewhat later.

Dr. KREPS. Quite so.

The CHAIRMAN. That difference is apparent throughout the whole history of the development of technology, isn't it, the effect upon the economy as a whole and the effect upon particular workers?

Mr. HINRICHS. I think that the problem of the relationship with the machine in detail to particular individuals and groups of individuals is of fundamental and overwhelming importance, and it may possibly be somewhat confused in discussions of the effects on the general economy. I know of no evidence to indicate the fact that the problem of individual displacement has not been a very acute one. Whenever a major innovation has been introduced the evidence of the nineteenth century in general economic literature seems to me to indicate that effect on the individual was present, was very terrific at that time, and was handled at that time with possibly less social consciousness and awareness of the problem than I should hope would be present in our handling of that problem at the present time.

Dr. KREPS. Certainly, beneficial as the machines in the aggregate have been in lightening the work of labor and in increasing the amount of available product, and even granting that in the long run labor manages to find other employment, the question still remains why those who can least bear the burden are required to make the sacrifices demanded of them by the machine. On this point the Industrial Commission, composed mostly of McKinley Republicans, stated 40 years ago in its report:

The interest of the man who sees a machine invading his craft and threatening to rob him of the opportunity to sell his skill is little affected by the results which the introduction of the machine may exert 20 years hence upon society, upon his trade, or even upon his children. He is concerned with getting bread and shelter today and tomorrow.²

And they go on to say:

From the social standpoint, justice might also seem to require compensation for the destruction of the value of special skill. When a man has devoted years to the acquirement of an ability, he may be excused for feeling that he has a vested right in his income from the use of it. This feeling, indeed, is at the bottom of the machine-breaking and the other less violent means by which men

¹ John L. Hammond, *The Village Labourer*, 1760-1832, Longman's, 1917. *The Town Labourer*, 1760-1832, Longman's, 1920.

² *Final Report of the Industrial Commission*, House Document No. 380, 57th Congress, 1st Session, p. 822.

have undertaken to maintain their hold on work which they have felt belonged to them.¹

Of more than usual interest is the recommendation of this Industrial Commission that—

* * * the only way in which the workmen in a particular trade can, by their own action, avoid the immediate hardship that results from improvement of machinery and methods in their own craft seems to be by united action, taken through some such organization as a trade union. It is believed to be impossible to point out any instance in which unorganized workmen have received any immediate and visible benefit from the introduction of new machinery in their trade.²

The problems of isolating such temporary technological unemployment from other kinds of unemployment is a difficult one. That accounts, of course, Mr. Hinrichs, for the lack of studies until a comparatively recent date. It is mixed up with various other forms of unemployment: Workers who have lost their employment on account of seasonal influences, cyclical unemployment, unemployment as the result of a change in the age composition of the population or overcrowding in certain branches of the labor market, for example, the middle classes of women workers, and so-called frictional employment which represents the reserve supply on the labor market.

Recently some notable sample studies have appeared, among them that of Dr. Isador Lubin, of this committee, entitled *The Absorption of the Unemployed by American Industry* (published by the Brookings Institution, pamphlet series vol. I, No. 3). In his sample of displaced workers less than a third of those who found jobs returned to their old industries, the rest being unemployed for as much as a year before they found work.

Another study by Dr. E. Wight Bakke followed certain displaced Hartford rubber workers.³ During the first year the skilled workers lost 4.8 months of work, the unskilled 4.6 months. The annual incomes of the former group fell to 50 percent of what they had earned in 1928, the latter to 62 percent. In the third year following the shutdown, not only were the relative losses of the skilled greater than those of the unskilled, but the absolute average annual incomes were lower. As Dr. Bakke says:

Apparently the qualities which helped men to rise to skilled jobs and high wages while at work are of limited use in helping to readjust satisfactorily when the job goes.

It is not necessary to refer to the excellent and graphic studies of the National Research Project, nor to call to mind *The Grapes of Wrath* of John Steinbeck, to emphasize the hardships suffered by those who are displaced today, even by those who are "tractored out" on a farm.

PRODUCTIVITY OF LABOR

Dr. KREPS. The next question I want to raise is: How has technology affected labor's ability to produce? The effect of machinery upon the average amount produced by the American worker in the manufacturing industries is strikingly shown in a chart entitled

¹*Ibid.*, p. 824.

²*Ibid.*, p. 825.

³E. W. Bakke, *Former L. Cantees Workers in the Depression*, Yale University Press, New Haven, 1934.

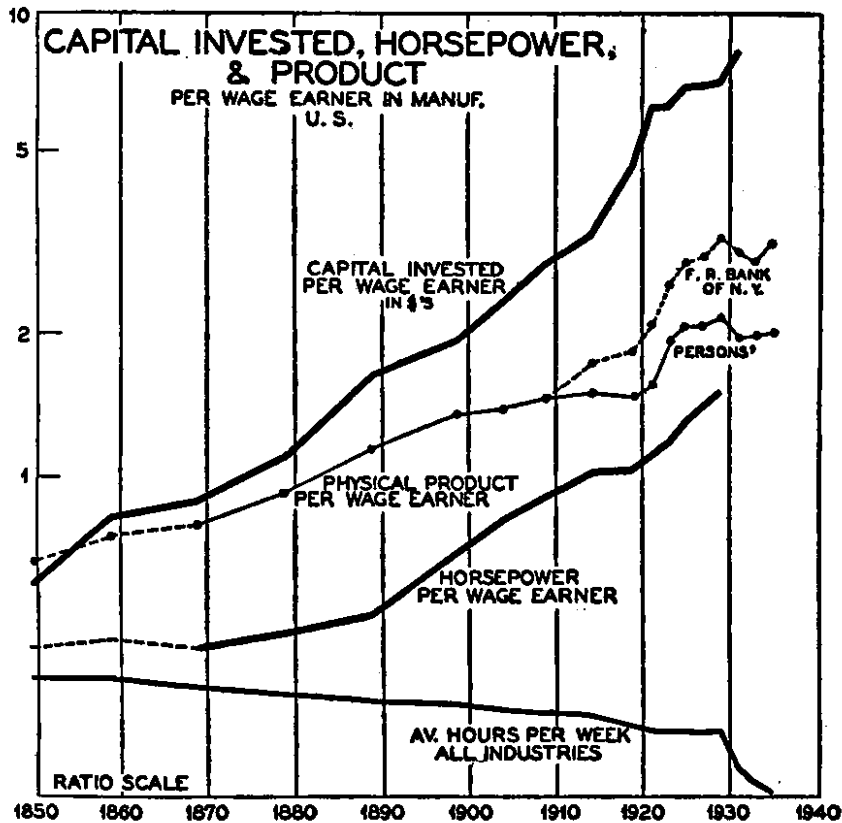
"Capital Invested, Horsepower, and Product," taken from Carl Snyder's book, *Capitalism the Creator*.¹

I would like to submit this chart as an exhibit.

The CHAIRMAN. The chart may be received.

(The chart referred to was marked "Exhibit No. 2431" and appears below.)

EXHIBIT No. 2431



XXVII. THE CAPITAL INVESTMENT AND THE WAGE OF THE WORKER

Dr. KREPS. You will note that the physical product per worker since 1870 has more than doubled. There has been a striking increase in the capital invested per wage earner in dollars and in the horsepower per wage earner. Meanwhile the average hours of work per week in all industries have dropped from levels of around 60 and 70 in 1870 to the 40-hour week at the present time.

The CHAIRMAN. Does that appear on this chart?

Dr. KREPS. You have to read it at the bottom.

The CHAIRMAN. Oh, yes; the lower line shows the trend of the average hours per week in all industry.

Dr. KREPS. That is right.

¹ Carl Snyder, *Capitalism the Creator*, MacMillan, 1940.

The CHAIRMAN. What is the source from which these figures were taken?

Dr. KREPS. Dr. Snyder, who is an economist for the Federal Reserve Bank of New York, had a vast array of statistical data and they have been pieced together from that array. To quote all the sources would absorb considerable time, but he is a rather competent statistician, and therefore I have taken it from him.

The CHAIRMAN. The heavy black line at the top indicates that there has been a tremendous increase in capital investment as related to the dollar wages of the worker. Is that correct?

Dr. KREPS. That is correct.

The CHAIRMAN. And that, of course, reflects, I take it, the increased cost of plant under modern technological change. Is that correct?

Dr. KREPS. There is a dispute on that point. The statistics do not speak with one voice.

The CHAIRMAN. What is the explanation, then, of the increased investment?

Dr. KREPS. First of all, the increased investment is in dollar figures.

The CHAIRMAN. Is in what?

Dr. KREPS. In dollar figures, and there is no good way of deflating dollar figures of capital invested for changes, for example, in the general price level.

Senator KING. We know that a great deal of machinery has been obsolete, characterized as obsolescent, which has called for very large capital investments in order to replace the displaced machinery and to keep up with the demand for the new products and the demand of the market for the products.

INCREASED CAPITAL PER UNIT OF PRODUCT

Dr. KREPS. The point that I think the Senator was raising was the one whether or not the amount of capital per worker, or rather per unit of product per worker, had tended to increase. We have to get back to the dollar figures, and as soon as we do that we feel that certainly the amount of capital kept up with product; in other words, there was what we call an intensive application of capital up to 1910. Since 1910, and particularly since 1925, there seem to have been certain changes introduced which made it possible to make more product with less dollar investment of capital; in other words, innovations have made it possible for a machine costing less money to do as much or more work than the old machine; we have improved the design and the effectiveness of our machinery, and it is on that second point that at the present time the statistics do not speak absolutely clearly, although they do since 1925.

The CHAIRMAN. Then what is, in simple words, the significance of this first line, this upper line?

Dr. KREPS. To indicate two facts, and Dr. Snyder, I think, has indicated them in his footnote: That the amount of increase in product per worker is largely due to increased machinery, and increased horsepower in that machinery, put at the worker's disposal, and that that larger volume of machinery in turn has been due to business-

men taking their savings and placing them in capital equipment at the disposal of society. That is at least what I take it this chart represents, and that is the meaning I wished to convey.

The CHAIRMAN. Doesn't that mean increased investment in plant and equipment?

Dr. KREPS. Oh, quite, an absolute increase, positively. I had interpreted your question as being one in which you wanted to know whether the increase was more rapid than the increase in physical product.

Senator KING. It was only a few years ago Mr. Ford discarded machinery and plants that were worth more than 50 to 65 millions of dollars, and the larger part of his capital now consists of plants which of course deteriorate from day to day and from year to year and call for increased investment.

Dr. KREPS. That is right.

Mr. HINRICHS. Mr. Chairman, in connection with this chart and merely to clarify the record, I would like to comment on that bottom line for a moment. This chart is constructed on a ratio scale and that means that the base line of the chart is not a zero line; that is, obviously hours per week have not gone down to almost zero, but effectively that bottom line as far as hours is concerned would represent about 38 hours a week at the present time, and back in 1929 it would have represented some 44 hours.

SHORTENED WORKING HOURS

Dr. KREPS. The point that I wanted to make in connection with that chart which slightly exaggerates the movement in hours is that there had been a declining trend throughout our earlier history. Our figures in the Bureau of Labor Statistics would indicate that between 1909 and 1929, let us say, hours were fairly substantially decreased, not as much as they have been decreased from 1929 to 1939, but the rate at which hours were shortened was not more than twice as great in this latter period as in the earlier period, and this chart, merely from the point of view of the record and from that single point of view, slightly exaggerates the movement that has taken place; it has not been quite as extraordinary a movement as it might seem to be in this ratio plotting. That was a period of unusually rapid and unusually concentrated change in hours worked. Since 1933, since 1932 as a matter of fact, there has been relatively little change in hours worked. Actually they tend now to be longer than they were in 1932. If you contrast the rate of change between 1929 and 1932 you have an exceptional and extraordinary change in hours worked. If you consider the 10-year decade as a whole, the shortening of hours is much less exceptional than it might appear to have been on the basis of this chart.

I think I can explain, Senator, that what Mr. Hinrichs is saying is perfectly true, namely, that a reduction, say, of 6 hours per week when you start from 60, is only a 10-percent reduction; that same reduction taken from, say, 30 hours a week, is a 20 percent reduction. Therefore, a chart of this order visually, particularly in that last period, would exaggerate the amount of decline.

Mr. PIKE. On the other hand, it dampens the upward movements, too.

Dr. KREPS. Yes; it does that.

Dr. WALKER. Would you explain exactly what that top line, capital invested, means?

Dr. KREPS. Dr. Snyder has taken this with certain modifications of his own from the successive censuses of manufacture plus a series that is kept up since 1920, I believe, by the Federal Reserve Bank of New York.

Dr. WALKER. Does it mean plant or all assets?

Dr. KREPS. It does mean all capital invested; it does not mean just fixed capital.

Dr. WALKER. It would be different if there were changes in the ratio.

Dr. KREPS. If there had been any substantial change in the ratio of inventories to fixed capital.

Representative REECE. What would be the effect of that top line representing capital invested, if it were based upon the wage-earner hour rather than upon the wage earned? The difference would be much greater, would it not?

Dr. KREPS. That is true. Of course in modern times plants are tending to operate on a more uniform basis, that is they will tend to operate, say 2 shifts, 16 hours; an intensive use of their capital, in other words, is taking place, so that you get a modified effect.

While Dr. Snyder's chart exhibits the rate of growth from 1870 to 1930, the chart which is found in a publication issued this morning by the Brookings Institution, written by Dr. Spurgeon Bell, entitled *Productivity, Wages and National Income*, shows the story in detail for the last 20 years for manufacturing enterprise. I should like to offer this chart for the record.

The CHAIRMAN. The exhibit may be received.

(The chart referred to was marked "Exhibit No. 2432" and appears on p. 16227.)

Dr. KREPS. Notice there that the volume of production in manufacturing has increased more in that period than the amount of fixed capital invested. (This is fixed capital only.) In other words, the productivity of capital has increased. In 1936-37, fixed capital investment was only 2 percent greater than in '23-24; the volume of output was 25 percent greater.

The steady decline in total man-hours of employment is also striking. In general, the productivity of labor seems to have increased by something on the order of 40 percent from 1924 to '38.

The CHAIRMAN. Would you mind making a comment on the background of Dr. Bell?

Dr. KREPS. Dr. Bell is a statistician who for a long time was at Ohio State University and then has been with the Brookings Institution for the last year, getting together these figures.

The CHAIRMAN. This chart represents the statistics which he has gathered while a member of the staff of the Brookings Institution?

Dr. KREPS. Quite so.

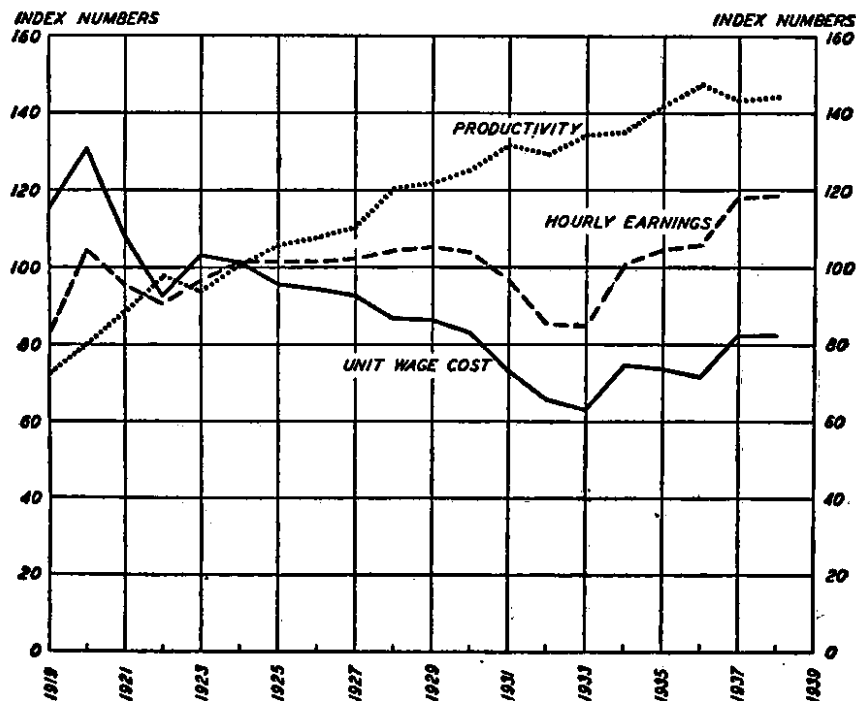
In this same volume, Dr. Bell presents a series of charts, all of them showing this same trend. This is the general pattern.

The CHAIRMAN. This upper chart would indicate that there has been not only a positive gain in the number of wage earners since 1932 until 1937, when it began to fall off, but that there has been a marked gain of wage earners as compared to the amount of fixed capital.

Dr. KREPS. That is correct.

EXHIBIT No. 2432

PRODUCTIVITY, HOURLY EARNINGS, AND UNIT WAGE COST IN
MANUFACTURING, 1919-38^a
(1923-25 = 100)



Source: Spurgeon Bell, Productivity, Wages and National Income (Brookings Institution: 1940)

The CHAIRMAN. That is, while fixed capital was falling off generally during that period, the number of wage earners was steadily increasing.

Dr. KREPS. That is correct. That tendency is present as one of the most significant tendencies, I think, since after the World War, since 1920.

The CHAIRMAN. What is the explanation of that in terms of technology?

Dr. KREPS. I offer some explanation of it. I am not quite sure—

The CHAIRMAN. (interposing). As you go along?

Dr. KREPS. Yes.

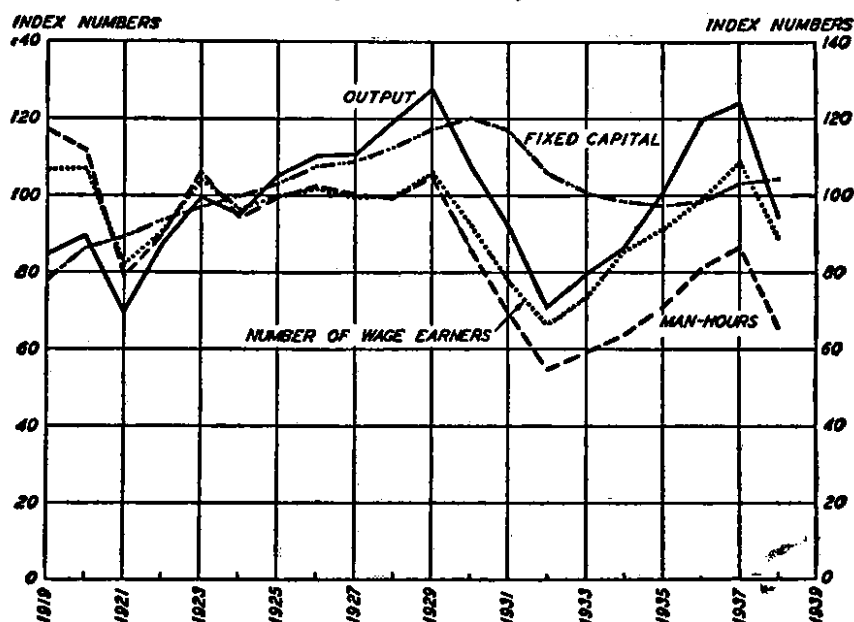
The CHAIRMAN. Very well.

(The chart, referred to was marked "Exhibit No. 2433" and appears below.)

Dr. KREPS. I may say this same picture holds true for many other industries. Fixed capital investment, for instance, has either fallen off in the automobile, textile, iron and steel, and manufacturing industries, or failed to increase as fast as output.

EXHIBIT No. 2433

FIXED CAPITAL INVESTMENT, OUTPUT, AND EMPLOYMENT IN
MANUFACTURING, 1919-38^a
(1923-25 = 100)



Source: Spurgeon Bell, Productivity, Wages, and National Income (Brookings Institution, 1940)

Employment and man-hours of labor also fail to keep pace with output, in most cases actually declining. Productivity shows a continuous increase over the entire period—no break in trend at any particular date. These phenomena, while I am showing them in this exhibit only for manufacturing, I can say from the book also are true for mining, railroads, electric light and power, and individual industries, such as automobiles, iron and steel, paper and pulp, cotton textiles, and tobacco.

A table summarizing some of these results has been compiled from his volume and I wish to submit it as "Exhibit No. 2434, Productivity, Output, and Employment; Percentage Changes Between Designated Years, in Major Groups of Industries and in Selected Manufacturing Industries."

The CHAIRMAN. The table may be received.

(The table referred to was marked "Exhibit No. 2434" and is included in the appendix on p. 17277.)

Mr. HINRICHS. You said that there was no break in this series on productivity.

Dr. KREPS. No break in the trend.

Mr. HINRICHS. I am not questioning your generalization, your characterizing that whole period, but there is a minor variation in there that I would like to point out and emphasize for just a moment, if I may. You will notice that in your chart between 1931 and 1932 your line stops rising.

The CHAIRMAN. Which chart are you referring to?

Mr. HINRICHS. I am referring to the chart entitled "Productivity, Hourly Earnings, and Unit Wage Costs."¹ That upper line marked "Productivity" shows a dip in that period from 1931 to 1932 which we think, in the work that we have been doing analyzing productivity, is rather significant, not so much in terms of the average for all manufacturing as more particularly in the components of manufacturing that caused the general line to stop rising. There were certain lines of manufacturing, notably in the heavy industries, in which productivity went down very sharply and will go down very sharply every time the volume of physical production declines. One of the characteristics of a depression is the tendency of the output per worker per hour to go down, which in large measure may offset the benefits of reduced labor costs that people seek to achieve through wage reductions in a period of depression such as we knew between 1931 and 1932.

THE MINING INDUSTRY

Dr. KREPS. I call attention to the fact that in this table, which gives the same picture for a variety of enterprise generally, the same trends appear. Employment in the mining industry and in railroads showed an absolute decline in the period of 1923 to 1929. Moreover, in that period volume of output increased 27 percent in manufacturing, while the number of wage earners increased only 2.8 percent.

An indication of the steadiness of the trend both in the twenties and in the thirties—and I am taking the decades and not particular years—is indicated in this tabulation, which shows productivity and unit wage cost for a variety of industries. I should like to submit this tabulation as an exhibit.

The CHAIRMAN. The tabulation may be received.

(The table referred to was marked "Exhibit No. 2435" and is included in the appendix on p. 17278.)

Dr. KREPS. By 1938 the productivity of labor had increased over 1923-25 levels by 44 percent in manufacture, 44 percent in railroads, 99 percent in mineral industries, 116 percent in electric light and power, 40 percent in automobile and parts manufacturing, 51 percent in blast furnaces, steel works, and rolling mills, 55 percent in paper and pulp manufacture, 38 percent in cotton textile manufactures, and 153 percent in the manufacture of tobacco products.

¹ See "Exhibit No. 2432," *supra*, p. 16227.

At the same time unit wage costs in 1938, compared with the base period of 1923-25, had declined 17.5 percent in manufacturing in general, the same for railroads, 46 percent for the mineral industries, 37.5 percent in electric light and power, about 7 percent in the automobile industry, 6 percent in the steel industry, 25 percent in paper and pulp manufacturing, 22 percent in cotton textile manufacture, and more than 50 percent in the tobacco industry. In all these industries, despite the increases in wage rates per hour, actual wage costs declined throughout the period. That is the sort of achievement which the machine makes possible.

Output per man-hour and per wage earner have increased considerably even since 1929. Various estimates place the amount in the vicinity of 25 to 30 percent. The detailed studies made by the National Research Project indicate that out of 67 industries 23 showed appreciable increases in production, 20 exhibited increases in employment, but only in 2 of them, the side and upholstery leather and the rayon industry, was there an increase in the man-hours of work.

I should like to submit this particular exhibit, taken from the National Research Project, showing what has happened to productivity, employment, and production in 59 manufacturing industries from 1929 to 1936.

The CHAIRMAN. It may be received.

(The table referred to was marked "Exhibit No. 2436" and is included in the appendix on pp. 17279-17281.)

The CHAIRMAN. All this material seems to show in a very definite and clear manner that in terms of wage cost the output is increasing tremendously.

Dr. KREPS. That is correct. Wage costs have been going down.

The CHAIRMAN. That trend is apparently a continuous trend.

Dr. KREPS. It has been in this period, with, as you will notice, some modification in individual industries, of course.

The CHAIRMAN. You say that that is a result of the machine.

Dr. KREPS. A result—I used the machine in an elliptical sense for technology, a result of improved methods of manufacture.

The CHAIRMAN. Is there any dispute about that?

Dr. KREPS. I know of none.

The CHAIRMAN. Do you know of any contrary statement or conclusion reached by any student?

Dr. KREPS. Not within the range of my information.

The CHAIRMAN. Have you heard of any statistics that indicate a contrary result?

Dr. KREPS. I have not.

The CHAIRMAN. One of these charts refers particularly to manufacturing, railways, mineral industries, and electric light and power. That pretty well covers the field of technological production, does it not?

Dr. KREPS. Dr. Bell estimates that 75 percent of the total employment is comprised within the sample of industries for which these figures are here given.

The CHAIRMAN. And while this technological advance has been going on in industry there has also been technological advance in agriculture, has there not?

Dr. KREPS. Quite so.

The CHAIRMAN. Have you covered that?

Dr. KREPS. I do not in my testimony, although we have hearings scheduled on the problem.

Dr. ANDERSON. Mr. Chairman, we have a 2-day hearing scheduled for agriculture, in which we will show the results of about a 3-year study that has been engaging the attention of the Department of Agriculture on mechanization in agriculture, which shows exactly the same tendency.¹

Mr. HINRICHS. When you used the phrase "three-quarters of industry," you were defining it as productive industries? You didn't include retail trade and service industries?

Dr. KREPS. No.

Mr. HINRICHS. Nor banking and finance and the other sources of employment which are rather large?

Dr. KREPS. That is true.

As you notice here, output per man-hour increased in all but 13 industries and declined in only 4 of them. The increase has ranged as high as 241 percent for rayon, in 8 industries they were in excess of 50 percent, and in 22 others range from 25 percent to 50 percent. Such is the magnitude of the technological advance in the midst of which we now find ourselves.

This tendency, it should be noted, is not peculiar to the United States. While I do not want to bring in an embarrassing volume of statistics, studies conducted by the International Labour Office and other research organizations show similar increases in productivity—not of the same magnitude, but increases, nonetheless—in England, France, Germany, and as a matter of fact throughout the modern industrial world. There is one computation for Great Britain which estimates that the same volume of output could be produced in 1934 as was produced in 1926, with 1,500,000 fewer workers than they had used 8 years previous.

THE NATIONAL LABOR FORCE

Dr. KREPS. Now I want to take up the question, how has technology changed the occupations of our national labor force?

As we have already noted, in the last 70 years technology has created hundreds of new kinds of jobs and required many new skills. It has also changed completely the number of workers in various groups of occupations.

I should like to submit as an exhibit a table taken from Dr. Bell's work showing occupational distribution of gainful workers from 1880 to 1939. These are in terms of percentages of all gainful workers. Notice that wage earners, since 1880, have comprised between 54 percent to 56 percent of all gainful workers, no great rise, and even an appreciable fall since 1910. The percentage of clerical and sales employees has about tripled, from 6.5 percent in 1880 to 18.3 percent in 1939. While the percentage of professional employees has doubled, it is still only 5.6 percent, and managerial employees 3 percent.

The CHAIRMAN. It may be received.

¹ See pp. 16922-16999.

(The table referred to was marked "Exhibit No. 2437" and is included in the appendix on p. 17281.)

Dr. KREPS. The percentage of gainful workers in self-employed enterprises has steadily declined from 36.9 percent in 1870 to 18.8 percent in 1939, although the decline is considerably less in the last 10 years than in any previous decade. The percentage among farmers has dropped more than half, from 27.8 in 1880 to 11.8 in 1939, while that in nonfarm business enterprises has declined from 8 to 6.6 in 1930, and 6.1 in 1939.

I should add that different technicians in this field get somewhat different technical results. This is a happy hunting ground of experts on vital and occupational statistics.

In order to provide some technical footing of our own, with the usual reservations, I would like to submit a small technical memorandum entitled "Population and Employment, 1870-1940," which has data that have been carefully compiled in a volume which will be published—it is not yet off the press—by Dr. H. Dewey Anderson and Percy E. Davidson, Stanford University. The publication is called *Occupational Trends*. All these figures, as all of you know, have to start with population statistics, then make some estimates about the number of gainful workers, at least intercensal, although there are census records at the end of each decade, and from that come to certain conclusions about the working force, and what it is doing.

I would like to call attention to two or three charts in this exhibit.

The CHAIRMAN. You are submitting this in advance of publication?

Dr. KREPS. With the consent of the authors and publishers.

The CHAIRMAN. May I ask Dr. Anderson the source of the figures?

Dr. ANDERSON. Mr. Chairman, the first chart is a basic chart built from data that have been introduced in this committee before, in the economic prologue discussion,¹ the chart with respect to population and its movement. Its recharting brings out certain facts with respect to movement.

All of the charts carry sources on them, I think, that are descriptive of them in each instance.

With respect to the population figures themselves, they are taken from the census, and regroupings were made by a technical staff at the university. They have been subjected to rigorous criticism by other experts in the field.

The CHAIRMAN. That is to say, they were submitted for comment to other students before publication?

Dr. ANDERSON. That is right. For each chapter of the book from which this has been taken, we made up a panel of the people considered most competent in the field, and submitted the data of the chapter, including the figures, to them for comment before they were finally revised for publication.

The CHAIRMAN. I notice that there are some statistics taken from *Enterprise and Social Progress* as published by the National Industrial Conference Board.

Dr. ANDERSON. That is right.

¹ See Hearings, Part I.

The CHAIRMAN. Did that board have anything to do with the preparation of any of the other material?

Dr. ANDERSON. No; nothing whatsoever.

Dr. KREPS. I would like to call attention to two or three points in these charts, first "Exhibit No. 2438-A", "Growth of Population of the United States." Population, of course, is continuing to grow and will do so, particularly in certain age groups. The rate of growth since 1860, as you notice, has become steadily less. That ought to solve certain controversies about what is meant when people talk about declining population.

I would also like to point out in the next chart that we have on our hands in this next decade a greater problem of finding jobs for youth than we have had certainly in the past, and that we will have thereafter. In other words, the percentage of the new entrants is larger for that decade than in any of the previous ones.

The CHAIRMAN. If the percentage of population increase is steadily growing less, as indicated by "Exhibit No. 2438-A," is it not a proper deduction that the problem will rather be one of providing for the aged before the youth?

PROBLEM OF THE AGED

Dr. KREPS. That was the next comment I was going to make, that after this decade of the forties, we are going to have increasing problems with the aged. The number of workers from 45 to 64 years of age is increasing rapidly percentagewise, and finding jobs for men over 40 will in the near future require every scrap of ingenuity that leaders in business and Government can summon.

I would like to submit this whole exhibit for the record. It will be referred to probably many times.

The CHAIRMAN. Without objection, the memorandum will be received.

(The documents referred to were marked "Exhibits Nos. 2438 and 2438-A to 2438-O" and are included in the appendix on pp. 17281 to 17299.)

Dr. ANDERSON. I would like to point out in connection with comments with respect to age groups, that the table supporting the chart shows that a very substantial number of persons are to be found among the youth population entering labor, so that would be a continuing problem, although to a lesser degree of intensity.

The CHAIRMAN. Let's refer to "Exhibit No. 2438-C."

Dr. ANDERSON. The table 2438-C supports the chart. It is an important point to make because we are dealing not only with percentage of decrease and increase but actual numbers. It is an individual's concern that must be faced, and if you will note the figures, while they do show a downward trend of the youth population entering labor, as a matter of fact, the number of individuals concerned is quite large in each decennial period until 1980, there are 6,633,000 people in that population.

The CHAIRMAN. As I glance now at "Exhibit 2438-C," isn't there an apparent error there in the figures for new entrance to labor for

1950? That is represented as a positive increase of 0.9 percent, whereas the figures show a decrease under 1940.

Dr. KREPS. There is an error in transcription, you are correct, sir. It should be a minus 0.9.

The CHAIRMAN. It should be a minus. Let that change appear in the record.

Are there any others? Perhaps you had better run over that.

Dr. ANDERSON. No; there are no others.

The CHAIRMAN. Strange how my eye picked out the only one.

Dr. ANDERSON. Thank you so much.

Mr. HINRICHS. This table is headed "Estimated labor force of the future in the United States." The next to the last column of the table is headed "Totals, 20-64 years of age." You are, therefore, referring to the estimated labor force of the United States less than 64 years of age and not to the total labor force.

Dr. ANDERSON. That is right.

Mr. HINRICHS. There is a fairly substantial working group 15 to 19 years of age, many of whom make their entrance at that period, so that the definition in the first column, "New entrants to the labor force," doesn't mean that that group is necessarily making its first appearance, but that you regard them as unstably employed until they are 20 years of age, and still you do regard them as workers.

Dr. ANDERSON. That is right. The last column shows what proportion this population is of the estimated entire working population 10 years of age and over. So there is a substantial number of persons above 64 years of age, and below 20 years of age, who normally seek gainful employment. The assumption under which the table is made was that by one means or another, legislative, educational, old-age pension, and other forces, this group at the top and the group at the bottom would not enter the labor market.

The CHAIRMAN. I wonder, Dr. Hinrichs, if the Bureau of Labor Statistics has made any effort to check these figures of the National Industrial Conference Board.

THE POTENTIAL WORKING FORCE

Mr. HINRICHS. We are very much concerned in studies of the potential working force; particularly in connection with our occupational outlook service we are working on this question of labor supply. At the present moment the problem of estimating the percentages in each group, particularly as it applies to family population is extremely difficult. The last fundamental information that we have relates to the 1930 census. The 1940 census is going to show some very great differences in the percentage of the population who are ordinarily working, but this is a vital field in which we are working, yes.

The CHAIRMAN. Did not the unemployment census which was taken a couple of years ago develop any substantial statistics on this question?

Mr. HINRICHS. That, unfortunately, was not fundamentally a census, but a voluntary registration; a so-called sample enumeration was hitched onto that registration and gave us a sample census, but since it was incidental to the registration and was a mere means of

checking on the registration. it raised perhaps as many questions as it answered. It did throw some light on the question, and it indicates what was at the time an unbelievable increase in the proportion of women, particularly above 25 years of age, who continued to remain in the labor market. The 1940 census has been worked out with the utmost care in the light of the information that was developed in 1937, and I think is going to give us a more reliable estimating base than we can derive from the 1937 sample enumeration.

The CHAIRMAN. You refer to an unbelievable increase in the number of women above 25 who remain in the labor market. Why do you so characterize it?

Mr. HINRICHS. Well, I should say, myself, an increase which many people did not, cannot, believe took place.

The CHAIRMAN. In other words, you think the indicated result is not actually representative of the facts.

Mr. HINRICHS. The doubt arises for this reason: It is very difficult during a period of extensive unemployment to phrase questions with reference to the status of the worker clearly enough so that you don't do one of two things. You may unduly limit your concept of people wanting jobs and seeking work. I can illustrate that by saying that if you insist that a person has to be actively hunting for a job to be counted as unemployed, you don't make sense when you come into a community with a single mine or manufacturing enterprise that is closed down, where the workers will hunt work as soon as the whistle blows, but as long as the plant or the mine is totally closed down there is nothing to hunt and everybody in the community knows it.

Therefore, if you make your definition extremely rigorous with reference to the activity of the individual hunting a job, you tend to underestimate the magnitude of your problem. If, on the other hand, you define your question very loosely as one of wanting work, you may stimulate respondents to say yes, they do want work. The best example of that sort of thing—

The CHAIRMAN (interposing). Though they don't need it.

Mr. HINRICHS. I regard any person who is actively interested in having a job as needing a job. A job is not only a means of maintaining income, it is also a means of maintaining an individual's self-respect. In most instances there is a very close corollary between wanting a job for economic reasons and wanting a job in order to be at home in the society in which the man or woman is living.

Need, so far as I am concerned, narrowly defined, isn't a relevant criterion to the question, "Is a person employed or unemployed?" It is relevant if you are asking, "Does this particular unemployed person need underwriting by the public because he doesn't have a job?" Some people, some of the unemployed, come in that category; others do not.

To just take the other extreme that I am talking about, an over-registration of a desire for work, you have a large number of people who are in and out of the labor market. The group in the cities that come in for the Christmas retail trade are perhaps the best example—a very important source of income to them, but many of

these people do not normally count upon working throughout the entire year.

Now, a woman who normally works at Christmas time and not during the rest of the year goes through a period of transition between the time in, let's say, September, when she is definitely not in the labor market, to December, when she is actually employed. There comes a period just before her employment when she certainly wants work and is counted at that time as unemployed. Actually, she becomes unemployed if she doesn't get work in the Christmas peak. I am not excluding her at certain times from the group of the unemployed. But I do say that there is a period just before her annual entry to the labor market when a question whether or not she wants work may stimulate her to say, yes.

That group is not the bulk of the people who respond, "Yes; we do (or do not) want work," but it may be large enough by hundreds of thousands, or possibly by a million or so, to make the question of the enumeration of the different categories extremely difficult. That, as I say, has been carefully approached in the present census. It was not possible to do that job back in 1937.

The CHAIRMAN. In other words, you don't place very much reliance in the figures of 1937?

Mr. HINRICHS. I think they are significant guides, but I don't think we learned at that time as much as we should have.

The CHAIRMAN. Dr. Kreps, it is quarter after 12. How much more time will you need?

Dr. KREPS. I could finish in about an hour if there weren't questions.

The CHAIRMAN. Well, the committee, then, will stand in recess until—

Mr. HINRICHS (interposing). Mr. Chairman, may I have 1 minute on this table that has been introduced, just to close that?

Mr. KREPS, in this table that was marked "Exhibit No. 2437," which gives the occupational distribution of gainful workers, 1880-1939, in percentages, you referred to the relative stability of the percentage that wage earners constituted of the total working force, pointing out some decline in that percentage since 1910. By and large, those percentages indicate stability.

You referred to this table as showing some of the basic occupational changes that have taken place.

Dr. KREPS. Groups of occupations; yes.

Mr. HINRICHS. It refers to very broad groups of occupations within which there may have been very substantial occupational displacements. For example, the relative constancy of the wage-earner proportion between 1930 and 1939 was completely useless from the point of view of indicating stability of employment for cigar makers. It doesn't indicate particularly what happened to men that had been engaged in the hand-rolling process in strip steel mills, so that inside the constancy of some of these percentages there was a tremendous churning that was going on in individual occupations, and if we are talking about technological displacement and its relationship to occupation, you are thinking really along two lines, one possibly the effect that the technological change in general may have in developing a requirement for a higher skilled group, as for example more professional people per thousand workers, or more clerical workers, if that were the case; and then you also need to think the problem through

on the level of the occupations inside each of these distributions of what happened to cigar makers, what happened to steel roll operators, what happened to hand transfer knitters, and so forth, and so on.

Is that correct?

Dr. KREPS. Yes; I agree.

Dr. ANDERSON. Mr. Chairman, may I make one addition that is pertinent at this point? The table refers to an occupational distribution of gainful workers as the census uses that term "gainful workers." This is not a distribution of employed workers, as would be implied from Mr. Hinrichs' remarks. This is a distribution of the way in which workers say they are normally employed. In other words, it presents an over all, and doesn't refer to employment or disemployment or displacement of workers, but it does give you a framework picture of the distribution of gainful workers seeking employment or employed.

The CHAIRMAN. Thank you.

The committee will stand in recess until 2:15.

(Whereupon, at 12:20 p. m., a recess was taken, to reconvene at 2:15 p. m. of the same day.)

AFTERNOON SESSION

The hearing was resumed at 2:25 p. m. upon the expiration of the recess, Senator O'Mahoney, the chairman, presiding.

The CHAIRMAN. The committee will please come to order. Are you ready to proceed?

Dr. KREPS. Proceeding next to the question of capital saving innovations, I think it is not overemphasizing the point to say that probably the most astounding feature of the technical progress which holds us in its grip at the present time is the extent to which capital saving devices are being invented, items such as multiplex telegraphy, fire-protection systems, cheap artificial illumination permitting 24-hour operation, skyscrapers, geophysical prospecting, and all the myriad devices of rationalization.

I have prepared a small memorandum indicating specifically what some of these capital saving devices are, from three sources.¹ One is an article in the *American Economic Review*, entitled "Effects of Current and Prospective Technological Developments Upon Capital Formation," in which are cited actual mechanical improvements that have all resulted in greatly increasing the amount of product per dollar of investment and per unit of machinery. I will cite just one to give a notion of the general tenor of the article. In the electric-utility industry, for example, a topping technique has been put into practice in which exhaust steam from high-pressure, high temperature turbines is utilized by being discharged into the steam headers of lower-pressure units. This tends to increase the capacity of existing stations from 40 to 90 percent without an increase in fuel requirements and without corresponding additions to plant and equipment, a fact which is sometimes ignored by those who state the so-called capital investment needs of utilities.

Similarly, I have got together certain excerpts from a study on inventions published in the two-volume work by Hoover's Committee on Recent Economic Changes and in that they have a section listing

¹ See "Exhibit No. 2489," pp. 17300.

a variety of industrial processes and the savings in costs brought about by these industrial processes.

The CHAIRMAN. Do you state what that committee was and how it was constituted?

Dr. KREPS. President Hoover, if my memory is correct, had summoned together a committee consisting of experts in various fields, labor, industrial relations, foreign trade, and the like, to trace the changes that had taken place in the twenties and they came out I think in 1930, or thereabouts, with a report called *Recent Economic Changes*. In that report there was a rather extensive chapter on industrial rationalization and industrial innovations. It is from that report and from a table in that report that I have taken an excerpt which gives a few examples of the type of capital saving innovations introduced at that time.

The CHAIRMAN. What do you mean by capital saving innovation?

Dr. KREPS. One that enables a given firm to produce the same volume of business, either in physical amount with the same machine or with a machine costing less money; that is, either the product per dollar of invested capital is larger or sales are larger per unit of technical equipment, sometimes without supplanting a single laborer. It still takes one laborer to operate the new machine. He just has a better machine.

The CHAIRMAN. To simplify it, just a cheaper machine to do the same or better work in terms of output?

Dr. KREPS. That is correct.

Mr. HINRICHS. Capital saving is also labor saving, isn't it?

Dr. KREPS. Capital-saving devices, as my outline indicates, save labor in the production of the machine, if the machine itself is actually made cheaper, and in part answers the question whether labor is reabsorbed in the machinery-making industries. Capital-saving inventions have tended to reduce the amount of labor that can be reabsorbed in the capital-making industries.

To quote certain other examples listed in this memorandum, the American Woolen Co. reports for 1939 that it has only about half as much plant and equipment today as in 1924, but nevertheless has the actual capacity to turn out the same amount of goods.

Similarly, in the iron and steel industry the average daily output of a typical 170-ton furnace increased from 302 tons per day in 1929 to 395 tons in 1939, a rise of 31 percent.

The CHAIRMAN. May I interrupt to say that we have with us this afternoon Mr. George E. Bigge of the Social Security Board, and I want to say, Mr. Bigge, that we will be very happy to have you ask any questions that may occur to you.

Mr. BIGGE. Thank you, very kindly.

The CHAIRMAN. The committee, of course, realizes that this is a subject in which you will naturally be interested, and we will be very happy to have any contribution you might care to make by way of question or statement.

Dr. KREPS. To show in detail what happens, I have taken an excerpt from a study on the textile industry, and cotton spindles specifically, which shows that cloth production per active spindle has increased from 276 million square yards in 1929 to 410 in 1939. Although the number of spindles has gone down, the increased effectiveness of the use of the spindles has actually raised the capacity beyond what we had when we had more spindles 10 years ago.

I would like to submit this exhibit from which I have quoted certain representative passages, for the record.

The CHAIRMAN. It may be received.

(The documents referred to were marked "Exhibits Nos. 2439 and 2439-A to 2439-D" and are included in the appendix on pp. 17300 to 17309.)

Dr. KREPS. To illustrate graphically what this means for our problem of idle money, I might say that it is possible to maintain and even increase productive capacity in a given industry with an actual curtailment of demand for capital. This is strikingly shown since 1920 in the automobile industry. I have a chart taken from Mr. Bell's book on *Productivity, Wages and National Income*,¹ showing the decline in fixed capital investment in the automobile industry since 1926 to a level that is now less than 80 percent of what it was in 1926. At the same time the capacity of the industry has not diminished.

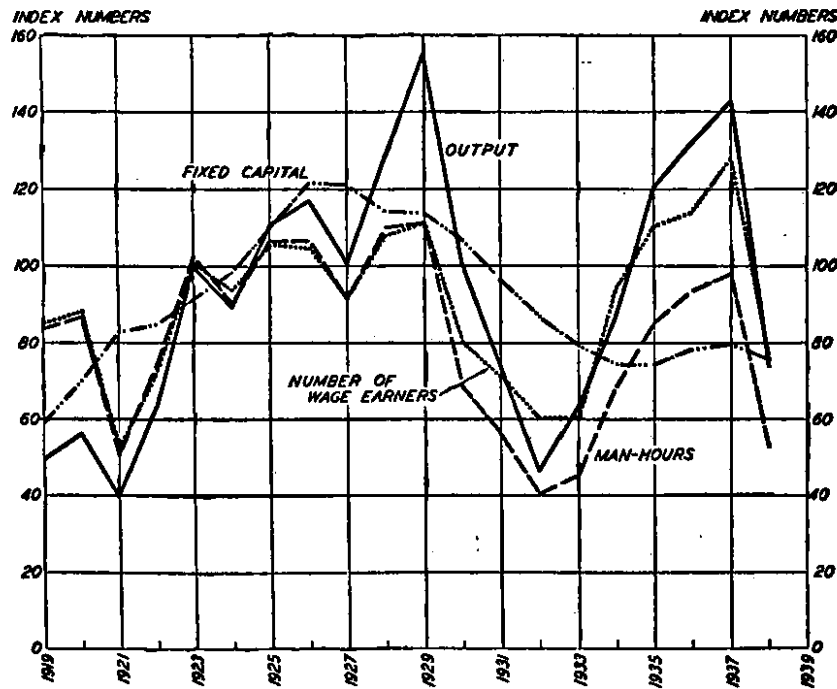
I would like to submit this chart, together with the table, as an exhibit.

The CHAIRMAN. It may be received.

(The chart referred to was marked "Exhibit No. 2440" and appears below. The statistical data on which this chart is based are included in the appendix.)

EXHIBIT No. 2440

FIXED CAPITAL INVESTMENT, OUTPUT, AND EMPLOYMENT IN THE
AUTOMOBILE INDUSTRY, 1919-38^a
(1923-25 = 100)



¹ Spurgeon Bell, *Productivity, Wages and National Income*, Brookings Institution, 10:40.

RATES OF RETURN ON INVESTED CAPITAL FOR THREE MAJOR AUTOMOBILE COMPANIES,
1927-1937

Year	General Motors	Chrysler	Ford	Year	General	Chrysler	Ford
1927	48.77	43.49	-3.97	1934	15.19	11.10	3.75
1928	45.75	34.91	-10.31	1935	25.62	40.61	3.25
1929	37.02	19.37	13.73	1936	32.82	61.12	3.98
1930	20.71	.71	5.79	1937	28.23	48.89	1.45
1931	15.64	4.35	-4.93	Average	25.25	23.59	.04
1932	1.34	-6.86	-10.46				
1933	12.67	15.68	-1.20				

Source: Federal Trade Commission, *Report on the Motor Vehicle Industry*, Washington, 1939, pp. 487, 618, 671.

Dr. WALKER. Is that accounted for in any way by the abandonment of plant?

Dr. KREPS. I don't know the detail of it, and as a matter of fact the detail will be developed in some hearings that we shall have, so I would rather have the industry speak because they have accurate first-hand knowledge. I do want to call attention to the fact that the decline in fixed capital investment can probably not be ascribed to a lack of sufficient profits in the industry to attract new capital. Throughout this period, and particularly in 1926, the industry enjoyed substantial profits and rates of return that were really above that of the average of industry generally. Such profits, however, failed to attract new capital investment, for, as this study indicates, the total amount of fixed capital investment in the industry began to decline in 1926. It is said that the most extensive investments actually made in the period were made by one of the firms that did not have nearly as good a profit record as some other firms. It changed over from a model T to model A.

In short, the alert, highly progressive managements of the automobile industry put into practice in their plants the most efficient new devices, machinery, processes, and tools known, plus all that scientific management had taught them. They thus created a capacity in excess of their 1937 volume of business. Relative to their volume of output they put in all the equipment that they needed, but so much of it consisted of capital-saving devices that total investment in fixed plant went down.

THE EFFICIENCY OF CAPITAL

Dr. KREPS. The efficiency of capital has also increased in other industries. This is not a unique case. I should like to submit a table of the record of fixed capital compared with output and employment in manufacturing, class 1 railroads, electric light and power, automobile and parts manufacturing, iron and steel manufacturing, and the cotton textile goods industry.

The CHAIRMAN. The table may be received.

(The table referred to was marked "Exhibit No. 2441" and is included in the appendix on p. 17310.)

Dr. KREPS. Such increases in the efficiency of capital may result, of course, from production control, time and motion study, budget control, orderly marketing, intelligent forecasting, improvements in shipping methods, salvage and waste reclamation, improvement in

service departments and tool control, betterments in inspection and office methods, but all tend to get more output for the same dollar of capital invested. The significance of such developments for the problem of idle money is obvious.

In the words of Lewis Mumford in his classic volume, *Technics and Civilization*:

Whereas the growth and multiplication of machines was a definite characteristic of the paleotechnic period, one may already say pretty confidently that the refinement, the diminution, and the partial elimination of the machine is a characteristic of the emerging neotechnic economy.¹

In the thirties, as before, there has been no hesitancy to invest capital in places where there has been a demonstrated need for it. To enumerate merely one or two examples, productive capacity in the rayon industry, in electric refrigerators, and in a number of chemical industries has more than doubled, even since 1935. Some of the largest chemical companies are now manufacturing substantial portions of their output in products they did not even produce in 1929. Monsanto Chemical Co. has reported recently that products whose commercial manufacture they had started since 1929 accounted for 39 percent of sales in 1938.

According to Shelby Cullom Davis, treasurer of the Delaware Fund, Inc., in a pamphlet entitled *The Investment Decisions of Industry*, many companies have changed completely from one industry to another. [Reading:]

Automobile accessory companies became builders of bathtubs, refrigerators and other household utensils. Automobile companies went into air conditioning. * * * Remington Rand went from typewriters to electric shavers, American Fork and Hoe from agricultural hand implements to sporting goods and railway track implements.²

In other words, industry has not been reluctant to make new investments when there was a market. Probably in no instance is this better shown than by the du Pont Co. in their annual report of 1937, that products relatively unknown in 1929 accounted for about 40 percent of their total sales that year.

The CHAIRMAN. What year was that?

Dr. KREPS. '37.

The CHAIRMAN. In 1937 products which were relatively unknown in 1929 accounted for 40 percent of the total sales?

Dr. KREPS. That is correct.

The CHAIRMAN. Was that in units of commodity or in dollars?

Dr. KREPS. In dollars. Among these products were some Duco finishes, Dulux enamels, Neoprene, synthetic camphor, Ponsol dyes, anhydrous ammonia, synthetic methanol, urea, titanium pigments, Viscose rayon, cellophane, and cellulose film.

The CHAIRMAN. All of those products, I suppose, would fall into the category of which you spoke this morning when you were discussing the cooperative nature of modern invention and discovery.

Dr. KREPS. That is correct.

The CHAIRMAN. These could be produced only by group activity, research, and study of a number of persons in the modern type of laboratory.

¹ Lewis Mumford, *Technics and Civilization*, Harcourt, Brace, New York, 1934, p. 258.

² Shelby Cullom Davis, *The Investment Decisions of Industry*, p. 8.

Dr. KREPS. That is right, by being alert.

The CHAIRMAN. Maintained by an institution, or by one of these large corporations.

Dr. KREPS. Exactly.

In 1927 they had only 10,700 workers making products like this. In 1937 they had 18,000. During the same period the company's investment in facilities for manufacturing these products increased from \$65,000,000 to \$174,000,000.

The CHAIRMAN. How many of these products are substitutes for natural products and how many of them are completely new products that were never used before, and which therefore do not compete, or compete only slightly, with previously known commodities or natural resources?

Dr. KREPS. That makes a larger demand upon my information concerning the chemical industry than I possess, but it is quite clear that synthetic methanol represents a substitute for a natural product such as you spoke of, that some of the finishes represent products new in composition, products that resulted in greatly decreasing the expense of painting automobiles and gave us a much superior finish. At the same time they also displaced some of the inefficient materials and inefficient hand methods and other methods.

Similarly, cellophane has in part developed a new market, as all these products tend to do, and in part supplanted an old market. When I say "supplant" I never want to be taken to mean 100 percent. For instance, this morning I talked about the electrical refrigerator tending to supplant the ice plant, but actually the sales of natural ice have not gone down a great deal. The need for refrigeration has become evident to people through the advertisement of mechanical refrigeration, so you have a larger volume of output, with the older industry finding a niche in this larger volume.

The CHAIRMAN. The electrical refrigerator can go into homes which could not possibly be served by the ice man.

Dr. KREPS. It works both ways. That is, you see, the factor of interindustry repercussion, which makes each particular commodity a study in itself. I have written a book which is devoted to one product that probably the members of the committee have rarely heard about, sulfuric acid, and yet problems of this sort arise, interindustry competition, intercommodity competition, joint cost, and developments of one sort or another, interprocess competition within the same industry.

Mr. PIKE. You think possibly among such products ethyl fluid might be one of the really new nondisplacing things?

Dr. KREPS. One would think so.

Mr. PIKE. That is as near as anything I can think of.

Dr. KREPS. Yes.

Incidentally, in these products, since the first time they were put on the market there has been a 40-percent decline in the price quoted in 1928. That again is a result of progress in technology.

At the present time industry needs more market rather than more capacity. Most of industry is equipped to produce a \$90,000,000,000 or \$100,000,000,000 national income. In the symposium of opinions of business executives in the *New York Sun* in its annual review

edition on Saturday, January 6, Lincoln Cromwell says for the textile industry:

There is little capital going into new cloth mills. Those we have can oversupply the market on two 40-hour shifts.

The CHAIRMAN. That is another way of saying that the problem now is one of distribution rather than of production.

Dr. KREPS. Yes; I think that would follow.

The CHAIRMAN. Do you find any difference of opinion on that?

Dr. KREPS. There is some difference of opinion on that topic.

The CHAIRMAN. What is the contrary view?

Dr. KREPS. Well, some feel that you must have an investment in capacity irrespective of whether that capacity is going to be used or not, that that investment in capacity then stimulates consumption and gives better distribution.

Similarly, railroad executives were almost unanimous on the point, to quote A. N. Williams of the Lehigh Valley Railroad, that—

The railroads are ready for more traffic when it comes. * * * Railroads are getting more out of their power and equipment than ever before. * * * We cannot escape the fact that the railroads now handle more traffic with less cars and locomotives.

In fact the only industries even at the high level of operations last fall, equal to 1929, that felt a strain upon capacity to produce were those that make war equipment, notably the airplane industry. This means, of course, that calculations tending to show how much obsolescence exists in American enterprise, based on 1929 valuations and so-called nonreplacement, lack solid substance. If it takes only a \$5 machine to produce the same amount of stuff as was produced by a \$10 machine 10 years ago, obviously there is not \$5 of underdepreciation or of obsolescence which can be represented as measuring a demand for capital goods. Such calculations completely ignore the most significant technological advance of the last 20 years, that of capital-saving innovation.

TECHNOLOGY AND THE BUSINESS CYCLE

Dr. KREPS. I turn to the question, Before the advent of technology, was there a modern business cycle? The connection between the modern cyclical fluctuations of business and the use of large amounts of fixed capital and equipment is stressed by all analysts of the business cycle, but especially by Bouniatian in his classic volume *Les Crises Economiques*.¹ Obviously a great portion of the fluctuation of business is due to the fact that errors in plant investment are made.

(Representative Sumners assumed the chair.)

Dr. KREPS. The further away from the consumer the original decision to try to fill his demand, obviously the greater chance for things happening which were not anticipated. No one who has analyzed the effect of technology on modern life has ever come to any conclusion different from that which Dr. Harry Jerome of the National Bureau of Economic Research summarizes in his volume on *Mechanization in Industry*, in the following words:

Finally, while advancing mechanization probably tends to lessen seasonal fluctuations in industry, there is reason to suspect that it may aggravate

¹ Mentor Bouniatian, *Les Crises Economiques*, M. Giard, Paris, 1922.

cyclical fluctuations through intensifying competition, enlarging the function of capital goods in the economic system, and * * * increasing the share of expenditures in those lines, such as durable consumer goods, the effective demand for which is characterized by sharp reductions when a recession sets in. In brief, to the extent that mechanization contributes to the unpredictability and the variability of economic processes, it may likewise contribute to an aggravation of the severity of cyclical fluctuations.¹

Or, in the words of Emil Lederer, in his volume *Technical Progress and Unemployment*, written for the International Labour Office, "technical progress aggravates the typical phenomena of depression."² Investment in capital goods starts credit expansion and usually results in malinvestment or so-called overcapacity in some line or other. When the bubble collapses we have the modern business depression—want in the midst of plenty—a new phenomenon completely different from those periods of feast and famine that existed in antiquity. Depressions then were periods of scarcity. Today scarcity is one way of making profits. Today it is abundance that characterizes depressions—a direct result of the miraculous ability to produce goods given us by technology.

DOES INDUSTRY NEED MORE CAPACITY?

Dr. KREPS. The next question I wanted to deal with has been argued about a great deal: Who has received the benefits of technology in the last 20 years? And I don't propose to embarrass the committee with a large treatise of statistics on prices and the rest, but I shall give you the summary results of two or three such studies.

Representative REECE. Would an interruption bother you before you leave the question which you were discussing when I came in? I don't want you to repeat it for my benefit, but having only heard part of it I am not quite sure about the conclusions which you reach. Was this conclusion that we did not need a further expansion of plants at this time, but that the problem now was largely one of administration?

Dr. KREPS. No; I was merely emphasizing that the question of capacity is one that isn't bothering American business at the present time; that is, the question of inability to give the consumer what he can pay for. What they really need is more market, more consumers coming on the market with funds ready to buy those goods. In other words, there was no problem of underinvestment in the sense that industries were begging for capital and couldn't get it.

Representative REECE. We are not yet in a position of the young man who comes into a large inheritance, to be under no necessity for putting it to work, but only the necessity for administering and spending.

Dr. KREPS. No.

The VICE CHAIRMAN. Doctor, don't you think it is pretty well agreed by everybody going around the country, without regard to statistics or data, that we have plenty of everything to produce everything we need if we could just manage to distribute it around?

¹ Harry Jerome, *Mechanization in Industry*, National Bureau of Economic Research, New York, 1934, p. 22-23.
² Emil Lederer, *Technical Progress and Unemployment*, International Labour Office, Studies and Reports Series C (Employment and Unemployment, No. 22). Geneva, 1935, p. 248.

There is no dearth, there are plenty of people to produce food and there are plenty of machines to produce all the things we need, and we have plenty of railroads to haul them around.

Dr. KREPS. I would say that is certainly a strong current of thought:

The VICE CHAIRMAN. All the folks who go around the country a little bit know that pretty well, don't they?

Dr. KREPS. I think so; yes, sir. Sometimes this problem of idle money is approached from the point that somehow or other there is an enormous demand in industry, but for some reason or other, it doesn't attract idle money.

The VICE CHAIRMAN. The only reason a person who has some idle money keeps it idle is because he doesn't know where he can make a safe investment profitably. If you and I had \$50, we would be governed by the same application, wouldn't we?

Dr. KREPS. I think so.

The VICE CHAIRMAN. And the man who has \$50,000,000 is just the same sort of a person.

Dr. KREPS. Yes, I think the problem is more market. There is the neck of the bottle.

The VICE CHAIRMAN. Yes, sure. It doesn't take a smart man to see that. Every man knows that.

Representative WILLIAMS. Have you any figures, or are there any available, that show the percentage of capacity of production that is now being utilized in general?

Dr. KREPS. There has been no survey of potential capacity since 1929. The Brookings Institution made a good survey,¹ and then there was another one by Loeb and associates, called the *Chart of Plenty*,² which has been subjected to considerable criticism one way or another. We do know, looking at industry after industry and judging by the reports of executives in the industry—I have just quoted from the statements given by executives to the *New York Sun* in the annual review edition of this year—that in industry after industry the executives say, "We can fill the demand for an increased volume of business, even over 1929 levels."

Representative WILLIAMS. That being true, of course there would be no demand for capital investment further along that line, would there?

Dr. KREPS. There is a school of thought that feels exactly that way, among which I would class myself.

Representative WILLIAMS. But upon what basis does the other school of thought rest? What is the economic theory back of the other idea that it is necessary or proper or useful to invest capital funds where there isn't any necessity for it, from the production standpoint? I can't see, myself, any basis for that kind of thought. There may be one.

Dr. KREPS. It is prominently argued, at any rate.

The VICE CHAIRMAN. You know, we have a lot of talk here about credit, about doing something about credit. Well, as Judge Williams indicates, credit doesn't help you to sell your goods. Somebody might borrow some money and buy some of your goods, but when you got

¹ Nourse and associates, *America's Capacity to Produce*, Brookings Institution, 1934.
² Loeb and associates, *The Chart of Plenty*, Viking Press, 1935.

ready to collect, he probably wouldn't have any more money than when you sold them to him. We seem to be adopting in this country the general psychology of the old lady who thanked God she had been able to borrow enough money to pay all her debts, and it doesn't seem to work.

Dr. KREPS. This controversy is just one of the controversies in the field of technology, and is no larger than that controversy which I am now going to raise, which is, Who has received the benefits of technology?

WHO BENEFITS FROM TECHNOLOGY?

Dr. KREPS. The extraordinary increase in production represented by the fact that in the United States in 1933, 43 men produced the volume of goods that required 100 men in 1899 has been characterized by Dr. Mills in an article entitled "Man and the Machine," which he wrote for the magazine *Today* in its issue of November 28, 1936, as—

A new industrial revolution, a revolution that strikes more deeply, falls upon a much wider front and a more complicated industrial system, and threatens more violent disturbances than did its progenitor of 150 years ago. . . . The heart of the problem that arises out of such technical and organizational advance—

he goes on to say, is the question whether it will mean—

on the one hand exceptional prosperity for limited groups, with concurrent unemployment of men and other productive resources or, on the other hand, higher living standards for the population at large.

Professor Mills has shown in his studies that prior to 1914 the benefits of technology were on the whole passed on to consumers and farmers in the form of lower prices. As a result 112 men were hired for every 100 men displaced. But after the World War a change took place. Even in the period from 1923 to 1929 only 91 new men were employed for each 100 displaced. These may not have remained unemployed for long at a time. They crowded into such occupations as hotel services, restaurant cooks and waiters, taxi drivers, beauty shop employees, garage workers, gas station attendants, and the like. But they were the first to be thrown out when the bubble broke in Wall Street in 1929.

If I may be permitted to quote Professor Mills here rather extensively:

Under prewar conditions, when higher productivity was promptly reflected in lower costs and lower selling prices, new contacts were established without great delay and without persistent hardships. * * * For a number of reasons, the gains in production since the war have gone largely to the managers and owners of industrial plants and to the men who work for industrial plants. * * *

Here is the central fact that emerges from this analysis. A host of economic frictions impede the readjustments made necessary by increasing industrial efficiency. The machine process itself, with its heavy fixed charges, has placed major barriers in the way of prompt adaptation of prices to changing circumstances. Most of the obligations of a modern business are fixed, in terms of dollars, and these rigid monetary charges tend to freeze great areas of the price system. To these elements we must add monopolistic and semi-monopolistic controls, public regulation of rates, the persistence of customary prices and scores of other factors that impede price changes and restrict the flow of capital, labor and enterprise. It is these frictions, apparently inescapable today, that prevent the prompt and full utilization of technical improvements.¹

¹ Frederick C. Mills, "Man and the Machine," in *Today*, Nov. 28, 1936.

The VICE CHAIRMAN. Doctor, as I understand your statement, it is that these technical improvements increase the amount of capital investment necessary to develop a unit of production that is economic in its operation.

Dr. KREPS. Right.

The VICE CHAIRMAN. That is pretty significant, isn't it?

Dr. KREPS. I think so. I think it is the heart of the problem.

The VICE CHAIRMAN. Mechanical developments tend to put the man of relatively small capital out of the picture insofar as concerns his ability to compete with the person who has more money and can buy modern equipment of sufficient size.

Dr. KREPS. In many industries that is the result.

The VICE CHAIRMAN. And in addition to that—I don't know whether this is beside your point—it requires a pretty big producing unit to be able to maintain an agency of distribution that can get to the general market. It seems to me that is in the picture.

Dr. KREPS. That is correct.

The VICE CHAIRMAN. I don't want to make a speech, but it seems to me that regardless of what may be to the advantage of the other side, the tendency to uniform wages everywhere it seems would tend to eliminate the small machine of probably not the highest productive capacity for unit of product. Take a cotton mill, an operator whose machinery is not the most modern but still can produce cloth, but not as cheaply as the better machines would produce it—it would seem that probably the operator of that plant couldn't pay as much money as the operator of the most modern plant. That seems to me to be in the picture. There may be something on the other side that quite overbalances that, but those things all seem to be tending in the direction of the concentration of the opportunity to produce and market.

Dr. KREPS. That is correct.

Representative WILLIAMS. Did I understand you to say, Doctor, that during the twenties for every 100 employees displaced, 91 were reemployed?

Dr. KREPS. In industries in which displacement occurred, that is correct.

Representative WILLIAMS. What has been the record since '29?

Dr. KREPS. We don't have the figures. I am giving you the results here of about 2,000 pages of statistics in 3 volumes by Frederick C. Mills, and that study of Mills has not been carried on to date in the same form. There have been other studies but they don't permit me to answer your question by quoting any number. We know that productivity has increased at something like a steady rate right through the thirties.

Representative WILLIAMS. And do you know that the displacement has been greater or less?

Dr. KREPS. All I could say in the absence of such definite measurements as Dr. Mills gives is that the evidence that I see leads me not to change what I conceive to be Dr. Mills' contention. In other words, there hasn't been so far as I can see, any tendency for displacement to become less in the thirties than it was in the twenties.

Representative WILLIAMS. It seems to me that is rather significant for our inquiry here to try to determine if we can whether or not

that tendency is increasing more and more. Of course, if that study hasn't been made, we just haven't got that information.

Dr. KREPS. It is a very difficult technical matter to make a relatively simple statement such as the one I have just made.

The VICE CHAIRMAN. And your statement is that from the best study you have been able to make, you are convinced that the increase of employment has not kept pace with the increase of productivity.

Dr. KREPS. Yes.

The VICE CHAIRMAN. And that would seem to indicate, as a matter of fact, it does not always follow that improvement in machinery results in better employment.

Dr. KREPS. No, not unless other things are adjusted, prices and a whole host of other factors, if you are going to get an increase in employment with an increase in productivity.

The VICE CHAIRMAN. It would seem probable to me that where the energy, the intellectual energy, of the people is devoted too much to improving the mechanism and not enough to taking care of the people who are released by reason of improved machinery, that it would be a question just how substantial progress that is when you put a machine in the place of a living human being and he walks the street and eats the bread of charity. Somebody may brag on the man who put the machine up there, but it would seem to be a serious question fundamentally as to just how much good he has done to society, until society does something about it.

Dr. KREPS. I would agree that if we don't make the economic adjustments, so the hind wheels of the automobile go as fast as the front wheels, or our technology—in other words, if we don't synchronize our changes, we are in for major spells of jerky production and distribution.

The VICE CHAIRMAN. The Government is continuing, however, to offer a premium, to offer an inducement of 17 years of monopolistic use to anybody who can figure out a machine that will put somebody else out of a job.

Representative WILLIAMS. While we are on that question of productivity and the relation to what it was 10 years ago, is it already in the record whether or not there has been an increase or a decrease in productivity during the last 10 years, from '29 to '39?

Dr. KREPS. Yes; I placed in the record this morning a series of exhibits.

Representative WILLIAMS. Have you that in percentages? I am talking as a whole, not as applied to any particular industry, just to get that broad picture of it.

Dr. KREPS. As a whole it is about 30 percent, somewhere in that vicinity, varying enormously from industry to industry.

Representative WILLIAMS. But the average productivity has increased during that decade 30 percent?

Dr. KREPS. In the manufacturing industries which were examined by the National Research Project.

Representative WILLIAMS. During that same time has consumption kept pace with productivity?

Dr. KREPS. I don't have the figures on consumption or consumption per worker. My recollection is—and I would defer to the Bureau of Labor Statistics in this regard—that real wages per worker employed are higher today than they were in '29.

HOW MANY ARE NOW EMPLOYED?

Representative WILLIAMS. And just one other question now: What about the number of actually employed compared with '29?

Dr. KREPS. I don't have those figures at my finger-tips. I would have to go to the Bureau of Labor Statistics and try to secure them.

Representative WILLIAMS. To my mind there are some very fundamental statistics that we certainly ought to agree on in this hearing if they are available, and it seems to me they should be, and that is one of them, whether or not there has been an increase or decrease of employment in the productive industries in the country and to what extent the productivity has increased, whether or not consumption has kept pace with productivity, and to my mind, what has been the labor cost to industry in this production.

Dr. KREPS. I submitted figures this morning showing the decline in unit wage cost that is accompanying recent increases in productivity. The reason I hesitated about answering your question on the total volume of employment is of course that we have had no good record of the number employed. All of us have to reason from the small sample for which the Bureau of Labor Statistics is collecting monthly figures. They are estimates.

Representative WILLIAMS. The reason I am asking that question is to try to get some authentic figures, because it ranges from nothing to a great many. It has got a very wide range in the discussion that is taking place in the newspapers and among some of the supposed economists of the country, and it does seem to me that we ought to reach some kind of a reasonable, fair, approximate understanding as to what is the truth about the matter.

Mr. HENRICHS. Mr. Chairman, there doesn't seem to be a very great range with reference to the estimate of the number of people employed. In the case of manufacturing industries the comparisons can be made quite exactly. In 1937 approximately the same number of people were employed in manufacturing as in 1929. At the present time the number is slightly less than it was in 1937 or 1929. The estimates for trade are not as good as the estimates for manufacturing. They indicate approximately the same levels of employment now as in 1929. We have no census information on trade since 1935. The census figures of the present year may indicate that there is some underestimate currently of the amount of employment.

In the construction field the figures on employment and all other aspects of that fundamentally important industry are woefully inadequate. We do know, however, that construction employment is very substantially below the levels of 1929. There is some question with reference to the figures on transportation.

In the railroads we know that the level of employment is substantially below the levels of 1929. As far as we can get any indication for the total field of transportation that would also be somewhat less than in 1929. The difficulty is there that we measure the areas where employment is decreasing more accurately than we measure the areas like motor trucking where the employment is increasing, and again I refer, as I have done several times in the past, to the census information against which we have to put current estimates periodically as they become available.

If you add up all of the figures that we can now put together as a basis of estimating nonagricultural employment, our current estimates of nonagricultural employment would be 33,800,000 people as against an average in 1929 of about 36,000,000 in nonagricultural employments. Now if you put together the question marks that people place against these estimates (not that the estimate could be better made at the present time, but simply that there are fields for which information is sadly lacking, where there is no basis of making a really sound estimate) and add up the probabilities, there is a probability that that estimate of 33.8 million is somewhat too low; we wouldn't be astonished if in various fields for which we have comparatively little information, casual workers, various types of service industry, we found that in the aggregate that figure was as much as a million too low.

At the end of a period of 10 years of the most violent changes in employment that we have ever known, I do not feel that that estimate is altogether bad. It means that we are estimating within a margin of some 2 or 3 percent, and have been looking forward regularly to the fact that just exactly today our information is worse than it is ever going to be or could ever have been; that is, we have come to the end of a 10-year period, a census is now being taken in this week that will give us a more accurate tying point for this whole series on the basis of which projections will be made, or estimates will be made from month to month, over the next 10 years, and in 1949 as in 1939 certain parts of that estimating process are going to be dangerously inaccurate. But if you say, what is the relationship between employment now and in 1929, within approximate levels at least we can estimate it, in some lines very accurately, in other lines less accurately, and the margin of doubt is in the order probably of a million people as between the judgment of various people. We are quite sure it is not less than our present estimates would indicate.

(Representative Williams assumed the chair.)

AVERAGE COST OF PRODUCTION

Acting Chairman WILLIAMS. You have already put in the record the decreased labor cost to industry?

Dr. KREPS. I have.

Acting Chairman WILLIAMS. Now what has been the actual trend with reference to the cost of production?

Dr. KREPS. I haven't, of course, the figures on the total cost of production, but the unit wage cost—

Acting Chairman WILLIAMS (interposing). I understand you have that in, but I am asking now what is the trend so far as the total cost of production has been during the last 10 years.

Dr. KREPS. In a particular industry?

Acting Chairman WILLIAMS. No; over the whole field.

Dr. KREPS. I am afraid I am not competent to answer that question. I wish I could.

Acting Chairman WILLIAMS. In other words, whether the cost of production as a whole has decreased or increased over that period.

Dr. KREPS. Of course it would vary with the industry.

Acting Chairman WILLIAMS. Naturally so, but I am trying to get a picture of the whole industry.

Dr. KREPS. Prices are lower than they were in some years in the twenties, and raw material costs are different, and the like.

Acting Chairman WILLIAMS. Then I judge from what you say we have not made any study, there aren't any figures available, to give us an idea of what the trend has been during the last ten years in the field of production with reference to its costs.

Dr. KREPS. No; we would say on grounds of general theory that prices and costs tend to be in line. Presumably costs came down in about the same way that prices have come down, but you are quite right, there has been no survey. There have been, of course, studies of costs of particular elements in particular industries. There has been a summation year by year of what has happened to certain types of costs in those industries.

Acting Chairman WILLIAMS. I had the impression that the claim had been made by certain industries especially that labor cost of production had been very materially increased in the last few years.

Dr. KREPS. I think that you will find that such claims usually rest upon a confused notion of what is labor cost per unit as opposed to wage rates. Wage rates have risen, but of course the wage rate is not the same as labor cost. The factor of productivity has been ignored. The charts that I showed this morning indicate almost universally an increase in wage rates per hour, but at the same time so much greater increase in productivity that unit wage cost per unit of product, which is the important item in quoting price, has gone down, broadly, since the twenties.

Acting Chairman WILLIAMS. It would look rather reasonable to me that that being true, so far as the labor cost is concerned, it might probably be true as to the general cost.

Of course I realize that there are a number of elements that go into cost outside the labor.

Dr. KREPS. I was going to remark that probably some elements such as taxes may have risen appreciably.

Acting Chairman WILLIAMS. Interest may have gone down.

Dr. KREPS. That is correct.

NONPRODUCTIVE WORKERS

Mr. PIKE. While you are off the track a little bit, Doctor, may we take this additional trip around. I was looking at your "Exhibit 2437," which gives me some idea that a great deal of the saving made in the primary production, the saving in actual wage earners on a machine, has gone to other people a little bit farther from primary production, the managers and clerks and the free riders, you might say. In 1880, against 52.7 wage earners you had 10.9 distribution, managerial, and professional people; in other words, around 5 wage earners carried 1 white collar man. In 1939 as against 54.3 wage earners you had 26.93 riders, so that every 2 wage earners had to carry a white collar worker. It probably is inevitable, along with higher technological efficiency, to have more management and professional help around the factory. I would say the laboratory would be part of it—not really a free rider in that sense, but not directly engaged in production. There has been more overhead on business in the way of people not directly at machines.

Dr. KREPS. Yes; they have been classified by accounting systems as overhead.

Mr. PIKE. A difference of 5 to 1 as against 2 to 1 in 60 years is quite marked.

Dr. KREPS. Of course, a machine that does the back-breaking job may involve substitution of a clerical worker who is just as productive as were the people doing the back-breaking work.

Mr. PIKE. And also they have to put a lot more people on the road to peddle them.

Dr. KREPS. The conclusion that something has happened to prices since the World War which has prevented the benefits of technology from being fully distributed to consumers is one that is arrived at by a wide variety of authorities. The Brookings Institution came to something of the same conclusion in a well-known study on *Income and Economic Progress*.¹ That situation has not changed in recent years.

Dr. Mills, writing in the New York *Sun* as late as January 6 of this year, stated that while "some correction of 1933 distortions has been effected," and he meant by that the distortion which his study revealed in 1933—

there still exist price and wage disparities, exemplified by low farm prices, high construction costs, high costs of some capital goods and high labor costs in certain industrial processes, that make for unemployment, idle equipment and a low volume of production. The benefits of technical progress must be widely disseminated. Economic bottlenecks are created when the gains resulting from industrial improvements are retained by a few. Price reductions are the surest way of effecting the desirable wide distribution of productivity gains. The advance of some 30 percent in man-hour output in manufacturing industries since 1929 is only in part reflected in prices to consumers today.

The fact of technology, therefore, makes the work being done by the Temporary National Economic Committee on concentration of economic power of crucial importance. For technology is bound to cause aggravating problems to the economy unless the benefits of the machine are distributed to the consumer in lower prices. The best argument for, if not the proof and substance of, technical progress consists of the lower prices that are quoted to consumers. These savings from increasing productivity, if passed on to consumers, increase the purchasing power of millions of people and thereby give increased opportunities for employment to millions of businesses throughout the country.

THE GENERAL EFFECTS OF TECHNOLOGY

Dr. KREPS. Now I turn to the final part of the testimony, part 3, in which I try to give some picture of the general effects of technology. So far we have been talking exclusively about economic effects, effects on labor productivity, prices, and the like.

Acting Chairman WILLIAMS. I would like to ask one question just before you leave the subject you were just on: Have you any figures available to show to what extent these benefits in cost and prices have been passed on to the consumers?

Dr. KREPS. There are variable measures. Dr. Bell, in the study which was referred to this morning, has figures that would indicate that while a substantial proportion of the increase in productivity

¹ Harold G. Moulton, *Income and Economic Progress*, Brookings Institution, Washington, 1935.

was passed on to consumers in the form of lower prices, by no means all of it was.

Acting Chairman WILLIAMS. That is not only shown, I assume, in the reduced price, but perhaps in the increased efficiency of the service and the better material, also, that has been passed on by reason of these technological processes.

Dr. KREPS. Quite so.

Acting Chairman WILLIAMS. Not only a lower cost, but better materials, better goods.

Dr. KREPS. Probably the dominant form in which the benefits of technology have been passed on has been in leisure, shorter hours to those employed, and, of course, complete absence of employment to others, whose exact number we don't know.

Now, so far, only a few of the major economic effects have been considered, in fact only those likely to occur at a given moment of time. But an innovation rarely shows its full power except after years and decades have elapsed. Moreover, it shows itself with different power in different countries, causing all sorts of changes in social life, in government, in education, and in religion.

The automobile, for example, affects not only the railroads, but the family, the size of our cities, the types of crime, the tendency for county seats to grow, as well as our manners, and, according to some, our morals. It has undoubtedly stimulated the growth of suburbs, changed the nature of much of our hotel business, decreased the employment of domestic servants, changed marketing areas, and made oil one of the centers of controversy in international politics. It has saddled our State and local governments with a vast burden of debt for the building of roads, brought in central school systems, dotted the landscape with tourist camps and roadside restaurants and pine board retail huts, in addition to killing and injuring more people each year in the United States than the American Army lost in battle during the World War.

A sample of the types of effects which must be studied even to trace out the more important changes caused by one relatively simple invention is interestingly shown on Exhibit 2442, which I should like to submit for the record. I have only taken an excerpt of some of the changes that are here listed. Each one of those could in turn be developed. For instance, there is one item, "interest in sports increased, it is generally admitted," and that leads to a number of other effects. I merely introduce this to indicate the complexity of the results that occurs when you try to trace the total effects of technology, and yet that is what statesmen have to do. Fortunately, economists do not.

I would like to submit this for the record.

(Representative Reece assumed the chair.)

Acting Chairman REECE. It may be admitted.

(The document referred to was marked "Exhibit No. 2442" and is included in the appendix on p. 17311-17312.)

Dr. KREPS. Obviously it is impossible to do more than name some of the more important results, and a few of these are indicated in an outline which shows the different levels of analysis within which most discussions take place, and I propose to discuss briefly only the topics that are underscored. I should like not to read the outline in

its entirety, but to have it introduced into the record at this point, not as an exhibit but as part of the testimony.

Acting Chairman REECE. As part of your remarks? It may be so admitted.

(The matter referred to follows:)

Levels of analysis

	Business policy	Industrial policy	Economic policy	Public policy
Having reference to	The business enterprise	The industry or trade	The economy	The whole life of the nation, economic, political, social, artistic, educational, etc. Enlargement of human liberties Protection of weak against the strong
Primary objectives	More profits either by increasing or restricting production Larger size Increased economic power	Expanding markets Larger share of consumer dollar Maximum use of government to secure tariffs, loans and other aid	Equal competitive opportunity Maximum consumption Capacity production Full employment	Elimination of economic duress and fraud National security Conservation of natural and human resources
Dominant interest	The interest of stockholders or proprietors Industrial empire-building	The interest of the organized, typically the larger concerns	Greatest good of the greatest number Consumer sovereignty	The national interest, i. e., the political, religious and cultural mores comprising the American way
Specialist with practical knowledge	The business manager	The industrial leader The trade association executive	The economist	The statesman
Types of prices or price control desired	"Good prices" Concessions when necessary	Don't chisel (ump of business fallacy) "Stabilized prices" obtained by adjusting production, by implicit or agreed on formulae, and/or by "fair or unfair" trade legislation	Prices promoting maximum consumption Prices responsive to competition Prices uncontrolled by any one person or group	Monopoly the enemy of democracy Uneconomically high prices to regulate consumption, e. g., liquor, or insure self-sufficiency e. g. war chemicals Subsidized prices to promote consumption, e. g. housing
Payrolls	An expense limiting ability to compete A stimulus to labor effort	A barrier to lower costs and wider market	Mass purchasing power vital to mass consumption	A public cost, e. g. in time of war The proof and substance of public well-being
Costs of technology	Plants, tools and machines displaced. Increased overhead Market research Cost of developing market	Small businesses displaced Migration of industry Defensive investment Restrictive national planning, especially cartels	Consumer illiteracy Loss of investment in labor skills Vocational retraining Displaced labor force thrown on community <i>Gigantic economic wastes</i> Wastes of monopoly and monopolistic competition Concentration of production, employment and investment decisions in a few hands Recurrent business depressions	Breakdown of family unit of production Standardization of work Occupational obsolescence Loss of handicraft artistry Factory towns <i>Pressure groups</i> <i>Increased interdependence</i> Increased centralization of economic and political controls <i>Increased destructiveness of war</i>

Levels of analysis—Continued.

	Business policy	Industrial policy	Economic policy	Public policy
Benefits of technology	<p>Lowers accounting costs by substituting mechanical for human power</p> <p>Affords surer control of processes of production</p> <p>Provides outlet for surplus earnings</p> <p>Implements industrial empire building</p>	<p>Promotes standardization</p> <p>Provides common basis for associational activity</p> <p>Affords weapon against outsider and chiseler</p> <p>Softens rigors of competition</p>	<p>New commodities and services</p> <p>Inter-industry competition</p> <p>Inter-commodity competition</p> <p>Lower prices</p> <p>Improved quality</p> <p>Higher wages</p> <p>Shorter work week</p> <p>Less child labor</p> <p>Fuller utilization of natural resources</p>	<p>Broader basis for higher standard of living</p> <p>Increased leisure</p> <p><i>Increased opportunity to create a civilization</i></p>

Dr. KREPS. Then I should like to point out that in the outline I have sketched the various horizons of thinking on the whole question of technology. You will find you will be able to identify—I was going to say pigeonhole—the remarks of most people, and sometimes even all the remarks that they not only have made but will ever make, in one of these classifications.

For instance, the first group I list is that of "business policy," that which affects the individual business enterprise and its welfare. Those might be called, if you like, individual effects. Technology, for example, involves as costs such accounting figures as the plants, tools, and machinery displaced, the increased overhead, the market research, the cost of developing the market; the benefits of technology to the individual enterpriser represent substantially lowered accounting costs in addition to affording surer control of production, providing outlet for surplus earnings of that firm, and implementing their expansion.

Others will reason from the point of view of an industry. They get beyond the individual firm and its problems, and talk about the industry as a whole, generalizing usually for some section of the industry. Sometimes the industry is divided into small businesses and large businesses, those of one process opposed to businesses of another process, businesses in one region sometimes opposed to businesses in another region, but very often the experience and the economic reasoning of people tends to be guided by the fact that on the whole, the horizon of their thought is, What is beneficial to that industry?

And referring to the costs of technology, as far as the industry is concerned, the small businesses that are displaced represent a cost very often causing vigorous protest.

The migration of industry that takes place is a cost to the industry concerned; the defensive investment that is necessary, the restrictive national planning that takes place, especially of the cartel type.

ECONOMIC POLICY

Dr. KREPS. Then the level that goes beyond an individual industry and tries to consider the economy, the wealth-getting, wealth-using activities of men, is what I have termed "economic policy," and economic policy, as you notice, has different objectives from business policy. A business has to make profits or there will be no business.

But so far as the economy is concerned, profits is a lure or inducement. What we really want from our economic structure is something like equal competitive opportunity, maximum chance for business to grow, something like maximum consumption, capacity production, and full employment.

Similarly, so far as technology is concerned, technology involves certain definite economic costs that may not be met by the individual business, may not have to be met by them, such as the cost of occupational obsolescence or the cost of retraining workers whose skill has been supplanted, or finding jobs for workers who are no longer needed. Even though the business can get rid of them, and even though the industry can get rid of them, the economy cannot. You have to support these men. They represent social costs involved.

I should go on to say, so far as economic policy is concerned, that the benefits of technology in terms of shorter workweek and less child labor, fuller utilization of natural resources, higher wages, improved quality, lower prices, are benefits which sometimes the individual business may not like, particularly the lower prices. Whatever resistance there is to lower prices is rarely found on the part of economists.

Now, finally, the legislators' job is more difficult by far, because the legislator has to consider public policy, the national interest, the political, religious, and cultural mores comprising the American way, and the legislator often has to disregard what is good business and what is good economics because it is bad public policy.

Mr. PIKE. We could get the price of liquor down if it wasn't for public policy.

Dr. KREPS. And there are certain social costs of technology that have become important—factory towns, pressure groups, increased destructiveness of war; and there are certain social benefits to be achieved, to be achieved not by solving economic problems but by solving public problems, including that of an increased opportunity to create a civilization.

Now, as I say, when people argue on the question of technology, you will usually find them arguing from one or the other of these points of view, one or the other of these levels, and frequently they never get away from any one of them.

I propose only to look very briefly at the five points underscored, namely, the effect of technology in creating certain large economic units, its impact upon the problem of pressure-group politics, its impact upon our economic interdependence, its impact upon the increased destructiveness of war, and finally, its promise of a better civilization.

TECHNOLOGY AND MODERN BUSINESS EMPIRES

Dr. KREPS. Technology, in the typical instance, means the use of power, of specialized equipment, large factories, large plant, and large sums of money. In the railroad industry and public utilities, steel and automobile manufacture, the aggregates of capital required for efficient size are much larger than any but the extraordinary individual can supply. Consequently the corporation has been developed, which could mass the savings and efforts of hundreds of thousands of people so that we might have abundance.

These aggregates of industrial production have in the last century grown so much in economic power that they have become of primary significance in modern economic life, a significance which Woodrow Wilson, in an address in 1910 to the American Bar Association, expressed as follows:

A modern corporation is an economic society, a little economic state—and not always little, even as compared with states. Many modern corporations wield revenues and command resources which no ancient state possessed, and which some modern bodies politic show no approach to in their budgets. * * *

Society cannot afford to have individuals wield the power of thousands without personal responsibility. It cannot afford to let its strongest men be the only men who are inaccessible to the law. Modern democratic society, in particular, cannot afford to constitute its economic undertaking upon the monarchical or aristocratic principle and adopt the fiction that the kings and great men thus set up can do no wrong which will make them personally amenable to the law which restrains smaller men: that their kingdoms, not themselves, must suffer for their blindness, their follies, and their transgressions of right.

It does not redeem the situation that these kings and chiefs of industry are not chosen upon the hereditary principle (sometimes, alas! they are) but are men who have risen by their own capacity, sometimes from utter obscurity, with the freedom of self-assertion which should characterize a free society. Their power is none the less arbitrary and irresponsible when obtained. That a peasant may become king does not render the kingdom democratic.¹

This utterance seems unusually prophetic considering the new governments where peasants and house painters have made their way to the top. Large corporate businesses are in no sense private, individual businesses. They are economic governments, created by political governmental units such as the State of Delaware. As Henry S. Dennison has stated in an article entitled "Business and Government" in a recent issue of the *Michigan Alumnus*:

* * * The basic pre-supposition that business can be considered as an entity separate from government is wrong. * * * In the modern world a large number, often a considerable majority of the citizens, spend the most significant hours of their lives as part of the business structure. In so far, therefore, as business governs the lives of its people when they are working for it, business is, itself, a government within a government. Its possibilities of affecting the well-being and self-respect of its people for better or worse cover just exactly the ground which the democratic hypothesis claims as the primary and essential field of government.²

This position has been seconded by the noted political scientist, Prof. Charles E. Merriam, in a book entitled *The Role of Politics in Social Change*. I want to quote only one or two passages:

The great company assumes many of the characteristics of what is commonly considered a government. It has a legislative body, an executive, an administration, a department of state (public relations), a law department, a treasury, of course. It takes on many of the characteristics of what is called bureaucracy. The heads are invisible and intangible or tend to become so; they lose contact with their men; personnel divisions spring up; security of tenure becomes an issue, leading the way to pensions and other forms of insurance. * * *

With reference to their weaker rivals these great ones may lay down rules of action to which conformity is as important or perhaps even more so than compliance with the law itself. Manner and mode of production, prices, profits, areas of marketing—the whole gamut of production—may be swept by the benevolent supervision of the stronger.

¹ Reports of the American Bar Association, 1910, vol. XXXV, pp. 428-430.

² Henry S. Dennison, "Business and Government," in *Michigan Alumnus; Quarterly Number*, June 29, 1935, vol. 41, No. 23.

* * * If they do not raise armies, they can organize their own deputies into coal and iron or other police and carry on struggles in times of industrial strikes—little short of civil war in some instances; and they may also control the local organization of force and justice, or intimidate, if not own.

They may control the working conditions and hours of thousands of men, and, privately, shall we say, regiment their conduct to an extent not equaled by the organization known as the government. * * *

* * * Curiously enough, a corporation may obtain powers under the laws of some States, giving greater powers than the State government itself may exercise.

Furthermore, the relations between these larger units themselves become a problem of far-reaching importance to the community of which they are a part. Great "companies" may struggle and make war with each other within the boundaries of the State, as railway groups, or steel groups, or oil groups arise and contend for the mastery. At the same time comes battle with the smaller companies, concerns, and individuals, and the pressure of all of them upon the consumer and upon the worker and upon the state itself.¹

TECHNOLOGY AND PRESSURE GROUPS

Dr. KREPS. I propose for just a moment to look at the connection of technology and the increased power of pressure groups. There have, of course, always been pressure groups, groups with the same or similar interests, such as the aged, the veteran, farmer, laborer, banker, manufacturer. All have organizations. Being in the same group and hearing over and over again the same sort of experience, they easily identify what is to their own advantage with that which benefits everybody—and thus press for higher tariffs, consumption taxes, higher prices, higher wages, Federal subsidies, lower income taxes, and the like. These pocketbook interests soon develop into full-fledged matters of emotional principle. I think it is this that the cynic refers to when he defines politics as a battle of interests masquerading as principles. These "principles" then become the group mores not to be questioned internally and the basis for a friend-enemy classification externally.

Each such major economic group then brings pressure to bear upon legislatures for favorable legislation, and the resultant legislation often sets up a department, a bureau, a commission designed to minister to the needs and promote the interests of those whose initial pressures motivated the legislation. Thus, in housing, several distinct agencies exist here and abroad to represent, among others, the separate economic interests of the contractors, the building and loan societies, the advocates of governmental housing, and the owners who were threatened with loss of their homes. As a result there sometimes is frozen into the governmental structure the same sort of confusion which exists outside. But it is particularly in the modern era of specialization and of rapid communication brought about by technology that pressure groups have multiplied, and it is particularly in the modern era of large-scale production and savings that the individual interest at stake has become large.

Consumers are hard to organize because no one consumer will gain or lose a great deal either way, but large units may gain much and lose much. And large units, as has been shown, tend to have a technological foundation. Moreover, no one so easily or so readily raises the funds necessary for maintaining an organization as those

¹ Charles E. Merriam, *The Role of Politics in Social Change*, New York University Press, New York, 1936, pp. 49-52.

able to tax consumers directly through price maintenance. Good causes often go abegging. Thus technology has increased both the number and the power of pressure groups.

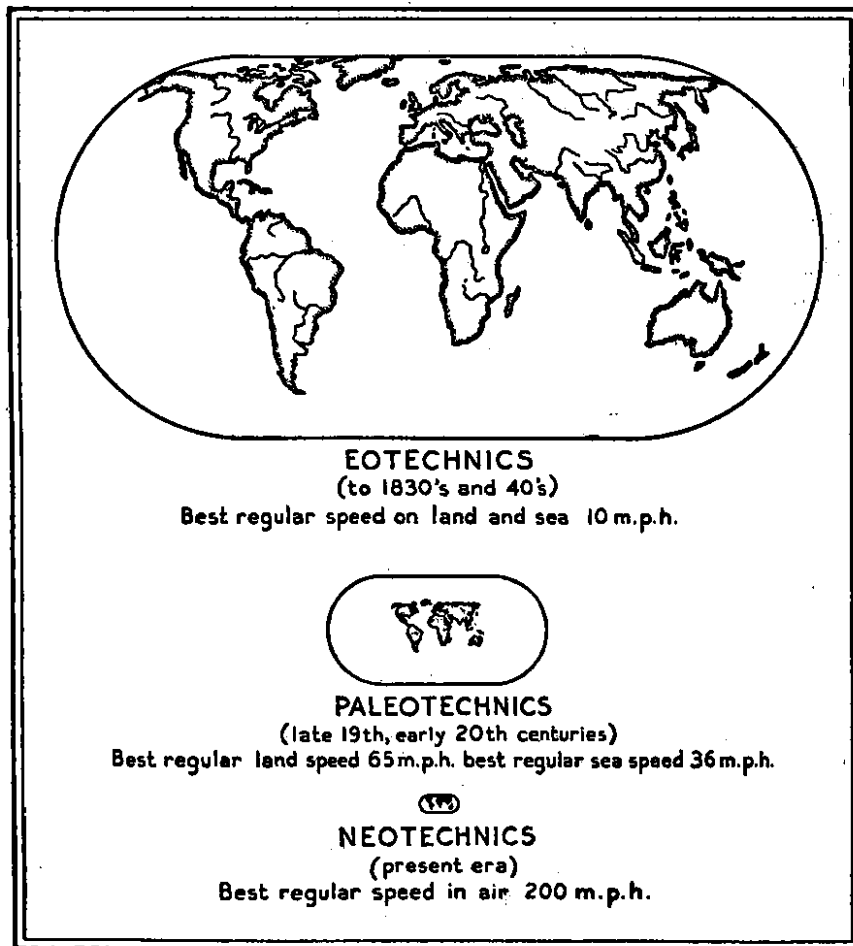
THE WORLD AN ECONOMIC UNIT

Dr. KREPS. Next, has technology made the world an economic unit? The extent to which technology has reduced the economic dimensions of the world is indicated in this exhibit.

The CHAIRMAN. The exhibit may be received.

(The chart referred to was marked "Exhibit No. 2443" and appears below.)

EXHIBIT No. 2443



TECHNICAL PROGRESS IN TRAVEL TIME

Size of the world, supposing best travel technology in each epoch were applied over the whole surface of the earth

Dr. KREPS. This is taken from Eugene Staley's *World Economy in Transition*¹ and is based on technical terminology taken from Lewis Mumford's book, *Technics and Civilization*.² Mumford calls the period which utilized wood as material and wind and water as sources of power, the eotechnic era. The size of the world in the 1830's is represented according to the best regular rate of speed on land and sea, about 10 miles an hour. The period beginning with 1800, which used coal, iron, and limestone, and mechanical devices, he calls the paleotechnic era. That, you see, is represented by the small size of the world, where the best regular land speed is 65 miles per hour, and the best regular sea speed is 36 miles per hour. The present age, in which chemical interaction, electric power, radio, and biochemistry are utilized, he calls the neotechnic era. You see the size of the world today, that little diminutive spot. The latter has been well characterized by a publication of the National Resources Committee entitled *Technological Trends and National Policy*,³ in the statement:

Four characteristic trends of modern manufacturing, (1) toward continuous processes, (2) automatic operation, (3) use of registering devices, and (4) of controlling devices are conspicuous.

(The chairman resumed the Chair.)

The CHAIRMAN. Have you, for ordinary folks, defined the meaning of these terms?

Dr. KREPS. Yes; I have; just before you came in. The eotechnic period is one which used wood for material and wind and water for power. The paleotechnic period is one using iron and steel for material and using mechanical power. The neotechnic period is the one we are in at the present time, of chemical interaction, and the like. I am describing some of the characteristics of this period as given by the Committee on Technological Trends.

The CHAIRMAN. Thank you so much.

Dr. KREPS. They point out:

The last two may embody the new electric eye or ear or only the older mechanical "senses." Or they may automatically make chemical tests, such as sampling furnace gas every few minutes for its proportion of carbon dioxide, to enable efficient and smokeless combustion, or measuring acidity, or chemical content by an automatic spectrophotometer.⁴

When you talk things like that, you are talking the neotechnic era.

Concerning the impact of technology upon nations, Mumford has made this, it seems to me, classic statement:

Both eotechnic and paleotechnic industry could be carried on within the framework of European society: England, Germany, France, the leading countries, had a sufficient supply of wind, wood, water, limestone, coal, iron ore; so did the United States. Under the neotechnic regime their independence and their self-sufficiency are gone. *They must either organize and safeguard and conserve a world-wide basis of supply, or run the risk of going destitute and relapse into a lower and cruder technology.* The basis of the material elements in the new industry is neither national nor continental but planetary: this is equally true, of course, of its technological and scientific heritage. * * * Under these conditions, no country and no continent can surround itself with a wall without wrecking the essential, international basis of its technology

¹ Eugene Staley, *World Economy in Transition*, Council on Foreign Relations, New York, 1930, p. 6.

² Harcourt, Brace, New York, 1934.

³ *Technological Trends and National Policy*, National Resources Committee, Washington, June 1937, p. 24.

⁴ *Ibid.*, pp. 24-25.

* * * Isolation and national hostilities are forms of deliberate technological suicide.¹

Thus it is that today measured in travel time, the whole world is smaller than the eastern seaboard in Washington's day or France in the reign of Napoleon.

Technology has been making for easier and larger movements of goods and persons across boundaries precisely at a time when nationalistic and pressure group politics seems bent on erecting walls to resist all these tendencies. The conflict of technology and politics is at the bottom of the present European mess.

Needless to say, from the point of view of raising living standards in the world, the forces of technology should be accommodated by the erection of a system of worldwide economic exchange which, through movements of capital and knowledge, or indirectly through trade in goods, would make every region more productive than it otherwise could be, and raise the income level of every country in the world.

While today population pressure, access to raw materials, and access to markets are fighting slogans in international politics [reading]:

One of the first principles for progress towards political peace as well as towards economic welfare must be: Lessen the economic significance of political boundaries,²

according to Eugene Staley in his book *World Economy in Transition*.³

TECHNOLOGY AND WAR

Dr. KREPS. The way in which wars have been made more destructive by the use of machinery need not be emphasized. Despite the fact that wars are carried on only by governments, probably no machines have been so greatly multiplied or so rapidly improved as the machinery of death. In the first World War we already had repeating rifles, hand grenades, machine guns, heavy artillery, mines, submarines, bombing planes. Then new expedients such as steel helmets, tanks, chemical warfare, flame throwers, and anti-aircraft were introduced. Today we have the additional fact of motorization. But, due to the machine age or due to technology the destructiveness of war has increased not only on the battle front but (and here is the important point) on the home front. As Mr. Frederick Lenz points out in an article entitled "Influences of Modern War" in *Plan Age*:

The modern battle on land, on sea, and in the air, becomes the true counterpart of our peace processes. It exhibits all the characteristics of mechanized mass production and transport. It stretches the efficiency of standardized destruction to the utmost. Despite the human factor involved, it takes on an objective, measurable character; the role of the fighting soldier is analogous to that of the modern factory worker who acts as an accessory to the machinery of which he is in charge. Officers, non-commissioned officers, and privates represent the three typical strata of our industrial society.⁴

Modern industry and the military machine have in many ways the same characteristics. The preponderance of fixed capital investments is paralleled by the mechanization of modern armaments. Both, when in full action, consume durable goods, steel, copper, chemicals, and the like. Both require concentration and regimenta-

¹ Lewis Mumford, *Technics and Civilization*, Harcourt, Brace, New York, 1934, pp. 232-233; italics in original.

² Eugene Staley, *op. cit.*, p. 329.

³ *Plan Age*, November 1939, Vol. V, No. 9, p. 289.

tion of large numbers of human beings into compact units. In both the tendency toward rationalization is strong, and standardized patterns promote continuous replenishment of spare parts. Both tend to plan on a Nation-wide scale, map out campaigns, and rely heavily on propaganda, stressing heavily that they are only protecting their own.

The military is in fact the ideal form toward which a purely mechanical system of industry tends. It affords large-scale demand for absolutely standardized goods. Individual taste, individual judgment, individual needs other than the dimensions of the body, have no effect upon the clothing or equipment of the soldier—all are alike. Moreover, a nation at war is the ideal consumer. It makes large demands for steel and iron and machinery—that is, the durable goods recovery so much emphasized by certain analysts takes place—and then in the process of battle these are sunk or shot to pieces. No problem of overcapacity or resistance to replacement remains to block further sales.

Technology, in short, not only accounts for a good part of the increased physical suffering and loss of life in modern war but it shares no small part of the responsibility for the terrific economic, social, and political readjustments that modern war brings in its wake.

AMERICA UNLIMITED

Dr. KREPS. One of the inveterate pathological characteristics of periods of depression is the hue and cry that opportunities no longer exist, that the frontier is gone, that the pace of advance in the future is bound to slow down. So also at present. On the one hand, there are those who point to the small amount of virgin territory remaining to be settled in the United States, to the tapering rate of growth of the population—despite the fact that the number of families in the 40's is going to increase by a larger absolute amount than in any previous decade in our history—and similar factors. Not allowing for the fact that the human mind rarely can see as far and as distinctly in a forward direction as it can see backward, they sometimes argue that employment opportunities in the future are bound to be limited.

Such persons should study the recent industrial history of other countries such as Great Britain or Sweden.

I wish to submit as an exhibit, a chart from Carl Snyder's book entitled "The Remarkable Parallel of Sweden and the United States." It is the middle chart on the easel.

Acting Chairman REECE. It may be admitted.

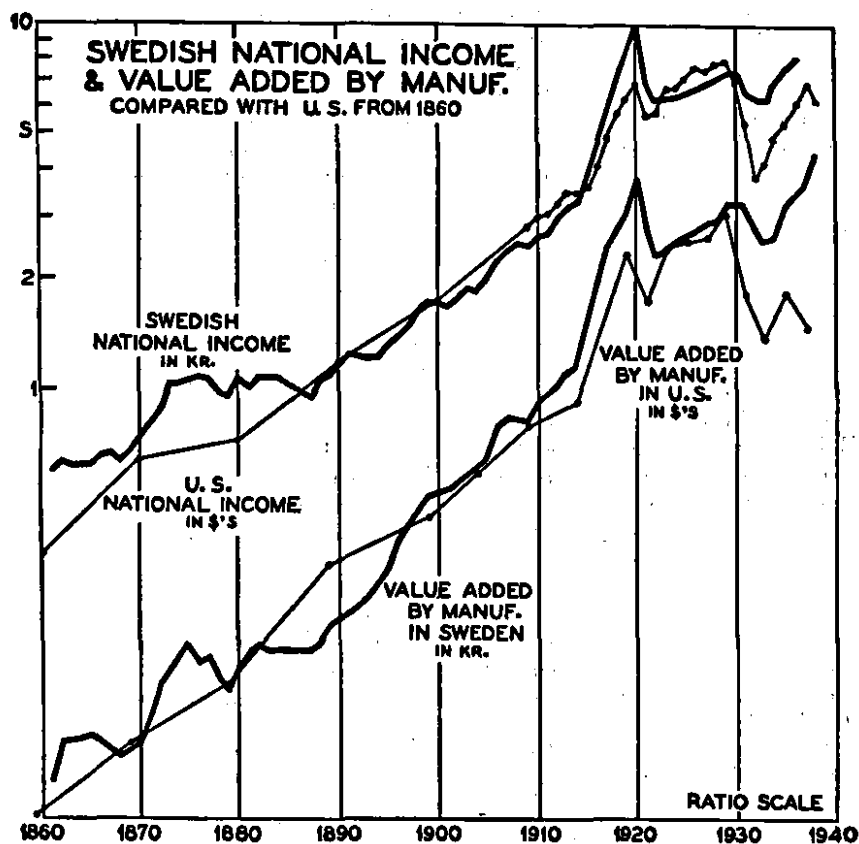
(The chart referred to was marked "Exhibit No. 2444" and appears on p. 16263.)

Dr. KREPS. This shows a growth paralleling if not exceeding that in the United States. Moreover, the rate of increase in value added by manufacture in Sweden, precisely in the period from 1880 to 1920, is, if anything, faster.

Now Sweden in 1870 seemed to have no such frontiers ahead of it as did the United States. Here most of the area west of the Mississippi River remained to be settled. We were to go through in succession a rapid development of the iron and steel industry, two hectic decades of railroad building, and a new era of automo-

biles, construction, and road building. In Sweden the land was already occupied. Its population growth in no sense paralleled that of the United States. Moreover, from the point of view of the writer, Carl Snyder, who published this chart, Sweden was "handicapped" throughout the period by measures which have come into effect in the United States only in the past 7 years. To some of these measures or "handicaps" I should like to call attention.

EXHIBIT No. 2444



XXX. THE REMARKABLE PARALLEL OF SWEDEN AND THE UNITED STATES

SOURCE: CAPITALISM THE CREATOR BY Carl Snyder

They have had a reserve works system, a W. P. A., if you like, since 1866, based on a national resources survey made in 1852. They have about the lowest tariff in the world. They initiated a national power system under a water power administration in 1909, with scores of municipal and cooperative distributing plants (T. V. A.). A governmental power network gridirons the whole nation, with rural electrification covering 60 percent of the farms (as opposed to less than 20 percent here). They have had a managed currency since 1920 and frankly ignore the gold standard. The State is a

partner in the largest iron mines of the country, those now of such importance to Germany. Tobacco profits are used to finance old-age pensions, which they have had for decades, together with unemployment insurance and other forms of social security. The State owns the trunk line railways, the telegraph and telephone systems, and most of the forests. They have had the basic elements of the A. A. A. since 1928. Their systems of State liquor control compares favorably with that of any country in the world. Their governmental aerotransport company has not had a fatal accident in 12 years. They have had full collective bargaining for decades and since 1909, when Hjalmar Branting came into power (by the way, to settle a general strike which the King refused to stamp out by violence or bloodshed), Sweden has been governed most of the time by its L. O. (Landsorganisationen) with the slogan "The same possibilities for living securely within the fatherland for all those who inhabit it." They have had a consumer cooperative movement that successfully and aggressively reduced the prices of manufactured goods. In spite of all these "obstacles" Swedish manufacturing grew faster than that in the United States.

Those who consider Sweden a special case should look at developments in Germany, Switzerland, the Netherlands, or any other industrialized country, including Great Britain. Even in that tight little island the increase in real wages from 1840 to 1900 was just as rapid as in the United States.

I should like to submit an exhibit showing real wages in Great Britain and in the United States, 1840 to 1900.

(Senator O'Mahoney resumed the chair.)

The CHAIRMAN. The exhibit may be received.

(The table referred to was marked "Exhibit 2445" and is included in the appendix on p. 17313.)

Dr. KREPS. Great Britain, I might say, has "suffered" similarly from free trade, full collective bargaining, and various forms of labor legislation. In addition to that, it has experienced a deficit in savings such that slightly more than half as much, that is only 7 percent, of the national income was saved in 1935 as was saved, 13 percent, before the World War.

What is the frontier that Sweden and England and many other countries have developed? It is obviously an intensive rather than an extensive frontier. It is the frontier represented by the needs and the will to progress of their own citizens. And that frontier still remains to be developed in the United States. As a notable business magazine, *Fortune*, points out in its issue of February 1940:

* * * The tools and extensions of industrialization do not exist for their own sake. They exist for * * * *the consumer*. The entire producers' goods industry, for instance, whose purpose is the making of tools, is quite secondary to the real purpose of industrialization. That real purpose may be defined as *an increase in the power to consume*. * * *

* * * The central economic problem is not a revival in the producers' industry, although that would help. Nor can it be a revival in "investment" in the old sense of the word. The central economic problem is simply the conversion of a high potential power to consume into an actual power to consume: a wider distribution of progress.

¹ *Fortune*, Vol. XXI, No. 2, p. 50.

The great differential that links potential and actual consuming power is *price*; and what the new era cries for is a drastic decline in many lines of industrial prices.¹

* * * Emphasis has been put on the need for confidence in making new investment; but * * * this emphasis is both unrealistic and academic. The realistic requirement is, rather, that the businessman should have *confidence in the consumer*: he must have confidence that if he decreases his prices and his profit margins he will get a corresponding rise in volume.²

* * * In the consumer lies the frontier. * * * By industrialization we built a new civilization. And during the last fifteen or twenty years, by further industrialization, we have created the possibility of an entirely new era for mankind. It is time now to get to work to make that era a reality.³

The magnitude of the frontier here to be explored is evident from the familiar pyramid showing income levels in the United States which was introduced once before at our hearings.⁴ I would like to refer to it now.

Dr. KREPS. It shows 8,000,000 families with incomes of less than \$750 a year, and an additional 11,000,000 families with incomes between \$750 and \$1,500 a year. These families, representing over 60 percent of our population, constitute a vast unexplored economic ore body open for the kind of pioneering effort which the Swedish and British have used throughout the past 50 years. Economic pioneers with vision are needed, able to get outside the shells of their prejudice and their self-interest. Here are some truly gigantic bridges to be built, economic bridges connecting the needs of these families with the goods which our superb machines can produce.

There are, in short, two frontiers—the industrial frontier and the frontier of economic adjustment. Changes in one must be synchronized with changes in the other, just like the front and back wheels of an automobile. If we vigorously push advances in technology and refuse to make the requisite economic adjustment, we will set up grave tensions in our society. Obviously to call a moratorium on research or on progress of the machine is both unwise and impossible. But the shortsightedness of those who argue that the industrial frontier is gone is only exceeded by the stupid defeatism of those who wish to call a halt to economic adjustment.

What is necessary is economic balance. Our capacity to produce goods must not change faster than our capacity to purchase them.

The CHAIRMAN. You should state that the other way, that our capacity to purchase goods should be kept in line with our capacity to produce them.

Dr. KREPS. Yes; I would agree to that.

The CHAIRMAN. Wouldn't you agree that that is a much better way of putting it?

Dr. KREPS. There has to be give and take.

The CHAIRMAN. No; the one as you stated it involves the idea of limitation of production, and the amended statement which I have suggested does not involve limitation at all, it involves solely building up of the consuming capacity of these 19,000,000 families at the bottom of this curious diagram that you have presented.

Dr. KREPS. I agree.

¹ *Ibid.*, p. 160 (italics in original).

² *Ibid.*, p. 163.

³ *Ibid.*, pp. 145, 164.

⁴ See Hearings, Part II, pp. 5424, 5565

The CHAIRMAN. In other words, here is a potential market of 19,000,000 families which is unable to take full advantage of what advances technology offers, because they are living in the individual era, depending upon themselves, whereas all of the great triumphs of modern technology, or most of them at least, are the product of some form of organized effort, either in the development of the technology or in the use of it. Most of these great new inventions are capable of use only by some sort of collective effort. A railroad, for example, can be made to serve the people only by the collective assets, the capital of thousands of people, and the huge industrial army who operate the railroads. The same is true of every communication system. The same is true of the airplanes. The same is true of the modern system of public roads, and of the automobiles which travel those public roads.

These families at the bottom of the scale have not been permitted to emerge into the area of using what organized technology and organized industry makes available to them.

Dr. KREPS. That is correct.

It is interesting to note that even before 1932, a committee of President Hoover's, writing a two-volume work on social trends, should summarize their findings by saying:

If, then, the report reveals, as it must, confusion and complexity in American life during recent years, striking inequality in the rates of change, uneven advances in inventions, institutions, attitudes and ideals, dangerous tensions and torsions in our social arrangements, we may hold steadily to the importance of viewing social situations as a whole in terms of the interrelation and interdependence of our national life, of analyzing and appraising our problems as those of a single society based upon the assumption of the common welfare as the goal of common effort.

Effective coordination of the factors of our evolving society mean, where possible and desirable, slowing up the changes which occur too rapidly and speeding up the changes which lag. The Committee does not believe in a moratorium upon research in physical science and invention, such as has sometimes been proposed. On the contrary, it holds that social invention has to be stimulated to keep pace with mechanical invention.¹

Some of these social inventions have already been applied in American life. Our genius in inventing and exploiting the idea that all the children of all the people should be educated has led to an investment in plant in every corner of the United States and created jobs for millions. If we should catch the vision of building an American civilization, we could create employment for millions, as did Sweden, in providing, to use their national slogan, "more beautiful things for everyday life." In every city an art center, an opera house, with native schools of painting, sculpture, woodwork, handicraft, music, and literature; in every home and school and public building examples of native American artistry; but above all in American economic life a realization of that type of economic and social adjustment which may lead some future observer to call the United States, as Marquis W. Childs describes Sweden in his *Sweden, the Middle Way*, a—

country where *laissez-faire* has continued to exist; where the so-called "laws" of supply and demand have not been wholly invalidated by the spread of monopoly.²

¹ *Recent Social Trends in the United States*, McGraw-Hill, New York, 1933, p. XV.

² Marquis W. Childs, *Sweden, the Middle Way*, Yale University Press, New Haven, 1936, p. 161.

Monopoly in its various forms in the United States is *the* enemy of democracy. If we fail to have sufficient American pioneer red blood in our veins to insist that there shall be no concentration and exercise of economic power without the consent of the governed, technology will never be able to create for us an America Unlimited.

I am sorry to have taken such a long time, Mr. Chairman, for this testimony.

The CHAIRMAN. It was very interesting.

Do any members of the committee desire to ask Dr. Kreps any question?

Mr. HENRICHS. Mr. Chairman, may I have just a moment? There were one or two questions that I should like to have asked, but the hour is somewhat late and it has been somewhat difficult at points to follow this very interesting discussion. Merely as a matter of safeguard, therefore, I might want to question the witness at some later time.

I would like, however, to indicate what you already indicated at the beginning, that Dr. Kreps spoke in his personal capacity, and certainly was not representing, more particularly, the point of view of the Department of Labor in presenting what seems to me to be in part at least a bridge between the work which the committee has been doing and the present hearings, presenting it very interestingly and significantly. That is, in the discussion, for example, of concentration of economic power, of prices, with which the committee has heretofore concerned itself, I think in showing the relationship between those subjects and the broader problems of technology, Dr. Kreps has done a very real service.

I should like, however, if I may, to address myself for a moment to Mr. Anderson with reference to the type of interest which we feel in the Department very keenly, in the problems of technology or the machine as such. We recognize these other problems; our interest in America Unlimited is as unlimited as Dr. Kreps'. As a matter of fact, I think the phrase might conceivably have originated within our Department.

The CHAIRMAN. It is a good phrase, if more than one wants to claim it.

Mr. HENRICHS. It is an excellent phrase, and the more widely used, the better, and the more widely it is realized that America Unlimited means a very broad attack on the problem, and not a specific attack by restrictive measures, either with reference to production or with reference to machinery, presumably the better.

I have gathered from Dr. Kreps' testimony that an attack on the problem through a mere limitation on the use of machines as such would be regarded by many as analogous to the machine riot approach to machinery in the nineteenth century. Merely in passing, I would put in a footnote that I wouldn't want to make the statement before we closed an examination of the problem. There has been some interesting thinking by David Cushman Coyle and others, for example, as to the poverty a society may find itself in through an undue rate of obsolescence of machinery, where an undue proportion of its efforts goes into the creation of plants which are then scrapped and don't result in consumer goods.

But turning to the particular problems that are involved, Mr. Anderson, I hope that this is a bridge and not a forerunner of the

attack which is going to be made by all witnesses. This is fundamentally important, but there is the problem of the machine itself, of the group of workers that are thrown out by a specific machine, or the individual worker that is thrown out in the process of technological change, with reference to which we in the Department of Labor have a vital and continuing concern.

The things that we are hunting for are the constructive efforts which are being made by industrial leaders, by trade union leaders, by thoughtful people in the Government, as to the means by which that dislocation can be made less in those instances in which it occurs. It has meant, for example, in the recent past, a fairly substantial extension of the field of collective bargaining in which, for example, collective bargaining has concerned itself not merely with the question of wages and of hours, but has also concerned itself with such questions as the rate at which machinery is going to be introduced, and the way in which machinery is going to be introduced.

To take examples from countries that Dr. Kreps has been talking about, there has also been a very great interest in such things as dismissal wages, with which we in the United States have relatively little familiarity. Now there is a developing experience in the United States, and a developing awareness of the problem of the dislocation for the individual groups, on which we need to focus our attention, and to which hearings on technology and machines as such can very properly be directed, and should be extensively directed, to find out the extent to which there is an awareness, the extent to which that problem is being handled in one industry after another, and the methods that can be applied. And it is along that line that our Department has a very vital interest, that operates in a sense on a narrower level, or operates at least on an un-underlined level of interest, in that chart that was submitted, and I hope that we can look forward to that material and point of view being developed.

Dr. ANDERSON. May I express the attitude of the staff in building up these particular hearings, Mr. Chairman? We had in mind two approaches. The first one has been reflected in Mr. Kreps' fine document, and will be included in the next witness's statement of new and impending technology. On this first day we planned to orient ourselves in the problem, to get a glimpse of its size and its ramifications, to form this bridge between the larger social policy problems of the economic situation that you have been discussing through the year, and this more specific topic of technology as it applies in particular industries. Not only have we had in mind these specific points, but also as I pointed out this morning successive witnesses will be in the nature of case studies for the committee. Mr. Ford, for example, will be here on Wednesday morning, and he will discuss the whole retooling story of the Ford plant, the thing which every economist and labor man has been wanting to know about for a long time. Specifically in detail he will talk about displacement in particular units of the plant, and the effect of displacement upon workers, particular workers, in definite lines of production.

We have had in mind, therefore, a twofold purpose all the way through. The first task today was to lay a groundwork, as it were, upon which to build the rest of the structure. Ultimately we hope that out of this will come some sense of the social obligations, of the

policies of a social character, that must be formulated, and I have cautioned every witness with whom I have discussed the hearings that we do not propose to prejudge the outcome of the hearings in any way, nor do we have any formula or panacea. We intend to look upon them precisely as Mr. Hinrichs has outlined, a succession of case studies in which specific data will be assembled and presented to the committee for its review.

We are ready for our next witness, Mr. Chairman, if the committee is.

The CHAIRMAN. Did you want to make any comment?

Dr. KREPS. Just one statement, that I want to second what Mr. Hinrichs has said. As a witness, counsel had instructed me to say that I was speaking for myself, in no way committing anyone, and particularly in no way committing the committee as such, or any part of the committee. I am sorry if I failed adequately to carry out that instruction.

The CHAIRMAN. That is clearly understood, I think.

Dr. ANDERSON. Mr. Chairman, we are ready with our second witness for the day, and I might say we have scheduled the hearings on such a basis that you will have two strong witnesses a day to contend with.

Mr. Chairman, Mr. Watson Davis is the director of Science Service. He is the author of the book, *The Advancement of Science*. He has written many articles in this field, and, when looking over all possible witnesses to bring to you, on the subject of "New and Impending Technology," your executive secretary and I concluded that Mr. Davis was the best qualified person we could find. We present him to you with the subject of "New and Impending Technology."

The CHAIRMAN. Your testimony of course is all a matter of opinion, isn't it, and the result of your own studies?

Mr. DAVIS. Not only my studies, but those with whom I have consulted.

The CHAIRMAN. If there is no objection, we won't bother administering the oath to witnesses who are just contributing expressions of their opinion and of their own researches.

STATEMENT OF WATSON DAVIS, DIRECTOR, SCIENCE SERVICE, NEW YORK

The CHAIRMAN. Will you be good enough to state for the record your background, please?

Mr. DAVIS. My name is Watson Davis. I am director of Science Service. Science Service is a nonprofit institution for the popularization of science, with trustees nominated by five bodies: The National Academy of Science, the National Research Council, the American Association for the Advancement of Science, the newspaper profession generally, and E. W. Scripps estate. It has been in existence about 20 years, and it is operating in the field of keeping the public informed as to the advances of science. We operate in part as a press association or a newspaper syndicate and we publish the weekly magazine, *Science News Letter*.

The CHAIRMAN. How long have you been engaged in this work?

Mr. DAVIS. Approximately 20 years.

The CHAIRMAN. You may proceed.

Mr. DAVIS. The pace of research, invention, and engineering development shows no sign of lagging. On the contrary, science and the organized knowledge of the world seem to be proceeding at an accelerating rate.

It does not seem possible to predict with great definiteness exactly what new things the world will have in the years to come. But we may all be very sure that there will be new things, that we live in a world which will never be finished and is not static today, that most of the things that we wish to have can be obtained if we put our minds and our hands to the task. It is one of the important facts about our world today that we know enough and we have techniques sufficient to give us an extraordinarily good chance to develop through scientific research an answer to a need. We can usually make an invention if it is deemed sufficiently necessary and if brains and labor and money are turned to the task. As Dr. Kreps has noted in his earlier testimony, the art of invention has been invented.

The purpose of my testimony is to give some inkling of the things that men, looking into the future, believe we should be able to accomplish, things that once the people know might be achieved they will desire. Calling upon representative scientific research workers in various fields, my presentation will skim high points of what is being done to achieve these ends. Based on the record of successful research to date, we may be sure that what we set out to do in the field of research and invention we shall be able to accomplish in large measure sooner or later. With a broad and comprehensive look at great problems of the future, we should be able better to comprehend the topic the committee is now considering. It would appear rather definitely that these great problems will, in the immediate future, become more, not less, urgent.

First of all, just what is science and invention? I want to quote Sir William Bragg's advice to England at war because it is pertinent here in America at peace:

Science—

Sir William says—

which is knowledge of nature, is of fundamental importance to the successful prosecution of any enterprise.

Science is of general application. There is not one science of chemistry, another of electricity, another of medicine, etc. There are not even distinct sciences of peace and war. There is only one natural world, and there is only one knowledge of it.

Fruitful inventions are always due to a combination of knowledge and of experience on the spot.

MODERN INDUSTRIAL RESEARCH

Mr. DAVIS. The investigators engaged in scientific research are the remakers of civilization and the true molders of history. They may be called the catalysts of civilization. Now who are they, and where do they work? They are in our universities, in our Government laboratories, and in our industrial research laboratories. A few are on their own, working on their problems when the rest of us play bridge or go to the movies.

The CHAIRMAN. How many of them are on their own?

Mr. DAVIS. That is a very difficult question to answer. Perhaps your best index would be found in the patent record. I don't think there are any good reliable figures on that at all.

The CHAIRMAN. The general picture that has been presented to this committee in the patent study¹ and elsewhere is that which was mentioned by the previous witness, that an increasingly large proportion of research and invention is the product of group activity rather than of the activity of the single individual.

Mr. DAVIS. I think that is very true.

The CHAIRMAN. Fifty years ago it was common to have an inventor work altogether by himself. He may have been a student of chemistry alone, seeking to develop new chemical properties. But today would you say, from your experience, that the reverse is largely true?

Mr. DAVIS. Yes; the reverse is true, and even if the person is of such a nature that he actually is seeming to work alone, he very often, through literature or through contacts in other ways, is a part of a group, even if he brings about that group through consultation or consulting the literature and so forth.

The CHAIRMAN. It emphasizes the organizational aspects of modern society.

Mr. DAVIS. Oh, very much so; yes. Numerically, they are few, although their works bulk large in the fundamental reckoning of progress. Exact figures are lacking but perhaps not over 100,000 individuals are engaged in scientific research in this country. Perhaps a tenth of these, that is, 10,000, less than a hundredth of 1 percent of the United States population, strike with the flint of genius from the steel of learning the sparks that continually kindle anew the forward-moving torches of science and industry. Throughout the world perhaps 200,000 scientific investigators in the aggregate are engaged in the extremely important task of creating new knowledge and new technologic developments.

On industrial research in the United States, approximately \$215,000,000 was spent during the past year by 2,000 individual companies, according to a survey by Dr. William A. Hamor, Mellon Institute of Industrial Research's associate director. The survey showed that 32,000 scientists and engineers are engaged in industrial research, half of them in chemical, petroleum, and electrical laboratories. Some 16,000 more persons backed up these scientists and engineers as assistants or clerical workers. Leading investors in research during 1939 were du Pont, with a research budget of \$7,000,000, and Dow Chemical Co., spending \$1,400,000 on research. About 110 individual companies in the field of chemical industry and 40 trade associations make research grants to educational institutions. Approximately 200 college laboratories are used incidentally for industrial research and commercial testing. About 250 manufacturing corporations are sustaining long-range investigations in research foundations. Many companies with no laboratories of their own turn to the 250 commercial laboratories in the country.

I might say that these figures are rather round and there are inquiries under way which will come to fruition in a couple of months

¹ See Hearings, Parts 2 and 3.

which will probably refine them, but in general I think they are of the right order of magnitude.

In the universities and research institutions a considerable amount of fundamental research is done, much of which will eventually be of industrial and community value in a practical way. In the Federal Government laboratories much fundamental research is undertaken with the money available amounting to approximately \$35,000,000 a year.

Again, you can compute that figure differently if you define research differently.

Progressive, forward-looking industries are in the habit of making it a rule to spend from 1 to 3 percent of their gross income on research. Some large organizations in older industries spend almost nothing, while a few industrial concerns, born largely of research and development in recent years, are reported to spend up to 5 and even 8 percent of gross income in this way. The amount of money spent by the Government for research on a percentage basis is far less than that of the average industrial concern.

The CHAIRMAN. Do you mean on a percentage basis?

GOVERNMENT RESEARCH EXPENDITURES

Mr. DAVIS. The Government, on all its scientific educational activities, spends approximately, or did a few years ago, 1 percent.

The CHAIRMAN. One percent of what?

Mr. DAVIS. One percent of the total expenditures of the Government; therefore, the amount spent on research, using the same definition of research of an industrial laboratory, would be closer to 1 percent.

The CHAIRMAN. You wouldn't expect the Government expenditure for research on a percentage basis to be anything like that spent by ordinary industry, would you?

Mr. DAVIS. I would like to see it larger. The biggest job the Government has is taking care of the country as such, and that certainly is as important to the Government as the operation of industry.

The CHAIRMAN. Of course a good lot of that activity of Government is the constitutional duty of enforcing the laws which have been enacted from time to time.

Mr. DAVIS. That is true. Personally, I would like to see the Government spend more.

The CHAIRMAN. Surely; I can understand that.

Mr. DAVIS. I think it would be a very good investment from a practical standpoint.

Dr. ANDERSON. Mr. Davis, isn't it true that Government research enters a field that is not otherwise properly taken care of or adequately handled, and therefore is vital to fundamental research?

Mr. DAVIS. Yes; very much. The Government can do certain things in research that no commercial concern would be justified in doing. I think one example of that is the very extraordinary record of the N. A. C. A., the National Advisory Committee for Aeronautics, in aviation research, undertaking a job of development which industry certainly was in no position to do, and which has revolutionized the whole aeronautical industry to a remarkable extent.

The CHAIRMAN. Well, the ordinary commercial industry cannot undertake research except as an incident to its own enterprise. It must be upon a profit basis. The Government, on the other hand, can undertake research without respect to the profitable phase of it at all.

Mr. DAVIS. Well, it seems to me, Mr. Chairman, that the Government can look at research in very much the same way as an industry does. As a matter of fact, one of the most profitable methods of conducting research is to allow competent scientists to do the sort of things that they want to do, make the inquiries that they want to make, with the confidence that as they explore new fields of knowledge which may in some cases be very remote to the commercial aspirations of that particular concern, there will be enough new knowledge plowed up, and the results from a commercial standpoint will be sufficiently large, to allow that.

The CHAIRMAN. I assume that you would feel that the product of Government research should be contributed to the public.

Mr. DAVIS. Well, it will be of necessity; yes.

The CHAIRMAN. In other words, it would not be made the basis of a profit-making enterprise on the part of Government, but would be contributed to the public to be used by the public in whatever form seemed advantageous.

Mr. DAVIS. Some Government research might very well form the basis of a very profitable activity by commercial concerns.

The CHAIRMAN. Yes; but I mean you wouldn't want the Government itself to make profit out of the research.

Mr. DAVIS. The profit to the Government would be its service to the people. I don't see that it is the function of Government to make a profit in the industrial sense.

The CHAIRMAN. I wanted it to be clear that that was your point of view.

Mr. DAVIS. Research, in a very real sense, is international in scope. I think that is very important. It can be said that it is cosmic in scope, rather than merely confined to this earth. For what happens to a distant star or galaxy, when viewed by a giant telescope, may very well give an essential hint of how atoms act on earth, enlightening and explaining the way to some new industrial process.

As Dr. Raymond B. Fosdick, president of the Rockefeller Foundation, said in his annual report a few days ago:

Scientific growth is almost invariably the result of cross-fertilization between laboratories and groups in widely separated parts of the world. Only rarely does one man or one group of men recite with clear loud tones a whole important chapter, or even a whole important paragraph, in the epic of science. Much more often the start comes from some isolated and perhaps timid voice, making an inspired suggestion, raising a stimulating question, the first whisper echoes about the world of science, the reverberation from each laboratory purifying and strengthening the message, until presently the voice of science is decisive and authoritative.

Achievement in science, more often than not, is the result of the sustained thinking of many minds in many countries driving toward a common goal. The creative spirit of man can not successfully be localized or nationalized. Ideas are starved when they are fenced in behind frontiers. The fundamental unity of modern civilization is the unity of its intellectual life, and that life cannot without disaster be broken up into separate parts.

What is it that science and technology can do for us in the future? What developments can be brought about through research? It seems worth while to attempt to look at the future possibilities, in terms

of what representative scientific authorities believe can be done or what fields of research may prove to be fruitful to our industrial, personal, and national life.

Being a prophet is always dangerous. Yet those who in the past have made predictions of things to come have in general, curiously enough, been too conservative. I am referring to well-considered predictions by those who are competent to look ahead rather than the romancing of fiction writers.

FIELDS FOR FURTHER RESEARCH

Mr. DAVIS. In an attempt to obtain for this committee a well-documented and expert survey of fruitful fields for future research and invention, I have consulted with a number of representative scientists and engineers in this country. Since the National Association of Manufacturers at its recent Modern Pioneers Celebration selected a group of nationally recognized modern pioneers, men who are judged to have made major contributions to American industry from a research and engineering standpoint, this provided an eminent jury to which this problem might be put. Many of these men are very busy. Some of them are absorbed in a particular line of work to which they have made great contributions. Nevertheless, from this jury have been obtained valuable suggestions which I am incorporating in the material to be presented to you. There have also been consulted numerous authorities in various fields of research and their comments are being made available to the committee.

Eight broad or highly significant fields in which scientific and engineering developments should be particularly fruitful have been selected for exploration. These are, of course, just eight fields, and there are other important fields which, because of the limitations of time, can not be included. These fields are photosynthesis, atomic power, long-range weather forecasting, synthetic materials, chemical cures of diseases, genetics, human relations, and mobilization of scientific knowledge.

From the experts that I have consulted by wire I have gotten some comments, a few of which I want to include. Every one of these items represents extremely important fields of investigation and ones which will have very important consequences even in the very near future, in the opinion of Dr. V. K. Zworykin, director of the R. C. A. Manufacturing Co.'s electronic research laboratory.

This morning I have a wire from Dr. J. V. Dorr which states:

Your wire shows great vision. It probably understates possibilities and probabilities of the next twenty-five years.

In the opinion of Dr. William D. Coolidge, director of the research laboratory of the General Electric Co., Schenectady, N. Y. [reading]:

The experience of the past teaches us that for the future we have much more to hope from the things that we cannot even dream of today. Prior to the work of Faraday no one could have envisioned a dynamo, or before Roentgen an X-ray tube, or before Maxwell and Hertz a radio. These things became possible only after the fundamental facts and principles had been discovered. The most successful research organizations are those stressing the importance of fundamental research looking to the discovery of new facts and principles, which may not lead merely to improvements in old things but which may lead to entirely new ones. This of course constitutes an unlimited field for research.

A general comment on the relation of research to industry and general living has been made by Dr. Charles F. Kettering, who, by the way, is vice president of General Motors and general manager of the General Motors research division. In the record I had him president of the General Motors Research Corporation, an organization which has been dead as a corporation for 15 years, but very much alive from the standpoint of research.

On the question put to him he says:

It is impossible to predict specifically the effect research will have in shaping developments in existing industries, in creating new ones, and on general living. It is no more possible for us to tell what the next new industries will be than it was for Columbus to know that he would reach a new continent when he set sail to the West from Spain on a proposed journey to India. Even more important than his actual arrival in the West Indies was the fact that after he returned to Spain he still did not know that he had discovered a new continent. It took a hundred years of exploration after his initial voyage to have the new continent well defined.

And so it is with research; the only predictions that can be made are of the most general nature. Benjamin Franklin predicted that in time the doctors would know how to cure all diseases. His prediction is just as good today as when it was originally made. The doctors have made remarkable progress, but there are still enough diseases that they don't know how to cure to give them plenty of work over a long period of time before they succeed in fulfilling Franklin's prediction.

The CHAIRMAN. And to give the patients plenty of trouble.
Mr. DAVIS. Exactly.

This idea—

Dr. Kettering says—

of our inability to look ahead as to specific accomplishments is something that must be recognized and its recognition is as important as the actual research work itself.

Now, to take up these 8 fields: first, the field of photosynthesis.

The utilization of energy from the sun is a primary problem of mankind. The sun is fundamentally our chief source of available power or energy. Heat and electric power are derived from the sun whether it is generated hydroelectrically or by use of coal and oil. All food is manufactured by green plants through the use of sunshine. For ages men have fought for, literally, their places in the sun. The war in Europe is largely a struggle for the fossil sunshine of past ages, the oil and coal necessary to modern industry and living.

The problem of solar energy is a very large one. According to Dr. O. L. Inman, director of the C. F. Kettering Foundation for the Study of Chlorophyl and Photosynthesis at Antioch College, the best estimates are that the energy reaching the earth from solar radiation each year is equivalent to that received from burning 400 septillion tons of anthracite coal (4×10^{23} tons, or 4 followed by 23 ciphers). From this source mankind could draw plenty of available energy for all its needs.

The green plant is the principal converter of solar energy into useful material for mankind. The process by which it does this is called photosynthesis, although just how the plant does this is still unknown. Obviously, this is one of the major problems of our civilization. Yet a rough estimate by Dr. Inman of the amount of money budgeted in 1940 for this work in the United States is only about \$250,000 to \$300,000.

Dr. Inman sees two ways of approaching this problem so important to the long-time provision of power to our civilization: First, we could learn more about plant growth and grow several hundred times the amount of vegetation we now grow, transforming much of this into more condensed charcoal from which gas, oil, and so forth, may be made. Second, through fundamental research we could solve the mechanism of how to fix with the tools we now have available the carbon of carbon dioxide and the hydrogen of water into chemical compounds similar to methane or marsh gas and gasoline; or, by the addition of oxygen, to get sugar, woods, or fats; and, by the further addition of nitrogen, to get proteins and so on to thousands of possible compounds or molecules with energy stores ready for our use.

The CHAIRMAN. In other words, we may confidently look forward to the synthetic production of coal and oil and similar carbon products before the natural products have been exhausted.

Mr. DAVIS. If we get at the job soon enough and hard enough, because it is a big problem.

The CHAIRMAN. Progress is already being made, is it not?

Mr. DAVIS. Not too much progress is being made. It is relatively discouraging. But after all, there is only a handful of people who are really at work on this job at the present time.

Dr. ANDERSON. Mr. Davis, the point to be made is that it is realizable. In the opinion of this expert, this sort of a future is before us.

Mr. DAVIS. Yes.

Dr. ANDERSON. And the period of time involved depends upon the amount of money and the attention devoted to it.

Mr. DAVIS. It is a good bet that we will be able to do this in the future. How soon we are going to do it, no one knows, but certainly it is a very real problem for the future, and one that is worth working on, and if and when our supplies of coal and oil are exhausted, this may be one of the ways that we can take care of the energy resources of the world.

When man solves this problem of photosynthesis and sets up his own method of storing radiant energy from the sun, it may very well not be an exact duplicate of the method used by the green plant. And it is rather important that it may be even more efficient than the green plant is.

Dr. Inman says that man has been taking for granted that he can in some way keep on depending on capital stores of coal, oil, and gas for energy. He feels that the solution of the problem of photosynthesis in a practical way is a long-time research program, which is the point that you brought up, Mr. Chairman. If it is not started sufficiently early on a large scale, mankind may find that it was too late beginning the research, and serious shortage of power and energy supplies may be visited upon the earth by our failure to begin research even though we knew the job had to be done.

Mr. Chairman, I have here an expanded statement by Dr. Inman that I would like to submit as an exhibit.

Dr. ANDERSON. Mr. Chairman, the number for the record is 2446, and I submit this as part of Mr. Davis' testimony.

The CHAIRMAN. The exhibit may be received.

(The document referred to was marked "Exhibit No. 2446" and is included in the appendix on pp. 17313-17315.)

ATOMIC POWER

Mr. DAVIS. Turning to atomic power, within the atom there are as yet untapped stores of energy which if released would furnish almost unlimited amounts of power, enough to take care of all the energy needs of mankind. A mere 2 years ago the probability of the release of atomic power of any kind seemed fantastic. Early in 1939, the splitting of the heavy chemical element, uranium, with the release of an enormous amount of interatomic energy was demonstrated. Laboratories throughout the world that had "atom smashing" apparatus have been exploring as rapidly as possible with relatively limited resources this very exciting possibility.

The best opinion at the present time seems to be that which it may be possible to obtain energy from uranium on a scale of commercial importance for special uses, this type of reaction if made practical will at best tap only an infinitesimal fraction of the total atomic energy around us. The hope of tapping large amounts of atomic energy seems to lie in the possibility of discovering in the future a mechanism for atomic annihilation, in the opinion of Dr. M. A. Tuve of the Carnegie Institution of Washington's Department of Terrestrial Magnetism, one of the leading investigators in this field. Dr. Tuve, Mr. Chairman, has prepared at my request a statement on atomic power which I would like to offer as an exhibit.

The CHAIRMAN. It may be received.

(The document referred to was marked "Exhibit No. 2447" and is included in the appendix on p. 17315.)

Mr. DAVIS. Dr. William D. Coolidge, director of research laboratories of the General Electric Co., states:

It has been shown that in the case of the element uranium an enormous amount of interatomic energy may be set free, so much, in fact, that if further research shows how the process once started may be made self-propagating, we may be able to get as much energy from a pound of uranium as from millions of pounds of coal. This might prove to be a cheaper source of power than any other. Even if it were more expensive it might be revolutionary in those applications where weight and bulk are all important. It also seems possible that further nuclear research may show how the interatomic energy of some of the more common elements may be economically set free.

Dr. Lee de Forest, famous engineer, now resident at Hollywood, Calif., whose inventions have been so important in radio and motion pictures, states:

The cyclotron as developed by Prof. E. O. Lawrence, of the University of California, has already justified man's hope that eventually he will be able to derive by elemental fission cheap, universally obtainable energy in unlimited quantities. Our oil and coal resources must otherwise be exhausted within a few centuries. These must be conserved for more essential services than mere power supply.

Mr. Chairman, it happens that this morning there was announced from the University of California a gift from the Rockefeller Foundation which makes it possible to construct a new and larger cyclotron or atom smasher, and I have a statement of that which is being distributed today by Science Service, which I would like to make available to the committee.

The CHAIRMAN. Do you wish to incorporate it at this point?

Mr. DAVIS. I think it would be suitable, perhaps somewhat edited to conserve space in the record.

The CHAIRMAN. Very well, if you will cut it down and edit it, it may be received.

(The document referred to was marked "Exhibit No. 2448" and is included in the appendix on p. 17316.)

Mr. DAVIS. As in the case of the photosynthesis, the amount of research being conducted upon the problem of atomic power is extraordinarily small compared with the large winnings to mankind if success should be achieved. Most of the research is being undertaken in university and scientific institutional laboratories without any commercial objectives. On account of the extreme importance of adequate power to national economy and military defense, as well as to industry, adequate support of investigations of atomic power would seem to be a highly justifiable gamble.

SUGGESTED USE OF GOLD

Mr. DAVIS. In connection with the possible obtaining of practical power from uranium, the use of a few tons of the gold stored at Fort Knox, serving no useful industrial or scientific purpose, would be helpful. Such use of the gold would not involve its loss. The most practical methods that have been suggested of concentrating uranium is through thermal diffusion or through centrifuging. The uranium would be in the form of a complex gaseous fluoride which is highly corrosive to ordinary material but which is resisted by gold. If sufficient gold to construct the necessary apparatus could be loaned by the Government to research laboratories, this particular investigation would be very much speeded. The gold after the experiment could be returned to storage and even while in practical use would not lose its value as an asset in the United States Treasury. Perhaps some of the same gold that was prized by the Egyptian pharaohs could be used in this experiment since gold is one of the most imperishable materials on earth.

The CHAIRMAN. How much gold would be needed for an experiment of this kind?

Mr. DAVIS. Oh, a ton or two. It wouldn't be very much. It would be really just a loan of that gold, and you might have to loan a Treasury guard or a few soldiers to protect it, but even that wouldn't cost very much money.

The CHAIRMAN. There ought to be a headline in that: The witness proposes the Government loan two tons of gold. [Laughter.]

Mr. HINRICHS. Incidentally, it was an economist about 300 years ago who first suggested that gold might reach the point where it was going to have to be used as a commodity, and this seems to me to be an interesting demonstration of the cultural lag that it takes to make an inventive suggestion free.

The CHAIRMAN. I haven't looked at the Treasury statement this morning, but I am conscious of the fact that the gold at Fort Knox is measured in ounces, not in tons.

Mr. DAVIS. It might do a good deal more good in a scientific laboratory than at Fort Knox.

The CHAIRMAN. I wouldn't be at all surprised.

Mr. DAVIS. It still could be used to back up currency, of course.

The work on atomic power shows the internationalism of scientific research, and again I quote from Dr. Fosdick, that:

In the case of the breakdown of uranium during the past year, the early tentative questionings came from Rome; they were caught up at Berlin, were eagerly heard at Paris and Copenhagen, and then spanned the Atlantic and were seized upon here so enthusiastically that literally within hours, rather than within days, the critical experiments had been checked and extended at Columbia University, at the Carnegie Institution of Washington and in Lawrence's laboratory at the University of California.

There has been some fear that the sudden production of a new energy source of large magnitude would be economically disturbing. The experience has been that any development of this sort from a practical standpoint can be introduced only over a period of years even when it is once perfected. The benefits to the community at large from cheaper power would be so large that if and when atomic power or other power of low cost is achieved it would well be worth while to make the necessary economic adjustments.

Dr. ANDERSON. I wanted to ask a practical question bearing upon the subject of this hearing with respect to the time element of such a new, cheap power. When you say it would come in gradually, do you mean gradually enough for us to make the economic and social adjustments necessary to its use without a great loss?

Mr. DAVIS. I think that is a very difficult question to answer. I should think that if we had atomic power in such a way that you could apply it, probably it might take a decade to get it into such form that you could actually use it in a torpedo or automobile or some device of that sort.

From the experience that the world has had in making itself at home with innovations of a technologic sort, perhaps 100 years isn't too long. There might be a certain amount of difficulty.

Dr. ANDERSON. In other words, a 10-year span would be so short in terms of its far-reaching effects that some serious dislocation might occur from such a wide-sweeping thing.

Mr. DAVIS. Yes; it might in the same sense that dislocations have occurred through the use of radio, perhaps.

Mr. HENRICHS. May I ask a question in that connection, Dr. Davis. Does the practical application of a basic scientific principle, such as is applied here in the development of atomic energy, ordinarily make itself immediately available as a substitute in a whole series of fields, or does it become available in parts, as it were. Potentially we may need to think of readjusting our whole source of power supply with all of our mines, all of the people engaged in the production and distribution of electric power, all of the people engaged in the production and distribution of petroleum. A decade, two decades, for that sort of transition would be a terribly short period. I am interested to know whether in fact the practical application of the basic scientific principles does manifest itself over the whole field at once, or whether it tends rather to be a matter of a decade or so of development of one use, another decade in the development of another use, and so on.

Mr. DAVIS. I think it is on the order of a decade-for-a-use type of development. That is certainly true in radio. Radio came relatively slowly. That is, we had radio approximately at the turn of the

century, and we didn't have broadcasting until approximately 2, perhaps 3, decades later.

I should think, particularly if you began to use uranium, that is if you used the energy from uranium efficiently, that would be the first practical development. Nobody knows what will be the first practical development or whether there will be any, but if there is, that would probably be a very limited use. And if annihilation of the atom were achieved, that might bring about much more general use.

Dr. ANDERSON. Just to follow that for one moment, because it has some important bearing on the whole problem of technology, is it true that the state of our knowledge has come to a point where we are able to make the application much faster than we ever did before, and that there is some prospect of wide-sweeping changes occurring more rapidly than has been true in the past?

Mr. DAVIS. I think that is true. We are certainly getting certain applications such as sulfanilamide, which I want to talk about later, that have come in a good deal shorter time than such developments would have taken place a decade or two decades ago.

Mr. PIKE. You would see nations like Italy and Japan, which have no fuels of their own, who wouldn't wait two decades to put that into use.

Mr. DAVIS. No. They would put it in use once it was achieved. One of the amazing things is that the crucial experiment was done in Germany. Instead of being bottled up as a military secret, probably partly because they didn't know what they had, it was allowed to get out into scientific literature.

The CHAIRMAN. Mr. Davis, it is now 5 o'clock.

Mr. DAVIS. I will speed it up, Mr. Chairman.

The CHAIRMAN. I think that some of the members of the committee feel that this might be a good time to suspend for the evening.

Dr. ANDERSON. The schedule for tomorrow begins with Mr. C. F. Kettering in the morning, Mr. William Green in the afternoon. Mr. Kettering has promised to be here by 10 o'clock if the committee chooses to meet that early. But we can delay his presence a half hour or longer if Mr. Davis is to finish, because we should have Mr. Davis' testimony. I think the testimony ought to be in this order.

The CHAIRMAN. Yes; I think it ought to be in this order. Suppose we recess until 10 o'clock in the morning and have this witness proceed at that time, and he will then probably be in position to finish in half an hour or so, do you think?

Mr. DAVIS. I should think so; yes.

The CHAIRMAN. Unless there is objection, that will be the program. The committee will stand in recess until 10 o'clock tomorrow morning.

(Whereupon, at 5 o'clock, a recess was taken until Tuesday, April 9, 1940, at 10 o'clock.)

INVESTIGATION OF CONCENTRATION OF ECONOMIC POWER

TUESDAY, APRIL 9, 1940

UNITED STATES SENATE,
TEMPORARY NATIONAL ECONOMIC COMMITTEE,
Washington, D. C.

The committee met at 10:15 a. m., pursuant to adjournment on Monday, April 8, 1940, in the Caucus Room, Senate Office Building, Senator Joseph C. O'Mahoney, Wyoming, presiding.

Present: Senators O'Mahoney (chairman), and King; Representatives Williams and Reece; Messrs. Hinrichs, Pike, O'Connell, and Brackett. Present also: Frank H. Elmore, Jr., Department of Justice, and Dewey Anderson, economic consultant to the committee.

The CHAIRMAN. The committee will please come to order.

Are you ready to proceed?

Dr. ANDERSON. Mr. Chairman, we are proceeding with the witness who was on the stand yesterday afternoon, Mr. Watson Davis, who will continue his testimony on new and impending technology.

STATEMENT OF WATSON DAVIS, DIRECTOR, SCIENCE SERVICE, NEW YORK—Resumed

Mr. DAVIS. Mr. Chairman, we had gotten to the point in my testimony where we were considering atomic power. During the night an event has happened which might have some significance in that connection. The German occupation of Copenhagen brings perhaps into jeopardy one of the great centers of research upon atomic physics, the laboratory of Prof. Niels Bohr, and it is quite possible from a long perspective of history that it may be more important than some of the military consequences of the events that have occurred in the last few hours.

I had gotten to the point in the testimony yesterday where we were discussing the possible economic consequences of the production of new energy from a source of large magnitude like photosynthesis or the energy within the atom.

Because the problem of atomic power is in essence bound up with radiation of all sorts and atomic particles, attention is called to the future fruitfulness of more knowledge about electromagnetic radiations and atomic particles, especially the electron. The electron, the unit of negative electricity, is of course fundamental to the whole electrical industry with its wide ramifications, including radio, telephony, television, and so forth. There are many undeveloped possibilities in ultra-high frequency electromagnetic waves as a means of com-

munication, including television, frequency modulation broadcasting, and so forth.

A new field of great practical importance, in which the electron plays a major role, involves the use of streams of electrons as though they were beams of light. Dr. V. K. Zworykin of RCA, a pioneer in this field, foresees many important applications of electron optics to industrial and scientific problems. By means of a microscope that uses electrons instead of light radiation, the scientist is developing a means of delving further into the depths of things about us than is possible by means of visible or even ultraviolet light. The electron microscope promises to have important applications to biological, medical, and industrial research.

Atoms that are made to explode, artificially radioactive elements, a relatively new achievement in physics (the textbooks of a few years ago will state that radioactivity is found only in naturally occurring substances, in such elements as radium) are proving to be useful tools for research. Whether they will have practical industrial use is a matter for the future to tell.

Not only to explore the universe but to determine the fundamental properties of matter, the astronomer turns large telescopes to the heavens, where in the stars are found temperatures and conditions of matter which cannot be attained here on earth. From these explorations of the universe, much of our fundamental knowledge about the nature of matter has come, and in the future it can be expected that additional information of technological importance will be snatched from the heavens in this way.

It is conceivable, in the opinion of Dr. Lee de Forest, that we may be able to tap subterranean sources of heat in many localities for power and heating purposes. A long-term heat-storage discovery or invention might permit us, in his opinion, to store and use solar energy in enormous quantities, but today he sees no promise of such. Adequate fuel crops are conceivable but Dr. de Forest believes that climatic vagaries would seem to make this uneconomical.

The direct conversion by combustion, of coal into electricity is a possibility upon which some research is being done. If this were accomplished efficiently the present round-about method of power production, burning coal to make steam for use in engines or turbines which in turn drive dynamos to generate electric power, would be replaced by a direct one-step process.

LONG-RANGE WEATHER FORECASTING

Mr. Davis. Turning to the problem of long-range weather forecasts, the weather is so important to the conduct of everyday affairs, industrial activities, and human activities in general, that knowledge of what the weather is to be in the future is of immense practical importance. At present the weather forecasts issued every 8 hours covering up to 2 days in the future are so much a part of our daily life that we take them for granted. The providing of these forecasts by the U. S. Weather Bureau is one of the most important of governmental functions.

The prediction of what the weather will be weeks, months, and years in the future is one of the important problems still to be

solved. If it were possible to know what the weather was to be next year, or several years from now, whether the growing season in various regions was to be satisfactory or unsatisfactory, whether the winter was to be abnormally cold, whether there was to be too little or too much rain, the savings to agriculture, industry, and the nation would be very large. Such information would be of great use in planning personal activities in the future. Both supply and demand of commodities are greatly affected by weather conditions, and long-range predictions that would reduce the hazard due to weather would be of great benefit. On a national or international basis reliable knowledge of the weather to come would allow the Government and business to make plans for meeting changing conditions, which without long-range weather forecasting, assume the shape of emergencies. Disastrous famines might be averted. Unmanageable agricultural surpluses might be reduced.

Research and progress on this problem holds out the hope that with enough work, adequately supported, there is a good chance that weather forecasts considerably further in advance of what is now possible will be developed. Prediction of the seasonal trends may be possible for years in advance.

Prediction of the weather as a general public service has been a function of the government in practically all parts of the world. Long range weather forecasting could hardly be considered the foundation of an extensive industry itself, but business and industry will benefit to a large extent when and if the long-range forecasts are possible.

Trends in long range forecasting research are shown by the following developments, made known in statements obtained from representative investigators:

"Short" long-range forecasts for 5 days in advance, on an experimental basis, have been made by the United States Weather Bureau during the past 2 years, based on a combination of statistical studies, synoptic techniques, and physical theory of the general circulation of the atmosphere. These forecasts have been subjected to rigid verification tests and have lately become sufficiently successful to warrant a broader try-out.

The extension of present forecasts from 2 days to 2 weeks, and the making of forecasts of temperature and precipitation for seasons and even years in advance, on the basis of solar radiation, are considered possible by Dr. C. G. Abbot, Secretary of the Smithsonian Institution, as the result of extensive research.

Long-range forecasts for the United States are considered possible for the future by Dr. Charles F. Brooks, director of Harvard University's Blue Hill Meteorological Observatory, but he feels that the problem is no easy one and would take much work at great expense to solve to a generally useful point. The value of such forecasts, however, would far exceed the cost. In one study of world weather it has been found that conditions in the Southern Hemisphere indicate subsequent abnormalities in the Northern Hemisphere more often than do antecedent conditions in the Northern Hemisphere itself.

I have here, Mr. Chairman, statements on behalf of the U. S. Weather Bureau, Dr. C. G. Abbot, and Dr. C. F. Brooks, which I should like to submit as exhibits.

The CHAIRMAN. They may be received.

(The document referred to was marked "Exhibit No. 2449" and is included in the appendix on p. 17316-17319.)

Mr. DAVIS. In the opinion of Dr. Lee de Forest, universal stratosphere flying and better interpretation of information obtained from radio transmission phenomena, cosmic rays, sun cycles, and earth-wide meteorological data will enable twenty-first century man to reliably forecast long-range weather conditions for agricultural and other planning.

Turning to synthetic materials, bountiful as Nature has been in supplying the earth with materials useful to man, research and invention have created important synthetic materials, many of them unknown in nature, which play extremely important parts in our daily economy. Many of these are familiar to us in our daily life: drugs, dyes, and chemicals from coal tar, a multiplicity of plastics or synthetic resins, alloys of iron and other metals, rayon, and so forth. In the field of textiles or fabrics alone in the last few years, chemistry has given us nylon, a silklike synthetic fiber made basically from coal, air, and water; vinyon, another synthetic fiber; synthetic wool, made from casein of milk or other protein; and even fibers of glass. Clay has been transformed into a synthetic mica which potentially makes us free from overseas export of this essential mineral needed by industry.

For the future, particularly if power is obtained by discovering the secret of photosynthesis or from within the atom, it may be considered a crime against society to burn coal or oil for power or heat, because their chemical constituents are so much more valuable than their energy content.

On behalf of the General Motors Research Laboratory, in a comment on the possibility of extended chemical utilization of oil and coal, prepared by T. O. Richards, head of the laboratory control department, it is declared:

Oil and coal have long been considered as finished products that only needed a certain amount of refining to put into commercial form. Within the last few years petroleum particularly has come to be considered as simply a source of chemical compounds which can be torn down and built up and rearranged into particular compounds of specific commercial value. The utilization of coal as a raw chemical material to be used as a building block for chemical compounds has barely begun, but it will become an important chemical industry. Just what products will be made, we don't know.

Du Pont comments as follows in a statement on this possibility prepared by Theodore G. Joslin, director of public relations department:

In our judgment, coal and oil will serve as valuable sources of raw materials for the synthetic organic chemical industry. It is our belief that there will be great developments in the future, but we do not see the future clearly enough to want to speculate for publication on what these possibilities will be. Beyond any doubt, many millions of dollars will be spent on research in connection with these problems, but it is impossible for anyone to make an accurate estimate.

The artificial production of diamonds is a possibility foreseen by Dr. William D. Coolidge, director of the research laboratory, General Electric Co. Such an accomplishment would be of great industrial importance and the production within the last few months of high pressures in the order of 3,000,000 pounds per square inch is a step in this direction. Dr. Coolidge states:

Diamond, the hardest known substance, would have much more extensive use as an abrasive material for grinding operations and for rock drilling if it were

less expensive. Through research on the effect on graphite of high pressure combined with high temperature it might be possible to learn how to make diamond artificially and relatively inexpensively.

The production of refractories which would withstand higher temperatures than the furnace linings now available would be of great industrial importance. Failure of the furnace linings is now the controlling factor in the production of high temperature industrially. With respect to this problem Dr. Coolidge says:

Power from coal or other fuels could be produced more economically through the use of steam or other vapor if higher temperatures and pressures could be employed. We are now limited by the high temperature strength of present metals. Current metallurgical research indicates possibilities in this direction and the importance of the problem warrants much further research effort.

Common building materials are susceptible to considerable improvement, as these two observations by Dr. Coolidge will indicate:

Present research on road materials is showing how the life of a pavement may be economically increased. Further research in this direction should lead to improved highways with all that this means in better living conditions and in the strengthening of our national defense.

Further research on plastics and other materials is certain to contribute greatly to the solution of our important housing problem.

METAL ALLOYS

Mr. DAVIS. The science of metallurgy has only begun to tap the vast domain of metal alloys. There are millions of combinations of metals possible that are not yet investigated. Only about a thousand alloying combinations of metals have been studied and most of these are inadequately investigated. Millions of binary, tertiary, and quaternary alloy systems still need investigation. Among them there undoubtedly many hundreds of combinations which would be striking improvements over alloys now in use.

Some of the unusual metals being used in alloys will give indication of the possibilities for improvements in metals in the future. According to information supplied by Dr. Oscar E. Harder, assistant director of the Battelle Memorial Institute, Columbus, Ohio, the unusual new elements being used in steel include silver, titanium, tantalum, columbium, and vanadium. These elements are being used in stainless steel. A columbium-containing heat-resisting alloy has been patented recently. Silver is used in bearing metals, as is cadmium. Tantalum and columbium are being used as pure metals and as the carbide for making bonded carbide tools. During the past few years high-speed tool steels in which molybdenum has replaced tungsten in whole or in part have been developed to where they are accepted by industry. Metallic manganese is being made by an electrolytic process.

The old dream of the alchemists, transmutation, has been achieved in the scientific laboratory. Although relatively small amounts of one element have been changed into another, almost every element has been transmuted into some other element. This holds out the possibility that in the future when large amounts of power are available, and when more is known about the constitution of the elements, it will be possible to manufacture the rare elements from the common elements.

As Dr. Lee de Forest puts it [reading]:

Today's astonishing, although as yet meager, atomic transmutations abundantly justify the hope that eventually we may be able to manufacture all rare metals from those more nearly inexhaustible and located within our reach.

He adds that—

many other elements will soon be in the rare category if present rates of consumption continue.

CHEMICAL THERAPY

Mr. DAVIS. Turning to the chemical cures of disease, the remarkable success in the use of sulfanilamide and its related chemical compounds in treating a large variety of diseases, some 40 different sorts, focuses attention upon the possibility of further chemical cures of disease in the future. While the results obtained with the sulfanilamide chemicals are truly remarkable—they have changed the routine method of treatment of many diseases—there are still many diseases of economic importance that are not successfully treated. There is hope that chemotherapeutic agents can be developed for the control of infectious and other diseases not now successfully treated.

The economic loss due to illness is appalling. The manufacture and distribution of drugs to be used by physicians is in itself a large industry. It is evident that there are many economic implications in the treatment of disease and the problem of human health.

A healthier population which will result from the application of medical advances should be an economically more secure and effective population, capable of greater consumption and production. A slowing population growth, undesirable from the standpoint of consumption of industrial goods, may be counteracted to some extent by the lengthening life span and the ability of individuals to engage in active work during a longer period of their life.

Despite the advances in medical treatment, there are non-infectious ills such as cancer and heart disease that are unsolved problems.

In the opinion of Dr. Perrin H. Long, of the Johns Hopkins Hospital in Baltimore, who brought sulfanilamide to America, there are still chemotherapeutic advances to be made. He states:

While great advances have been made in the chemical treatment of bacterial and parasitic diseases, there is every reason to believe, if research is prosecuted vigorously in the laboratories of the chemical and pharmaceutical companies of this country, that more effective chemical compounds can be elaborated for the control of infectious diseases, for example: We still do not have as effective drugs as we need for the control of infections caused by the typhoid-colon group of bacilli, the staphylococci, and we have nothing that affects such diseases as the common cold, influenza, infantile paralysis, or the other virus diseases. All of these problems ought to be attacked. I can not estimate how much money is being spent on chemotherapeutic research in this country at the present time, but my rough guess would be in the neighborhood of 2½ to 3 million dollars, that is, if one leaves out or does not consider the experimental work that is being done on syphilis.

About 20,000 substances related to sulfanilamide have already been made, according to Prof. Paul D. Lamson of the Vanderbilt University School of Medicine. The task of trying all these on diseases in which they may be helpful is a gigantic one. In Professor Lamson's opinion, we are for the first time faced with a public which has come to see that cures can be produced with chemical substances. The public is beginning to see that something can be done about the

problem of disease and that the time has come to do it. In Professor Lamson's opinion, investigation should be conducted to find out how the animal body works, by using chemical substances as exploratory probes, thus giving the knowledge needed for the development of better treatments of disease.

In recent years the chemical nature of vitamins and hormones has been discovered and many of them have been synthesized. Striking cures of diseases have resulted from the use of vitamins and hormones therapeutically. One of the latest disease conquests has been the abolishment almost overnight of the bleeding tendency in jaundice patients who have to be operated upon, by injections of the new synthetic vitamin K.

According to Dr. Walter Simpson, of the Miami Valley Hospital, Dayton, Ohio, in a communication transmitted by Dr. Charles F. Kettering, experiments now under way indicate that by combining relatively large doses of arsenic compounds with artificial fever it may be possible to reduce the minimum time for the treatment of syphilis from 18 months to a few days. When the treatment for syphilis becomes simpler and cheaper, we shall be well on our way toward the eradication of this great destroyer of mankind.

Statements by Dr. Simpson on vitamin K, pneumonia, syphilis, and malaria are made available to the committee, and I would like to offer these as exhibits.

(Senator King assumed the chair.)

Acting Chairman KING. They may be received.

(The document referred to was marked "Exhibit No. 2450" and is included in the appendix on pp. 17319-17320.)

Mr. DAVIS. To an even greater extent than in many other fields, the development of medical research is an international undertaking. This is shown vividly in the case of the sulfanilamide compounds. The first hint of this amazing development came in connection with the dye industry in Germany, and the drug actually was shoveled around an industrial plant for years before its medical usefulness was discovered. German, French, British, and American institutions all played important parts in the development of this drug, which has brought such brilliant results in the treatment of disease.

GENETICS

Mr. DAVIS. The living plants and animals that populate the earth constitute one of our most important natural resources. Primitive man, by selecting the best plants and animals for his purpose and allowing them to perpetuate themselves, made remarkable advances in quality and usefulness of his crops and his livestock.

Since the turn of the century, when the scientific fundamentals of genetics began to be known, this process of scientific breeding of both plants and animals has been greatly speeded. The superior grain, fruits, and vegetables, the more efficient animals, from the standpoint of milk, the improved meat and wool production that the farmer now has, are indications of what can be done through this improved process of invention applied to living things.

In recent years the role of man's part in invention of new plants has been recognized through the inauguration of plant patents.

Industry has always used to a large extent the products of the farm and forest, but there is an awakening realization that agriculture can furnish more of the raw materials of industry than it now does. Improved crops and animals will play an important part in this promising movement.

Promising possibilities for further advancement are seen by scientific investigators working in the field of genetics.

Dr. A. F. Blakeslee, director of the department of genetics, Carnegie Institution of Washington, Cold Spring Harbor, Long Island, N. Y., states:

Scientific plant breeding, known as genetics, is responsible for the conscious development of superior types of plants and their preservation against the ravages of disease and other unfavorable conditions. The economic value could be cited of crossbred seeds in corn which gives increased yield from hybrid vigor, hybrid vigor in forest trees, the development of rust-proof grains and other disease-proof crops through hybridization and selection. Genetics is at the basis of improvement in the present wide range of agricultural and horticultural forms. In the future, genetics will play a greater role than in the past, with ability to control increase of chromosome number by such stimuli as colchicine and by other methods, new species and variety will be made up in order to meet special needs. In ways and to an extent impossible to imagine at the present time, I believe geneticists will exercise conscious control of evolution to the betterment of mankind. Important sources of raw material, such as cellulose from cottons, paper pulp, and cornstalk waste, as well as plants as sources of food, are all controllable by genetics methods.

Dr. E. D. Merrill, administrator of the botanical collections of Harvard University, Arnold Arboretum, Jamaica Plain, Mass., states:

It is very difficult for one to indicate the tangibles in genetics in reference to plants and plant breeding. I personally doubt if any new major industries can be developed on the basis of research in this field; but, manifestly, many existing industries could be increased in importance by the utilization of existing and potential knowledge within the general field of genetics and plant breeding. New significant social developments could hardly be expected, but the increased utilization of knowledge in industry would have a very favorable reflex action on our whole social set-up. I would be inclined to forget genetics as genetics, and emphasize plant breeding. Too many individuals are working on abstruse phases of the general subject of genetics, and too few well-trained men are devoting their efforts to the actual problems of breeding plants for resistance, adaptability, yield, and other similar factors.

Prof. M. F. Guyer, professor of zoology of the University of Wisconsin, states:

The application of genetics to domestic animals is very important from the standpoint of resistance to disease. The genetic constitution of the host is no less important than the nature of the invading germ. Many investigations indicate this. The work should be greatly extended.

Dr. W. C. Curtis, professor of zoology of the University of Missouri, states:

Considering that all our most important knowledge in genetics has been acquired since 1900, it is not surprising that practical applications are just beginning. With the theoretical foundation now established and being rapidly extended, it will be surprising if important applications are not forthcoming in the next few decades. Such has been history in all branches of natural science once the basis has been laid in fundamental knowledge. Such applications have already been made in many instances in domesticated plants. Applications to animals are more difficult but are on the way. The possibilities of human applications with advancing knowledge are very great within the limits that such knowledge can be applied to human beings.

It is possible that in the years to come the greatest contribution of genetics to our society will be the conscious evolutionary improvement of our human population that it will make possible.

The way in which human beings get along with each other, at work and in general living, is perhaps the paramount problem of industry and the world at large. Human relations in the factory, in the community, and in the home, might not seem to be at first consideration a problem for research and technology. As a matter of fact, it seems probable that the methods of scientific research applied to this great problem in which the reagents are human beings will be capable of producing useful and fruitful results with as much assurance as they do in less animate fields. Admittedly, the difficulties in this field are larger because we are dealing with ourselves and we always feel that we know all there is to know about ourselves.

Man, as an individual and in the group, is the subject of investigation by psychologists, psychiatrists, teachers, administrators, and others who deal with various human problems. It would seem logical that some of the findings in these fields might be applied profitably to the difficult relations in the fields of business, politics, and international affairs. Any scientific developments or researches that would minimize the conflict between labor and management in industry would be likely to pay large dividends. Any scientific inquiries that would be likely to minimize the chances of economic and military conflict between nations would likewise be very profitable.

I have turned for an analysis of the situation with relation to the problem to Dr. Elton Mayo, professor of industrial research of Harvard University's Graduate School of Business Administration. He sees three outstanding present and future problems in industry and general living. They are: better human relations, executive authority, and unemployment. He finds the amount of research being done on these problems so small as to be negligible. It is only the obvious aspects of the difficulties that are being studied, and the various inquiries deal only with palliative measures for the symptoms instead of diagnosis of malady.

I have a statement from Dr. Mayo I should like to submit as an exhibit.

Acting Chairman KING. It may be received.

(The document referred to was marked "Exhibit No. 2451" and is included in the appendix on pp. 17320-17324.)

Mr. DAVIS. This material from Dr. Mayo is particularly pertinent to the subject under discussion by the committee because of the fact that it does go into the human basis of conflict between employers and employees, and I think it is worthy of rather detailed consideration. However, I am not going to take the time of the committee to read these quotations.

I have an excerpt from a document by Lawrence K. Frank that I should like to offer as an exhibit that discusses the background of conflict.

Acting Chairman KING. It may be received.

(The document referred to was marked "Exhibit No. 2452" and is included in the appendix on p. 17325.)

Mr. DAVIS. I should like to call to the attention of the committee the very difficult problem of the mobilization of knowledge.

SPREAD OF TECHNICAL PROGRESS

Mr. DAVIS. With the accelerating pace of scientific research, invention, and development, the distribution, interpretation, and utilization of the knowledge already obtained become increasingly important problems.

The normal way of announcing a scientific discovery is to publish a paper in a scientific journal or the report of a scientific institution. An invention is made public through the issuance of a patent; in effect, the inventor tells the world what he has done in exchange for a monopoly of his invention for a limited time. Scientific meetings and conferences are an effective way of exchanging scientific information and results.

There has been built up through the years a vast and complex scientific literature containing the results of past researches. These journals, books, reports, etc., are accumulated in libraries. The channels of publication are relatively adequate. It is usually possible for any important scientific contribution to be published in at least abbreviated form in a scientific journal. The facilities for keeping on file in libraries the scientific literature are also relatively adequate.

The great failure of our organization of our written knowledge lies in the inability of anyone to put his finger upon all the literature on a given subject with relative completeness and at a reasonable cost. Our organized knowledge as contained in the printed literature is extraordinarily poorly indexed from the standpoint of its efficient utilization.

In a few fields, such as chemistry, there are abstract journals which do an invaluable job. But in many fields bibliographic resources are quite inadequate, resulting in investigators not being able to discover what researches have been made in a particular line of inquiry in the past.

New mechanisms recently developed, or in the process of development, which may be called new tools for intelligence, are likely to prove useful in this needed mobilization of knowledge.

The card index was a major invention in connection with scientific information services. Of similar usefulness is microfilm, reduced-size images on photographic film, which can produce with facility and low cost single copy editions of anything that a camera lens can see. Microfilm is in practical use, making available to scientific workers copies of articles in libraries which they need in their researches. It is also being used to publish upon demand extensive research reports which it is not practical economically to print in extenso and distribute widely.

With mechanical and photographic devices already existing, under development, or capable of being developed in the future, the marshaling of the scientific and technical knowledge of the world so that it may be used to the fullest extent would seem to be a project that could be contemplated if the need were realized, attention were given to the problem, and means were available. It would be of immense benefit to the world to create what H. G. Wells has called engagingly a "world brain."

Most of the scientific literature has been listed by title or abstract bibliography somewhere in abstract journals or in special bibliographies or large card compilations. Microfilm would make it possible to multiply the cards under various subject classifications and to copy them for distribution to the scientists and inventors that need them. A great many fields of development would come to fruition in such a project. This is a large project that will require cooperation between different kinds of research workers and even between different nations to make it effective. It is of such magnitude that it is probably a matter for public rather than industrial support. The cost would be considerable but the returns to industry and the community at large through the speeding up of research and invention would make the project a very profitable undertaking to the community at large.

Better coordination of research and the exchange of information about research in progress between investigators will also help in our mobilization of human knowledge.

It is very important that the public be informed about the progress of science and invention and the possibilities of further advances. Cooperation of the press and other media of distribution of news and information is essential in this connection.

Acting Chairman KING. Thank you very much. Are there any questions?

Who is your next witness?

Dr. ANDERSON. In calling the next witness, I might refer to the closing remarks of Mr. Hinrichs yesterday and outline once more the issue of these hearings. We have had in mind not only the oral hearings conducted with your questioning, but the published record. In doing so, we have devoted the first day, yesterday, and half of today, to the general topic under review. We have called, in the first place, an economist to give a detailed statement of what technology looks like in terms of economics. You have now had Mr. Watson Davis, who is a scientific writer, who has outlined the scope of impending technology, and we wish to call now a man whom we selected with great care, Mr. C. F. Kettering, vice president of General Motors Corporation, and general manager of the Research Laboratories Division of General Motors. We bring him before you as the third member of this general review section, to speak as an industrial engineer on the topic that he knows best—technology and the social economic horizon.

Mr. Kettering has prepared a statement which is submitted to the committee at this time, and I understand his secretary will read that statement to the committee as the opening of his remarks. Mr. Kettering has been before the committee before and you know him so well that he doesn't need an introduction. I know his lively treatment of the topic will call forth a great deal of questioning from many. We begin with his statement, and then, as Dr. Kettering says, it is up to you, and he is at your disposal for any questions.

Acting Chairman KING. The committee is well aware that Dr. Kettering has been before the committee, as you have indicated. It isn't necessary that he be sworn again.

STATEMENT OF CHARLES F. KETTERING, VICE PRESIDENT, GENERAL MOTORS CORPORATION, IN CHARGE OF RESEARCH, DETROIT, MICH.

Mr. PAUL GARRETT, secretary to Mr. Kettering (reading):

We have been accused of producing unemployment by too many inventions, yet the facts are that we haven't enough new things to provide sufficient jobs for all of the people who want to work. Someone said years ago that necessity is the mother of invention. Necessity for invention *then* was to produce machines and devices which would save human labor because there were so many more things to do than there were hands to do them. Today, necessity is again calling on the inventors to produce new things, because we have more hands than we have jobs to do.

We know that this call for new products from the inventors and industries will not go unheeded. Many of these products will come directly from a system called industrial research, a process which is American through and through. This is a process of cooperative invention and it will surely bring into our industrial machinery many new products and improvements.

In the field of automotive transportation, with which I am most familiar, we are not even predicting when you hear that the next ten years will show a rate of improvement greater than that of the past ten years. This fact is established as clearly as anything in the future can be established. Scores of research projects are now under way in the industries which make automobiles, trucks, buses, tractors, airplanes, and Diesel locomotives. This is also true in every one of the industries which make and supply the materials for our industry, such as petroleum, rubber, steel, fabrics, chemicals, etc. Success in only a small percentage of the projects now in mind will give American workmen thousands of new jobs and will increase the value of the transportation dollar more than can now be realized. Statistics show that of the millions of people who earn a living in the automotive transportation business only about 10 percent are employed in making the vehicle.

In research laboratories all over the country we now have men who are learning to think. In the management of the automotive and associated industries, we have enlightened executives who have learned how to spend money to give research men the *opportunity* to think. They are providing the tools to make ideas come alive.

I like to think of this mass production of ideas as a team play in an immense effort to readjust our economic system so as to put to work our excesses of men, money, and materials. Our team includes many men, many companies, many industries.

Speaking from my own experience, I think particularly of the automobiles of tomorrow, the airplanes of tomorrow. They are being built right now in secluded laboratories by specialists in fuels, metals, ceramics, rubber, plastics—by designers of engines—by petroleum technologists—by others who are devoting their lives to improving such humble but indispensable engine parts as valves and fuel pumps, lubricants and gasoline, for these oil products are now as much a part of the engine design as the crankshaft and pistons.

Progress encounters new and more difficult problems. Each year the road ahead is steeper. When Orville and Wilbur Wright made their historic flight of 120 feet in 12 seconds, they had to think only of the process of flying, but now, just 36 years later, when you buy a ticket to Europe the company which operates the airplanes has a thousand additional problems and it has to take the question of successful flight for granted. But we in America take progress on this road for granted, as we also take for granted blessings unknown anywhere else on the face of the globe. This has happened partly because we are, in a healthy sense, an unsatisfied people. We who make automobiles are not satisfied with the fine new model that rolled off the production line today. It may be the best car that has been built up to now. But tomorrow, so help us, we'll build a better one. The chemists who spin a silken thread from a magic brew of air and water turn back to their laboratories bent on new discoveries. The petroleum engineer makes a better gasoline. Now, he says, we'll make it cost less. And he does.

Thinking men are driven by a God-given dissatisfaction with present achievements. Through such men, industries are revolutionized. And even if research workers and their companies were content to rest on their laurels, you and a

hundred million others would not let us. Somehow, because you are Americans, you demand and think you have a right to expect more value, more usefulness from everything you buy, and I think you have.

That's why our tempo of progress is speeding up. American industry is cultivating ideas as its richest investment in the future. We are looking for young Marconis, young Bells, young Edisons. We have many of them in our laboratories now. We encourage them. They are taught to look upon progress as a road that has no end.

If we give them the opportunity of free enterprise, they will contribute freely. In every industry—those existing and those to come—their improvements will demonstrate clearly that what we have today is not enough or good enough. That is why, with all conviction, I say that the future is boundless. It holds a treasure of great and good things for all of us to share and of jobs enough for all of us to do.

Acting Chairman KING. Do you desire to supplement the statement that has just been read?

Mr. KETTERING. If you care to ask any questions, I will be very glad to answer them.

Acting Chairman KING. Do any of the members of the committee desire to ask Mr. Kettering any questions?

Mr. PIKE. On one point, Mr. Kettering. You say that the process of industrial research is American through and through. How does that differ, say, from the German process of research, which for very many decades was regarded as tops in the world?

GROUP V. INDIVIDUAL RESEARCH

Mr. KETTERING. I think the main difference is the fact that you get a group of men to cooperate. I think the particular thing is, our concept of industrial research is not so much an individual working on a problem as a group of men working on a problem. In the German industrial research they usually segregated the individuals on a specific problem, and here we—

Mr. PIKE (interposing). Under competent direction you work the problem out.

Mr. KETTERING. You see, if you can pick a problem, it may be a many-sided problem, and therefore you have to correlate the activities of a group of them. I think that particular thing is original in this country.

Representative WILLIAMS. In that work, do you confine that cooperation to the ones in a particular industry, or do you work in cooperation with research laboratories from other industries?

Mr. KETTERING. The thing I was particularly speaking about was a particular research in any industry in which is required the services of metallurgists, physicists, chemists, and so forth. You see, the average inventor is pretty much of a personalized thing. He likes to work alone. The great difficulty is the transition period from the individual as an inventor to the group as an inventor; that is what I was trying to develop—group invention rather than individual invention.

Representative WILLIAMS. In other words, you have a separate and independent research department—

Mr. KETTERING (interposing). Oh, yes.

Representative WILLIAMS. In your company that works not in cooperation with other companies, but within their own group.

Mr. KETTERING. Yes. We work with other organizations in the problems developed. If it is necessary to work with a chemical company or oil company, we will work with them, understand. But we originate the problems that pertain specifically to our industry.

Representative WILLIAMS. How many men have you in your research division?

Mr. KETTERING. About 400 or 500.

Representative WILLIAMS. And what is your annual expenditure on that branch of the industry?

Mr. KETTERING. I will have to guess. I would say it is in the neighborhood of \$1,500,000 to \$2,000,000. That has nothing to do with the engineering of the General Motors products, you understand. We have nothing whatever to do with the products General Motors makes. We have only to do with broadening the base. You see, we work only on new industries, trying to develop new industries to take up the slack in employment.

Dr. ANDERSON. Will you describe the set-up of industrial research within General Motors and then within the organization of which you are also the head?

RESEARCH IN GENERAL MOTORS

Mr. KETTERING. I will be delighted to do that. Our particular set-up is something like this. There is no very definite way in which you can draw departmental lines of research because they shift almost with every product, but for the sake of generalizing the situation we have our laboratory set-up divided up like this: We have a department of chemistry, and in that department of chemistry we have allocated all of the specific problems that have to do with the chemistry of our industry, which will be paints, varnishes, fuels, and all of the others—metallurgy, and so forth—in that chemical department, and we are departmentalized to the extent of having a fuel-research department, a rubber-research department, plating, and so on; then in the material division, which comes under the general head of chemistry, we have our metallurgical department; then material tests, and so on.

(Senator O'Mahoney resumed the chair.)

Mr. KETTERING. Then we have a department of physics, and in that department we have all the ordinary apparatus that goes with a department of physics. We have our X-ray department, we have our high-voltage department, our ignition departments, and spectroscopy and all of the other facilities that would be in a high-grade physical laboratory. And those are all equipped with technicians, and it is the correlation of the technician, say, in the physics department with the technician in the chemical department that I was talking about particularly when you asked the question.

Then we have a department of design, because all of these ideas have to be formulated finally into a concrete thing, and if it were a Diesel engine, we would design a Diesel engine for a service, but not as a product, because you have to design something that you can put in and prove the principle. So we have a design department. In that design department we design apparatus, build it, and subject

it to test, without any idea whatever as to how it is going to be manufactured.

After we have had demonstrated the fundamental principal of that, then some manufacturing division takes that, and we act only as consultants, and have nothing to do with the final application.

Dr. ANDERSON. At that point, how do you determine upon the projects to be investigated by the scientific section of your organization?

Mr. KETTERING. We have a committee of about three or four men, consisting of myself and three or four of my assistants, who try to select the general subject of investigation. Of course, from Mr. Watson Davis' discussion, you could see there are a million things to investigate, but research men are quite hard to get, and therefore you have to select what you might call the control problems that control an industry, and we are the ones who select those problems, and—

Dr. ANDERSON (interposing). On what basis do you make the selection?

Mr. KETTERING. We make our selection very largely on this basis: looking down the road, what are the most important problems that our industry has? The most important single problem the industry has is the question of fuels, so fuels have been one of our researches ever since the laboratories were started. In fact, long before our laboratories were started, when I was running my own laboratory in Dayton, I had been working on this fuel thing since about 1913, and some of the same boys that started in 1913 are still on the job, and every year we think we know a little something about it and the next year we slip back a little bit, but I think we have gained.

But the reason that is an important problem is because with our best automobile engine that we have today we are utilizing less than 5 percent of the total efficiency of the fuel. That isn't because we don't want to utilize any more. That is the best we have been able to do. That is, there are theoretically about 450 miles, if you could use all the energy in a gallon of gasoline, in a gallon. A small car, Chevrolet, Ford, or Plymouth, would go about 450 miles on a gallon of fuel. I don't think anybody claims we are getting that, but I think we are getting 5 percent of it. As long as there is a 95 percent waste factor in that thing, you can see right away you can't let that go neglected. The fuel and the engine are so tied together that you can't treat one without treating the other, you see. They are integral parts of each other, so engines and fuels have been and will continue to be, as long as the industry lasts, I think, a major problem, and it was out of that work on the study of engines and fuels that we developed this new Diesel engine which we use on these high-speed trains, submarines, and so forth, because we were simply trying to see if the thinking that we were doing was applicable in these other lines, and that has worked out very well.

Dr. ANDERSON. When you make a discovery within fuels, such as ethyl or some other discovery, is that discovery then patented by the company, in the company's name? What is your policy with respect to control of the discovery?

PATENT POLICY OF GENERAL MOTORS¹

Mr. KETTERING. That varies with every one of them. There is no rule. We have no rule on that thing at all. We take out patents, and they are usually turned over to the division that is going to market the thing. They become the property of the commercial organization.

Dr. ANDERSON. So that research beyond the actual discovery and perfecting of an invention does not move over into its application.

Mr. KETTERING. No; you can't do that, and I am glad you mentioned that point because that is one of the places we have to watch. Any new device, it doesn't make any difference what it is, is two things. It is a principle and it is a product. Now, when you put the product on the market first, it is bought by a few people who think they want it. They immediately begin to reflect back on the modifications of that, and it is purely the function of engineering from then on. If you take your research men to do that you don't do another research job for 10 or 12 years, so what you have to do is to set it pretty clearly, and when we set up our research laboratories we set this very clear and distinct line, that we were to have neither authority nor responsibility.

Mr. PIKE. That is where the individual inventor is in a pretty bad fix. He hasn't any separate sales and engineering organization.

Mr. KETTERING. I went through that several times myself.

Mr. PIKE. You did a very good sales job on one of yours.

Mr. KETTERING. That is still going on. The weakest thing—when I say the weakest thing that the technical man per se has, it is that he only knows three dimensions; length, breadth, and thickness. He deals with the material relationships completely, while there is a fourth dimension that we say goes into that, and that is the economics—how much it is going to cost. The thing doesn't become a product until its cost is brought down to the place where people can buy it. You have to get a man cost-conscious, and of course you can't be cost-conscious when you haven't anything to work on.

Dr. ANDERSON. With that divorce between research of a primary and secondary character and its application, the scientific men are not in any sense responsible for the economic aspects of the product. They are not concerned with whether or not it is put on the market immediately, whether it is held off the market, whether it goes on in partially completed form for trial and error in purchasers' hands, or anything of that sort. They have nothing to do with that.

Mr. KETTERING. No, no. You couldn't have anything to do with it, you see.

Senator KING. My recollection is that we have many examples of brilliant investigators and researchers and inventors who have, at the same time, had considerable business ability, and associated themselves with others in putting their product upon the market to their great advantage.

Mr. KETTERING. Oh, that is all right; yes.

Senator KING. There is no assumption that the inventor lacks skill as a businessman.

Mr. KETTERING. Oh, no.

Senator KING. And as promoter of the product which he has invented.

¹ In this connection see also Hearings, Part 2, pp. 328-372.

Mr. KETTERING. No; but merely to facilitate the organization, here is what we have. We have 1,000 people who can make and market a product to one who can originate it. The system that we have set up is a conservation of our originating talent.

Mr. HINRICHs. It does, however, distinctly separate the two functions, so that the inventor, the developer, the research man, has no interest in the question of whether the product is marketed or is pushed into competition with existing processes.

Mr. KETTERING. He has. You have to draw some line where his responsibility stops, see. For instance, we will take our small truck and bus engine. The men who developed that in the research laboratory as a principle elected to go into the factory. There were about 100 or 125 of the boys who had been in that development end who elected to go into the commercial phases of it, so they moved bodily out and went with the thing. They always have that opportunity to do it if they want to do it.

Mr. HINRICHs. It does involve a clear-cut separation of the inventive scientific function and the subsequent decision to commercialize the product.

Mr. KETTERING. Yes.

Mr. HINRICHs. And you now have a situation in which fundamental scientific research on a very large scale is being conducted in enterprises which have an extremely heavy stake in existing processes as well as in the prospective process, whereas in the individualized inventive function the inventor's stake in the past is ordinarily comparatively slight, has been frequently very slight, and his stake in the future may be very large. There is some change in that respect in terms of the commercial application of the product, isn't there?

Mr. KETTERING. I don't quite grasp the point you are making there.

Mr. HINRICHs. The decision now to apply scientific investigation has to be made by a commercial organization with a very heavy investment in the methods of production which have characterized the past, and an investment which might be jeopardized by the prompt application of scientific discovery, and you introduce a commercial consideration into the question of whether it is worth while to apply.

Mr. KETTERING. Well, are you asking whether or not we hold back things because they might interfere with something that is already on the market?

Mr. HINRICHs. I was asking in the first place whether it is correct to assume there is a change in the general situation. My second question was going to be, does that mean that at any point the application of invention is held back, and how is that conflict reconciled by the company between its interest in its existing investment and its interest in the application of a new principle which might result in substantial economies in the future to users of the products, but might also involve jeopardizing, for the time being, a rather large investment that has not yet been fully amortized.

Mr. KETTERING. I can only speak for my own industry. We are always behind. Our people say we are slow. We are not getting

stuff out fast enough. Almost all of our things are new things, and don't interfere with anything that we have already got.

Representative WILLIAMS. May I just interrupt for a moment. There is a call of the House, and I ask to be excused.

Dr. ANDERSON. If a research worker discovered a means of utilizing not 5 percent but, say 50 percent of the full content, and it resulted in a drastic alteration in your automobile, what would be the procedure? You have startling inventions. What happens?

Mr. KETTERING. Of course, I couldn't draw a conclusion from a fictitious thing.

Dr. ANDERSON. Let's take an example that you have had in the recent past, of a great change. Has it in any way been held back?

Mr. KETTERING. Never, never; we have never had that condition in our industry at all.

Senator KING. Even in your large group of investigators, there may be some person who prefers to pursue a very narrow field, and he achieves success in that, and of course coordinates that.

Mr. KETTERING. For instance, here is a particular fellow that may be a specialist along that line. Let him work his specialty in coordination with some other fellow's, of which that is a component part.

The CHAIRMAN. I gather from what you say, Mr. Kettering, that it has been your experience that the researcher and the inventor are constantly endeavoring to produce a commodity, a new invention, a new product, at a cost which will make it commercially profitable to the producer.

Mr. KETTERING. Not necessarily. You can never make them profitable in the beginning.

The CHAIRMAN. But your constant effort is to bring it out so you can put it on the market and dispose of it at a profit; isn't that it?

Mr. KETTERING. Ultimately. Of course, we never have anything to do with it except at the beginning.

The CHAIRMAN. You are head of the research laboratory and you have to do with this long preliminary study which is intended to bring forth the new invention or the new commodity or whatever the discovery or invention may be.

Mr. KETTERING. That is right.

The CHAIRMAN. The problem of marketing is not your problem.

Mr. KETTERING. Not in the least.

The CHAIRMAN. But it is true, I take it, that the research expert is constantly faced with the problem as to whether or not the particular study on which he is working will result in a product which can be marketed successfully.

Mr. KETTERING. That is right.

The CHAIRMAN. For example, my attention has been called over a long period of years to the effort to find new industrial uses for agricultural products. It is a very desirable end to be achieved, because obviously, when we find new industrial uses for agricultural products, we will be successful in benefiting the producer of agricultural products.

Mr. KETTERING. That is right.

The CHAIRMAN. One of these studies has been designed to make alcohol at such a cost that it can be used in automobiles as a fuel,

but to date, it is my information, science has been unable to produce the alcohol at a cost low enough to make it commercially available, isn't that correct?

Mr. KETTERING. Yes.

The CHAIRMAN. That is to be found throughout the line of scientific research, is it not?

Mr. KETTERING. Yes. As I say, the great difference between the fundamental principle and the product is one of economics. That is, you may have a fundamental principle that is all right but it isn't a product yet because it hasn't been whipped into shape from the point of view of its over-all economics.

GOVERNMENT AID TO RESEARCH

The CHAIRMAN. Have you any thought about what may be done, by society, or by Congress, or by the State legislatures, to enable science to pursue its studies more rapidly by making better markets for the products which you are working with?

Mr. KETTERING. Of course, the big problem in that, Senator, is the fact that the process of getting the new industry is almost diametrically opposite from the process of operation. For instance, you take any industry that is a manufacturing operation; they are set up on a schedule of production depending upon the reports from the field, from the sales department, and the current markets of raw materials, and everything. In other words, you have got to budget a modern industry very carefully or the sheriff will get you. You can't go on just making a lot of things ad lib.

The CHAIRMAN. That is true.

Mr. KETTERING. Now, remember that is 99.9 percent of that industry's business. When you come over to the research and development thing, you can't answer any of the questions on the forecast. You don't know when you are going to get the thing done, whether it is going to work or not, and whether it is going to have any value whatever, because it is an intangible thing.

It is the lack of understanding between the operating ends of industry and the development phases—they are almost diametrically opposite in their whole content.

The CHAIRMAN. In what way are they diametrically opposite? We are coming to a very interesting point and I would like to develop it.

Mr. KETTERING. They are diametrically opposite because you can't forecast what a thing is going to be worth before it is developed. I can only work on a very small detailed thing. "When are you going to get that thing done?" I don't know. We have been working on problems—as I say some of the men who started with me in 1913 are still working on this fuel problem.

The CHAIRMAN. The inability of the researcher to predict when he will finish his studies or exactly what he will produce, and the inability of the operator to predict what the result will be, does not in itself indicate there is any opposition between the two.

Mr. KETTERING. No.

The CHAIRMAN. The operator will be most anxious to put on the market the product of the research laboratory as soon as it can be disposed of at a profit.

Mr. KETTERING. There is no opposition. There is just impatience. That is, there is a terrific impatience between operations and researches.

The CHAIRMAN. The operator then is very anxious to have you get through with the job so he will have a new product to dispose of.

Mr. KETTERING. That is right.

The CHAIRMAN. That is what you meant?

Mr. KETTERING. That is right. Now then, it is a lack of understanding. For instance, there is another kind of accounting. You take the detailed cost accounting that is absolutely essential in an industry, it is quite different from the actuarial accounting used in insurance. You have to apply the actuarial type of accounting to research; not what a specific problem is going to cost, but what reasonable percentage of the problem you undertake will come through.

Mr. PIKE. What is your mortality?

Mr. KETTERING. Oh, I would say 99 percent.

Mr. PIKE. Naturally, a lot of these things do end up in thorough and bitter disappointment.

Mr. KETTERING. When I said 99 percent, I wouldn't say 99 percent of the long-range things but 99 percent of the workaday things you are working on today will be a failure. In other words, that is the biggest problem we have in keeping the morale of our personnel up. If you were to walk through a research laboratory with me, the thing that would perhaps discourage you is that almost every one of the projects is in a jam, the thing "busted" up yesterday, you see.

ACCELERATING RATE OF INVENTION

The CHAIRMAN. I have been reading over the prepared statement which you presented at the outset—unfortunately, I wasn't here when you went on the stand—and it suggested several questions which I should like to direct to you. In the first place, beginning toward the end, I note this statement: "Progress encounters new and more difficult problems. Each year the road ahead is steeper."

Do you mean by that that the progress of science and invention is getting more difficult?

Mr. KETTERING. If you read the rest of that, it is explained there as to what I meant. You have to take more things into consideration.

The CHAIRMAN. But as a matter of fact, standing alone, that statement doesn't convey a correct idea.

Mr. KETTERING. No; not if you pull it out, because that was a preliminary statement to another paragraph which came after that.

The CHAIRMAN. The impression I have had has been that the pace of progress is constantly accelerating.

Mr. KETTERING. That is right.

The CHAIRMAN. And because of the accumulated wisdom and invention and development of the past, we can expect larger and larger gains in the future; isn't that correct?

Mr. KETTERING. Well, I don't know, because there are many things that we take for granted. If a young man who comes to work for us can survive two shocks he usually makes a pretty good man. I am talking of the young man who is a graduate of one of our technical institutions. The first shock he gets is that we are working on such

terribly elementary things, because we don't know much. If we don't know a thing, we usually give it a Latin or Greek name.

The CHAIRMAN. I have noticed, during the process of these studies, that lack of knowledge is frequently covered up by a mass of words and statistics.

Mr. KETTERING. And so we say if the boy can survive the fact that we are working on terribly elementary things, that we don't know very much about anything—

The CHAIRMAN (interposing). Of course, elementary things are frequently, I think, the most important, and that leads me to this thought. I think the most elementary of all problems is the problem of jobs.

Mr. KETTERING. That is right.

The CHAIRMAN. And work for people.

Mr. KETTERING. That is right.

The CHAIRMAN. And that leads me to this quotation from your statement:

I like to think of this mass production of ideas—

And I like your phrase "mass production of ideas" because I think that correctly describes our modern condition—

as a team play in an immense effort to readjust our economic system so as to put to work our excesses of men, money, and materials. Our team includes many men, many companies, many industries.

Now, it is implicit in that statement that there is an excess of men, that there is an excess of money, that there is an excess of materials, which is not being used, and that there is something in the economic system which needs readjustment—

Mr. KETTERING (interposing). They haven't got the projects.

The CHAIRMAN (continuing). In order to enable society to put to use these several excesses. Have you any contribution to make on that?

Mr. KETTERING. That is why I say we are behind technologically rather than ahead. We are 'way behind. And I was going to explain why we are behind, because we have taken for granted a great many things. Going back, speaking of the young man, I say he must survive two shocks, one that we are working on such terribly elementary things, and the next that nothing he can find in the books will help him out very much on it. We have used this very simple illustration. You rub your hands together and they get warm, and why is that, and the fellow says, "That is quite simple, that is friction," and yet if you pursue that, you say, "What is friction?" and you end up by saying, "The thing that makes your hands warm when you rub them together." You don't know a single thing about the mechanism of why your hands get warm when you rub them together.

It is hard to get men back to those things and that is the reason I think we are behind. We haven't been willing to go back and take those very tedious jobs.

The CHAIRMAN. Those tedious jobs, I take it, can be pursued successfully only by large, comparatively large, cooperative effort such as that which is illustrated in your research laboratories.

Mr. KETTERING. Well, I don't know. I think that individuals can work on that kind of thing. In fact, there have been some very good individual contributions made, both in this country and abroad, on this mechanism of friction.

The CHAIRMAN. All right, suppose you can get sufficient investigation of these elementary things to satisfy you, what would be the result?

Mr. KETTERING. You immediately begin to broaden out, for instance, you take on some of the things that are available now but not perfected, we will say. We have heard a lot of talk, we will say, about air conditioning. Air conditioning has done a very, very good job, but yet the economics of air conditioning perhaps haven't reached the point at which it can be of general usefulness.

We are trying to find out what we can do to make this thing more flexible, easier to handle, more easily installed, and things like that. In other words, that is an economic problem. We know in our climate up North that one of the factors that is involved, especially in air conditioning in the wintertime, is very low humidity. That requires a new type of window.

The CHAIRMAN. To what extent do economic conditions prevent, if at all, the use and development of inventions and discoveries which have already come into the scientific consciousness?

Mr. KETTERING. I think they have a lot of retardation in the beginning because you don't know quite what the problem is, you see. For instance, I was going to mention on this window business—in trying to hold the humidity up in our section of the country where it gets rather cold in the wintertime, we have to have double windows. There are a number of people that have been working on that, and if we ever get at satisfactory double window, then you immediately would see quite a change in the method of building structures, in houses, and everything else. But we haven't had it yet. We are getting closer to it all the time.

Take television as a new industry. It will have to struggle along quite a long while before it strikes its pace, because you can hit the middle of the road but very rarely, and then it is an accident.

The CHAIRMAN. What is in the back of my mind in asking these questions may probably best be illustrated by reports which have come to us in Congress with respect to housing, for example.

The statement is frequently made that so-called slum-clearance housing in some communities has progressed physically to a very advantageous point. That is to say, very fine apartment houses have been constructed, but it has been found that these new apartment houses are not being occupied by the low-income groups for whom they were originally intended. In some instances it is said the destruction of the slum to make way for the new and improved modern housing project has resulted only, in some instances, in the moving of such families into worse slums, because the group at the bottom of the scale were not economically so situated as to make use of the new product.

Now, isn't it true all through the field that markets are essential to the development of research, and science, and invention?

Mr. KETTERING. The only time we get those research problems which you mention there is when they are reflected back from the

field. For instance, suppose we develop the best thing we know how to do in a research, and it is turned over to the manufacturing division to make and sell, and suppose they try to put that on the market, and after a couple of years they come back and say, "This is pretty good, but it doesn't fit the market. Now, you fellows will have to take another cut at this, make another study of this." Very seldom do they do that, because that organization immediately sets up its own development and research department for that particular product, you see.

The CHAIRMAN. If it were possible to increase the market, either by opening up new fields in other countries, or by increasing the purchasing power of the masses of the people in America, would not that in itself be of tremendous assistance to the scientist in his efforts to develop new products?

Mr. KETTERING. Sure. Of course, the average scientist doesn't get that far in the picture.

The CHAIRMAN. Of course, that is one of the phases of this matter we are studying.

Mr. KETTERING. We can help the scientist best by taking his thought or his idea and developing it into a tangible shape.

The CHAIRMAN. You started your statement with this sentence, which was of great interest to me: "We have been accused of producing unemployment by too many inventions." By whom have you been accused?

Mr. KETTERING. Well, the newspapers and others. It has leaked in through various sources. I don't know where it comes from.

The CHAIRMAN. I often wonder if that isn't a misunderstanding. For example, there was distributed to the members of the committee today a pamphlet, apparently issued by Iron Age, entitled "The Threat to the Machine," and on the second page of this I find a statement attributed to me. It reads as follows—my name, in the first place, and then quoting: "Science and invention are to blame for the present unemployment in America."

Now, I am not conscious of ever having made any such statement.

Mr. KETTERING. I never saw that.

The CHAIRMAN. I know you didn't. I am taking advantage of your presence here, you see, to make a statement with respect to that.

Mr. KETTERING. That is all right.

MASS PRODUCTION AND MASS PURCHASING POWER

The CHAIRMAN. That statement, of course, doesn't begin to represent my attitude toward the machine. Never in my conscious moments have I ever intended to intimate that science and invention are responsible for unemployment.

I think there can be no dispute about the fact that science and invention have immeasurably increased the standard of living in the world, and particularly in America. But while the standard of living has unquestionably been increased, it seems to me it has also become less stable than it used to be. Our grandfathers lived at a very much lower scale; they didn't have electric lights, they didn't have automobiles, they were content to get along with kerosene lamps

or candles; they didn't have any of the luxuries or comforts which we have, but they could support themselves because they were living upon the land.

Mr. KETTERING. That is right.

The CHAIRMAN. Their economy was on a lower plane, but it was stable. Now, our problem is to make certain that the undoubted advance of technology will redound to the benefit on a stable basis of the masses of the people, and that their purchasing power will be so increased that the scientist may make constantly increasing gains. Do you agree with that statement?

Mr. KETTERING. Yes. You have to broaden your industrial base. That is the reason why we have the excesses of men, money, and materials. We simply haven't got the projects. We are behind on the project-getting end of this thing. That is what I am getting at.

The CHAIRMAN. I think there is a good deal of misunderstanding of what is meant and intended by persons who are studying this problem, and I wanted to make clear here in questioning you, that at least speaking for myself, I want to do everything in the world to aid technology and to aid the machine, to make wider and wider use of it.

I recognize the fact that labor-saving devices are desirable and excellent and beneficial in every possible way, but I also recognize the fact—at least it seems to me to be a fact—that the market for all technological advance depends absolutely upon the ability of the masses of the people to use what the scientists are producing.

Mr. KETTERING. That is right.

Hr. HINRICHS. Along that same line, I have one or two questions. Your part, I judge, in this team play that you refer to is to make fundamental scientific advances which may be of either of two sorts. It may result in a totally new product; it may result in a very much better use of an existing product, or a product which is substituted for an inferior product now in use. An increase of fuel efficiency from 5 to 7½, perhaps 10 percent, would result in substantial economy in the use of fuel and probably to an extension of the use of automobiles.

Now you implied in your discussion that the business organization, the operating and sales end, has the job in this team play of making the products of scientific research widely available.

Going back to your first page, you say that there is a necessity for producing new things because we have more hands than we have jobs to do. There is no question that people at present are unemployed, but you would hardly say that in a physical sense the people in the United States were at the present time well supplied with the goods that we know how to make and know how to use, would you? That is, we have, roughly, two-thirds of our population with family incomes of less than \$1,500 a year. As far as I can calculate, it would take an addition of about \$50,000,000,000 to the national income to raise the group that is below \$1,750 to \$1,750. We don't have the technical capacity nor the hands to produce an additional \$50,000,000,000 worth of goods at the present moment.

So that there really are two approaches that are conceivable in team play. One is the stimulation and the easy flow into the econ-

omy of new products. The other part of the team play of your sales organization, your producing organization, is to make existing things available at the lowest conceivable costs in order to get the widest possible distribution within the existing distribution of income. Would you agree with that general statement?

Mr. KETTERING. Yes.

Dr. ANDERSON. Mr. Kettering, getting back for a moment to this divorce between invention as your industrial researchers conduct it, and the application of invention that is carried on by the business end of your plant, I wonder if you would hazard a statement as to how general that situation is in industry?

Mr. KETTERING. No, I wouldn't. I think that every industry is set up, depending upon its operating conditions. You see, we operate on a decentralized basis. That is, our automobile factories, Cadillac, Buick, Chevrolet, Oldsmobile, and so forth, are all operated as individual units.

That makes it rather easy for us, then, to have a centralized detached laboratory. Now, in an organization in which you have your engineering and your research and your design and everything tied up together, it will work differently. There is hardly any general rule that I can say on how to put that up. We just happen to be fortunate in our set-up to be able to get that sort of thing.

Mr. PIKE. And still there are some things you say you are interested in that are not close enough to the automobile business to put them in your laboratories; for instance, your chlorophyl research, where you go out to Antioch.

Mr. KETTERING. That is a personal thing. The reason for that is that you couldn't ask any industry to take that on. I have been interested in that one for a great many years, and we are interested in that. You know, the word "chlorophyl" is just the Greek word for "green leaf," and we don't know any more about it in Greek than we do in English.

PHOTO-SYNTHETIC ENERGY

The only reason we are here is because of the ability of a plant to trap the sun's energy. I felt that was important enough to set a group of scientific fellows to see if we could find out how it is done. Out of that has come a lot of very, very interesting things already, although that is absolutely set up as a purely scientific research. It has nothing whatever to do with business or anything else, and we have been on it about 10 years now and we have been able to clarify a lot of things. Some practical things have come out of it. For instance, this question of why certain pastures are poisonous to white stock but not to black stock.

There are certain pastures in which only black sheep can be pastured, or black cattle. The reason for it is that there is some weed or something that the cattle eat that sensitizes them to light. Now, if they are white, that lets some of the undestroyed radiations go into the blood stream and they get quite sick. Well, some practical things like that have come out of this already.

We know a ton of hay dried in the dark is worth about four tons dried in the light.

The CHAIRMAN. That is pretty far afield from the motor industry, isn't it?

Mr. KETTERING. This is my scientific golf game.

Dr. ANDERSON. Mr. Kettering, why is it with such a practical prospect as you have indicated, that industry does not undertake such basic research as your study of chlorophyll?

Mr. KETTERING. I think the reason for it is that there is no way in the beginning of drawing a line between the question of whether it is fundamental or whether it is some fellow's hobby, because if you try to follow all those hobbies you would just go out of business in a hurry.

Dr. ANDERSON. That leads to the next question: How does your corporation determine on the fund, the size of the fund, the amount to be placed at your disposal for research?

Mr. KETTERING. They leave that entirely to us. We ask for an appropriation to cover what we believe is an honest interpretation of what we are able to do.

Dr. ANDERSON. Is that fairly general in industrial research?

Mr. KETTERING. I couldn't answer that.

The CHAIRMAN. In presenting your request for an appropriation you have to make some justification of it, I assume.

Mr. KETTERING. Not very much, Senator. We are pretty well known in our organization.

The CHAIRMAN. Of course, you are pretty well known outside of your organization, too.

Mr. KETTERING. I mean by that, we have been working along certain definite lines. We set up our projects just about as I outlined. For our physics department we would like to have so much money for that, and here are the problems that are in there, and here is the probable new thing we would like to put in if things work out during the year. Then we put a cushion in there of X number of thousands of dollars that this thing can be automatically pulled out or shoved in.

The CHAIRMAN. The output of your laboratory over the years has paid for itself, has it not?

Mr. KETTERING. They still give us money.

The CHAIRMAN. They wouldn't do it if you weren't paying; isn't that right?

Mr. KETTERING. They never tell us. The only way we know whether we are going along right is when we see the corporation building a building to make new things they never made before.

The CHAIRMAN. Industrial research, I suppose, is keyed to its utilitarian phases.

Mr. KETTERING. Not nearly so much as you would think.

The CHAIRMAN. Then to what extent are you permitted to go outside of utilitarian objectives?

Mr. KETTERING. I am going to assume that you mean by utilitarian that thing which is obviously applicable to our industry.

The CHAIRMAN. Oh, no. I think that in your case, or in the case of any similar or comparable research laboratory, the corporation would be very glad to accept your judgment that the eventual result of a particular line of inquiry is likely to produce something of value to the corporation.

Mr. KETTERING. I can tell you how that is evaluated.

GENERAL MOTORS RESEARCH BUDGET

The CHAIRMAN. That is what I would like to know.

Mr. KETTERING. In dividing our appropriation, we say that it has worked out about this way: about 40 percent of our appropriation goes to consulting services to our divisions. We are a free consulting engineering operation to all of our divisions, and they come there and talk to us about this, that, and the other thing.

The CHAIRMAN. In other words, they bring to you their immediate problems.

Mr. KETTERING. They don't bring the problems there so much as they come and ask us to come out to their place and help them work on a thing there.

The CHAIRMAN. But it is an immediate problem that they want worked out.

Mr. KETTERING. That is fine, for two or three reasons, because that keeps us very definitely in touch with our industry. Then there is about 30 percent of our budget that is applied to more or less advanced engineering and where we have to design the apparatus to demonstrate the principle; and then there is 30 percent that is very long-range material.

The CHAIRMAN. It is conceivable that the 40 percent represented by your assistance to the various divisions, and the 30 percent which is represented by the development of problems which you yourself see for the improvement of the industry will produce sufficient results to carry the other 30 percent without profit.

Mr. KETTERING. Because you see the 30 percent, we will say, of design and engineering, 4 or 5 years ago was the top 30 percent. It is working this back down into that thing, because it is surprising how long it takes, sometimes, to get a thing clarified enough in your mind to put it down on a drawing board and make a piece to represent it.

For instance, you take the simple thing of a spectroscope, which is this method of splitting light out as an analysis factor in a foundry. Well, we have been playing on that for a great many years, but it is only recently that we have been able to get a spectroscope which is a highly scientific piece of apparatus, that you could put out in a foundry. Yet, if you had come to the practical board 20 years ago, they would have said, "We don't see how you can do that." But all the fellows all along the line have been making improvements—the optical men, the glass men, and so on—and finally you have an object of scientific accuracy in a light-proof case and you can put it in your foundry and a fellow can make his analysis and control his steel very much better than he did before. So that intangible 30 percent is going to come of age some of these days, so you have to have that put in.

It is just like a calendar. You have a calendar here of 365 days and you keep tearing one off each day, and it gets thinner. That is the way it is with products. Every time you take one off you have to put a new intangible one on the bottom, otherwise you run out.

Dr. ANDERSON. Mr. Kettering, how much money did you budget last year for research in General Motors?

Mr. KETTERING. I think it was between \$1,500,000 and \$2,000,000.

Dr. ANDERSON. What percentage would that be of total General Motors expenditures for the year?

Mr. KETTERING. I haven't the slightest idea. Do you mean from an engineering standpoint?

Dr. ANDERSON. Yes.

Mr. KETTERING. I couldn't tell that. I think we could get those figures for you. You take an organization like the Buick; they have their engineering expense divided into two classes. They have what they call research, a group which has to do particularly with their product, but this would only be a very, very rough guess; I imagine the total engineering and research budgets for the divisions would be around ten or twelve million dollars, so that I should say our specific research thing was maybe about 10 percent. Those figures are purely guesses, and we can get them for you if you would like them.

Dr. ANDERSON. You made a point a moment ago that you didn't know precisely what is going on in other plants with respect to research, but I would like to question how independent of each other large business units, supposedly competitive units in the same business field, are in the research field.

Mr. KETTERING. Well, they are independent in one way and in another way they are not. They bring all of this stuff together through their engineering societies. For instance, we have a very fine society known as the Society of Automotive Engineers, the S. A. E. We have a research committee in that, and through the papers and so on I think everybody knows what the general problems of the industry are. As to what is being specifically attacked by each organization, I don't think we attempt to find out. Chrysler is working on problems that we are on. We don't make any attempt to find out. I am perfectly sure if we asked they would tell us, but we don't abuse the courtesy.

Dr. ANDERSON. How near standardized has the product become as a result of this general knowledge of research in the full field?

Mr. KETTERING. Not very much standardized, because there are always many approaches to the thing. You take in our own corporation we have two schools of engineering so far as engines are concerned, the so-called L-head and the valve-in-head engine, and you can't standardize those two. Each of those groups sticks to its own view-point.

Dr. ANDERSON. Why is that?

Mr. KETTERING. Because a man's experience and his work have been along one line, and the two things aren't alike. There are a lot of things different in them. When the valve-in-head fellow tries to step across he tries to carry the valve-in-head practice and vice versa.

Dr. ANDERSON. In other words, you would say that there is little hope from the research side to come to the standardization in which there would be a common product.

Mr. KETTERING. I think that would be very dangerous. You might agree on a standard today, and say that this thing is the only thing we ought to make, and tomorrow, if you went ahead, you would find out something else. We have seen that happen in materials like steel, in which they wanted to standardize a kind of steel, and a few months afterward we found out that if they had, they would have taken the wrong one. No; I think you want to keep the front of

industry fairly broad, and specific standardization can be very dangerous.

INTERORGANIZATIONAL COOPERATION

Dr. ANDERSON. Undoubtedly basic research is carried on both in industrial research laboratories and in universities and Government laboratories.

Mr. KETTERING. Yes.

Dr. ANDERSON. Do you have any estimate of the dependence of industrial research laboratories upon the universities and Government research?

Mr. KETTERING. They work together in a great many cases; in other cases they can't. But there are good working arrangements—you take between the Bureau of Standards and industry, and between the university laboratories and industry—but there are certain of those problems. For instance, let's take a very specific case. Take the injector that we use in our Diesel engines. That was a very difficult problem, because it parted from what you call conventionalism. We arrived at a conclusion from other work we had done that we had to raise the injection pressure from, say, 4,000 pounds to 25,000 pounds. When you begin to try to pump oil at 25,000 pounds it introduces quite a problem. The argument was that if you made this thing accurate enough so that you had to fit a piston into a little barrel so accurately that oil at 25,000 pounds wouldn't leak by, logic said if that is the case, you only need to move that a couple of times until that accuracy will be worn away.

It didn't work out that way at all. It doesn't wear at all. We have injectors back from locomotives that have been run a million miles, and they are still absolutely accurate. But if you make a little more clearance it wears very rapidly.

There was a thing on which it took us years to get over the hurdle. The limits that we use, the tightness of the fits, can best be illustrated by saying that if you take a human hair, that is three-thousandths of an inch in diameter, and you cut that up into 120 equal pieces, the size of one of those pieces is the limit we have.

To make that commercial was regarded as an impractical thing, and they said, "It is impractical because if you make it that close it will wear." If you make it that close it doesn't wear. Why, we don't know. We have all the time to be investigating such terribly elementary things.

Out of that, of course, came quite a step in the so-called Diesel engine development.

Now, answering your point, the university laboratory can do certain types of work that have to do with fundamental principles. You take one piece of research work that is being done in a university that is tremendously important is by Dr. Lawrence out on the cyclotron. That certainly could be done only in a university, and that depends on Dr. Lawrence. Then Dr. Urey's work on heavy nitrogen. Many of these universities are doing splendid work. What you have to do is gather them up and write them up, and see how much of it you can use in today's product.

Dr. ANDERSON. There is no thought in your own mind that industrial research is actually supplanting basic—

Mr. KETTERING (interposing). Oh, no, no. We are still shy. We need much more of it all the way through.

Dr. ANDERSON. Do you think there is any danger of basic research to lag for lack of funds due to the fact that industrialists are applying more and more of their funds to their own research?

Mr. KETTERING. No; I haven't seen that to be the case at all. I have two or three of these researches which I couldn't and wouldn't ask industry to do. Chlorophyl is one, some of the medical work we are doing at Dayton, and one or two other things, and you just couldn't ask industry to do that to start with. That is the reason why I have underwritten those, to get them started. After a while they may go on their own.

Dr. ANDERSON. Is there a lack of capable people for research work?

Mr. KETTERING. No; there is not a lack of specific technicians. You can get somebody to do anything you want done. The lack that we have is the keeping of those people on a definite track. In other words, the one great temptation you have when you are working on a research problem is, you are uncovering something new. That something new may be just a way station on this thing you are working on. The great temptation is to run off sideways. It is a grapevine; you want to run off there, but to keep the fellows on through to destination first is your problem. Then you can always come back and do this afterwards—the problem is to keep men's minds definitely on a problem until you get that solved, and that furnishes your survey line from which you can do all your other work.

Dr. ANDERSON. What are the incentives that inventors in your industrial plant have, the monetary incentives? Do they gain by the invention made?

Mr. KETTERING. They gain in this way. We don't give specific bonuses to the inventor. We give the bonus to the laboratory, and the reason we do that is because we want to keep these fellows from becoming individuals. If we gave the bonus for a new invention to the specific man under whose care it was done, then these fellows would just begin to make little cliques, but if the laboratory gets the thing—

The CHAIRMAN (interposing). That is your team play.

Mr. KETTERING. That is the team play, and it works out very well because everybody is assured something every year.

Dr. ANDERSON. What would a bonus look like, say, for last year?

Mr. KETTERING. I can't tell you.

Dr. ANDERSON. It doesn't apply to a particular project that has been consummated.

Mr. KETTERING. No; what they do, they give the laboratory a bonus depending upon what they think we have done.

The CHAIRMAN. I like that phrase of yours, Mr. Kettering, about team play. It suggests to my mind the desirability of putting a lot more people who are at the bottom of the social scale on the team so that they will benefit equally, or at least to some extent, from the wonderful progress of technology. I think it will work both ways.

Mr. KETTERING. Most of us came from there anyhow.

EFFECT OF PATENTS ON INVENTION ¹

Mr. O'CONNELL. Mr. Kettering, I would like to ask you a question or two relative to the patent system which has, as I understand it, the general purpose of promoting progress in science and the useful arts. I wondered if you had any view as to the importance of existing patent laws as regards the type of invention you have been describing, so-called group activities.

Mr. KETTERING. I think if there is any modification in the patent laws, it ought to be made by the patent department and, say, the patent solicitors, and that sort of thing.

Mr. O'CONNELL. I understand they would do it. I thought you might have some views on that.

Mr. KETTERING. We are celebrating tomorrow the one hundred and fiftieth anniversary of the first patent law that Washington signed 150 years ago. You never get anything perfect, but I think our patent laws are pretty good.

Mr. O'CONNELL. It is a fact, if I understood the testimony, that the type of invention that you have been describing is more or less on the increase, the cooperative activity by large organizations.

Mr. KETTERING. I think it would have to be. For instance, on a complicated thing like that injector, we had to have the expert metallurgist, expert physicist, and all that. There wasn't any one of those fellows that could have done that job.

Mr. O'CONNELL. Wouldn't it be the fact that organizations such as yours would function and continue to operate even if there were no such thing as a patent system?

Mr. KETTERING. So far as patents concern an organization like ours, I think they are only important from one standpoint, and that is of preventing other people from coming in and saying they did the thing, so you have to patent a lot of things as a protective thing. I think patents still have an enormous value from the standpoint of the inspirational effect they have on people, and certainly for the small concern they are vital, very vital.

Mr. O'CONNELL. Addressing ourselves solely to the type of organization you have been describing, it occurred to me that even in the absence of any patent laws at all, the mere force of competition in the industry would probably require the type of organization you have been describing.

Mr. KETTERING. I imagine so, yes; but I am a terribly optimistic person on what can be done if we get coordinated right, if we get the thing understood as to what our problems are. Only 10 years ago we didn't have enough people to supply the job and I think we can do this job. I say, if we have brains enough to get out of the cave, I think we can keep from going back in.

The CHAIRMAN. That is a very hopeful statement.

Mr. O'CONNELL. I don't want to press the point, Doctor, but apparently organizations such as yours would undoubtedly continue to function and would be forced by competition to function even were there no patent laws.

Mr. KETTERING. We don't run our organization for the purpose of taking out patents. We think only of the general problems. And

¹ For general discussion of this subject see Hearings, Part 2.

I would like to say, if any of you are out in Detroit any time, we would be glad to have you spend a day or an hour, whatever time you have, to take a look around and see how it is done.

The CHAIRMAN. I shall take advantage of that.

Mr. KETTERING. It is quite different when you see it from how you talk about it, when you see what foolish little things we have to work on to get a link cleaned up.

The CHAIRMAN. Doctor, have you given any thought to this problem of coordination which you have just mentioned?

Mr. KETTERING. We have thought about it a lot.

The CHAIRMAN. Do you want to testify about it?

Mr. KETTERING. No, no. It hasn't crystallized in any specific thing.

The CHAIRMAN. Don't you think we ought to try to crystallize it?

Mr. KETTERING. Well, I am doing that. I think within our own industry we have it pretty well worked out.

The CHAIRMAN. That is true. There can be no question about that. The record of General Motors demonstrates that.

Mr. KETTERING. But we are working very closely with educational institutions and everything else, and we are trying out a few experiments this, that, and the other way, and I think some of these days we will have something that we can give you, at least a program, at least something to prove wrong, and I haven't it crystallized enough to lay that on the table for you today.

Mr. PIKE. Of course the production department is here again a little bit impatient for results.

Mr. KETTERING. I think that is a good stimulating thing. I have no objection to the impatience of the production department.

Mr. PIKE. There is one thought I had in mind. As a small part of this coordination you spoke of interindustry cooperation—and it occurred to me the development and commercializing of ethyl fluid, perhaps, was a fairly good example of cooperation between yourselves, du Pont, Standard of Jersey, and Dow Chemical—there must have been research by all of those organizations in one way or another to make that thing go.

Mr. KETTERING. Well, for instance, you take the one particular thing in that; when we started to make that material the total production of bromine in the world was only 600,000 pounds, and we couldn't think of starting anything unless we had at least 2,000,000 pounds a year. I had to go and bargain my shirt almost to get the Dow Chemical Co. to drill the necessary salt wells to produce the bromine. We knew we couldn't continue that, but there is 1 pound of bromine for every 10 tons of sea water; that is 1 part to every 20,000. We have a plant at Wilmington, N. C., taking 43,000,000 pounds of bromine out of the sea this year. That couldn't have been done by any individual. We just had to have it, because that was the only supply of bromine that was available in that quantity, and you see that is a very small percentage, 1 part in 10 tons.

Mr. HINRICHS. Mr. Chairman, I would like to come back to your question for just a moment on the bonus at the bottom of the heap. That sometimes shows up in the form of larger wage incomes, but I am thinking of the situation in which the bonus on invention is often the specific displacement of a particular group of workers, or of a particular individual as the process changes. Your phrase is that through these men, without giving dissatisfaction, industries are rev-

olutionized. A revolution of any sort may be a very necessary thing, but it is inevitably a very disturbing thing in the area in which it occurs.

In the Bureau of Labor Statistics, Congress set up what it called an occupational outlook service, and I am interested in the problem of the point at which it is possible to visualize the changes which are coming so that they lend themselves to planning by business executives, by trade-unions, by those who are concerned with the operation of an industry in an effort not to stop progress but to minimize the dislocations which are inherent in this revolutionary process.

Now, is it possible at the stage when one of these machines leaves your laboratory as demonstrating the practicability of the principle or the fact that a principle will work—is it possible at that stage to forecast even approximately, not in detail, but what in general the area of the impact of that upon the technological structure will be?

Mr. KETTERING. No. Take the Diesel engine. We made the Diesel engine without any regard to where it would go. It went in the railroad industry first, and yet nobody would have anticipated that, and nobody even predicted it. As Mr. Harriman said, they tried it out purely as a means to see if they couldn't do something to have people look at a railroad train again, and the fact it was a success was as much a surprise to them as to anybody else.

The CHAIRMAN. Sort of a matter of general research in the beginning?

Mr. KETTERING. Yes.

Mr. HINRICHS. At what stage did it become possible to see where this was going, what its impact was going to be?

Mr. KETTERING. It isn't even evident yet what it is, and 5 years ago—to show you how you can't tell—we didn't have a plant to make the Diesel engine, and we bought a piece of ground outside of Chicago, out at La Grange, Ill. We built a little plant there for three hundred people and broke ground just 5 years ago now. We have between 3,000 and 4,000 people working directly in that plant, and perhaps 5 times as many working indirectly in it, and nobody could predict from year to year what was going to happen, and we can't do it today. We haven't the slightest idea what that business is going to be.

Mr. HINRICHS. Do any of your principles and does any of your work affect the production practices of your own establishment?

Mr. KETTERING. We have nothing whatever to do with any production problems.

Mr. HINRICHS. That work is all in the engineering, designing, and research division of the operating companies?

Mr. KETTERING. That is right.

Mr. HINRICHS. And it is at that level you would have to work if you were trying to anticipate change in the going occupational structure?

Mr. KETTERING. Yes.

COST OF INDUSTRIAL RESEARCH

Dr. ANDERSON. Getting back for a moment, Mr. Kettering, to this cost of research, you indicated in your own division you spend approximately \$1,500,000, and the total General Motors expenditure

would be approximately ten to twelve millions of dollars. If it could be assumed that other large units in this business would spend correspondingly, it would appear, would it not, that it cost a great deal to carry on the day-by-day research necessary to produce an automobile?

Mr. KETTERING. Yes.

Dr. ANDERSON. Would you hazard a guess as to what effect that would have on the smaller units within the business? Is it true that that is an advantage so large that it would be a hindrance of smaller business?

Mr. KETTERING. No; they can buy those units—they can buy practically all that stuff on the open market.

Dr. ANDERSON. They can buy what you produce in your research laboratory?

Mr. KETTERING. Yes; as soon as it gets into production. There is a great advantage in having a large company put it on the market first. For instance, this hydromatic transmission we are putting on the Olds this year is quite an expensive thing and is being worked out. We have got up to a production of a couple of hundred a day now, but the independent transmission manufacturers have an article for sale almost exactly like that.

Dr. ANDERSON. In other words, you would say it works just in the contrary way?

Mr. KETTERING. I would say it doesn't work either one way or the other. In other words, the automotive industry has never been very tight on patents. I mean, we have never tried to hold exclusiveness at all.

Dr. ANDERSON. Who takes out the patents, your division or the corporation from the operating side?

Mr. KETTERING. We take out the patent in the name of some individual, whoever originated the project.

Dr. ANDERSON. Your division takes it out?

Mr. KETTERING. Or the company, the General Motors Corporation under the name of the particular fellow.

Dr. ANDERSON. And what about intercompany use of patent rights?

Mr. KETTERING. That is always done.

Dr. ANDERSON. One more question. From 1920 to '30, the economists quite generally in the literature regard the automobile as having been largely responsible for a generally high level of employment and general prosperity, and you have indicated that there is a lack of projects, of new areas of performance which need to be explored and made practical. Do you anticipate in the decade 1940-50 anything comparable to the automobile?

Mr. KETTERING. No; I haven't, but we started one in this railroad business, the Diesel engine business. That has grown pretty healthily and we are feeding in new things all the time. The length of time that it takes an industry to become an important factor is around 10 or 15 years, and you never can tell when you start them out how far they are going to go.

But you take the aviation industry. That is only 36 years old. It started when they made the first flight. Its development has come in the last few years because we have learned how to make engines, and things like that.

So I think all you have to do, if we can get everybody to understand that he ought to go ahead, that the thing should be done—but a lot of people are pretty gloomy today.

The CHAIRMAN. The common assertion is that we may not look confidently for a boom through the development of aviation as we did through the development of the automobile, because the automobile was obviously much more suited to universal use than the airplane.

Mr. KETTERING. I think that is true. But you take things like radio. There were great contributing influences on employment.

The CHAIRMAN. Because the radio can be used by the masses of the people.

Mr. KETTERING. The interesting thing about radio is that the development of the parts that go into radio has made possible doing a lot of other things that never could have been done abstractly. So the interrelation of these things can't be anticipated at all.

The CHAIRMAN. It has been said that the building of the railroads contributed to the era of prosperity after the Civil War because that construction made a demand for almost unlimited quantities of material, for labor, and for capital; and then the development of the automobile industry and the development of the radio industry likewise had a very beneficial effect upon general prosperity.

As a research expert, do you see anything to take the place of railroad development, motor development, radio development, in anything?

Mr. KETTERING. Yes; I do.

The CHAIRMAN. What do you see?

Mr. KETTERING. I think in these new types of locomotives that you could perhaps re-do to a large extent the method of railroad transportation.

The CHAIRMAN. That would be rehabilitation of the existing roads?

Mr. KETTERING. And when you go around, you can go around the second time. You take housing—certainly many of the new factors being developed in other industries when applied to housing, are tremendous. In fact, I think that is one of the big things. When I speak of air conditioning, I mean the control of humidity and temperature the year around, not just the summer time. That is little understood, and that is going to have a tremendous effect which we haven't broken open yet, you see.

The CHAIRMAN. Are there other questions, Dr. Anderson?

Dr. ANDERSON. No.

The CHAIRMAN. Any other members of the committee?

LOW-PRICED AUTOMOBILES

Mr. HINRICHS. I have just one. This is a chart which was introduced yesterday referring to income levels in American life.¹ You are talking about new industries. I would like to call your attention to the fact that the automobile industry itself has on several occasions become a new industry by digging deeper into the going structure. That is, prior to 1914, you were selling automobiles generally in the \$5,000 income class and above. That is that very thin, long, white line with about 800,000 families in it. Then during the war

¹ See "Exhibit No. 933," supra, p. 5440.

you dug down in the next level of 1,500,000 families, in the \$3,000 bracket. At the present time the automobile industry has, of course, done a magnificent job in supplying transportation to the American people, but a relatively small percentage of the population in the income levels where these families are concentrated still has automobiles.

Take the group, for example, from \$2,500 down to \$500; in that group some 50 percent of the families have automobiles—a much higher proportion at the higher income levels, something like 10 percent in very old cars at the lower income levels.

Now, there is an opportunity for the development of a new industry, if there is any way to furnish a larger proportion of these people at the lower-income levels with cars, either by raising their incomes, which puts them into a different class, or by lowering prices and costs in such a way that that group can be served in precisely the same way that the automobile industry has heretofore reached down and bored deeper into this population that becomes denser, the further down you go.

Now, is there any prospect, in terms of the research work, as you see it, in the automobile industry, of digging more deeply than we now have?

Mr. KETTERING. That wouldn't be a thing that would contact us. That looks to me more a matter of engineering, economics, manufacturing facilities, and so forth.

Mr. HINRICHS. That is, you pass the ball to other members of the team, quite properly?

Mr. KETTERING. It doesn't belong to us anyhow, you see. That is, if we should accidentally discover a new way of developing power, something like that, that would make the automobile cheaper, then that would immediately pass over to us, but as the thing stands today we haven't anything—that is, we have gone around this circle many, many times; in other words, the automobile consists of an engine, transmission, axle, and so forth. Every one of those we have been around dozens and dozens of times to see if it is possible to break what we might call the conventional points of view in it, and, of course, we go far afield in that, but none of them have been fruitful of anything, because you remember there have been 60 or 65 million motorcars made, and there has been an awful lot of engineering done on that particular thing. That is, your chance of changing specifically to any great amount the present type of motorcar isn't very great, only by such radical changes as fuels, metallurgy, and things like that, and, of course, they are being followed right up to the last minute.

Of course, there are $2\frac{1}{2}$ used cars sold in the market for every new car that is put out, so you have quite a large production of reasonably low-priced cars.

Mr. HINRICHS. The chances, then, of a very much greater extension of automobile production for complete servicing of the people with cars, so far as scientific possibilities are concerned, seems to depend upon the distribution of income rather than on the cost of the car?

Mr. KETTERING. That is as our knowledge stands today. I wouldn't say our knowledge we get tomorrow or day after tomorrow wouldn't help, but we know what our limiting factors are today, and we

haven't been able to push any of them over. We are working at them all the time.

Dr. ANDERSON. Automobile trade publications make much of the fact that after the period of sharp reduction in delivered price of automobiles that came, say in the early '30's, when it began to flatten out, we had a period in which you engineers built more quality into the car.

Now, will this quality improvement ever suffice to do what Mr. Hinrichs has suggested? Will it not continue to keep that big buying group in the lower part of the pyramid using old cars?

Mr. KETTERING. I don't know. Of course, the adding of radios and heaters, and that kind of stuff, which is apparently what the public demands, we don't try to follow at all over in our place.

Mr. PIKE. Of course, if you ever got anywhere with your fuel problem, you would have some sort of an answer to this. I think it is a fair statement to say it costs as much to run a \$50 car, of which there are a great many—

Mr. KETTERING (interposing). I agree with you.

Mr. PIKE. As it does to run a new \$600 or \$700 Chevrolet or Ford or Plymouth, and I believe it would be a fair guess that it is the cost of operation rather than the first cost that keeps a great many families in the lower bracket from owning cars.

Mr. KETTERING. I told you fuels and motors are the two No. 1 problems, and have been ever since the research laboratories were organized.

Mr. PIKE. You get us 200 miles on a gallon and there will be a whole lot more people able to own and operate a car.

Mr. KETTERING. I can't promise that today.

The CHAIRMAN. Are there any other questions?

Dr. Kettering, we are again very much indebted to you for an interesting and stimulating discussion.

(The witness, Mr. Kettering, was excused.)

The CHAIRMAN. Is there to be a session this afternoon?

Dr. ANDERSON. Mr. Chairman, unfortunately, William Green, who was to have been here this afternoon, was unable to be here so there will be no session so far as we are concerned.

Tomorrow morning we will have Mr. Edsel Ford, and in the afternoon, Mr. Thomas, U. A. W. A. They both definitely said they will be here, and unless we get a later announcement we know they will be.

The CHAIRMAN. The committee will stand in recess until 10:30 tomorrow morning.

(Whereupon, at 12:30 p. m., a recess was taken until Wednesday, April 10, 1940, at 10:30 a. m.)

INVESTIGATION OF CONCENTRATION OF ECONOMIC POWER

WEDNESDAY, APRIL 10, 1940

UNITED STATES SENATE,
TEMPORARY NATIONAL ECONOMIC COMMITTEE,
Washington, D. C.

The committee met at 10:40 a. m., pursuant to adjournment on Tuesday, April 9, 1940, in the Caucus Room, Senate Office Building, Senator Joseph C. O'Mahoney, of Wyoming, presiding.

Present: Senators O'Mahoney (chairman), and King; Representatives Sumners (vice chairman), Reece and Williams; Messrs. Davis, O'Connell, Hinrichs, Pike, Kreps, and Brackett.

Present also: Frank H. Elmore, Jr., Department of Justice; Commissioner Charles H. Marsh, Federal Trade Commission; George E. Bigge, Social Security Board; and Dewey Anderson, economic consultant to the committee.

The CHAIRMAN. The committee will please come to order.

Dr. ANDERSON. Mr. Chairman and members of the committee, on this third day of hearings we are fortunate in having Mr. Edsel Ford, president of the Ford Motor Co., Mr. R. H. McCarroll, who is seated in the middle of the trio, engineer of the chemical and metallurgical divisions of the Ford Motor Co., and Mr. H. L. Moekle, auditor for the Ford Motor Co. These three gentlemen have kindly consented to come and share with us their knowledge of the technological processes in the Ford Motor Corporation. Mr. Ford has submitted a statement to the committee which Mr. McCarroll, I think, will read. It was in answer to questions directed to him concerning technology and his answers are contained in the statement which he is prepared to enlarge upon at the committee's pleasure.

Beyond that, however, he is also here to tell that very important story of the change-over from one model of Ford production to another, which involved the building of the Rouge plant, so that we have two aspects of the Ford Motor Co.'s testimony, one their response to questions directed to them on the problem of technology, and then following that Mr. Ford's contribution concerning the re-tooling story and its implications.

Mr. McCarroll will proceed with the statement of the Ford Motor Co. with respect to these particular questions.

**STATEMENTS OF EDSSEL FORD, PRESIDENT; R. H. MCCARROLL,
ENGINEER, CHEMICAL AND METALLURGICAL DIVISIONS; AND
H. L. MOEKLE, AUDITOR, FORD MOTOR CO., DETROIT, MICH.**

Mr. MCCARROLL. The information set forth hereunder is compiled for the use of the Temporary National Economic Committee of the

Congress of the United States, created pursuant to Public Resolution 113 of the Seventy-fifth Congress, and is intended to be submitted in this form and to be made a part of its records of the hearings during the period of April 8 through April 19, 1940, on the subject of Technology and Its Relationships to Economic Recovery. The information is compiled in accordance with an outline suggestive of the scope and character of the hearings attached to letter dated January 24, 1940, from the Temporary National Economic Committee addressed to Mr. Edsel B. Ford and signed by Mr. H. Dewey Anderson. Examples are given from plant operations in some cases better to illustrate the statements made.

The Ford Motor Co. has pioneered in the continual development of labor-serving and labor-saving machinery. With such machinery and technological improvements it not only has been able to lower costs and make more desirable products but it has helped to increase employment.

Question 1, on the effect of investment :

What is the effect of technological change on the use of new capital?

Answer. In the operations of the Ford Motor Co. technological change in the way of improvements calls for the continual investment of new capital. A recent and good illustration of this is the development and use of a new type of cylinder liner which is now being introduced and made a part of the product. At present (March 1, 1940) this is taking 12 men off the former type cylinder work, but is adding 386 men to the work in the manufacture and installation of the new part. In 60 days the added employment from this new development, which improves motor operation, lessens the amount of oil used, and decreases maintenance cost to the owner, will be about 500 men. The capital expenditure to equip the factory for this job so far has been about \$880,000. The total expenditure by the Ford Motor Co., for new and improved machinery, together with the necessary buildings, during the year 1939 was about \$36,000,000.

Question 2. To what extent has technological change become related to the size of an industry and its control of substantial capital? Is it true that the complexity and cost of modern techniques place them beyond the use of small independent business, thus giving an advantage to multiple-unit industries and monopolies?

Answer. It is true that some technological changes in the line of improvements and new developments require much time and money and therefore, it is believed, can be done more readily by large industries. Many improvements probably would not be put to use except for the facilities of large industries, especially where their effectiveness depends upon large production. It is necessary at times to spend hundreds of dollars a day over a period of years before a new method or article can be put in production. The improved Ford crankshaft and method of making it is a good example of development of this type.

It is not believed technological advances are beyond the use of small independent businesses, as this company always has taken advantage of such advances. Many ideas for new developments can be worked out by individuals or small businesses. As an illustration, mention may be made of new mechanical devices or new plastic materials and parts. Work of the kind that the Ford Motor Co.

is doing on the industrial use of farm products would be in this class. Reference is directed to page 4, chapter 5, Background 1940 Census by Department of Commerce, Bureau of the Census, on "Cash Crops For Use In Industry," where it is stated:

The 1940 Census will carry an important message to the farmer in the measure of the increased industrial use of his products. An example: Soybeans were first imported in 1804 but it was not until 1910 that there were enough of them to show in the census report. Since then the acreage has jumped to more than 6,000,000 acres, mostly as a result of expanded commercial use. They are utilized for everything from oil and paint to automobile accessories; to bread for humans, and food for livestock.

Question 3. What are the effects of patent rights on technological development?

Answer. Patent rights can be used or misused. When used as they are by this company, they help to advance development. Every attempt is made to develop their widest use at the lowest possible cost.

When patent rights are held by those who make no effort to put them to good use, they may retard development. However, when considering modification of patent rights, there must not be overlooked the incentive given to thought and work and development by the possible compensating returns from proper use of patent rights.

Question 4. What would happen if technology were freely developed? What retards use of available technological devices? Are we slower or faster than we should be?

Answer. It is assumed that "freely developed" in this case means "without patent rights." If this is so it is believed this question is answered by the reply to question No. 3.

It is believed the use of some devices is retarded by the fear of capital to make the necessary investment under the present limiting conditions, whereby it shares in all the losses but in little of the profit. The chances against success are too great. Too; the theory of scarcity (to which this company does not subscribe) rather than that of plenty is another retarding factor.

Usually, full use is slower than desired. Some advances come as a series of intermittent or gradual and continual steps to the final total improvement desired. It is estimated that the time in general between the conception of an idea and its use in practice is from 1 to 5 years.

Effect on labor:

Question 1. What is the effect of technological change on the volume of production, the number of workers employed in that production, and the volume of wages paid?

Answer. It is believed that the effect of technological change (improvement) has been and will be to increase the volume of production, to increase the number of workmen, and to increase the volume of wages paid.

The amount of pay roll and purchases per Ford, Model T, with its about 5,000 parts, in 1926 was \$454.42.

The amount of pay roll and purchases per Model A (the 4-cylinder car which succeeded the Model T in 1927) with its about 6,000 parts in 1929 was \$526.84.

COST OF LABOR WITHIN THE FORD PLANT

Mr. McCARROLL. The amount of pay roll and purchases per Model V-8 (which was placed in production in 1932), with its about 16,000 parts, in 1939 was \$683.23.

The CHAIRMAN. I notice that you combine pay roll and purchases. Have you any figures on segregating those two items?

Mr. McCARROLL. Not in this particular report. We combine them for a very definite reason, because the purchases total up to hours of work, and if you don't include both of them you don't get the full story.

The CHAIRMAN. What do you mean by purchases?

Mr. McCARROLL. All material purchased outside and going into the car.

The CHAIRMAN. Is there any way of segregating the two?

Mr. McCARROLL. They are segregated in our records, but we haven't segregated them here because we believed they would be much more informative if we gave them together.

The CHAIRMAN. You do know what the difference is?

Mr. McCARROLL. Yes; it is in the company records.

The CHAIRMAN. Could you tell me approximately what proportion this figure, in each of the two instances, was for labor alone?

Mr. McCARROLL. I haven't that figure here. Mr. Moekle says that we don't have that figure here. It is in the records.

The CHAIRMAN. I understood that you didn't have it. I wondered if you could give an approximate figure.

Mr. FORD. We would be glad to furnish it, Senator.

The CHAIRMAN. You don't care to make an approximate figure?

Mr. MOEKLE. The reason we haven't got the figure, and it may be a little difficult to get, is the fact that at different times the volume or the work done inside our factory changes. It goes from inside the factory to outside and from outside to inside.

The CHAIRMAN. I can understand that, but I thought for example you could say whether or not of this sum in 1926, of \$454.42, for example, 50 percent was labor, or 60 percent, or 70 percent. You are probably familiar enough with your figures and your accounting to give us some notion.

Mr. McCARROLL. You will find a figure coming a little later which will give you amount of purchases per unit during two different 3-year periods, and I think we can get the figure you are after by comparing that figure with the figure we have just given you, which amounts to about the figure that Mr. Moekle is talking about now, about 25 percent inside and about 75 percent outside.

The CHAIRMAN. Of labor? Of course it is obvious that when you purchase any material to be used in a motor there must be labor costs combined in that purchase price, because it took labor to produce the commodity or the article somewhere else.

Mr. MOEKLE. Roughly about 25 percent of these figures represents labor in our own plants and about 75 percent represents the price paid for materials, services, and so on from the outside.

The CHAIRMAN. Would you say that that proportion held true in 1929 and also in 1939?

Mr. MOEKLE. Roughly.

The CHAIRMAN. In other words, the proportion of labor in the factory apparently remains about the same.

Mr. MOEKLE. Yes.

The CHAIRMAN. Thank you.

Senator KING. And there is a great deal of labor, however, is there not, in the production of what might be called raw material? For instance, as I understand, the corporation owns coal mines and mineral deposits and operates those, and the costs of labor in obtaining these raw materials would be part of the cost, or the entire cost, of the product.

Mr. McCARROLL. You can really figure every cent paid out goes for labor in one form or another. Figure it all the way back in any material—transportation—

The CHAIRMAN (interposing). Actually, cost of labor is a very large factor in every step of the industrial process, isn't it?

Mr. McCARROLL. You can reduce practically all of it to labor if you want to go back far enough.

Dr. ANDERSON. Just to retouch the question that Senator O'Mahoney has asked, does the modern Ford plant, say the Dearborn plant, do more of its production than the old Ford plant?

Mr. FORD. Do you mean by that that many more parts of the unit are manufactured by ourselves?

Dr. ANDERSON. Proportionately, what would it look like? You say you have about the same labor cost, your purchases and production within your own units are about the same now as they were formerly; but isn't it true that in this intervening period you have integrated your plant tremendously, so that appreciably more of your product is made under your own roof?

Mr. FORD. That is true. We have taken on a great many more parts.

Dr. ANDERSON. Does that mean that you have bought more and more on the outside? Your total is greater now than it was?

Mr. MOEKLE. Yes; but the proportion in the total is approximately the same.

Mr. FORD. There is one factor in that that may be illuminating, and that is the fact that there are about 16,000 parts in the car we make today as compared with 5,000 parts in the car we made in 1915.

Dr. ANDERSON. So you continue to buy on the outside about the same quantity of equipment and materials.

Mr. FORD. I couldn't answer that offhand as to quantity but we buy a great amount of material on the outside. We have between 5,000 and 6,000 suppliers.

The CHAIRMAN. What would the answer be in terms of parts themselves; for example, of the 5,000 parts of the Model T Ford in 1926, what proportion were manufactured by the plant itself, and what proportion were purchased from outside?

Mr. FORD. I don't think I can answer that in accurate figures, Senator, but in general there were many more parts purchased on the outside at that time compared with today; we purchased many more things on the outside which we did not make any part of ourselves.

The CHAIRMAN. You purchase more outside today, more of the 16,000 than of the 5,000. Did I understand you correctly?

Mr. FORD. I don't believe so. What I meant to say was that we purchased a great many more parts on the outside in the earlier days than we do now.

The CHAIRMAN. A larger proportion of the 5,000 parts of 1926—

Mr. FORD. Were purchased on the outside.

The CHAIRMAN. Than of the 16,000 today?

Mr. FORD. That is right.

Mr. McCARROLL. Records show that during the past 6 years, both the labor and the purchases per automotive unit produced by Ford Motor Co. have steadily and substantially increased. For example, during the two 3-year periods ending February 29, 1936, and November 30, 1939, the average daily production was almost identical, but average labor-hours performed in the factories increased considerably. The details are as follows:

Period	Average daily production	Total hours	Average hours per unit
3 years ended—			
Feb. 29, 1936.....	3, 276	448, 947, 000	179. 13
Nov. 30, 1939.....	3, 267	507, 294, 000	201. 95

Mr. HINRICHs. In that connection these are total hours in all of your plants for that volume of assembly, I take it?

Mr. McCARROLL. Total hours in the Ford Motor Co. only for that number of units, and then averaged over the number of units produced during those two periods which were selected because they were alike in the volume of production, so you could get a good comparison.

Mr. HINRICHs. During part of that latter 3 years there was a tire plant that was producing part of your tire requirements?

Mr. McCARROLL. That is true.

Mr. HINRICHs. That extension of your activities would be included in that larger number of hours?

Mr. McCARROLL. That undoubtedly accounts for part of that difference there, but when you consider the figures we mentioned before when we include both purchases and hours within the plant, and dollars for this plant, you will see why we used that combined figure as being the more important and the more informative one, because it takes out of all consideration just points such as you just raised then.

Mr. HINRICHs. I judge from your earlier answers that on balance you feel you are doing about the same proportion of outside purchasing in these two periods. Would that be correct?

Mr. McCARROLL. I believe that is true. Furthermore, the following figures also taken from the company's records, for 6 calendar years, clearly show that accompanying the increase in the average hours of labor per unit there has been a gradual increase from year to year in the labor cost per unit produced. These figures are the more significant in view of the fact that even in 1934 the minimum daily wage paid by Ford Motor Co. was \$5, the minimum being raised to \$6 the following year:

Calendar year:	Labor cost per unit
1934.....	\$119.41
1935.....	130.01
1936.....	145.24
1937.....	160.99
1938.....	190.39
1939.....	197.84

Dr. ANDERSON. Mr. McCarroll, just at that point, may we go back to the previous question. Your labor cost per unit is per unit, such as the vehicle. I understand you have gone into extensive tire production. You have developed a foundry; you are doing more of your own rolling of steel. If you took out all those things for all years in the trend would you still hold that the cost per vehicle for labor is greater now in the Ford plant than formerly?

Mr. McCARROLL. Yes, sir.

Dr. ANDERSON. Could you give an approximation of the amount?

Mr. McCARROLL. No; I can't; without the figures.

Dr. ANDERSON. Could you supply us with such a figure? It is a very important one, if we can get it.

Mr. McCARROLL. Mr. Ford says he would be glad to. The figure is here.

Representative REECE. But the amount of labor required to produce the unit would be the same, whether it was done in your company or done in another company from which you purchased.

Mr. McCARROLL. Approximately. The thing that influences that increase is, of course, the thing Mr. Ford mentioned a minute ago, that every year there are added parts, not only a few but a great many, and that is the thing more than anything else that is affecting the increase in labor-hours going into the car and in money cost of the car.

Representative REECE. But based upon your experience the amount of labor required to produce the parts is approximately the same whether the parts are produced in your plant or some outside plant from which you purchase the parts?

Mr. McCARROLL. As a general rule that would be true. Of course it would be affected by the efficiency of the equipment that two people might have.

Representative REESE. What I have in mind, and what I am driving at is in a general way the amount of labor that is required to produce a unit.

Mr. McCARROLL. That would probably be on an average quite true; yes.

PROPORTION OF SKILLED TO UNSKILLED WORKERS

Mr. HINRICHS. These figures I understand represent the total number of man hours of labor required by an increasing number of parts and the average hourly earnings of the workers engaged in that process, and your wage rates have obviously increased in this period. I am interested also in the change in the internal composition of the labor force, irrespective of its relationship to wage rate. For example, has there been a tendency not only within this period but over a longer period of time, to decrease the proportion of skilled workers and increase the proportion of semiskilled and unskilled?

Mr. McCARROLL. I think you will find there are some questions directed toward that answer later on, and suppose we cover it by our

answers there and if that is not sufficient, why then we will be glad to try to answer further.

Mr. HINRICHs. I am sorry to have anticipated you.

Mr. FORD. I think there is one point that might be added on that subject which might clarify that in a very simple wording, and that is the fact that the average or lower minimum rate has remained more or less static. Our average wage has gone up consistently, indicating more skilled pay.

The CHAIRMAN. I didn't hear that statement, Mr. Ford.

Mr. FORD. The question was asked as to whether the labor cost of the car was paid out to more highly skilled workmen, or whether, due to the improvement of processes, we were employing more unskilled labor.

The CHAIRMAN. And what was your answer?

Mr. FORD. My answer to that was that our average wage is on the increase continuously. That would indicate these men are becoming more skilled and are receiving higher rates.

The CHAIRMAN. Then the answer would be that skill is increasing?

Mr. FORD. More skilled men are involved at the present time than in the past.

Dr. ANDERSON. Mr. Ford, would your consistent average increase in wage rates indicate a change in the composition of skills used or would it mean simply in the over-all increase in wage rates, regardless of skill? How do you make the direct connection between the wage-rate increase average and the increase in skill of workers employed?

Mr. FORD. The lowest rate, our minimum rate, applies to only the most unskilled labor, sweepers, cleaners, and common labor. Every other classification of rate is based on skill. These men are classified, based on the skill of the job. Now, of course, the trend has been upward for the last several years; the general scale is on the upward turn.

Dr. ANDERSON. You would say two things are at work; the average wage rate in your opinion is moving up and also the composition of your labor force is altering with more skilled workers employed, relatively?

Mr. FORD. Yes; I would think so. There is less hand labor and less unskilled labor involved and more semiskilled.

Senator KING. With these improvements upon your car, of course, it calls for a larger proportion of skilled labor, I assume, and that—

Mr. FORD (interposing). Yes; the fit and technique is becoming more complicated and involved all the time. We are putting things into our product which will make for a great deal longer life. All those things are highly technical and highly developed, which calls for more skill.

Mr. McCARROLL. The foundry department is noted for the vast amount of technological improvement and installation of so-called labor-saving machinery. Therefore, it seems of interest to present below, figures on the number of men employed in this department in the years listed, showing also amount of production at those times.

Year	Production	Number of men	Men per car	Year	Production	Number of men	Men per car
1933.....	414,953	2,346	0.0057	1937.....	1,117,241	7,330	0.0066
1935.....	1,193,121	6,311	.0053	1939.....	803,761	6,310	.0079

The CHAIRMAN. What is the unit of production?

Mr. McCARROLL. The unit of production is in the foundry where there is a number of motors produced during that period.

The CHAIRMAN. This, then, refers to the production of motors?

Mr. McCARROLL. This refers to the production of motors.¹

The CHAIRMAN. Thank you.

Would it be a proper inference that the increase of men per car in 1939 is due rather to the decreased production than to the difficulty of production?

Mr. McCARROLL. It undoubtedly has something to do with it, but the thing we have mentioned before comes into it there; for instance, in the foundry we cast a great many of the motor parts. In that year we started putting these valve-seat inserts into intakes as well as the exhaust. Well, now, that just doubles the number of those parts that we make every day and there are a good many other parts that come under that same kind of heading.

The CHAIRMAN. So both factors would operate?

Mr. McCARROLL. Both factors would operate.

Dr. ANDERSON. There must be a third factor. Supposing you put in a column on hours worked so as to get at the actual technological effect of change; the hours must have been changing during this period of time?

Mr. McCARROLL. Yes.

Dr. ANDERSON. It is true that your over-all number of men increased there, but the difference in working time would have an unusual effect, a decided effect upon that last column of men per car?

Mr. McCARROLL. That would go back to the figure which we have used in the case of the whole plant, of the number of man-hours per unit. We stated this in a slightly different way here, and we stated it in the other way in the case of whole units because this would be interesting information.

Dr. ANDERSON. And could you supply us with the man-hours for this particular division?

Mr. McCARROLL. We could.

Dr. ANDERSON. That would fit into a column there. Also, is there any way of measuring under this tabulation, not on the basis of motor production but on the basis of the product of this particular division of the plant, so as to get at the measure of technological increase?

Mr. McCARROLL. Yes, sir; it would be possible to get that.

Representative REECE. And, Mr. Anderson, if he supplies that information, might it not also be helpful if he would supply the labor costs?

Mr. HINRICHS. Would the figures for the assembly line for the assembling of the motors show the same story that your foundry story has; that is, this, like any other partial piece of work, represents a changing situation with respect to your materials purchased. As those are increased and decreased, obviously your own hours show a similar change?

Mr. McCARROLL. Yes.

¹ In a letter dated April 29, 1940, from the Ford Motor Company, Mr. Moeke says, regarding this table, "The unit of production is cars produced rather than motors, as Mr. McCarroll stated. However, the theory under which we were working called for the production of cars, and we believe our use of cars rather than motors is better."

Mr. HINRICHs. Your assembly of the engine has always been done within your own establishment. Does the assembly line for engines show the same results, or could you supply similar figures for the assembling of engines?

Mr. McCARROLL. Usually it would show the same result.

Mr. FORD. I don't quite get the drift of the question. As I understand it, the question is whether in the assembly of motors there is more stability to the cost per man, or the man cost per motor as compared with the complete car, as these figures show.

Mr. HINRICHs. Well, I wasn't thinking of it in relationship to the complete car, but rather as possibly a more clean-cut illustration, less subject to variations in terms of what you were purchasing on the outside. Obviously every time you shift your practice with reference to the foundry department, as you manufacture internally, your hours or man-days go up. As you purchase on the outside, they go down. Your assembly on the other hand has throughout this period been done completely within the confines of your own company, and I was wondering if the assembly of engines would show this same kind of relationship you have here.

Mr. FORD. There are more parts being added to the engine all the time, which would tend to increase the labor cost per engine, I suppose, due to refinements. As Mr. McCarroll mentioned, the bushings that go into the seats of the valves, these cylinder liners that we are putting in now, which are very hard steel liners, and go in all the cylinder barrels, and various things like that weren't in an engine 10 years ago. That keeps adding to the cost of that assembly for additional parts.

Mr. HINRICHs. And similar things have added to the costs of the manufacturing operations in the foundry?

Mr. FORD. Oh, yes.

Mr. HINRICHs. You have been processing more parts in the foundry. None of these exhibits are intended to indicate that a given part requires more man-hours on higher labor cost today?

Mr. FORD. Probably they require less man-hours, but the product becomes more and more complicated all the time and there are more parts being added.

Mr. HINRICHs. I understand that.

Mr. FORD. And the refinement is becoming greater.

Senator KING. As I understand, many of the parts which are involved in the construction of an automobile you purchase from other manufacturers of parts, if not entire plants. I assume you can't control the costs of those commodities that you purchase from other people?

Mr. FORD. Those costs are controlled by competition. We have several sources for practically every part we buy.

Senator KING. But some of the parts which from time to time you purchase from other persons you have to pay higher prices for by reason of the competitive demands, and that necessarily increases your aggregate cost?

Mr. FORD. Naturally.

Senator KING. For the car?

Mr. FORD. But if those prices on the outside increase there is some basic reason for it which would perhaps apply to other things we buy, and also to our own.

The CHAIRMAN. What has been the trend of prices of the outside parts?

Mr. FORD. That varies with the design. If we were buying today the part that we bought 10 years ago we would be buying it at a very much lower price probably than we bought it at that time; but the fact is that we are buying an entirely different type of part, which goes into a different vehicle.

The CHAIRMAN. Then the price tends upward because of the improvement, does it?

Mr. FORD. The price per unit is upward, yes; and the price per part. If the same type of part were being bought today that we bought 10 years ago, the tendency would be that we are buying it probably at a less price than we did then because of refinements in manufacture.

Senator KING. But you are making better cars and with better parts?

Mr. FORD. Spending more time on parts; better raw materials going in, which cost more, and much better finish; much more inspection.

Senator KING. And the finished product calls for more technological improvement and higher costs with respect to some of the parts that go into the car?

Mr. FORD. A great deal.

Senator KING. And what is the effect upon the final price to the consumer?

Mr. FORD. Well, the price trend has been somewhat up as compared with the old model T and model A, which we built, but it is still competitive.

The CHAIRMAN. It is a much better car?

Mr. FORD. Competitive; the whole trend is that way. No longer what you might call a very low-priced motor car. The public apparently demands lots of room and lots of power.

The CHAIRMAN. Of course, your company was the pioneer in the low-price field?

Mr. FORD. Yes.

The CHAIRMAN. And you are still in the low-price field, of course, although the tendency of the price may be upward because of the improved character of the car?

Mr. FORD. The whole field has risen. The whole low-priced field has risen; the price of the vehicle.

The CHAIRMAN. But still the level of price is lower than before the pioneering effort of your father began; isn't that correct?

Mr. FORD. The level of the price is higher. You mean when large volume started? Oh, yes; surely.

The CHAIRMAN. And the reason why it was possible to produce the original Ford car for a low price, in other words, the reason that your father was able to pioneer in this field was that he was able to tap a much larger market than the high-priced car could tap?

Mr. FORD. Oh, quite, and that was only possible with low prices.

The CHAIRMAN. So that after all the basic cause for the expansion of the industry has been the lowering of the price to reach a larger number of possible purchasers?

Mr. FORD. That is right.

The CHAIRMAN. So that the market is the essential factor in the growth of the industry?

Mr. FORD. That is quite correct.

Dr. ANDERSON. If that is true, Mr. Ford, and in the light of your statement of a moment ago that there is no low-priced car in the sense of the earlier product of your father, what do you think is the prospect of a new car in the low-price field that will fill that gap, that will reach that purchasing mass we have been speaking of who cannot at the present time buy even the low-priced new cars?

Mr. FORD. There have been several factors that have entered into that problem since the day that we built a very low-priced car. The first one was that those cars were being sold to original owners to a great extent, to people who hadn't owned a motorcar before. In the meantime they purchased that car and many others, and have created a used-car field, used-car market. Now the used car is merchandised by a dealer, and his market for that used car is the man who formerly bought a new car in that very low-priced field. He is in the \$200 to \$400 class for a used car.

Dr. ANDERSON. You leave the person with low purchasing power the used-car field rather than attempting to provide him with a new unit, giving him all the efficiency of a new unit?

Mr. FORD. That is the way it exists today. We have hopes that some day we will have a low-priced unit again that will supply the purchaser with a new car at a lower price and a more efficient operation than in the past.

Dr. ANDERSON. Is there any technological reason why that hope couldn't be realized shortly?

Mr. FORD. None whatever, except the question of buying power, whether there is a sufficient volume of buying power in that field to warrant a low-priced product which can be produced only in large volumes.

A \$500 AUTOMOBILE

Dr. ANDERSON. In other words, if you could see a market for 1,000,000 to 2,000,000 cars a year, say at \$500, you could produce the car?

Mr. FORD. We could produce the car all right; yes.

The CHAIRMAN. Now just to repeat what I understand you to have said, an increased market for technological advance depends upon an increase of purchasing power; is that correct?

Mr. FORD. Mass purchasing power.

The CHAIRMAN. Mass purchasing power?

Mr. FORD. I believe so.

The CHAIRMAN. That is the essential need for further technological improvement?

Mr. FORD. I believe so.

Mr. McCARROLL. In the Ford Motor Co.'s exhibit at the New York World's Fair, there was in operation a display illustrating how machinery creates employment. Perhaps this may have been seen by members of the committee. There, side by side, a man was pounding out hub caps by the slow hand method and a mighty progressive machine was stamping them out with great rapidity. The man made one piece while the machine made 2,160 pieces, and at first glance it would seem that this machine might eliminate 2,159 jobs, but a study of the figures proves otherwise.

Representative REECE. Will you permit a further interruption? I am interrupting to refer particularly to the summation which the chairman made. He stated that the ability to make a low-priced car and sell it would depend upon mass purchasing power, but what would the effect be if our standard of living had been raised so that when this mass purchasing power came about the people demanded a better car than was the case when you produced your original low-priced car? Would it then result in the production of a new low-priced car or an increased volume of cars comparable to the present so-called low-priced cars?

Mr. FORD. We feel there is always a field way down below that everybody in the world wants a motor car. It is a question of being able to afford it, and we feel the lower the price of a motor car adequate for general use, the greater the market will be. If the cost of living, the standard of living, had been higher—you mean if it were higher than it is today or had been higher in the past? I didn't quite get which you meant.

Representative REECE. I might state it this way. We have a greater mass purchasing power today than we did when your father produced the original low-priced cars, but with this mass purchasing power is going a demand for a better car, for better service, which you are supplying in accordance with the demand?

Mr. FORD. Yes, that is true. We are supplying the demand as it exists today among the class of people that can buy new motor cars. There are strata underneath buying used cars. We feel that if a low-priced new car were produced to fit that price class they would buy those cars rather than the used cars, because of the increased efficiency. There is still a great mass of buying power underneath the present standard.

Representative REECE. I agree with you in that statement.

Dr. ANDERSON. Mr. Ford, then I take it that the future of the automotive, the new car building, industry at the present time, unless you can tap a new consuming public, is inseparable from the sale of old or used cars?

Mr. FORD. It is inseparable because those old or used cars exist and they have to be disposed of. The unfortunate part is that the dealer takes them in as part allowance on his new car. If the dealer could make a clean case deal, or clean deal without the used car being involved he would be a lot better off, perhaps, than he is, because he takes those used cars in and it is somewhat of a gamble as to the salability of them. He either fixes them up, or sells them as is, and there is an element of risk involved and the tendency is to over-allow sometimes on that used car.

The CHAIRMAN. That is wholly the risk of the dealer, isn't it? It isn't passed on to the manufacturer?

Mr. FORD. The dealer takes that risk, entirely.

The CHAIRMAN. He is the judge of how much he shall allow and he takes the gamble as to what disposition he can make of the used car?

Mr. FORD. That is right. Of course, there is a great amount of skill involved in that in appraising these cars.

The CHAIRMAN. Oh, naturally.

Mr. FORD. But the sales factor has a lot to do with it, too. If the salesman has a deal about ready to break and there is a question of

\$25 or \$50 between the appraisal of this used car and what the owner expects from it, well there is sometimes a compromise and the dealer therefore makes the sale but he gives up part of his gross profit.

NEW VERSUS REPLACEMENT CAR MARKET

Dr. ANDERSON. Mr. Ford, following up that question I asked a moment ago, I notice in the *Automobile Facts and Figures* recently published the heading of a table that spans a long period of time, showing that in the last year, 1938, the replacement market took all of the new cars sold in the United States. In other words, new customers in the over-all, people who did not own cars, did not appear in the shops in sufficient numbers to offset the replacement market. They balanced. Everybody coming in turned in a car in order to buy a new one. Now, if that becomes a trend, does that offer any hazard to the market for new cars in the United States?

Mr. FORD. It may.

The CHAIRMAN. Do you agree with that premise, Mr. Ford? I thought I saw Mr. McCarroll shaking his head.

Mr. FORD. I don't know what those figures are.

The CHAIRMAN. The statement as I gather from Dr. Anderson is that the original purchaser has apparently disappeared from the motor market. Is that true?

Mr. FORD. Well, I wouldn't think it were true 100 percent; no.

Senator KING. That can't be true in view of the fact that you just a day or 2 ago turned out your twenty-eight millionth car.

Mr. FORD. Mr. Moekle said 15 to 20 percent don't turn in cars.

Mr. MOEKLE. I don't know the exact figures but we do know some percentage, 15 or somewhere around there, of what we call clean deals, that is purchasers come in and buy cars without trading in an old one.

Mr. FORD. Those people may have disposed of their car before the deal, before they came to the dealer for a new car.

The CHAIRMAN. But the replacement factor is a constantly increasing one, is it?

Mr. FORD. Increasing problem. Until a new field is tapped by lower prices.

Mr. HINRICHS. At lower prices, the market now is certainly not saturated. You wouldn't contend there is a saturated market?

Mr. FORD. I wouldn't, by any means. As I said before, everybody wants a motorcar. It is a question of whether they can afford it. If you lower the price, the greater the field.

Mr. HINRICHS. About one-third of the families at \$900 to \$1,200 buy a car; about half of those at \$1,200 to \$2,000 have cars; so that at lower prices there is a presumption of a vast untapped market, isn't there?

Mr. FORD. I believe so.

Mr. HINRICHS. Now, development of the Ford Motor Co. in recent years has been in the direction of tapping that market through lower prices and lower costs? Or have they been rather in the direction of giving the existing market a better product at essentially the same price, slightly higher, slightly lower?

Mr. FORD. The latter is what we have been doing of late. We haven't attempted, of course—we naturally wish to reduce the cost of the car as we can, but we are not taking parts off the car to do it. We are adding all the time to the refinement of the car, because we feel that is the car that is in greatest demand at the present time.

The CHAIRMAN. The table which Dr. Anderson referred to is taken from *Automobile Facts and Figures*, published by the Automobile Manufacturers Association, twenty-first edition, for 1939, and this table would indicate that in 1930, '31, '32—in those 3 years, there were no new buyers and multiple car owners and that the replacement market took up all of the cars sold in the domestic market; that in 1934, '35, '36, and '37 new buyers appeared again in increasing proportion but disappeared wholly in 1938.

Mr. FORD. 1938 was a bad year; 1937 was good; and 1939 was much better than '38.

The CHAIRMAN. It would appear from this table that the disappearance of the original purchaser is accounted for by the poor years.

Mr. FORD. I should think so.

The CHAIRMAN. In every other year there is a substantial original purchaser market.

Mr. FORD. Yes.

Dr. ANDERSON. It might be added that the chart shows, and figures tend to bear out the fact, that while the trend is not a constant downward trend of new purchasers, there is a tendency that corroborates your point that somebody has to find some way of tapping new purchasing markets for low-priced cars.

Representative REECE. If the present car owners, however, were unable to trade their old cars in, that is, if the market was not available for the used cars, they themselves would use their cars for a longer period of time and not buy as many new cars as they do at this time?

Mr. FORD. I believe that is true, and then when he did dispose of them he would have to dispose of them at a lower price.

Representative REECE. Dispose of them at a lower price or they would go to the junk heap?

Mr. FORD. Any introduction of a new low-priced car will have a very drastic effect on the used-car market. It will tend to lower the whole range of used cars definitely.

Representative REECE. And from the utility standpoint many of the used cars which are taken in by the companies are very useful.

Mr. FORD. They are useful?

Representative REECE. Yes.

Mr. FORD. They are transportation, but they are not sufficient transportation, as the new car is perhaps.

The CHAIRMAN. You don't expect to have him say the used car is as good as a new car?

Representative REECE. I included the words "had a high utility value." They give us luxury and comfort that our old car didn't have, if it is only 1 year old; although our old car is 1 year old, and we feel the urge for a new one, it still runs very successfully and gets us back and forth without any difficulty, so strictly from a utility standpoint it serves the purpose.

FEASIBILITY OF LOWER-PRICED CAR

Mr. HINRICHs. Mr. Ford, you mentioned the fact that the used-car market might be seriously disturbed for a period of, I take it, several years during a transition to a really low-priced car. Has that factor played an important part in your considerations as to the businesslike feasibility of introducing a low-priced car at any time?

Mr. FORD. It has been one of the factors that we have considered right straight along. I don't think it would perhaps stop us from producing a job of that kind when the time comes, because we feel that perhaps a situation of that kind might take care of itself. There will be some losses involved, of course, but there will be greater profits and greater benefits when the thing has stabilized itself and worked itself out. It isn't an element that prohibits us from doing it. There have been many other factors besides that one.

Mr. HINRICHs. Technically, you can do the job?

Mr. FORD. I believe so.

Mr. HINRICHs. What is the chief inhibiting factor?

Mr. FORD. We have felt with the vast number of unemployed people and the depressed state of the farmer, and so forth, that there perhaps wasn't the buying power for that type of car that there might be later on.

The CHAIRMAN. The chairman intervenes now, noting that Mr. McCarroll has read only a small portion of the original statement. Perhaps we might expedite the presentation if we permit him to proceed and then we will ask the questions later on.

Mr. McCARROLL. Thank you. The automatic machine produces this part at about \$0.12 each, but there was spent \$115,000 for the machine and dies.

The first point to consider is that machinery begins to create employment before it goes into production. Divide the cost of the press by a day's wage, say \$7, for every dollar of material cost is ultimately reducible to someone's work. At this rate the press and dies represent 16,428 days work.

Next consider making the article by hand. A man can be equipped with hand tools for \$24. This would seem to be a big saving over the \$115,000. But the \$24 must be multiplied by 2,160 which would be \$51,840. Then there would have to be a factory to house those 2,160 men which would cost at least \$500,000 for the building and land, and about \$83,000 per year for maintenance, heat, light, and taxes, making a total of \$634,840. Now, as a practicable business matter, such a development could never be realized, but imagine that this were done and that the hand worker could turn out 2.7 parts in an 8-hour day, then the part would cost about \$2.50 each, as against \$0.12 on the machine. If this practice were followed throughout all the manufacture of an automobile, it is calculated that the cost of making a Ford car would exceed \$17,000. At such a cost, not more than about 50 cars a year would be sold. There would not be work for more than 1 of the 2,160 men, none for most of the more than 125,000 men now in the Ford industry alone.

Could this be avoided by paying for the hand work just what it would be worth by comparison? Hardly, for under that arrangement a man on this job would earn about \$0.18 per day.

Three million men are normally employed in making, selling, and servicing cars, because, with machinery, cars can be produced at prices people can pay. And that, in turn, creates jobs at wages that enable people to buy. The cars, the jobs, the wages would not be there, were it not for machinery.

Some who object to machinery still think they have a point. They say "We'll grant that we need the machinery we have now, for it has created most of the jobs there are today. But let's not have any more. Let's freeze things as they are and keep the jobs we have." In the opinion of this company's management, that again shows a lack of understanding of the way things work. There is no point in denying that manufacturing costs are constantly cut by taking certain men off certain jobs because better machines have made those men unnecessary on those particular jobs. But that does not mean that the total number of jobs has been permanently decreased. The Ford Motor Co. has been cutting costs for many years, but as has been shown, there are many more man-hours of work in today's Ford car than in the model T or model A. Cutting costs enables the company to put more in the car, and it takes more men to put it there.

In the following actual figures comparing 3 separate 12-month periods which had a similar average daily production, it will be observed that there has been a progressive increase in both the total hours of labor and in the average hours per automotive unit produced.

Period	Average daily production	Total hours	Average hours per unit
12 months ended—			
Jan. 31, 1935.....	3,074	146,373,000	186.74
Apr. 30, 1938.....	3,115	168,790,000	211.64
Nov. 30, 1939.....	3,069	173,638,000	220.18

With regard to purchases the following figures from the company's records for the same two 3-year periods referred to earlier show that during the same time that labor hours and labor cost per unit were increasing, the amount of purchases per unit produced also was increasing.

Period	Average daily production	Purchases	Purchases per unit
3 years ended—			
Feb. 29, 1936.....	3,276	\$1,198,609,000	\$478.24
Nov. 30, 1939.....	3,267	1,259,242,000	501.30

These purchases were exclusive of those for plant facilities.

Here, reference is suggested again to the Government publication, Background 1940 Census, page 4, chapter 4, but it is asked that the

whole text be read, rather than just the heading "New Products Hurt Old Ones" which seems misleading.

For instance while certain silk fabrics declined from 336,000,000 square yards in 1927 to 109,000,000 in 1937, rayon fabrics advanced from 66,000,000 square yards to 947,000,000 square yards.

This shows a net gain of 604,000,000 square yards.

Electric stoves and ranges more than doubled while gas cooking stoves and ranges declined only slightly. Electric clocks rose nearly 50 fold in 10 years while other clocks declined by half.

And on page 5—

Probably no figures in the manufactures census tell more as to the changed habits of Americans in transportation than those having to do with automobiles, carriages, and wagons. In 1904 we made only 20,000 passenger motor vehicles but then we made 937,000 carriages, buggies, and sulkeys. In 1937 we turned out 3,847,000 passenger motor cars and only 900 buggies. Horse-drawn wagons reduced from 644,000 in 1904 to 108,000 in 1937 and motor trucks rose from a production of 160 to 602,000.

Many other figures can be gotten from this Government Publication which, it seems, further justify opinions expressed herein on the subject under discussion.

It is also suggested that note be taken of Mr. Justin W. Macklin's (First Assistant Commissioner of Patents) article in *Nation's Business* for January, 1940, under the title, "Labor Saving Machines Make More Jobs."

Question 2. What does the size of industrial unit, the type of ownership or management, and the kind of industry have to do with the rate and character of technological change?

Answer. Regarding size of unit, you are referred to the answer to "Effect on Investment"—question No. 2.

Regarding type of ownership, it is believed that results may be much more quickly accomplished where efficient compact management is demanded and developed and such management is given a free hand than where, due to an unduly complicated corporate structure, much red tape must be gone through before a development may be started or carried through.

Regarding the "kind of industry," it is preferred to confine remarks herein to experiences in this company for obvious reasons.

Question 3. What kinds of technological change result in permanent displacement of workers?

Answer. This company has no knowledge of any technological improvement that has resulted in the permanent displacement of workmen, in the sense that generally cooperative willing workmen cannot thereafter find employment. If there are isolated individuals seriously affected, undoubtedly they should be and can be compensated without impeding for the use of civilization generally the great benefits of new developments.

Question 4. How many and what kinds of workers are displaced by technological changes in particular industries, and what becomes of them?

Answer. As far as this company's information goes, there is no known permanent displacement of workmen in this industry, as under normal conditions they are absorbed in jobs created by one or another technological change.

Question 5. What is the annual volume of technologically displaced workers in particular industries? What is the aggregate effect of technological displacement on the labor force employed in these industries?

Answer. In this industry there has been no permanent displacement.

Question 6. What is the effect of technological change on occupational skills, individual earnings, and social-economic status of workers?

Answer. The technological change has increased occupational skills, increased individual earnings, and improved the social-economic status of workers.

Question 7. What is the effect of technological change upon various age groups and sex groups of workers?

Answer. Technological change has made possible the use of men older and with less physical strength. This company has use for very little female labor.

EFFECT ON SOCIETY

Question 1. What are the effects of technological development in the "one-industry town?"

- a. On employment.
- b. On pay rolls.
- c. On community agencies and activities.

Answer. As some members of the committee may already know, the Ford Motor Co. has 14 small plants located within a radius of 60 miles of Dearborn, in an effort to help rural communities by the decentralization of industry where possible. This is its only direct contact with "one-industry towns." Where technological change has affected these plants, it has been found both convenient and desirable to make arrangements to maintain or increase the amount of labor in those places.

TECHNOLOGY AND MIGRATION OF INDUSTRY

Mr. McCARROLL. Question 2. With technological change having made possible standardization of industrial processes, what is the effect on the migration of industries? What causes these migrations? How do they occur? What do they leave behind them in the way of social, economic, and human gains and losses? What do they accomplish in these respects in their new location?

Answer. This company has had little direct contact with the migration of industry. So that its industry at Iron Mountain, Mich., might not "migrate" from there when the average amount of wood decreased from about 350 pounds per car to 34 pounds per car, other jobs, such as the station wagon assembly, were moved to our Iron Mountain plant.

Question 3. What is the extent and character of the bidding made by States and localities for the transfer of businesses? Is there need for economic and social policy to mitigate or eliminate the undesirable features found in this situation?

Answer. No experience has been had with the bidding of different localities for transfer of business. In a few instances benefits offered locally to any new industry have been received, but the decisions to

establish this company in such places were dictated by other considerations.

Question 4. How successful are public and private agencies in meeting the problems of vocational training and placement, retraining and replacement of workers?

Answer. At the company's main plant, it maintains its own training schools with more than 2,000 students. This has been advantageous both for the students and the company.

Question 5. Is technological development resulting in degrading or upgrading of workers? In either case, what is the effect on purchasing power and standards of living? Is there need for the formulation of social policy in this connection?

Answer. It is believed technological development is resulting in upgrading of workmen. It makes for increased purchasing power and increased standards of living. The laws of cause and effect and the natural desires of businessmen and employees for improvement from every social angle are accomplishing this without a formulated social policy.

Question 6. How successful are the various industrial plans for spreading work, annual income payments, wage-and-hour adjustments, in-service training, intraplant shifting, etc., in adjusting the labor force affected by technological change? Is there need for legislation along these lines?

Answer. It is believed that this company has been very successful in these matters under the conditions, and that it will continue to improve its handling of them. The company strives to lead in improvements along these lines. It does not believe that new legislation is necessary or helpful to these ends.

Concerning Ford plant extension and replacement, the records show an outlay for the past 6 years of \$169,152,000. Plant equipment scrapped or otherwise disposed of amounted to \$96,682,000. Yet, at the end of 1939 after these important improvements in plant were made, employment by the company, for a like volume of production, stood at a 10-year peak of approximately 125,000 men. During the years 1927 to 1929, inclusive, the company's annual gross outlay for replacement or expansion purposes was \$36,000,000.

It is believed that the foregoing comparative figures taken together establish definitely that employment by Ford Motor Co. during the past 6 years has not been affected adversely by any possible technological reaction. On the contrary, the company, even with improved working facilities, has steadily employed more men, paid out more in wages, and purchased more materials per automotive unit produced.

The CHAIRMAN. Do you care to ask any questions now, Dr. Anderson?

COST OF PRODUCTION AS MEASURE OF EFFECT OF TECHNOLOGY

Dr. ANDERSON. Well, Mr. Ford, before moving over into this very interesting retooling story, I would like to ask two or three questions concerning parts that we covered here and didn't ask questions about. In answering the question as to the effect of technological change on the volume of production, the number of workers employed in that production, and the volume of wages paid, you listed 3 periods of time and the number of parts used, and each period showed an

increase in the amount of pay rolls and purchases of cars. The last statement is, "The amount of pay roll and purchases per model V-8 (which was placed in production in 1932) with its about 16,000 parts in 1939 was \$683.23." What is that, the V-8 "60" or the V-8 "85"?

Mr. FORD. I couldn't say as to that. There is very little difference.

Dr. ANDERSON. So there won't be any significant difference in one or the other?

Mr. MOEKLE. It is a composite.

Dr. ANDERSON. Then I take it the \$683 means the total cost in terms of pay roll and outside purchases, but not in terms—

Mr. FORD (interposing). All purchases for production.

Mr. MOEKLE. It is not the cost per car. It is the amount of purchases and pay roll per unit produced.

Dr. ANDERSON. Per car produced.

Mr. MOEKLE. Which includes, of course, materials that are resold or sold as service parts. It wasn't possible to segregate that.

Dr. ANDERSON. What proportion of your total production would that be?

Mr. FORD. Service parts?

Dr. ANDERSON. Would it run anything like 15 to 20 percent?

Mr. FORD. It runs about \$10,000,000 a month, but I can't tell you what it is in number of parts.

Mr. MOEKLE. I suppose 10 or 15 percent is somewhere near.

Dr. ANDERSON. Then, in other words, to get the production cost of that car you would have to deduct parts and accessories sold for replacement or sale on the outside.

Mr. MOEKLE. Yes. This wasn't made with the intention of showing the cost per unit. It was made to show the trend of purchases of labor and materials per unit.

Mr. FORD. More and more going into the unit as years go on.

Dr. ANDERSON. It goes beyond that. If there are 10 to 20 percent of accessories in here, the unit basis of production will not be a suitable one for determining change over a period of time. You would have to take out this element.

Mr. FORD. Those parts are all manufactured; they involve labor.

Dr. ANDERSON. But they don't involve labor on that particular car. The measuring unit is a bad one at that point, isn't it?

Mr. MOEKLE. We thought it was all right.

Dr. ANDERSON. I want to lead you to a curious point, then, if it is all right. Your cost here is \$683, and according to the Federal Trade Commission's report your V-8 "60" at that time was selling for \$666, f. o. b. your factory.

Mr. MOEKLE. This is not the cost.

Dr. ANDERSON. So your costs were above your f. o. b. selling price.

Mr. FORD. This is not cost. This is a lump sum of all the material and labor for a given period, divided by the number of cars, and we only did that for comparative reasons. It has nothing to do with the actual cost of the car at all.

Dr. ANDERSON. And to get at the actual cost of production you would have to proceed in quite a different way?

Mr. MOEKLE. Somewhat different; yes.

The CHAIRMAN. What are the differences which produce the different figure? If we are not to regard this as cost, why not?

Mr. MOEKLE. The difference is, altogether, that this includes all purchases and all pay rolls, and a certain amount of the purchases and pay rolls goes into service parts, parts that are sold, service parts and accessories that are sold separately from the car.

Mr. HENRICHS. This would also include, I take it, materials put into inventory for the time being; that is, all material purchases during a calendar period.

Mr. MOEKLE. It would.

The CHAIRMAN. There is no duplication?

Mr. MOEKLE. There is no duplication.

Mr. HENRICHS. Suppose the proportion of your repair parts or replacement parts, and your inventory within a calendar year, would change from one period to another. They are not constant. There may have been a higher proportion of repair part production in 1938 than in 1929, with which you are making a comparison.

Mr. MOEKLE. If inventories were proportionately different in one period and another, it would make that difference.

Mr. HENRICHS. Actually, in 1939 you were somewhat building up inventory, weren't you, in anticipation of 1940?

Mr. MOEKLE. I don't think so.

Mr. FORD. Not abnormally.

Mr. MOEKLE. Not abnormally. We don't have accurate figures here, however, on that point.

Dr. ANDERSON. My point, Mr. Ford, was that the question concerned the effect of technological change on the volume of production and the number of workers employed in that particular production. To answer that question, we need some measure—some unit—which eliminates as many fallacious elements as possible.

Using the measure you do, it would be possible that in your plant you had gone into businesses quite removed from the production of automobile units and thereby swollen your number of workers employed and the volume of wages paid. In other words, the character of the business would have much to do with the figures in the over-all. My point, therefore, is that only on the basis of some comparable unit, such as actual motor cars produced, could we get at a measure of the effect of technological change on volume of production or upon the number of workers employed.

Mr. FORD. You feel that this example isn't quite an accurate one?

Dr. ANDERSON. I wonder if you consider it precise enough to get at such a question.

Mr. McCARROLL. Don't you think that in some ways it is better, because, although such parts as the radios and heaters are included under what we call parts sold separately from the car, they are a very definite part of the car and a very definite part of the labor that goes into the making of the car, and it is just those extra things that are being put on the car, both as regular production and as service, if you like, units, that are helping to cause this increase in the amount of labor in the car.

Dr. ANDERSON. In other words, you don't have any figures to show what the trend with respect to replacement parts and accessories is.

Mr. McCARROLL. We haven't separated that figure in here.

Dr. ANDERSON. You see it could reasonably be, Mr. McCarroll, as there are more old cars on the market, that we have an increase in replacement-part business that becomes a vital part of your total

business. You say it already amounts to some \$10,000,000 a month, which would mean an appreciable part of the total.

Mr. FORD. It doesn't fluctuate very much.

Mr. BIGGE. Isn't there much more change over a period of time due to the change in the model itself rather than the proportion of total cost that is spent on the replacement parts, and so on, in connection with your outstanding cars? It seems to me the major change is in the character of the car that you are turning out.

Mr. FORD. The unit is building up all the time.

Mr. BIGGE. And you can't compare today's costs of producing a model T with the 1924 cost of producing a model T because it isn't produced today.

Mr. FORD. Here is one instance which is rather illuminating. The demand for remote-control gear shift, which is up on the steering wheel, has become universal, and we, as well as the rest of the industry, have installed that method of shifting gears. Well, we used to run a lever from the transmission directly up, with a ball on the end of it, and you shifted the gears with it. But because of the engineers' creation of this change and the popularity with which it was received by the public, we have had to put this remote control on, which requires 40 parts, compared with one or two parts, and yet it doesn't function any differently than the old method did, but those parts all have to be designed, tooled, and produced, which all adds to this involved product which we are building today as compared to the early days.

INCREASE OF DECREASE OF SKILL

Dr. ANDERSON. I am interested in more elaboration of the point with respect to the upgrading of workers due to technological change. Some people have labored under the impression that once a belt-line conveyor is installed you get a semiskilled to unskilled level of worker doing almost automatic things. I can remember a Charlie Chaplin film in that respect.

Your testimony is quite the reverse; that as technological innovations increase in a large institution such as yours, the proportionate number of skilled workers in the labor force increases.

Mr. FORD. I don't think you can quite call them skilled workers, but the standards are increased, and of course you have to take into consideration the fact that all these devices and machines, the machine tools that are built and designed for this so-called technological change for greater efficiency, all require the highest type of skill to manufacture those machines.

Dr. ANDERSON. Those would be the tool and die makers. What proportion are they of the total labor force?

Mr. FORD. They are about 10 percent of our total direct labor. We have perhaps 40,000 to 45,000 men on direct labor, and 4,000 to 5,000 tool makers.

Dr. ANDERSON. About 10 percent of the total, then?

Mr. FORD. Of course, they are not considered direct labor, though. But you are asking the proportion.

Mr. HENRICHS. That comes back to the same question that I was asking earlier. I would expect an increase in the skill in any particular occupational level, more skill among your semiskilled work-

ers, for example, as you improved your process, but would it be possible to indicate what has happened to the proportions of the groups of workers that you would regard as skilled workers, as opposed to semiskilled, in three quite distinct periods, say 1920, 1929, and 1939? Is the proportion of skilled today as high as it was in 1929, as high as it was in 1920?

Mr. FORD. I don't believe I could answer that, offhand. I would say that because of the refinement that goes into the product as compared with 1920, for instance, the natural tendency is for those men to all require more intelligence, or for us to require more intelligence of those men, and they have to improve their skill.

Mr. HINRICHS. I am thinking of this sort of a situation: I am very much interested in terms of the work that we are doing in the changing levels of occupational demand, and if it would be possible to make a reasonable answer, not offhand but at some later time, without giving you too much work, I would appreciate it.

Mr. FORD. We would be very glad to make a study of that.

Mr. HINRICHS. Conceivably you might have 10 out of 100 skilled workers today, and have had 15 out of 100 in 1920. The 10 might be on the average a more highly skilled group than the 15, and yet the change in that demand for skilled labor as a proportion of the total is rather significant with reference to the changing occupational pattern. If you can throw further light for us—

Mr. FORD (interposing). I would like to ask Mr. McCarroll or Mr. Moeke if they can. I don't believe I can, offhand.

Mr. MCCARROLL. When we were studying some of these questions on here, while we didn't get those detailed figures to which you refer, we had to keep in mind several things that are different in different departments, but I think it will be very easily proved by these figures that we are going to get that increase in skilled and semiskilled, and we haven't had them separated in any way. For instance, the boys coming out of the trade schools are making every year a much larger proportion of the total number of men employed, and they are certainly much more skilled than their predecessors were.

Mr. HINRICHS. A second question along the same line: again, if it can't be answered at this time, I would appreciate an answer later if it is convenient. Are these people who are coming out into the skilled jobs coming out with a highly specialized skill, or with an all-around skill? Is the proportion of those who have to have the all-around skilled training increasing, or is it becoming a very specialized type of skill?

Mr. FORD. I wouldn't think so from our experience. The men that we are making in our apprentice schools, our trade schools, are men that have a well-rounded-out experience in all types of mechanical operations.

The CHAIRMAN. Would you say, then, that the effect is not to make an automaton out of a man?

Mr. FORD. Not in our business, we feel definitely.

The CHAIRMAN. So that the experience which the man gets in a modern plant such as yours is such as to give him a well-rounded mechanical knowledge and capacity?

Mr. FORD. Yes, sir.

The CHAIRMAN. And could you switch him easily from job to job?

Mr. FORD. Very easily.

The CHAIRMAN. What type of skill is required of the individual worker in tending these machines?

Mr. FORD. Average intelligence, not any great technical experience. A machine-tool man requires a little training. They go into a department in many instances green.

The CHAIRMAN. We were discussing the skilled, and I was wondering just what type of skill is required of the worker beyond intelligence to handle the machines.

Mr. FORD. Do you mean skill based on past experience, training skill, skill from training, or education?

Dr. ANDERSON. From machinery.

Mr. FORD. Not a great deal.

The CHAIRMAN. Then what does the skilled worker do?

Mr. FORD. He is a different type. He is a toolmaker, a patternmaker, a jig and die-fixture maker.

The CHAIRMAN. And to what extent does the worker merely manipulate a machine and to what extent does he, by his own intelligence, shape the product?

Mr. FORD. The machine shapes the product. That is practically automatic. He has the intelligence to put them on, to operate the machine and not get caught in it, and that, I would say, would just require average intelligence.

Dr. ANDERSON. Let me ask, what is the training period for an assembly line worker to make him proficient?

Mr. FORD. The assembly line worker goes on the line as a green man. I am assuming that he probably would get as proficient as he ever will be inside of 30 days.

Dr. ANDERSON. In 30 days he attains maximum efficiency?

Mr. FORD. That is on plain assembly. That has nothing to do with machining parts.

Dr. ANDERSON. On machining parts, what would be the training?

Mr. FORD. You mean on an automatic machine? I should think a few days.

Dr. ANDERSON. And you wouldn't call the person working at proficiency in a few days a skilled worker?

Mr. FORD. Not a technically skilled worker; no. He is skilled at the work he is doing.

Dr. ANDERSON. But he is not classed generally as a skilled worker in the plant?

Mr. FORD. No. As we all understand skilled work, that means craftsmanship—toolmakers, patternmakers, die makers, and so on, the highest class of employee we have.

SUPPLY OF LABOR

Dr. ANDERSON. Is there any oversupply or undersupply of workers in any of the levels in which you demand workers? Can you get all the workers you need?

Mr. FORD. We can get all the common labor we need. It has been very difficult the last year or two to get toolmakers; patternmakers of the higher skills are in great demand.

Dr. ANDERSON. What is that due to?

Mr. FORD. It is due to the style change people want in a motorcar. Detroit is the center of the motorcar industry and either the sales

department or the buying public seem to want a new facial front on their automobile every year, and that requires a vast outlay for dies and tools and new fixtures every year to comply with that. We spend about \$5,000,000 a year on just style changes.

Dr. ANDERSON. Do you propose, in your trade schools, to train those very workers needed most?

Mr. FORD. Our trade school boys all come out technical workers if they are so fitted mentally. Then we have an apprentice school for employees who are older and don't go into the technical arts quite as much, who come out more of the skilled assembler, garage man, service man. He knows the motorcar, he knows the function of the internal combustion engine, but he couldn't sit down and read a blueprint and make a die or tool or fixture.

Dr. ANDERSON. Let me ask, do you see any prospect in the immediate future, knowing the market as you do, for what would be comparable to full employment in the automotive industry?

Mr. FORD. You mean by that, whether the market will increase to the point where there would be full employment?

Dr. ANDERSON. You have overcapacity at the present time, do you not?

Mr. FORD. We have; yes. I think we are running three-quarters of our capacity.

Dr. ANDERSON. Do you see any prospect in the immediate future of that thing being stepped up?

Mr. FORD. I couldn't comment on that.

Dr. ANDERSON. You are not projecting?

Mr. FORD. I really don't know.

Dr. ANDERSON. From a businessman's standpoint you are not making any decisions of your own to occupy the whole plant?

Mr. FORD. No; we are trying to build a product that will compete and be as successful as we are able to do it, and we hope that they will continually increase in volume, but there is no way of estimating that.

Mr. HINRICHS. Coming back to this question of the capacity of your different groups of workers, the assembly worker, you have indicated, is trained to full production in about 30 days. What general requirements have you in hiring such a man? You indicated average intelligence, and I suppose actually you aim at something a little better than that if you can get it.

Mr. FORD. Yes; we do. We naturally want to get the best type of employee we can.

Mr. HINRICHS. What about physical stamina?

Mr. FORD. They are all given a physical examination for their insurance and our insurance against occupational disease and that sort of thing.

Mr. HINRICHS. The average worker on the assembly line now has to work under very considerably higher tension than was true in the earlier days of motor production.

Mr. FORD. Did you say tension? I wouldn't think so.

Mr. HINRICHS. You would feel there was no greater tension now than there was in the days of essentially hand assembly?

Mr. FORD. I think parts fit together better than they did 20 years ago. My own observation in observing the line is that the men seem

to have more leisure time, take it in a more leisurely manner, and seem to know what they are doing. There is no stress that I can see.

Mr. HINRICHS. Would it be your feeling, for example, that an average man over 45 would fit on any of your assembly lines, or that a younger man would be more satisfactory?

Mr. FORD. I should think either would be satisfactory. We have a great many men that are past the age of 45 who do any work that is assigned to them.

Mr. HINRICHS. What has been happening to the average age of workers in your plant? Is your average age higher now than it was in 1929, the age of the average worker?

Mr. FORD. I believe it is. We had some figures a while ago on that.

Mr. McCARROLL. Mr. Cameron had some figures on that which he used on the air, which showed there had been some increase.

Mr. FORD. That is my impression. I would have to verify that before I would want to make a definite answer.

Dr. ANDERSON. I wanted to refer to the question of seasonality and its effect upon production and workers. How sharp are model changes in your plant? How long a period of time does it take to make a model changeover, annually?

Mr. FORD. We usually consider approximately 2 months are involved, but that means from the time the assembly line cuts down until the new model is rolling off the assembly line. In the meantime, the only people that are involved in that shut-down are the assemblers, but they, in turn, are starting to assemble the new product long before it appears to the public before it appears in the dealers' show rooms, so that there is about a 2-months period until we start to get settled, but that doesn't mean every man is unemployed for 2 months.

Dr. ANDERSON. What do you think would be the unemployment period for the people involved in that changeover who are not permanently employed?

Mr. FORD. I should think in a normal year about 30 days.

Dr. ANDERSON. Then they spend their 11-month pay over a 12-month period of time. Is that about right?

Mr. MOEKLE. That would be about right. They would have to.

Mr. FORD. That is right.

Dr. ANDERSON. What do you find them doing in the off months?

Mr. FORD. We try to bring that period at a time when they can do some gardening and get the benefit of the summer months. That is usually from the middle of August to the middle of September, or all of August.

Dr. ANDERSON. They do stay in the vicinity of the plant?

Mr. FORD. Not necessarily. They may go off on a vacation. They may take their families off to the woods. They look forward to it.

Dr. ANDERSON. Do you find, then, in this condition, labor turnover of any substantial size as a result of a shut-down of that character?

Mr. FORD. No, sir.

Dr. ANDERSON. They come back?

Mr. FORD. Right away.

Dr. ANDERSON. Do you see any evidence at all of a halt in the movement or migration of people? I understand that the population studies show you people in the automobile area have pulled approximately 200,000 to 300,000 people from the South and Midwest to the motor area. Is there any halt in that movement of people?

Mr. FORD. I really don't know. I should think so, but I don't know.

Dr. ANDERSON. Are there more people at the gates waiting and asking for jobs, or less than we have had during the trough of the depression?

Mr. FORD. In the past 18 months there have been less, but there are still a great many looking for employment. There is still a big welfare load in Detroit.

Dr. ANDERSON. Do you think, Mr. Ford, that that problem of the unemployed is related throughout various industries? If, because of the situation of your plant in regard to size of output, efficiency of production, and cost, it does not experience an over-all technological displacement, do you think that this situation is general in industry, or that it has any bearing upon the load of unemployed in the Nation?

Mr. FORD. I would hate to comment on that, because I am so ignorant of all those facts. I know what our own industry does, but I know very little of other industries.

Dr. ANDERSON. Is your industry disturbed about the size of the unemployment population in the United States?

Mr. FORD. Yes; I think our industry is as conscious of that as any industry and are trying as hard, if not harder, to create more jobs.

The CHAIRMAN. How do you try to do that?

Mr. FORD. Create more jobs? By this so-called more highly developed product that we are producing, in design, requiring more men to produce it.

The CHAIRMAN. What could be done to cooperate with you in that effort? How could Congress, for example, help you or industry in general to create more jobs in private industry?

Mr. FORD. Well, there has been a feeling of uncertainty in the minds of a great many people which I suppose has a tendency to arrest development, to arrest purchasing. I really don't know, I am sure. It seems to me a thing that has to wear itself out.

The CHAIRMAN. You don't think there is anything that we can positively do?

Mr. FORD. I hadn't thought about it. This is a new thought to me.

DECENTRALIZATION IN FORD MOTOR CO.

The CHAIRMAN. It occurred to me that perhaps you might have been think about it because of the effort which the Ford Co. has been making toward decentralization. The paper this morning, on page 7, quoted, in response to the question "What are the effects of technological development in the one-industry town," your statement, "As some members of the committee already know, the Ford Motor Co. has 14 small plants located within a radius of 60 miles of Dearborn, in an effort to help rural communities by the decentralization of industry where possible."

Mr. FORD. Yes.

The CHAIRMAN. What was the motivation for that? What was the purpose of bringing about decentralization if possible?

Mr. FORD. We wanted originally to show an example of how a small stream could be developed hydroelectrically. We took the Rouge River and bought dam sites along the Rouge River as far as we could, depending on the flow of the river, and we put these

small plants in there. They are hydroelectric plants. The source of power comes from these generators.

The CHAIRMAN. But your purpose was to decentralize industry. Why?

Mr. FORD. That went along with it. We wanted to show how a small stream could be utilized for power output, and naturally if the power was being produced it would have to be consumed.

The CHAIRMAN. Did you think that that would create more jobs?

Mr. FORD. I don't think it created any more jobs, because we took those departments away from the main plant and put them out in the small plants.

The CHAIRMAN. How did it help the small community?

Mr. FORD. That was the best thing about it, the way it affected those small communities.

The CHAIRMAN. It struck me that it would be, and I thought you might describe it for us.

Mr. FORD. These plants are created; I know one plant has 6 or 7 men in it, but that is a very minimum. They range from 40 or 50 up to 300, and we have 1 plant where we make starters and generators, in Ypsilanti, Michigan, which is a larger town, with perhaps 1,200 people in it. When you take 1,200 people in a new industry with a minimum wage of \$6 a day, and that money is spent in that community, it revives the whole community.

The CHAIRMAN. It doesn't necessarily create more jobs, you say, but it does improve the community and the standard of living for the worker.

Mr. FORD. We didn't transfer very many of the men when we transferred this operation. We tried to employ local labor in and around those small communities. We found work for the men who had been doing that particular job in the main plant on other things. We built this small plant, the hydroelectric plant. We employed local labor, farm or semifarm labor, either men who had been working on farms by the day or farmers or small-town citizens who hadn't any great skill.

The CHAIRMAN. Your objective here was rather social improvement than the self-interest of the industry itself?

Mr. FORD. That is right. We tried to prove a point on social improvement, and to show the possibility of developing a small hydroelectric unit taking this one stream as an example; and incidentally, in every instance where we have moved these departments out there and the local men have operated them we have found that our costs have been less than in the main plant.

The CHAIRMAN. So that social improvement is a desirable thing from the point of view of industry?

Mr. FORD. Decidedly, and decentralization, I think, has a great part to play in it.

The CHAIRMAN. But you don't have any suggestions to us as to positive steps that might be taken by others to push forward this desirable ideal on which you have been working.

Mr. FORD. Well, all those suggestions are things that might create an urge on the part of other people to do the same thing. I don't know—we like to do it. But we aren't representative, necessarily, of all industry. They all have their different problems.

The CHAIRMAN. If it is to be done upon a broad scale, it must be done by the action of the entire population.

Mr. FORD. Where the most benefit would occur.

The CHAIRMAN. That is right.

I gather from your testimony, which has been most interesting, two simple facts, and I am going to ask you whether they correctly represent the picture that you have of this problem. The first is this, that without the modern machine and technological improvement it would be utterly impossible for an organization like the Ford Motor Co. to supply cars on so large a scale to so many people.

Mr. FORD. That is absolutely correct.

The CHAIRMAN. And the second is that it would be impossible for the Ford Motor Co. to use the machines which have this beneficial effect without a large-scale purchasing power upon the part of potential customers.

Mr. FORD. Yes.

The CHAIRMAN. And the conclusion to be drawn from that is that the measure of technological advance is the capacity of the masses to buy the products of technology.

Mr. FORD. Absolutely correct.

The CHAIRMAN. You agree with all those?

Mr. FORD. I agree with that decidedly.

Mr. DAVIS. Mr. Ford, your company has a number of assembly plants throughout the country, has it not?

Mr. FORD. Yes, sir.

Mr. DAVIS. Were they established solely from a transportation standpoint, or for other reasons, or both?

Mr. FORD. Well, I should say both. Originally from a transportation angle, because we have had them a great many years.

Mr. DAVIS. But you have found them beneficial from other standpoints as well?

Mr. FORD. I believe so, just the same as these small manufacturing plants have been beneficial. They, of course, are located in larger communities, but I think they have their beneficial effect in those communities. But it isn't quite the same parallel as these small plants in these very small communities, where you see the effect a great deal more.

Mr. DAVIS. In other words, your assembly plants are located in fair-sized cities, are they not?

Mr. FORD. In Louisville, Atlanta, Kansas City, Chicago—all the big cities where there are distribution centers, trading centers, so that that doesn't apply quite as effectively, although I do feel that, by giving employment in those communities at the wage scales we pay, there must be some benefit.

Mr. O'CONNELL. May I ask a question, Mr. Ford? I notice on page 7 of your statement a sentence to the effect that technological change has made possible the use of men older and with less physical strength. Converting that possibility into the realities of the situation as regards your company, does that remain merely a possibility, or is it a fact that you use more?

Mr. FORD. That is a fact. These machines are much less difficult to operate. We have devices for handling materials that enable a man of much less physical—

Mr. O'CONNELL (interposing). It would enable them, but in terms of your labor force would it be the fact that your labor force now is generally composed of older and less physically strong men than was the case 20 years ago?

Mr. FORD. They are older. I wouldn't say about less physical capability.

Mr. O'CONNELL. It occurs to me that this possibility to which you refer would, generally speaking, continue to be only a possibility.

Mr. FORD. We don't go out and try to hire older men for those particular jobs. The men are naturally getting older day by day, but we have no restrictions on age when we do hire them.

Mr. O'CONNELL. You have no general rule?

Mr. FORD. Not at all. We try to take our share of all types—crippled, blind, and incapacitated people—and work those into our industry in what we think is the proper proportion.

The CHAIRMAN. Are there any other questions?

Mr. HINRICHS. Along that same line, Mr. Ford, most of your changes in your labor force, I presume, occur during the period of rehiring after a shut-down?

Mr. FORD. After a drastic shut-down due to depression of change of model.

Mr. HINRICHS. Change of model, and a rather drastic shut-down occurs every year.

Mr. FORD. I wouldn't call those drastic shut-downs. That month is common in the industry. Everybody expects that. I mean where we are down for 3 or 4 months due to one cause or another, there is a great turn-over.

Mr. HINRICHS. But it is at those times that you make your general changes in the composition of your labor force as regards the industry.

Mr. FORD. We send out notifications to these men that have been on our pay roll, as we reemploy, and we find many of them have drifted back to their original homes, have gone into other businesses.

Mr. HINRICHS. Have you ever studied your rehiring on the basis of the age composition of the people who were laid off prior to one of those shut-downs?

Mr. FORD. No, sir; I don't think so.

Mr. HINRICHS. Would such a study be sufficiently significant from the point of view of your own management interest to warrant an analysis for the last several years of the age of the groups laid off and rehired at the opening of the new model? If so, I would be very much interested in seeing what that is on different 5-year age intervals.

Mr. FORD. We will be glad to see if we can get that information out. I am not sure; I suppose it would be available.

The CHAIRMAN. If there are no other questions, let me thank you again, Mr. Ford, for coming here and cooperating with us so efficiently. We appreciated very much your statement.

(The witnesses, Messrs. Ford, McCarroll, and Moekle, were excused.)

The CHAIRMAN. The committee will stand in recess until 2:15.

(Whereupon, at 12:35 o'clock, a recess was taken until 2:15 p. m. of the same day.)

AFTERNOON SESSION

The hearing was resumed at 2:25 p. m., upon the expiration of the recess, Senator O'Mahoney presiding.

The CHAIRMAN. The committee will come to order.

Mr. ANDERSON. Mr. Chairman and members of the committee, our first witness this afternoon is Mr. Douglas F. Winnek, who will testify about a new technology and offer examples of it so the committee can ask questions pertinent to an understanding of the beginning of a great new technological product. Mr. Brackett and I went to some pains to corroborate the statements that you will hear this afternoon and to determine the fitness of witnesses that might do this sort of thing for us and we hope to bring you at least two more before the hearings are over.

We wanted to give Mr. Winnek a brief time with you in the discussion of a very revolutionary new technological change, three-dimensional photography.

TESTIMONY OF DOUGLAS F. WINNEK, NEW YORK CITY

Mr. WINNEK. Good afternoon, gentlemen. I am the reputed inventor of trivision.

The CHAIRMAN. Do you have any doubt about it?

Mr. WINNEK. Trivision is not a trade name, trivision being the name I have given to what has been heretofore known as stereoscopic photography, or three-dimensional photography; trivision being the word which to me simplifies the technical description of the process considerably. Three-dimensional photography or trivision has been sought after for a good many years, as you may or may not have known, and it started as far back as 1861 when Wheatstone and Brewster, two British scientists, thought that the supreme excellence of photography should lie in its ability to truthfully record objects as the two eyes see them, rather than as one eye alone sees them. Wheatstone developed the old familiar stereoscope that I am sure we are all familiar with, and was possibly responsible to a great extent for a very well-known photographic concern here in the country making a tremendous fortune out of the old stereograph, I think you all remember.

The CHAIRMAN. Do you contend that one eye does not take in the three dimensions?

Mr. WINNEK. Yes; I do that.

The CHAIRMAN. Is it only habit that makes me think I see the three dimensions if I close one eye?

Mr. WINNEK. As a result of considerable experimental work and research in photography, I am thoroughly convinced that 90 percent, approximately, of the perception of depth or space, or the illusion of solidity and plasticity, is due to binocular vision. About 10 percent, I should say, is the result of all of the tricks that are now being used in Hollywood, especially by Walt Disney.

The CHAIRMAN. When I close my eye I am not conscious of any loss of depth.

Mr. WINNEK. I think primarily because you have had sufficient experience with two eyes to know that there is space there. If a one-eyed man were to argue with me or debate on the subject I am sure

he would say, "I see depth, too." I think that is primarily due to experience, certainly not binocular depth. The best proof of binocular depth is to close one eye and walk down a strange stairway. I wouldn't recommend it. You will find that you will have considerable difficulty.

Another interesting thing about binocular depth is that when you hold a card, your hand, or anything solid in front of you and look at it first with one eye and then with the other you will see two distinctly different images. It is the fusion of those images in the brain in the optic thalamus that produces the rather amazing but natural result of depth or space.

Photography for generations has been, with few exceptions, completely lacking in three-dimensional relief. The stereoscope, the red and green glasses that you see once in a while in the motion-picture field, the polaroid glasses, the oscillating shutter device that was at one time quite popular in New York theaters, were all methods of producing two distinctly different retinal images; that is, the right eye and left eye were provided with two different pictures. The illusion of depth heretofore has required some visible viewing device. Trivision or third dimension by my method introduces, I believe, for the first time the three-dimensional photograph without the necessity of any visible viewing device.

The interesting thing about trivision, distinct characteristic of the method, is that we are able to take an ordinary photographic film, emboss it by momentarily softening it, putting minute microscopically small invisible beads or lenses on one surface of that film. We take any film on the market and run it through a machine which momentarily softens one side and impresses it with this lenticulated surface, as I call it, or minute beaded surface.

That surface takes the place of the stereoscope, and when you look through it, always keeping it between your eyes and the image on the emulsion or printed page or on the motion-picture screen, that surface, even though it is invisible and part of the film, performs the same function as the old stereoscope, and once again your two eyes are allowed to see two distinctly different views, and you get the illusion of depth. I could go on for quite a while talking about it. Let me show the pictures to you and probably they will do more than I can to convey the idea.

May I suggest that you hold them to the light? These are transparencies; look through them with the folder face toward you. This discovery is relatively new. It is the result of a number of years of development work starting as a hobby on my part, and since September last I have devoted my entire time to it. I have a small group of engineers helping me in Mount Vernon, N. Y. These pictures you are now viewing have been made just recently. I believe most of them are less than a month old.

Dr. ANDERSON. Are these the first evidence of trivision known? Are these the first pictures that we have of this character?

Mr. WINNEK. I believe they are. About a year ago we produced a few black and white experiments, but to my knowledge these are the only pictures of this type in existence. The interesting thing about trivision is that we are able, by momentarily softening the film, to impress it with this surface, then take the film and put it into any camera which you may have, the amateur camera or the professional

camera. By closing the lens down to a horizontal opening, rather than to a small peephole, as you usually do, we produce this illusion of depth. The negative with no further apparatus contains this effect.

(The vice chairman assumed the Chair.)

Dr. ANDERSON. Mr. Winnek, in your judgment what is the practical use of such a thing as this?

Mr. WINNEK. The invisible stereoscope, or, if you wish, this lenticulated or beaded screen, even though it be out of sight on all film used for commercial purposes, lends itself to use both in the taking film and in the print. Unfortunately, I am unable to show it to you at the moment, but certainly within a month we will have a photographic print paper. I only wish we could have waited to show you those. A photographic print paper that will probably serve every commercial use that ordinary glossy or semiglossy photographic paper now serves is certainly within immediate reach, and due to the character of the product will probably be used everywhere that ordinary paper is used.

TRIVISION FOR X-RAY PURPOSES

Mr. WINNEK. Similarly, we find in the laboratory as a result of considerable experimentation in X-ray, a great possibility of applying this film to X-ray work. We are making surgical X-ray pictures with them now, although they are quite crude, naturally, due to the newness of the machinery; they are very remarkable, nonetheless.

Dr. ANDERSON. What is the advantage of the trivision over X-ray?

Mr. WINNEK. The distinct advantage of the three-dimensional film or trivision film in X-ray is that it provides for the first time a three-dimensional result without the necessity of the old stereoscope.

Dr. ANDERSON. You were speaking about the value of the X-ray.

Mr. WINNEK. It is embarrassing, possibly—it certainly is to me—for the average inventor to talk about his product and claim it is the most wonderful thing in existence in the industry. I sincerely believe that trivision is probably a revolutionary product, certainly an evolutionary one, one that fulfills the demand for natural appearance of photographed objects. In X-ray this contribution probably will be more valuable than in any other field we will go into. There the physician will be able to make an instantaneous exposure on this film of the heart or the lungs.

I deliberately select a part of the body that naturally respire or in which there is normal movement. This instantaneous shot will produce for the first time on one film a three-dimensional picture of the subject, just as he would have seen had he looked into the subject with X-ray eyes.

By the slightest motion of his head, just as he would normally look at something from left to right, he will actually be able to look around the bones and beyond them. If you look at those pictures again for a moment you will notice that by moving your head to the right or left you look around the object in the foreground and see something that has been behind it.

I would like to call your attention to the picture of the lilies. One rather amazing thing about that picture is that you can hold it up against the light and take a pencil and project the pencil right down through the heart of the lily. As a matter of fact you will feel as

though you touched the lily long before you have touched the film. The picture actually projects space, and you think it is solid, even though it isn't. In X-ray that illusion of solidity, with the addition of the panoramic quality, is tremendously valuable, I am sure.

Dr. ANDERSON. Beyond the scientific use in X-ray, what would be its commercial uses?

Mr. WINNEK. Recently I gave up what has been a rather poor living as a photographic expert in New York and delved into this hobby, converting it from a hobby into a business. The first pictures that showed possibilities for commercial application, suitable for window and counter display purposes, were made last July. A large advertising display company in New York became interested in them and offered to make a market study for me.

As a result of that market study they told me that in their opinion they could keep a plant continuously busy producing pictures for display purposes, both transparent and paper, when we got the paper. Since then I have held back commercial application for the interim period for the purpose of building the production machinery capable of producing not only a transparent film but the paper as well. My thought now is to purchase film, ordinary photographic film, from every film manufacturer and to convert that film, in a plant here in this country, into third-dimension film suitable for use in ordinary cameras.

The VICE CHAIRMAN. Have you testified as to the relative cost?

Mr. WINNEK. I haven't as yet, sir. A rough estimate, and I think quite a fair estimate, would indicate that the increase in manufacturing cost, or the cost of converting that film in our plant, not the manufacturer's plant, would be about 5 percent over the ordinary manufacturing cost of that film. In the manufacturer's plant it would probably be less since the necessity of shipping the product from one place to another is eliminated. Ultimately I believe that trivision will be licensed to the manufacturers.

I think the products is of such a character that the manufacturers in the photographic film industry, possibly photographic equipment industry, and certainly in the graphic art industry, where we will reproduce these pictures by varnishing the page and embossing the varnish right on the press, should be licensed. I presume that is the simplest way to exploit most efficiently certain machinery, apparatus, and film materials that have been developed to produce third dimension under the patents.

The VICE CHAIRMAN. Can you treat a completed photograph or painting and give to it that third dimension?

Mr. WINNEK. When you take an ordinary photograph it is monocular; when you take it it is just a one-eye picture; you can put all the ridges you please on the surface of it, and it will not be converted into a three-dimensional picture. We must photograph three-dimensionally to begin with.

Mr. PIKE. You have to do it with the raw film, before exposed?

Mr. WINNEK. We do; yes.

Mr. PIKE. Would you have to?

Mr. WINNEK. I think it might be possible to take ordinary film in complicated equipment and make a series of views and combine them optically, but it would not be practical.

Mr. PIKE. Wouldn't be any sense in it?

TRIVISION IN AERIAL PHOTOGRAPHY

Mr. WINNEK. One of the most, if I may use the word, dynamic possibilities, and items of interest, at the moment to me is the application of trivision, almost immediately, to aerial photography. With the action over Norway, a great many people are war-minded, as a result of the front pages. My men and I have given considerable thought to photography from the air on this film, using slightly different aerial equipment, of objects on the ground, terrain, topography, camouflaged trenches, gun pits, and buildings of that sort. The normal camouflage would not be of much value here.

We would build up on one film the three-dimensional picture. An interesting feature of the trivision film in aerial photography and in X-ray is that for the first time we are able to calibrate the film itself.

The VICE CHAIRMAN. Able to do what?

Mr. WINNEK. Calibrate the film.

The VICE CHAIRMAN. What happens to it when you do that to it?

Mr. WINNEK. We can put a faint ruling on the film with a scale at each edge of the film. When the picture has been made, simply by holding it to the light and wiggling it back and forth there is a relative displacement of images on that film. The movement of the images is in direct proportion to the third dimension and can be read directly on the scale. The aerial photographer can go up in the air above the gun range and with an infrared filter and telephoto lens can photograph objects in safety on the ground. The picture will have the same magnification and the same depth as the objects on the ground, and all the dimensions can be easily and accurately measured on the film.

Similarly, the X-ray film being calibrated will offer the physician a very accurate way of diagnosing exact distances.

The VICE CHAIRMAN. You mean you can measure accurately the distance between objects by a picture?

Mr. WINNEK. Yes, sir; you do so simply by looking at the film; the slightest motion of your head, once you have focused your eye or eyes on any one point of focus, will reveal a displacement of images on all other planes. That is, the further away an object is from the point of focus the greater the motion of the images on that plane.

The VICE CHAIRMAN. What I mean is, Can you measure in feet or miles?

Mr. WINNEK. Yes. By calibrating the aerial film, we would be able to read directly and instantaneously the exact number of meters, miles, or feet. The unit of calibration you might want to put on there will determine the answer.

The VICE CHAIRMAN. You mean you have something on the film that measures the distance between objects?

Mr. WINNEK. Yes, sir; that is right; it will be especially valuable in X-ray and I am sure very valuable in aerial photography.

Mr. PIKE. Like putting latitude and longitude lines on a map?

Mr. WINNEK. Somewhat similar. I don't know whether or not I am using the proper technical language—cross-hatch lines with the scale at the top and bottom. One feature of trivision is that it will probably apply to motion pictures. I have tried to identify myself for a number of years now, even though it has been a hobby until recently,

as being the one inventor in the photographic industry with a third-dimension idea who didn't expect to revolutionize motion pictures overnight.

I pay tribute to all the other inventors; a great many of them, I think, sincerely believe they have the answer to the third-dimensional motion picture.

The VICE CHAIRMAN. How many patents, have you testified, do you have on this thing?

Mr. WINNEK. I believe I have as many as 5 patent applications in Washington and as many as 200 others on their way in. Commissioner Coe and Mr. Brackett invited me down in what certainly are the early stages of development.

The VICE CHAIRMAN. Two hundred applications for patents on this matter you are talking about?

Mr. WINNEK. We have as a result of considerable work in the past few years developed over 200 patentable developments suitable for application as the finances justify it in this field. I believe that the distinct feature, the interesting thing about trivision is that it is the beginning of a new industry, not a series of gadgets. We have developed new X-ray camera equipment, new X-ray tubes, a new aerial camera, new rangefinders, all utilizing the principles of trivision. Certainly an amateur will be able to buy this film very shortly, I presume between now and the fall, and put it in his camera or one of our cameras, which we will probably sell. These cameras will give additional depth.

You will be able to take the film back to the drug store, and 48 hours later, after we have processed it in our plant, get back third-dimensional pictures.

The VICE CHAIRMAN. How many patents have you on making the picture distinguished from the mechanism through which you display it?

Mr. WINNEK. Of the material we have been developing, I would say that probably 200 of the disclosures, a little less, are necessarily mechanical ideas. I would say that out of the 200 disclosures we have extracted or are extracting no more than 6 basic or fundamental ideas, methods of, and apparatus for—mostly methods of. The stronghold, at the moment, from a patent viewpoint lies in our ability to do something that men have tried to do and haven't done before successfully, namely, putting these little invisible beads on the plastic film or on the plastic resinous coating of the print paper, so that they are optically accurate and permanent in character.

The ridged material is not new as an idea.

The VICE CHAIRMAN. What is not new?

Mr. WINNEK. The idea of putting ridges on a film for the purpose of producing a stereographic result, third dimension, or color. Dr. Herbert Ivez—

The VICE CHAIRMAN (interposing). When you say the idea of putting those ridges on so as to create the third dimension—what other word did you use there?

Mr. WINNEK. I am sorry, I don't know myself.

The VICE CHAIRMAN. The idea of making pictures stand out.

Mr. WINNEK. The idea of putting a ridged screen or a grating between the eyes of an observer and the photographic plate for the purpose of producing color or depth is not entirely new. I think the

distinct contribution here is the reduction of that idea to practice in almost every field of photography.

Dr. ANDERSON. Mr. Winnek, when you speak of creating new industry, are you thinking in terms of an absolutely new industry? Is there nothing in the field? How much of a displacement of other industries will this thing cause?

Mr. WINNEK. I have given considerable thought to displacement of labor and machinery, or possible replacement, if you wish, by the process, or due to the process. I think that shortly the public will demand third-dimensional pictures because they will see some and expect them. I think that trivision, or the process displayed here, will undoubtedly permit the conversion of existing equipment very quickly to eliminate flat photography and produce third-dimensional photography. I think the market will demand it almost as fast as we can produce. I don't foresee a displacement of labor.

I do feel that the activity of the industry will increase considerably, certainly during the novelty period, which can exist for quite some time, and in the graphic art industry where textbook illustrations will no doubt sooner or later be printed in third-dimension. I think there will be new jobs, but to what extent I can't say.

Dr. ANDERSON. Once having gotten over the main hump of inventing a thing of this kind, what confronts you as an inventor, businessman, in carrying on to a practical industry?

PROBLEMS OF FINANCING DEVELOPMENT

Mr. WINNEK. I would like to reduce it to inventor in the first place. For the last few years as a result of having been very active as a more or less engineer—I have no college degree and consequently I presume I don't qualify as an engineer—I have specialized in photography and for a number of years have been very active in jobbing out my time and that of my men in developing photographic equipment and methods. In September I seriously decided to give up that business and go into this as a business, and since then I have definitely sought the proper financing, because money is necessary to carry on and convert from this laboratory exhibition stage into a producing stage.

Fortunately I met a display company official who immediately grasped the opportunities. I have no connections other than moral with them or with anybody else, as yet. I have from time to time met and discussed with businessmen the thought of their putting money into the thing. Long before I decided to go into this thing as a business I did explore the possibility of getting finance back of it. I found that the first thing the businessman thinks of, I presume quite justifiably, when you go to him with an idea, is just what merit has it, just what patent protection can we get or have you got? As a businessman he is naturally subconsciously, or consciously, thinking of a trading position, and to justify any finance put into it. Unfortunately it has been my experience that the more revolutionary an idea is the more difficult it is to get the original finance. The more revolutionary an idea the more patent expense, more patent development cost, you are confronted with; the more gamble there would be on the part of investors and the more difficult it is to interest that investor.

I have met with continuous failure for a number of years now. I, for a while, was considerably ashamed of it; I thought I didn't know how to promote it, or the product wasn't any good. Recently I gave up seeking money or discussing finance and for almost a month and a half now the young men and myself in the laboratory have resorted to making gadgets and selling them. We have a photographic exposure pencil, for example, and little nonsensical gadgets that certainly are not utilitarian in quality, just novelties. We find that those seem to sell very quickly and from the revenue derived we hope to keep ourselves living comfortably and get this product on the market.

Dr. ANDERSON. Let us look at this matter of capitalizing a new and revolutionary enterprise such as this that you say would likely result in a whole new industry. We have heard a great deal of risked capital and the venturesomeness of promoting businessmen. You have had some experience in that connection, haven't you?

Mr. WINNEK. Yes; a little.

Dr. ANDERSON. What does it sum up to? You say you haven't been able to raise the capital in that way. Have you had people who were willing to go in with you on some terms?

Mr. WINNEK. Naturally the first thing that enters into the mind of anyone in the photographic industry, looking at this picture or these pictures, is, "Well, I should imagine the boys in Rochester or Binghamton or New Jersey, the film manufacturers, would just love to get hold of that" and I sincerely believe as a result of many friendly and helpful contacts with them that they are all interested in the development, more or less. I think that the attitude of the businessman in that industry is, "Well, when you get something, when you have successfully demonstrated there is a market, there will be time enough." It is pretty revolutionary; there is an awful gamble attached to it.

Mr. PIKE. You will get a much bigger price for it then?

Mr. WINNEK. Possibly. One thought has impressed me tremendously from time to time, about the advisability of different means of marketing, to do justice to the process, looking at it from both a selfish and a business viewpoint—I mean my selfish viewpoint, not that business is necessarily selfish—I think the greatest revenue could be derived by licensing all of the film manufacturers, rather than to go under the wing of one exclusively, or attempting to do business with one alone. The contacts with the three manufacturers I have mentioned indicate that any one of them would be more than glad to help, provided there was some exclusiveness attached to it.

I think that by purchasing the film and the product of these manufacturers and converting it ourselves and reselling it we would more or less keep their good will and hope, in due time, to build up a position that would merit and justify licensing relations with all. I think there is money available for developments of this character. There are two ways of getting it: one is to give a stock promoter a set of pictures to put in his pocket—and I am sure that the enthusiasm displayed to me by a few of my friends who are in that business indicates that they would like and are ready to go out and raise money through the novelty value of the product.

I think the other way would be to offer a manufacturer the exclusive sales of the product. My natural desire is to refrain from

granting any exclusive rights. I think that a great deal more can be accomplished and developed without that exclusiveness.

Mr. PIKE. That is why you are going to take all of the film first and then process it? Establish the attractiveness of it in the market and then you think they will all come running?

Mr. WINNEK. Well, not exactly, but very close to it, I believe, once we have demonstrated there is a market and are selling their film. If the film is all I really believe it is, the public will demand it, and the manufacturers will have to have it.

Mr. PIKE. One more question. I would like to ask—I think you have covered it, but I am not clear. So far you are using the coat-chrome, or something similar, just for transparencies?

Mr. WINNEK. We are using an ordinary color film, simply running it through the machines and taking our pictures.

Mr. PIKE. Now, when you come to putting it on a print, must the picture have been taken on that sort of film? I mean, when you really get so you can make the print with your process on the gelatine, or whatever it is.

Mr. WINNEK. The prepared photographic paper might be used in the camera, but undoubtedly a negative made on prepared film would be necessary first.

Mr. PIKE. When you finally get so you can make a print of it, must the print be done from this prepared film in both cases?

Mr. WINNEK. Yes; or from a prepared film. Referring once more very briefly to the technical end of it, the ridged surface on the negative resolves the picture into a depth picture when you look at it. The ridged surface on the projection screen, on the X-ray film, on the print paper, or on the magazine page (in that case the resinous coating is embossed with a warm roller almost simultaneously with the print) serves as the viewing device.

Mr. PIKE. About what is the size of the little cross hatches?

Mr. WINNEK. On the present film I believe about 200 to an inch; on the commercial film that we propose to release almost immediately, one way or another, we will have certainly no less than 300. The object is to get the ridges so small that you don't see them.

Mr. PIKE. Same as a half-tone or something of that sort?

Dr. ANDERSON. Mr. Chairman, we have promised Mr. Thomas, the next witness, we would get him out of here this afternoon and if there are no other questions of Mr. Winnek (we wanted to give you a glimpse of a new technological development in the making), and we will proceed with our next witness.

Mr. WINNEK. Thank you.

The VICE CHAIRMAN. Thank you very much, sir.

Dr. ANDERSON. Mr. Chairman and members of the committee, Mr. R. J. Thomas, the—

The VICE CHAIRMAN. We haven't been swearing the witness. We used to do it but found it didn't do any good.

Dr. ANDERSON. Mr. R. J. Thomas, president of the United Automobile Workers. Is such he is in daily contact with the industry which we have been discussing for the last 2 days. He is to present a statement to the committee and is available for questioning at this time.

STATEMENT OF R. J. THOMAS, PRESIDENT, UNITED AUTOMOBILE WORKERS, DETROIT, MICH.

Mr. THOMAS. Gentlemen, I would like to say that I think I am pretty much qualified to discuss this problem for the automobile industry, due to the fact that I have only been out of the automobile shops for the past 3 years. I spent over 15 years working in the automobile shops and actually have personal knowledge and know what happens in the automobile plants.

More than any other industry the auto industry has been credited with stimulating and promoting the prosperity of the 1920's. Basing its expansion upon the accumulation of wealth in the country through American primacy in post-war years in the world's economic and industrial life, the auto industry set the pace of national prosperity.

The value of its product increased from \$30,000,000 in 1904 to \$3,000,000,000 in 1919, and over \$5,000,000,000 in 1929. Employing directly 12,000 workers in 1904, the auto industry gave jobs to 343,000 in 1909 and 447,000 in 1929 (Census of Manufactures). By 1929 the auto industry, according to claims of the Automobile Chamber of Commerce, provided either directly or indirectly for the employment of over 4,000,000 Americans.

This tremendous expansion in production and employment was linked up with an even more striking accumulation of profits. From 1919 to 1929 profits of major automotive companies had averaged year by year 21 percent of their net worth. And net worth had risen steadily from \$606,000,000 in 1919 to over \$1,500,000,000 in 1929.

At least 100,000 men and women found employment directly in the auto industry during these years who would otherwise have found no gainful occupation. For the most part these new workers required to turn out a constantly expanding automobile production came from the agricultural regions of the South and the Midwest. Distress in the farm belt, together with the displacement of farm labor by improved technology, was providing the auto makers with a generous reserve supply of labor. Between 1920 and 1930 over 200,000 native whites of native parentage migrated to the State of Michigan, drawn by the magnet of jobs in the auto shops (C. W. Thornwhaite, *Internal Migration in the United States*, p. 20). These people had seen the advertisements of employment in the papers of Georgia, Alabama, Tennessee, or Mississippi. They found economic salvation (for the time being at least) by migrating to such cities as Detroit, Flint, and Toledo. Their new purchasing power helped prop up our economy against the underlying threat of economic crisis. Expanding auto production in those years gave the Joads of that time a chance for employment and a decent life.

While expansion of the auto industry was providing jobs for hundreds of thousands of Americans, another and contrary process was going on within the industry itself—the increasing displacement of labor by technological progress.

During the 20's this process was almost always relative, not absolute, in its effects. While the total demand for labor to produce at a given level was being constantly reduced, an equally constant rise in the level of production increased the over-all demand for labor.

The clearest picture of these tendencies is given in a recent study by the National Research Project of W. P. A. On the basis of the National Research Project figures it can be estimated that man-hour productivity in the auto industry rose from 100 in 1919 to 234 in 1929. In other words, a group of auto workers able to produce 100 cars in 1919, were able to produce with the same labor time in 1929 a total of 234 cars.

But in spite of this increased man-hour productivity the National Research Project figures show total employment increasing by 30 percent from 1919 to 1929. Now this increase in employment was brought about despite increasing man-hour productivity, as is made plain by the rise in production between 1919 and 1929—from 100 to 312.

So long as the buying power of the public was sufficient to allow this explosive growth of production, total displacement from the industry was no immediate menace to the auto worker. This mass production was the keynote to the prosperity and efficiency of the auto industry.

Compare the development of the auto industry with that of the 59 industries studied by the National Research Project. From 1919 to 1929 auto production rose 212 percent; in the 59 industries it rose 44.9 percent. Employment in the auto industry rose by 30 percent; in the 59 industries by 1.6 percent. In productivity the auto industry rose 134 percent while the 59 industries could squeeze out an increase of only 43.2 percent.

Since the automobile industry is included among the totals for the 59 listed above, the 1.6 percent increase in total employment between 1919 and 1929 may be attributed to this one industry. Only a phenomenal increase in auto production kept the country from an overall decrease in its employment in this period.

CHANGES IN PRODUCTIVITY SINCE 1928

Mr. THOMAS. As was noted before, the tendency of improved machinery to displace labor in the auto industry during the 1920's was balanced out by a consistent expansion of production. But when the purchasing power, which had allowed this expansion, slumped disastrously in 1929 and the the years following, the story was a very different one. Accumulated relative displacement of labor became, in those years, absolute. Had something close to the 1919 level of productivity been maintained, even the low level of production from 1930 to 1934 would have insured an employment of nearly twice the actual employment. But with advanced technology, employment sank lower and lower until in 1932 and 1933 only 54 percent of 1929's labor force was employed.

Nor did the coming of the depression check the trend toward ever-increasing man-hour productivity. By 1935 man-hour productivity stood at 112 percent of 1929; by 1936, at 116 percent; and, according to recent figures worked out by the National Research Project, at 117 percent in 1938. This is the over-all picture proved by the most reliable and accurate studies that have been made in the industry.

That the displacement of necessary labor for a given level of production in the auto industry has taken place, is beyond question. However, the Automobile Manufacturers Association, in a recent

study by Andrew T. Court (*Men, Methods, and Machines*, 1939), expressed a different point of view. Says Mr. Court:

During 1937 employment in automobile factories averaged 15 percent higher than in 1929 although production lagged 10 percent below 1929 levels.

Mr. Court concludes:

There has been no aggregate technological displacement of labor in automobile factories despite the introduction of countless new and more productive machines and processes.

In making this cheery estimate Mr. Court has neglected to take into consideration two or three factors of primary importance:

First, Mr. Court's figure for employment in 1929 is taken from the Census of Manufactures. His figure for 1937 is estimated from the indexes of the Bureau of Labor Statistics. Unfortunately for Mr. Court's thesis, the Bureau of Labor Statistics figures are not necessarily comparable with Census of Manufactures statistics. Economists generally estimate that the Bureau of Labor Statistics partial survey of the industry indicates employment figures for the entire industry about 15 percent higher than they are in actuality. The Bureau of Labor Statistics figures are, therefore, constantly revised downward to coincide with more complete statistics from the Census of Manufactures. For 1937 the Census of Manufactures lists 479,341 wage earners in the motor vehicle, motor vehicle bodies, and parts industries. Mr. Court estimates for the same year, from the Bureau of Labor Statistics, an employment of 517,000. Exactly why this economist should choose the unrevised Bureau of Labor Statistics figure is a question toward which I can offer no solution. At any rate, comparing employment between 1929 and 1937, using in both cases the Census of Manufactures as the source, it appears that employment rose from 447,448 in 1929 to 479,341 in 1937. In other words, instead of Mr. Court's 15 percent rise in total employment, we have a rise of only 7.1 percent.

Mr. HINRICHS. Mr. Thomas, I don't want to stop you at this point, but I would like, for the sake of the record, to comment on that, later. Please continue your testimony now.

Mr. THOMAS. Secondly, Mr. Court neglects to take into consideration the shortening of hours per week which has taken place throughout the automobile industry as a result of collective bargaining. Average hours per week in 1929, according to the National Industrial Conference Board, were 46.8. In 1937, according to Bureau of Labor Statistics, average hours in the industry per week were 35.8 hours.

This single factor, which Mr. Court does not consider worthy of reference, is more than enough to explain a 7 percent rise in the total number of men employed in the industry.

What is essential, however, in determining total labor displacement, is not the total number of men whose names may be on the pay rolls of auto companies, but the actual number of man-hours worked at a given level of production. On this basis, according to the National Research Project figures in 1937, 92 percent of 1929 production was obtained, with 82.1 percent of 1929's man-hours. This figure is clear evidence of the actual labor displacement which has occurred.

To get a fuller realization of what these statistics mean it is necessary to estimate the total employment at 1929 hours per week, which would have been available in 1937. Assuming, then, that the average

auto worker had worked 46.8 hours a week in 1937, only 366,000 men could have been employed in the industry to obtain 92 percent of 1929's production. With shorter hours per week, 479,341 were actually employed. This means that in 1937, 112,000 jobs, at least, were saved by the union's battle against long hours.

It may be noted also that wages for this increased group of workers were larger in 1937 than in 1929. Total wages paid in 1937 were \$756,000,000; in 1929, \$733,000,000. These facts suggest very strongly that unionism in the auto industry has not only protected the auto worker against the menace of technological unemployment; in addition, the stability and general welfare of our economy as a whole have been supported. One hundred thousand auto workers can provide the life blood for a city of upwards of 1,000,000 inhabitants. That this city was not wiped out by the force of technological change can be explained only by the growth of collective bargaining as supported by the National Labor Relations Board and other progressive Government agencies.

WAGES AND TECHNOLOGY

Mr. THOMAS. It has been claimed by various representatives of automobile manufacturers that the relatively high wages paid in the industry have been made possible by "technological progress." Said Mr. Sloan, of General Motors:

In the automobile industry improved methods resulting in constantly increasing efficiency have made possible wage rates well above the level of industry in general.

Our friend, Mr. Court, has similar opinions. He says:

The gains from technological advances show in many ways. Weekly earnings of factory workers in the industry have averaged 24.3 percent above the comparable average for all manufacturing industries for the past 10 years.

It will be granted without question that wage rates in the automobile industry are somewhat higher than those paid throughout industry in general. To explain this differential on the basis of the industry's improved technology is a highly questionable procedure. Far more relevant to the issue are two facts:

First, competition for workers in the industry. From the earliest days of automobile manufacturing up to the mid-twenties, expanding production required an expanding labor force. This labor force could be supplied only if automobile employment were made sufficiently attractive to recruit new workers. Workers in the automobile industry in the old days, moreover, were of comparatively high skill. Carpenters, cabinet makers, sheet-metal workers, blacksmiths, and others would move into the industry only if the bait of high wages were offered. As a result of this, during the twenties the automobile industry was among the higher-paying industries of the country. So anxious were automobile manufacturers to overcome this relative shortage of labor that their advertisements continued to appear in Southern newspapers and their employment agents continued to be active even after a more than adequate labor force in Michigan and other automobile centers had been built up. After 1929, needless to say, competition among auto manufacturers for workers languished considerably. With hundreds of anxious applicants for every job, high wages were no longer necessary. Thus the

depression, with its millions of unemployed workers, drove wages down precipitously after 1929. The average hourly wage rates were 75 cents in 1928, 62.8 cents in 1932, and 59.9 cents in 1933.

It should be noted, of course, that in the years 1928 to 1933 as wage rates were being pushed down technological progress was moving forward rapidly. Although man-hour productivity in 1931 and 1932 apparently fell, this is explained by the decreased efficiency of a low production level. Correlation between technological progress and higher wage rates is to be found in the minds of apologists for the industry and not in its statistical records.

Secondly, union influence on wages. It would seem exceedingly difficult to prove that the rise in wages from 59.9 in 1933 to 92.2 in 1938 and 92.8 in 1939 can be accounted for by technological progress. Much more relevant to the issue would seem to be the union's policy of demanding higher wage rates. Auto workers are now organized to bargain collectively for better wages. Employers are no longer able to beat down wages by playing one employee against another.

Further evidence toward this conclusion is seen in the fact that a considerable differential in hourly wage rates exists between organized and unorganized automobile plants. For instance, the Chrysler Corporation is paying at the present time an average hourly rate of 97 cents. The Ford Motor Co., protected from organization by various agencies, pays an average hourly rate of about 87 cents. Automobile workers doubt very much that Mr. Ford would pay even this rate were it not for his desire to forestall organization.

The experience of 1937 and 1938 is final proof for our thesis that high wages are to be credited to union organization rather than technological advance. The latter part of 1937 and all of 1938 were depression years. Auto production and employment slumped to 1932 and 1933 levels (1938 production, 51.8; employment, 63.3; man-hours, 44.2).

But wage rates did not slump accordingly, as in earlier depression years. Instead they rose from 88.5 cents in 1937 to 92.2 in 1938 and 92.8 in 1939. Again it was demonstrated that only when union organization is strong may workers secure any share of the benefits of technological progress.

General Motors has and continues to earn more money for its owners than any manufacturing corporation in the history of the world. Although its total assets as of December 31, 1937, totaling \$1,566,000,000 were slightly exceeded by a few other corporations, yet its average yearly earnings in the 29 years of its corporate existence have exceeded those of all other corporations.

So reports the Federal Trade Commission in a recent study of the automobile industry.

Even for the 11-year period, 1927-37, the Federal Trade Commission finds G. M. profits averaged 35.5 percent of total investment in manufacturing. This average was made in spite of depression conditions.

For the same years the Chrysler Corporation made an annual average return on total investment in the auto industry of 27.27 percent.

These truly remarkable figures on profits suggest very strongly who the principal beneficiaries of increased productivity in the industry have been.

To make any reliable estimate of the benefits of technological advance to the car owner during recent years is impossible. It is clear that the modern automobile is the product of a whole series of improvements. Competitive conditions existing in the industry have forced manufacturers to improve the quality and the appearance of automobiles with a fair degree of consistency.

Whether the progressive elimination of competition in the industry would have the effect of checking improvement in the product is a question on which we have been unable to obtain any reliable information.

The experience of the Ford Motor Co. since the change over in 1927-28 has not encouraged other manufacturers to make any basic changes in over-all methods of production. In this connection a recent statement by one W. J. Cameron, of the Ford Motor Co., is interesting. Mr. Cameron said in his Sunday Evening Hour of March 3, 1940, in reference to the Federal Trade Commission report:

The report shows that the cost of making a Ford car is higher and profit in selling it is lower than for others in the low-price field. Why this higher cost of making and this lower profit in selling? Is it due to wasteful expensive Ford manufacturing methods? On the contrary, everyone adopts them. Or does it indicate that more quality is built into Ford cars? Some members of our organization complain that too much quality is built into Ford cars. It takes too many years to wear them out.

I want it understood that I am quoting Mr. Cameron, not myself.

The VICE CHAIRMAN. What do we get out of this advertising anyhow?

Mr. THOMAS. Those familiar with the auto industry will recognize, of course, that the low-profit margin on Ford cars is not to be explained on the basis of super value created in the car. Rather it is to be explained on the basis of high overhead costs per car which follow inevitably upon a level of production lower by far than capacity.

(Senator O'Mahoney resumed the chair.)

Mr. THOMAS. The Federal Trade Commission report (p. 672) indicates that in the years since 1927 Ford's average annual rate of return on the total investment during the entire 11-year period was 0.04 percent. This means simply that because of low sales high overhead costs per car wiped out the anticipated profit margin.

In 1929 the Ford Motor Co. ran somewhere close to capacity production, turning out over 1,600,000 vehicles. In 1932 and 1933 the Ford Motor Co. turned out a little over 300,000 vehicles. Even in 1937 the Ford Motor Co. turned out only 900,000 vehicles. Place over against this the total productive capacity of the company—in the neighborhood of 1,800,000 vehicles—and the high overhead cost per unit is evident.

These figures on Ford production in relation to productive capacity will serve to explain the \$91,000,000 profit made by Ford in 1929 as well as the \$74,000,000 loss marked up by the Ford Motor Co. in 1932. Mr. Cameron's effort to explain these losses as evidence of his company's generosity is not very happy. This incident serves to illustrate as well the fact that heavy investments in new machinery sometimes serve to defeat their own purpose; that is, the reduction of costs. Without seeking to analyze this subject in detail, it is apparent that heavy investments in new machinery are profitable when a steady mass market is assured.

When operations proceed at near capacity, then the tremendous saving in labor costs is sufficient to wipe out investment in machinery and return lush profits. But when operations are at a low level, capital expenses refuse to be laid off, speeded up, or technologically displaced. They continue exacting their heavy toll in unit costs per car. To counteract this tendency the employer naturally seeks to reduce labor costs still lower, though in this case primarily through the intensification of labor itself. This is one of the keys to the tremendous development of raw speed-up in the industry after 1929.

Other manufacturers have preferred to keep their plants up-to-date by a series of small yearly changes. This appears to be Ford's method now.

Mr. Court claims that these yearly change-overs in automobile models have restricted the rate of technological displacement in the industry. He says, "Thus the prospect of model change delays or eliminates entirely the use of many labor-saving machines." Mr. Court apparently had not read the report of the General Motors Corporation for 1938. Stating its policy on model change-overs, G. M. announced that its purpose is—

To inject into each new series of products * * * features which promote comfort and convenience and add to greater appeal from the standpoint of appearance * * * (so that) the time during which the original purchaser operates any one car is reduced and there is a flow of relatively up-to-date cars into the used-car market. * * * The rapid evolution of design necessitates a more rapid turn-over of productive equipment * * * with resulting benefit to costs, because advancing technology is always producing more efficient instruments of production.

In other words, the corporation believes the change-over in models with its necessary season of slack production is desirable in that it gives the company an opportunity to introduce labor-saving improvements in machinery and technique.

Most auto workers believe that these labor-saving improvements in machinery bulk much larger than do actual improvements in cars produced.

The VICE CHAIRMAN. Would you like to stop for a moment there? What is the statement you just concluded?

Mr. THOMAS. "Most auto workers believe that these labor-saving improvements in machinery bulk much larger than do actual improvements in cars produced."

The VICE CHAIRMAN. What do you mean by that? I don't quite get that.

Mr. THOMAS. In recent years there hasn't been very much change, mechanically, in an automobile. I have met many manufacturers who tell me quite frankly that the reason they change models annually is not because they are producing a better car but so they will have a better sales field, something different. It is like keeping up with the Joneses. They change the model so the man doesn't want to drive last year's model.

The VICE CHAIRMAN. What I didn't get is quite the connection between the proportion of new devices to the new feature of cars.

Mr. THOMAS. What I am trying to say is that the technological improvement in the industry, the change in machinery, is very much greater than the change in the automobile would warrant.

The VICE CHAIRMAN. You mean, then, that these technological changes are for the purpose of increasing the productivity of the individual?

Mr. THOMAS. That's right.

The VICE CHAIRMAN. That is what you mean?

The CHAIRMAN. But Mr. Ford made the statement this morning that there are about 16,000 parts in the 1939 model as compared with about 5,000 parts in the 1926 model.

Mr. THOMAS. I don't doubt that statement at all. That is probably true. There are many more parts in the average automobile today than there were a number of years ago, but following that theory, does that mean that in 10 years from now there are going to be 32,000 parts in the automobile? That change from 5,000 to 16,000 parts was done through a few years there, when the technological improvement in the automobile itself was greater. For the past several years there hasn't been that improvement.

The CHAIRMAN. His testimony was that in 1926 they had 5,000 parts; in 1929, 6,000 parts; in 1939, 16,000 parts, so that in the past 10 years there has been quite a change in the inherent quality of the car and not alone in its style or fashion.

Mr. THOMAS. That is correct. But as I say, in the last 2 or 3 years that hasn't been the case at all.

The CHAIRMAN. You are telling us that the change in the machinery in the last 5 or 10 years has not been very great?

The VICE CHAIRMAN. Just the opposite, is what he says. He says the change in machinery has been great, but the change in machinery has been out of proportion to the change in the automobiles.

Mr. THOMAS. That is right.

The CHAIRMAN. I see.

The VICE CHAIRMAN. And the point seems to be that this change in machinery is to increase the production of the individual working man.

Dr. ANDERSON. Beyond that, isn't it to increase the salability of the product?

Mr. THOMAS. That's right.

The VICE CHAIRMAN. How about that? That seems to me to get at cross purposes on that.

Mr. THOMAS. No; you might increase the sale of an automobile without improving anything mechanical about it at all. If you have noticed, they put a bulge in here, leave a running board off there, and just by changing the looks of the car they make the car salable.

The VICE CHAIRMAN. What I am trying to get at is the substance of the point you make, that the new devices are increased out of proportion to the improvement of the car. Do you mean by "improvement" the improvement in the wearability of the car or the looks of the car, or is it the new devices to increase the number of cars which a given group of employees can produce?

Mr. THOMAS. The improvement has come about—well, I have had a manufacturer, or several manufacturers, say to me, for instance, on some certain skilled trade—of course, I disagree with what Mr. Ford said on that this morning, because I have had manufacturers say this to me—that they are developing new technological processes. When I go in and ask for a wage raise for a certain skilled trade, they

say, "Well, if you get that wage rate too high we will put a machine in to do the job which can do it cheaper."

The VICE CHAIRMAN. There is something to that, too, isn't there?

Mr. THOMAS. Certainly; that is what has happened. The automobile manufacturer has only put in technological improvement to reduce wages.

The CHAIRMAN. To reduce cost.

Mr. THOMAS. That is right. Well, that is wages.

The CHAIRMAN. It is a very important element in the cost, probably the most important.

Mr. THOMAS. That is right.

The VICE CHAIRMAN. Now, have you ever figured out, with regard to any more improvement for increasing productivity, how much you would have had to reduce wages to keep human beings doing what these important machines have done?

Mr. THOMAS. I can't answer that question.

The VICE CHAIRMAN. Has anybody ever gone into that at all?

Mr. THOMAS. I haven't. I heard Mr. Ford ask that question this morning. He told about what the car of years ago would cost if it were sold today.

The CHAIRMAN. There was testimony, of course, this morning, that wages would have to be reduced to a perfectly ridiculous level, if you could hire enough persons to produce the same number of cars at the same cost.

Mr. THOMAS. I agree with that.

The CHAIRMAN. That is perfectly obvious. There is no dispute about that.

Mr. THOMAS. That is right.

EFFECT OF THE "SPEED-UP"

Mr. HENRICHS. While you have been interrupted, Mr. Thomas, you used the phrase "gross speed-up." What do you mean by that?

Mr. THOMAS. Well, for instance, today, or the other day, a man walked into my office. This man happened to work for the Ford Motor Co. He was a very good friend of mine. He is a younger man than I am—considerably. He was a metal finisher in the plant and, by the way, is not a union member. He walked in and sat down and talked to me about a half hour, and then he stood up. This man is in a perfectly healthy condition, but when he stood, because of the way he had to work in the plant, he fell down on his knees, because he had been used to being in that position so much that he couldn't stand up after sitting down like that for a short while.

The CHAIRMAN. Do you mean that that is characteristic? You give us a single instance. Do you want us to understand that that is characteristic of all workers?

Mr. THOMAS. No; I wouldn't want to do that. I want it understood that there are a lot of workers in that same condition.

The CHAIRMAN. You are contending that the speed of work which is required is too great for many men to stand.

Mr. THOMAS. That is right. I myself, working in the automobile industry—of course in the organized plants we try to overcome that to a great extent—over a period of years, when I was a much younger man than I am now, have worked, well, there was no limit to the

hours, and when we worked, I suppose most of the time the average was a 9-hour day. I would say that was about the average, and when I went home from work I sat down and tried to read a newspaper but I was so tired I couldn't do it. I would immediately go to sleep, or my hands would be so sore, maybe, from working on a job that I couldn't open them after I got up out of bed in the morning. I would say that 5 years ago in the automobile industry that was generally true.

The CHAIRMAN. But it is not true now?

Mr. THOMAS. Not generally in the industry. It is quite generally true in the unorganized part of the industry.

The CHAIRMAN. You attribute that change to organization?

Mr. THOMAS. Yes; I do.

I have a number of cases here of statements that men have made to me who work at the Ford Motor Co. I wonder if I could read them. It will take only a few minutes.

The CHAIRMAN. Surely.

Mr. THOMAS. First, these are each different men whom I have spoken to at the Ford Motor Co. The names of these workers I don't want to give out; it should be quite obvious to everybody why I don't want their names in the record. I am quoting what the men say:

The foreman says "Step on it." So much has to be out a day. Production is raised every day. If behind, I have to work faster.

A second man says:

When we start working on these frames our foreman and his two bosses threaten us worse than slaves. Not even a chance to blow my nose.

A third:

The threat of being fired or laid off; boss and foreman standing behind the men's backs.

A fourth man:

He (speaking of the foreman) would tell the men "Either get them out or go home." Why can't they handle the working men like human beings?

A fifth:

Whip-cracking, browbeating, bulldozing, a tyrannical and autocratic attitude is assumed and maintained at all times by all officials from foremen up. No improvement is too extensive or complicated as long as it tends to speed up production, but practically no improvement is ever considered concerning the comfort or wellbeing of the workmen. We have no relief to get to the toilet; no attention is paid to ventilation and temperatures. Toilets, coat rooms, and exits are over-crowded. We sit on the floor to eat lunch. The floor is oily and full of ruts which are full of water and oil. Hell!

That from a worker employed 16 years by the Ford Motor Co.

Representative SUMNERS. Do you think that is, from your observation and experience, a correct picture of the conditions in the plant?

Mr. THOMAS. I have talked to hundreds of men from the Ford Motor Co., and I can go right down the line, and that is the picture I get from them. I have been at the gates of the Ford plant. It so happens that I was there once and Ford put me in jail, but I have been out at the gates of the plant and any reasonable person who would go and watch the Ford men coming out of work and then go to the gates of any other automobile plant, I don't care what com-

pany it is, could see the difference in the spirit of the men coming out from work.

Dr. ANDERSON. Let us look at the assembly line of two of these different firms. What marks the difference in the speed-up of the Ford assembly line over any of the other motor groups?

Mr. THOMAS. Well, as I said, 5 years ago there probably was very little difference. Of course, originally Ford was the originator of the conveyor lines. That was one of the biggest technological improvements in the automobile industry, and Ford was the originator of that. Up to about 5 years ago men would start to work on those lines and as they got broken into the job the foreman at the end of the line would turn a crank to make the line go faster; and he would just keep turning that crank, making the line go faster and faster each day. Finally, the men with the least resistance or the men who were a little grayhaired, or maybe physically weaker than the others, found it impossible to stay on the line, so they were replaced by, well, better athletes, I would say.

Mr. HINRICHS. But daily increase in speed at the beginning of a season is a necessary part of the process of getting a new model under way, isn't it? That is not the thing you are complaining of.

Mr. THOMAS. We are talking about two different things. I agree that what you are talking about has to be done. The thing I was talking about continued throughout the year.

Mr. HINRICHS. And the union now concerns itself with this question of the amount of effort required?

Mr. THOMAS. The union concedes that a man, or especially a group of men working on an assembly line, when they first start on a job, are not at their top efficiency to do an honest day's work until after about 30 days, I would say; but after that, after they reach a certain speed, then we claim, in our organization—well, in some companies we negotiate joint standards with the companies, but, after that, if a man protests the speed at which he has to work, we have the right in all our contracts to take that up with the management as a grievance, and they are pretty generally settled by negotiations throughout the industry.

Mr. HINRICHS. Which of the companies are negotiating joint standards?

Mr. THOMAS. The companies that are negotiating joint standards are, most of them, small companies. I believe the Briggs Manufacturing Co., a body company, is one of the biggest companies that is doing that.

Mr. HINRICHS. From the union point of view, are you finding conditions in those plants more satisfactory?

Mr. THOMAS. Oh, yes; considerably so. I might say that I was in with one manufacturer the other day—I hate to state the names of manufacturers because it might give some of them a bad reputation, and we are getting along well with them now—and he said:

I am glad we got the union in here. We used to be known all over the city as a butcher shop, and today we have good labor relations, and we want to keep that.

Dr. KREPS. Coming back to the subject of technology, maybe I am anticipating something you are going to deal with, but I have been wondering whether technological change in the industry can be meas-

ured in terms of displaced workers. You seemed, as I looked at it, not to separate the amount of work that is done, such as the figures that you just gave on man-hours, from the amount of employment that you think does not exist because of technological displacement as such. Now, as I say, maybe you have some measurements further down the line in which you allow for seasonal and cyclical changes, and for other types of unemployment besides technological unemployment. Is that correct?

Mr. THOMAS. Yes.

Dr. KREPS. Maybe you would like to go on with your statement, then.

Mr. THOMAS. I think this has to do with the question you ask right here: Speed-up in the automobile industry.

1. INTENSIFIED LABOR (SPEED-UP)

Speed-up in the automobile industry is a controversial subject. Certain authorities explain that there is no such thing. The unanimous testimony of 400,000 auto workers stands definitely and unanimously against that conclusion. They have experienced the terrific speed-up of the modern auto shops.

The N. R. A.'s study of the automobile industry issued early in 1935 points out:

The automobile industry throughout its history has always been efficient and became more efficient through the decade of the 1920's. At the end of this decade it had reached a peak of practical efficiency; that is, efficiency that takes into account human capabilities from an effective and industrial engineering standpoint. The industry led the country in effective time study of its operations and the time-study men gradually brought its operations to this efficient peak.

I might say, in speaking of this time study, I have been time studied on a job. By the way, because the workers in the automobile plant had been speeded up so much, there was a tendency on their part, when a man came around to time study them, to try to cheat on that time study if they possibly could, and I might say I was the same as every automobile worker. One day I was being timed on a spot-welding job, and I tried to get as good a time as I could on the job, and I was given my time on that particular job the next morning. I went to work on the job and I tried my best to get out the number of pieces I had been timed for the day before, and it was impossible to do.

A lot of workers at the plants say that to me today, and a lot of times I have thought, well, maybe they just don't want to do so much. Yet I know what my own experience was, that it was just impossible for me to make the time study which they had made upon me.

The CHAIRMAN. You were glad enough to make that record while you were being timed.

Mr. THOMAS. But I didn't make that record.

The CHAIRMAN. When you were being timed you made a record, as I understood you.

Mr. THOMAS. No the fact of the matter is, I tried to slow down.

The CHAIRMAN. While you were being timed?

Mr. THOMAS. While I was being timed, and the next day I couldn't keep up with that time.

The CHAIRMAN. But slow down time—

Mr. THOMAS (interposing). The point I am trying to make, this time study that they talk about doesn't mean a thing because they set men with stop watches to take the employee's time, and it used to be the system in the automobile industry that the man in charge of the time-study department got a cut on added efficiency every time he could cut time and get the men to do so much more work. The result was, instead of taking honest time, they would look and see what your record was last year, and maybe boost a little more for the last model.

Mr. PIKE. You both were playing tricks, and he won.

The VICE CHAIRMAN. You mean the next day you couldn't go as slow as you went the first day?

Mr. THOMAS. The next day I couldn't go as fast as what the company claimed I had gone the day before, but I actually knew I hadn't gone that fast.

In other words, before the depression even began automobile production was carried on with every scientific method for squeezing a maximum quantity of work per hour from the individual worker. Jobs were broken down and timed to the fraction of a second. Men were offered bonuses to exceed the production on the rates established by time study men. When these levels had been surpassed the new attainments were accepted as normal, and intense pressure was applied for higher and higher records of output. With the coming of the depression the universal testimony of the auto workers is that speed-up increased beyond the powers of human endurance.

Quoting again from the N. R. A. report of 1935:

The only reason that it (speed-up) can exist as at present is because of the huge available supply of labor through which as one man falls by the way-side, another is there to take his place.

"If you don't like this job there are thousands outside the gate who do." That was management's stock reply to every grievance and admonition to everyone who fell behind the frantic pace of the assembly line.

Hounded by foremen, supervisors, and time study men, workers "turned out production" with no regard to standards of health or safety. Miserable as job conditions may have been, they were less miserable than the chronic disaster of an auto worker's life—unemployment. Although the N. R. A. brought a slight upward revision of wage rates, those gains according to the testimony of thousands of auto workers were nullified by the exactions of this increasing speed-up.

Summing up workers' testimony on this development during 1933 and 1934, the N. R. A. report states:

Everywhere workers indicated that they were being forced to work harder and harder to put out more products in the same amount of time, and with less workers doing the job. There was a tendency to excuse the automobile manufacturers for lack of steady work. "That is caused by market conditions." But when it comes to increasing their work loads they are vigorous in denouncing the management as slave drivers and worse. If there is any one cause for a conflagration in the automobile industry, it is this one.

It would be untrue to say that since the organization of the U. A. W. speed-up has been absolutely eliminated from the automobile industry. Auto workers are producing even yet on levels above those of most industrial workers in this country. But the more vicious features of the speed-up system have been eliminated in the

organized plants at least. Workers are no longer subject to dismissal at the whim of a foreman or company spy. Unfair production standards are negotiated with management and in most cases eased down. The vicious piece-work system has been eliminated from many plants. "Slave driving" has been replaced by collective bargaining, and an industrial dictatorship has given away to the recognition of human rights.

Only in the unorganized plants does the speed-up system still prevail.

SPEED-UP AND OLDER WORKER

Before the coming of the union, few men over 40 could be found on assembly lines or basic production jobs in automobile plants. Most operations had been simplified and specialized until they required no experienced skill for satisfactory production. It is alleged that in the Ford plant 43 percent of the workers require 1 day to learn their jobs, 36 percent up to 8 days, 6 percent up to 2 weeks, 14 percent from a month to a year, and only 1 percent more than a year.

Mr. PIKE. What is the basis of that? Have you any idea who made that statement?

Mr. THOMAS. We have—whether Ford recognizes it or not—a local union in the Ford plant, and this is from our people who belong to our union in the Ford plant.

Mr. PIKE. That is, workers in the plant believe that is about true.

Mr. THOMAS. Yes.

The VICE CHAIRMAN. Is the difference in the time to learn how to do that work, due to the difference in the ability of the individual to learn or the difference in the difficulty of the work to be done?

Mr. THOMAS. It might be both. This means that experience and skill are relatively minor assets in a modern auto plant. Instead the ability to endure incredible demands upon nerve and muscle are wanted—not patient craftsmanship.

Some of these older workers find places on the few skilled jobs remaining in the auto plants. Others are relegated to sweeping floors or running elevators. But the vast majority are simply laid off and allowed to shift for themselves.

Says the N. R. A. report:

The most tragic situation in the industry was revealed to us through the testimony of the older workers. They had service records of 10, 15, 20, 30, years, often in one plant and occasionally in one department of a plant. Always their story was the same. After many years' service with less layoff than anybody else there came a time (often in the early years of the depression) when they began to be laid off early and were taken back only during the busiest season of the year. That happened for several years and then finally they did not get back at all. Seldom if ever were they told that they were too old. They were merely told that when there was something for them they would be called back. But they were never called back.

Protection for the worker over 40 through a seniority program has been one of the central objectives of the union. The U. A. W.-C. I. O. is proud that it has saved thousands of older workers from unemployment and a hopeless dependence on charity at the prime of life. However, an adequate social-security program alone will provide salvation for that group of older men who are unable to meet the still rigorous demands of automobile production.

To deny that this problem of the older worker exists is irresponsible folly. Mr. Court claims that—

The automobile industry increased the proportion of men 45 years or over between 1920 and 1930 by 9 percent, according to the U.S. Census. The normal expectation, considering this rate of growth of the industry during this period and using the performance of other industries as a criterion, was for a decrease of 7.1 percent in the proportion of these older men.

The CHAIRMAN. Mr. Thomas, have you made any computation of the ages of your members?

Mr. THOMAS. No.

The CHAIRMAN. How many members are there in your organization now?

Mr. THOMAS. We have contracts covering some 400,000. There is something I would like to explain at this point. In the automobile industry as a whole there are peaks and valleys. When a new production season starts usually their employment goes up to the peak. There are thousands of automobile workers in the industry who only get 2 or 3 months' work out of a year.

The CHAIRMAN. How many persons?

Mr. THOMAS. I said thousands—I imagine, guessing—I was going to take a guess. I would say 15 or 20 percent of the automobile workers don't get over 3 months' work out of the year, and I don't know that those figures are anywhere near correct. I am just guessing by my own experience.

Dr. ANDERSON. Will you explain that, please? Why is that?

Mr. THOMAS. When they bring out a new model, and as the old model goes down, salesmen and dealers try to get all their current models off the showroom floors as quickly as possible. When they start in production on a new model, they try to have their dealers' stocks built up to a great height, have their dealers filled up full of cars before they announce a new model, which means that there is a tremendous amount of work during those 2 or 3 months. After those dealers are supplied, then they usually go below normal for about, I would say, 8 or 9 months, and then there are about 3 months in the industry, as a general rule, in which only the various oldest workers in the industry work at all.

Dr. ANDERSON. You are coming to such seasonality in a moment, I know, but according to the testimony of Mr. Ford this morning with respect to seasonality, there is a lay-off of a month for a small proportion of the total force.

Mr. THOMAS. Of course, as I heard Mr. Ford this morning, I think what he said there is at least 75 percent wrong. I happen to know from experience at the Ford Motor Co.—I have been working around or watching that plant for a long time—there are great peaks and valleys where thousands of men are called in and thousands, after a short time, are laid off who are never brought back to work.

Dr. ANDERSON. So the idea of an 11-month working year, even for those who are not hardest hit by the yearly model changes, would not, according to your observation, be correct?

Mr. THOMAS. That is right. Anyone coming to Detroit wouldn't have to look very far to find, even at peak seasons, thousands of automobile workers on the streets, on W. P. A., and every place else.

Dr. ANDERSON. Do you have any figures in your union respecting seasonality in the plants in which your union works?

Mr. THOMAS. We have.

Mr. J. H. WISHART (director of research, U. A. W.-C. I. O., Detroit, Mich.). We have a statement on that in 1934.

Dr. ANDERSON. Would it be possible, without too much trouble, for your able statistical staff to compile figures on seasonality of workers as you know them?

Mr. WISHART. I think that can be done.

The CHAIRMAN. You have not compiled statistics on the average age of your members?

Mr. THOMAS. We have a comparatively young membership.

The CHAIRMAN. That would be a pretty good indication, would it not, of the age of automobile workers, the average age of your members? That would just about tell the story, wouldn't it?

Mr. THOMAS. That is right.

The CHAIRMAN. Don't you think it might be a good thing for you to do that? You could probably do it without a great deal of difficulty.

Mr. THOMAS. I think so. According to a Brookings Institution report, in 1938-39, 7.2 percent are less than 25 years old; from 25 to 29, 16.6 percent; 30 to 34, 18.8 percent; 35 to 39, 17.6 percent; 40 to 44, 14.8 percent; 45 to 49, 11.8 percent; 50 to 54, 7.4 percent.

The CHAIRMAN. That is about equal to the first group you mentioned, isn't it?

Mr. THOMAS. Yes. From 55 to 59, 3.5 percent; 60 and over, 2.3 percent.

The CHAIRMAN. What is the authority for those figures?

Mr. THOMAS. That is written by William Herndon McPherson, *Labor Relations in the Automobile Industry*. This is compiled for the Manufacturers' Association.

The CHAIRMAN. Does he state, on the page from which you read, the source of his figures?

Mr. THOMAS (reading):

Estimated by the Automobile Manufacturers' Association, based on a 10 percent sample of employees of member firms.

The CHAIRMAN. Do you have any reason to believe that that is inaccurate?

Mr. THOMAS. I just don't know.

The CHAIRMAN. You would assume that it is fairly accurate?

Mr. THOMAS. It is fairly accurate, I think. Ford, of course, doesn't belong to the Automobile Manufacturers' Association.

Dr. ANDERSON. Mr. Thomas, figures of that kind, standing by themselves, haven't very much comparative value. I presume you treated of the topic of older and younger workers in your paper.

Mr. THOMAS. Yes; I have already mentioned as I went through here that we are having absolutely no difficulty in the organized plants today. In every contract we have, we have seniority provisions, and we are having no difficulty at all with aged workers.

The CHAIRMAN. What are those provisions?

Mr. THOMAS. It is occupational seniority, and a man can't bump another man off his job, regardless of how old he is.

The CHAIRMAN. Just on account of age, regardless of how old he gets?

Mr. THOMAS. That is right. We protect his job, no matter how old

The CHAIRMAN. Suppose his productivity falls off?

Mr. THOMAS. In an automobile company there is always a place where a man can be used no matter how old he is. For instance, in the Chrysler Corporation they have one department of old men; in the Dodge plant in Detroit there are men there who are working who are extremely old. I went through there the other day. One man was formerly a superintendent of a plant, some 76 years old now, who is working on a bench there. It happens that at this time he belongs to the union. He had a grievance and we took up the grievance for him. They call it the old men's department, and they have work there which they are capable of doing.

EFFECT OF SHORTENED HOURS ON PRODUCTIVITY

The CHAIRMAN. In the earlier days of the labor movement it was, I think, pretty well demonstrated that shortening the hours of labor tended to increase the productivity of the worker.

Mr. THOMAS. That is right.

The CHAIRMAN. When instead of working 10 or 12 hours a day the worker was required to labor only 8 hours a day, he did a better job for his employer and he was a better citizen, too, because his health was better. That is correct, is it not?

Mr. THOMAS. I wouldn't say that he had done a better job. The average automobile manufacturer—when you are working in there, it is pretty hard for an employee to do a better or worse job.

The CHAIRMAN. I wasn't talking about the automobile manufacturer in presenting that question. I was talking about the history of the labor movement.

Mr. THOMAS. That is true; yes.

The CHAIRMAN. That was true, was it not? Now then, what is your impression of the result upon productivity of these activities of the union which you are describing?

Mr. THOMAS. Well, I don't think there is any question that we have less productivity, because we have lessened the speed-up.

The CHAIRMAN. But you feel that you compensate for that in the condition of the worker, is that correct?

Mr. THOMAS. That is right.

The CHAIRMAN. How much have you lessened productivity?

Mr. THOMAS. I would doubt very much that it would be over (in the industry as a whole) 5 or 10 percent. Ten percent would be a large figure, in my estimation.

The CHAIRMAN. That productivity, thus reduced 5 or 10 percent, compares with the productivity of 5 or 7 years ago in what way?

Mr. THOMAS. I think there is a big fatigue factor. When men worked 10 or 12 hours a day there was a big fatigue factor, and when they went to 8 hours a day, many manufacturers got out the same production—and this is not taking technological improvements into account at all. The Ford Motor Co. especially was able to get out the same amount of production in 8 hours that they had formerly done in longer hours. In the organized plants, I don't think we have cut productivity any, in comparison with the hourly productivity of a 12-hour day, for instance.

The CHAIRMAN. In other words, the elimination of the fatigue factor does not decrease productivity.

Mr. THOMAS. That is right.

The CHAIRMAN. What is it that has decreased productivity?

Mr. THOMAS. Well, the organization.

The CHAIRMAN. I mean what requirement of the organization—what practice that you now require?

Mr. THOMAS. If a member of ours is working on a job and he feels so fatigued that he can't keep up with that job any longer, he places a grievance.

The CHAIRMAN. It is the elimination of the speed-up, then.

Mr. THOMAS. That is right. It is the elimination of the extreme speed-up. There are still speed-ups, but it is extreme speed-up.

The CHAIRMAN. Speed-up of such a character that it becomes a grievance which can be presented to the proper committee and argued out.

Mr. THOMAS. That is right.

The CHAIRMAN. So that the elimination of the fatigue factor of itself does not decrease productivity, but the elimination of excessive speed-up does.

Mr. THOMAS. That is right; yes.

Mr. HINRICHS. As a matter of practice, have most of those grievances risen in connection with standards that have already been in practice, or have they originated when the speed has been further increased?

Mr. THOMAS. We have very few. We have some, but the proportion is very small on jobs, as you say, that have been standard. We pretty much generally go along with that.

Mr. HINRICHS. When you say that productivity has been decreased, do you mean that you had restrained the increase in productivity, held back the increase?

Mr. THOMAS. That is right.

Mr. HINRICHS. Rather than actually decreased productivity?

Mr. THOMAS. That is right. Another thing, when I say that, of course, there are many times violent disagreements between us and the management on where there is a speed-up or a slow-down. We go into production on a new model, for instance. The management has figures from a previous year of what amount of work they were able to produce, but they have made what they consider is a technological improvement. Our workers find that it is not a technological improvement in many cases; it is a hindrance, so that actually they are able to do less work after the improvement is made than before.

I ran across that in several instances in the last year. The management put fewer spot welds on the floor board of a car, which is all steel now, than they had the year previously; so they said, "You ought to be able to do more of them," but when we went in to negotiate on the thing we found that even though they were putting fewer welds on, the ones that were left were in more awkward places, so it actually took more time.

Dr. ANDERSON. Mr. Thomas, has the union ever attempted to restrict introduction of new technological processes?

Mr. THOMAS. No.

Dr. ANDERSON. You accept the introduction, and then attempt to control their use?

Mr. THOMAS. That's right. Well, I don't know; you say "control their use." We often get accused of that. When I go out into a

plant I tell every member of our union that I want him to give management a fair day's work. Now, a fair day's work is a hard thing to measure, sometimes. I mean, I don't want any of our people standing around, I want them to work steady, but I don't want them to be like race horses, either.

Dr. ANDERSON. But the union is conscious now, as perhaps it hasn't been in the past, that there is a technological productivity increase, and are you attempting to reach any understanding with the management about it? You say the slow-down is part of that. Are there other ways that you attempt to control production?

Mr. THOMAS. I still don't admit that there has been any slow-down. I say we have gone to normal. There has been no slow-down. We have tried to stop the management's speed-up rather than have a slow-down. In our opinion we don't try, in any way, to hinder technological improvements. In fact, we go along with what perhaps Mr. Ford would say, in that we agree with technological improvements, but what we ask for is that the savings made with those technological improvements should be shared to a greater extent with the workers.

Dr. ANDERSON. Is that why you referred a few moments ago to the large net earnings on capital? Do you infer that that is an improper situation?

Mr. THOMAS. Yes; I do.

Dr. ANDERSON. What, in your judgment, should be the prevailing situation?

Mr. THOMAS. I don't think Mr. Ford's money should get any bigger return than what I get on mine.

Mr. PIKE. It doesn't, by the record.

Mr. THOMAS. We will say General Motors, or Chrysler.

PLANT INVESTMENT AND PRODUCTIVITY

Mr. PIKE. There is a point there, I think, that perhaps might be made that was perhaps missed. You said that Ford's low earnings are very largely due to the fact that he has a very large plant not very much used. Isn't it true that both General Motors and Chrysler, also, have substantial plant capacity not used to its peak?

Mr. THOMAS. Not to such a large extent as Ford, because Chrysler's and General Motors' production has increased more rapidly in the last few years than Ford's has.

Mr. PIKE. There is also another point, Mr. Thomas, that in the automotive industry there is a very high speed of production as compared with plant investment, where you can say \$1,000,000,000 of investment can produce \$3,000,000,000 of automobile, or so. So the importance of plant investment to output isn't anywhere near as great as it would be in many other lines where you have, say, only \$1 of output per dollar of investment, or as in the public utilities, where you have \$1 of output for \$6 of investment. The burden of fixed interest charges, whether paid by the public or whether paid to the bondholder, as in Mr. Ford's case paid to himself as a shareholder, is nowhere near as great on the production.

Mr. THOMAS. That is correct.

Mr. PIKE. So it is pretty difficult for me to see that any great proportion of the difference in earnings can be due to the differences in the plant.

Mr. THOMAS. There is another factor that enters into Mr. Ford's case. I am not sure of the figure, I believe I could say honestly that Mr. Ford has thousands of service men on his pay roll who put nothing into the automobile at all. They are just there; well, in the union we call them "good squads."

Mr. PIKE. I have heard the expression. I never knew it meant service men.

Mr. THOMAS. When you put thousands of service men on your pay roll who have nothing else to do but to go out and watch other workers to see that they don't whisper to each other and that they don't talk and that they keep away from other departments, you are bound to have a high overhead.

Again I must accuse Mr. Court of not hitting the nail right on the head. According to the Census of Occupations, 17.4 percent of auto employees were 45 or over in 1920. In 1930, 19.1 were 45 or over. This is an increase in proportion of 9.8 percent. In all manufacturing and machine industries 26.2 percent were 45 or over in 1920 and 29.5 percent in 1930. This is not a 7.1 percent drop in proportion, as claimed, but a 12.2 percent increase. Even by 1930, then, before the weeding-out process had become most ruthless, more than 1½ times as many (proportionately) workers 45 years of age or older were employed in all industries as in the auto industry?

DISPLACEMENT OF MEN BY MACHINES

Mr. THOMAS. It is impossible at the present time to give any full or adequate survey of changes which have been taking place in machinery, techniques, and methods of production generally throughout the industry. With tens of thousands of operations involved, this subject is one which requires a special analysis by a group of trained engineers and economists provided with specific facts on production costs. We intend, rather, to give certain examples of changes which will indicate general tendencies and illustrate the techniques involved. Obviously, the examples will not by themselves prove that there has been an over-all displacement of labor in the industry. Representatives of the manufacturers may well cite changes in machinery and products for the improvement of automobiles which have tended to increase the necessary manpower in automobile production. That there has been over-all displacement of labor is proved not by these examples but by the general statistics regarding production and man-hours of employment which we have already cited.

Approaching this question of technological change generally, it can be said that the tendencies pointed out in 1935 by the N. R. A. report summarize most of the present developments in the industry. Since 1935 there have been few, if any, basic changes in the method of manufacture or machinery. Rather there has been a continuation of incessant small changes which individually may have had no considerable effect, but which in the aggregate have served to intensify tremendously total labor displacement.

1. The N. R. A. report, for instance, lists the introduction of a photoelectric automatic inspection device used in the inspection of wrist pins. This inspection robot was introduced in one of the departments of the River Rouge Plant of the Ford Motor Co. in 1935.

It resulted in the displacement of 8 out of 10 workers previously employed on the inspection job.

The robot proved so satisfactory on wrist-pin inspection that a similar machine was designed for application in the camshaft section of the same department. On that job now 4 men are doing the work formerly done by 18.

Mr. PIKE. Do they do as good a job?

Mr. THOMAS. A better job.

With this background of success, another robot was designed along similar lines to inspect crankshafts weighing 75 pounds each instead of 18 pounds for each camshaft. When this machine is finally introduced it is expected that 2 men will be able to do the work formerly done by 90 on this job.

2. The most striking example cited by the N. R. A. report of technological advance was the labor saving achieved through the introduction of the all-steel automobile body. According to estimates made in the report the all-steel body was turned out at a cost of \$30 less per unit. This was done in spite of heavy costs for steel and new equipment.

Since 1935 no such revolutionary change has taken place in automobile body making. Rather, there has been the development of more satisfactory and efficient machinery reducing the number of stampings necessary for a body and turning out a product requiring much less time for finishing and repair.

The CHAIRMAN. I presume that you have no objection to the machine, have you?

Mr. THOMAS. No.

The CHAIRMAN. Because the statement is frequently made that anybody who presumes to discuss this question of technology and its effect upon the human element is necessarily an enemy of the machine. But I gather from your testimony here that you and your organization recognize that the machine has made a most invaluable contribution to society.

Mr. THOMAS. That is right.

The CHAIRMAN. And you are not in any sense, in discussing the desirability of better human application, desiring to displace the machine?

Mr. THOMAS. No; we don't want to do that.

The CHAIRMAN. I thought it would be well to bring that out.

Mr. THOMAS. In this phase of the industry the development of strip mills in the steel industry has had considerable effect. Sheets are now received from the steel mills made exactly to size for the stamping out of car bodies. This has eliminated the jobs of scores of shearmen who previously were required to trim steel sheets to size.

In painting bodies, considerable changes have been realized within the last few years. In one medium-sized plant the substitution of synthetic enamel for Duco paint has reduced the number of coats from 2 to 1, eliminating sanding operations altogether and dividing the number of paint operations in half. This change resulted in the displacement of 250 men in 1 department that I know of. I might also add that the manufacturers always say when they make an improvement like this, "It is better for the customer." But you look at any automobile that was painted 3 years ago, and it is a perfectly

smooth job. Look at any cheaper automobile today (the higher-priced automobiles still use Duco), in any automobile in the cheaper price class, you will find what is called by the manufacturer an "orange peel" finish. It is very wavy if you look at it very closely, and it is not nearly the smooth glossy finish that the automobile of 2 or 3 years ago had on it.

The CHAIRMAN. To what do you attribute that?

Mr. THOMAS. Before Duco they put many coats on, and they did a lot of hand polishing on it to bring out a high luster. With the paint they have today they don't need to do that. The luster comes out without any rubbing whatsoever, but any spray-painting job leaves that orange-peel effect. It is not perfectly smooth and it doesn't have any rubbing done on it at all.

The CHAIRMAN. But it is just as durable.

Mr. THOMAS. It is just as durable. It may be more durable.

The CHAIRMAN. And the appearance is as good?

Mr. THOMAS. The appearance is not as good.

The CHAIRMAN. Except for this orange-peel appearance. That is the only defect?

Mr. THOMAS. That is right. Any automobile manufacturer himself will admit that.

The CHAIRMAN. And it is a cheaper finish, is it?

Mr. THOMAS. Oh, much cheaper, because they do away with over half the employees in putting it on.

The introduction on this same job of an automatic paint sprayer in place of the dip method formerly used has eliminated approximately 90 men. This is in another department.

3. Constant changes are taking place in the thousands of machines used for turning out the various mechanical parts going into the construction of an automobile. The types of changes here might be listed under three main items:

(a) Increase in the operations performed by a single machine. For instance, in many plants where previously 4 or 5 stamping presses were necessary, a multiple press has been introduced. Dies are now constructed so that the whole series of stamping operations may be done on one machine.

(b) Speed-up of the machine through improved cutting tools. The use of diamonds or carbide tips speeded up many drills, cutters, milling machines, broaches, lathes, and other machines.

(c) The simplification in operation of machine has made it possible in many cases for a single operator to increase the number of machines he can run.

(d) The introduction of conveyors in handling bodies, parts, engine blocks, and so forth, has gone on consistently throughout the industry.

In one plant, for instance, a conveyor system was installed for the making of car cushions. Where before a single worker did the complete assembly, now on the conveyor line workers are assigned to one small part in the whole assembly job. This has resulted in an increase of 200 percent in production. Steadily during the past years the efficiency of conveyors has been increased and their use extended over wider and wider sections of the industry.

The CHAIRMAN. Then I would take it as a result of the conditions you are now describing, there would necessarily be a displacement of

labor unless the market for the increased product which the new process is capable of putting out were increased proportionately.

Mr. THOMAS. That is right.

Dr. ANDERSON. Just to add one more question to that, is it your contention that the reason why we do not see the absolute technological displacement effected in the automotive industry is that very fact of still meeting an expanding or large market demand?

Mr. THOMAS. No; the automobile industry is not at the moment expanding.

Dr. ANDERSON. I said "an expanding or large market demand." You can take your choice.

Mr. THOMAS. I think Mr. Ford was right in one statement he made. It was along this line, that if they only put 5,000 parts into a car there probably would be another half of the auto workers who wouldn't be working today, because of technological improvements. But the fact that there are many more parts is the only reason they have been able to stabilize the thing as much as they have.

Mr. HINRICHS. I think you also mentioned the reduction of hours as being a very important factor.

Mr. THOMAS. That is another factor; yes.

PRODUCTION AND EMPLOYMENT SINCE 1929

The CHAIRMAN. But the output of the automobile industry is not expanding now, is that your statement?

Mr. THOMAS. Yes. I think I read a report in the newspaper last night by one expert who claimed that last month there were as many automobiles built as in any other time in history with the exception of 1929, and it was very close to the figure of 1929, yet there were many more people working in the industry in 1929 than there are today.

The CHAIRMAN. Have you definite figures to show that?

Mr. THOMAS. I haven't definite figures, only from what I know in my own experience in the industry.

The CHAIRMAN. Is there any statistical basis for that statement?

Mr. THOMAS. I think there is. What I base my estimate on is that practically every plant in the automobile industry is employing fewer people today.

The CHAIRMAN. That is a very important statement, if I understand you correctly. If 10 years ago the production of automobiles was practically the same as it was last month, and the production last month was accomplished by fewer workers, that would be a very significant statistical fact.

Mr. THOMAS. I think that could be very easily proved.

Mr. HINRICHS. You meant, didn't you, Mr. Thomas, that it was accomplished with fewer man-hours. Did you also mean a smaller total number of people on the pay roll?

Mr. THOMAS. Yes.

The CHAIRMAN. Will you look into that and furnish us a statement?

Dr. ANDERSON. Mr. Chairman, Mr. Thomas has, in his last table of his document, a table showing the story through 1936. Do you have it built up beyond '36 to '38?

Mr. WISHART. We have it for '37 and '38 here.

Dr. ANDERSON. It will settle the question immediately.

Mr. WISHART. If I may be allowed to read the figures, production in 1937 was 92; employment, 107.1.

The CHAIRMAN. Now you are talking in terms of indexes.

Mr. WISHART. That is right, and we are taking 1929 as 100. In other words, in 1937 there were 7.1 percent more workers who had employment for a part of the year than there were in 1929; in 1938 employment was 63.3, with production at 51.8. Naturally the figure is higher for this year. My guess is that total employment, the total number of workers whose names were on pay rolls in 1939 was perhaps a trifle under 1929.

The CHAIRMAN. And what about the output?

Mr. WISHART. The production index for 1939 hasn't been worked out yet on this basis, so there is not much that can be said. Production will be lower than it was in 1929.

The CHAIRMAN. Well, of course, then there is no comparison. The statement as you made it is not borne out by these figures.

Mr. THOMAS. But proportionately I say what I said is true.

The CHAIRMAN. That is still your analysis of the statistics?

Mr. THOMAS. Yes; that is my best estimate.

The CHAIRMAN. All these economists make a lot of estimates, you know.

Dr. KREPS. You certainly agree that the man-hours are much lower. Whether or not the number that were reported on pay rolls was lower is another question.

Mr. THOMAS. I think the names on pay rolls are less.

The CHAIRMAN. I think it would be a very important fact to develop if it is a fact.

Dr. ANDERSON. Is it possible for you to get such data?

Mr. THOMAS. I think it is; yes.

Dr. ANDERSON. Will you supply it to the committee?

Mr. WISHART. We hope to provide that.

Mr. THOMAS. I might say, in talking about these changes, I had another experience with technological improvement myself in an automobile plant. I happen to be a welder. I have done the plant's gas and electric arc welding. I got a job in the Cadillac Motor Car Co., and was welding rear-axle housings by hand, and they paid \$1 apiece for welding those rear-axle housings. Their production averaged about 100 per day, which required, obviously, 10 welders. We did 10 housings apiece a day, which we were paid \$10 for doing. There was an engineer who worked for the company, and I worked with him quite a lot—a Mr. Goodspeed was his name—who developed the Goodspeed automatic head for welding. That machine would turn out more than enough in a day, with one man operating it, for the day's production, and the wages were less than the \$10 which each one of us originally received.

The CHAIRMAN. That machine was capable of turning out more than 100 welded housings?

Mr. THOMAS. Which formerly the 10 men had turned out. I was quite interested in the analysis Mr. Ford made, arguing that the cost of these machines offset the number of people laid off. I can take an average mechanic and take this Goodspeed head. Of course, it was worth something to the man who invented the thing, but it is such a simple affair, and they use only one in a plant, that if any

decent mechanic at all couldn't build one in two weeks' time I would think he was a pretty poor mechanic.

Mr. HINRICHS. What happened to you 10 men? Were you given other jobs in the Cadillac plant?

Mr. THOMAS. The 10 of us were given other jobs, yes, but we were given less skilled jobs; that is, most of them were. I continued welding there for several years, but most of those 10 men were given less skilled jobs. Their wages were cut. Some of them, of course, left, because they thought they had opportunities of finding a job for their trade some place else.

Here are a few more examples of changes along the lines suggested above which have taken place recently in the automobile industry. In the production of moldings, graining was formerly done by hand. This operation was replaced by an automatic graining machine which has increased output per man by 400 percent.

On a press used in the manufacture of clutch release bearing springs an air valve was installed, operated by foot, thus enabling the operator to increase production by 90 percent.

On the operation of division channel fabrication in an automotive hardware plant a drill press was moved closer to the operator, and the table lowered. On this job production was increased from 542 per hour in 1938 to 794 in 1939.

The introduction of an automatic polishing machine used for the finishing of many parts and accessories occurred in one automobile parts plant in 1938. Before a man had been polishing stock on individual grinding wheels. With the introduction of the polishing machine, production per hour for each man on one typical part increased from 100 to 500.

Automatic machines were installed in 1938 in many plants for the milling, reaming, and boring of many cylinder blocks. Previously this operation had required six machines; now the whole job is done by one operator on one machine. The job of the operator is to feed housings to the machine and move on finished housings as they are ejected.

Changed methods introduced in one plant in 1939 in the setting of tappets in engines has resulted in an increase in the number of tappets set per hour by 1 man from 96 to 201. Before tappets had been set hot; that is, engines were running and well warmed up; operators had been setting the old-style cap screw tappet and locking them in place. One man did a complete one on one engine and then moved on to work on the next.

Now tappets are set in cold engines as they move between the operators on a conveyor. Self-locking tappets are used which are supposed to stay set without a lock nut. Tappets set in this manner are reported to give less satisfactory operation, but the change has been vindicated by the tremendous savings in labor.

In one motor-assembly plant the installation of conveyors for the handling of car bodies as they are trucked in from body plants has resulted in considerable saving in labor. Before bodies had been handled on push buggies—that is what the workers call them (they are a flat truck) then stored until called for on the production line. Now with the conveyor picking up the bodies they are produced in the proper number of each style and are run directly onto the assem-

bly line. This has meant the loss of jobs to 25 of the 105 men previously engaged in this work.

In one medium-sized automobile plant a whole series of milling operations on engine blocks are due for elimination within the next year. A broaching machine costing \$750,000 is due for installation. One operator using an air hoist will lift the engine block onto a rail which will force it through this broaching machine. It is expected that the installation of this machine will mean doing away with 126 men in a department now employing 641.

These examples, as has been suggested before, represent only a fraction of the continuous changes going on in the industry. There is no reason to believe that this rate of change will be slowed down in the years to come. Every resource and ingenuity of engineering skill has been, and is being, applied to this problem of reducing the amount of human labor necessary for a given quantity of production. From discussions with men experienced in the engineering side of the industry it can be said that few major changes either in the production or methods are to be expected within the next few years.

The only basic change is likely to come about through the introduction of plastic bodies. Already we are informed that some production of plastic bodies has been carried on in European automobile plants. Although there is some evidence that these new bodies have not yet been developed from the point of practical production, those familiar with the industry predict their introduction within 10 years at the outside. The coming of the plastic body would mean a tremendous technological displacement through the elimination of labor necessary in stamping, painting, and finishing automobile bodies.

REGULARITY OF EMPLOYMENT

Mr. THOMAS. In listing the blessings which the auto industry has achieved for its workers, Mr. Court, whose figures we have had occasion to refer to before, mentions stability of employment. He says:

The average record of continuous employment (in the same plant) for men employed in the plants of members of the Automobile Manufacturers Association during 1938 was about 6 years. One-fifth of the men had 10 or more years in one plant.

Here again Mr. Court is giving the automobile manufacturers credit for what the union has accomplished in the face of their opposition. Stability of employment through the seniority system has been and continues to be one of the principal objectives of our union. However, the U. A. W.-C. I. O. cannot share Mr. Court's satisfaction even with present conditions in this phase of the auto workers' life

The average record of continuous employment, as Mr. Court states it, does not reflect necessarily year-round employment. It is well known that a large proportion of workers whose only employment over a long period of years may be in one plant will have only partial employment.

A study made by the United States Department of Labor, Bureau of Labor Statistics, on stability of employment in 1934 states:

One third of the motor vehicle employees work throughout the year. One-half of the employees had less than 6 months work. Another quarter worked 6 to 10 months.

With constant fluctuations in production throughout the year there are also constant fluctuations of employment, as the Department of Labor statement indicates.

Mr. HINRICHS. May I make one comment at that point. I don't have the figures. I am sure you are quoting them correctly. As you have indicated, those figures relate to employment in an individual plant; in some instances—and we weren't able in that study to determine quite how many—the worker may have had employment opportunity in two plants. The general picture that you give of the large volume of short-time employment is quite correct. I don't want to minimize your statement, but I would like to make it technically quite accurate at that point because those figures have been in a good deal of controversy.

Mr. THOMAS. I would like to say this: You say the worker may have had employment in more than one plant. In the automobile industry that would be unusual, to say the least. The automobile industry strives and they compete with each other. They are all trying to beat the other fellow, so the result is they all come out practically at the same time, and they have their peaks and valleys at the same time, so it is practically impossible for an automobile worker to work in more than one plant for the duration of a year.

It should be noted that the Bureau of Labor Statistics study here includes salaried employees, who usually work a full 12 months, in addition to hourly rated employees.

Now this is the question you asked awhile ago.

Organized labor has learned through centuries of experience that the intent to check or destroy new machinery is plain social folly. We do not stand for artificially increased labor requirements in the production of any of America's basic commodities. What we are concerned about is that such technological advance should not be entirely at the expense of American workers, and the stability of American economic society.

It is our belief that in the past the benefits of technological improvement have been monopolized by the rulers of our financial and industrial systems. More efficient production has meant a greater and greater accumulation of wealth in the hands of the most powerful. This has been accomplished by what appears to be an actual decline in the total share of wealth produced going to the employees of industry. We are opposed to this tendency not only because we feel that it is unjust. We are opposed to it because we recognize that continued technological advance is impossible without an adequate mass market to consume the products of our new skills.

We believe in genuine technological progress, based upon and resulting in the greater welfare of the mass of our people. We are opposed both to the vicious speed-up system, which has nothing to do with genuine technological progress, and to the monopolization by the favored few of the benefits flowing from new productive power.

As the experience of the automobile industry shows, technological displacement is realized primarily through the failure of markets to expand in proportion to an expanding productive capacity. This, the United Auto Workers feel, is one of the basic causes for the unemployment, insecurity, and economic hopelessness of our present time. We are proud of our contribution to the solution of these problems

through the fight for the economic security of our own people. Organized labor does not believe that a solution to present-day economic problems will be found in the discovery of new and improved products. We believe that new and improved products will appear and bring industrial prosperity when the buying power of the American people as a whole is sufficient to make their production profitable. The experience of the automobile industry would seem to bear this out. American prosperity during the 1920's was based on automobiles, but automobile sales in turn were based upon the high level of income enjoyed by the American people during the first quarter of this century. Without that high level of income the automobile industry would have no more effect in developing our prosperity than it had in such countries as England, France, and Germany. In these countries, although technological advance proceeded as rapidly as in America, consistently low-mass purchasing power made impossible the circulation of new products to the general public.

The CHAIRMAN. Any further questions, Dr. Anderson?

Dr. ANDERSON. These figures on Ford production related to producing capacity will serve to explain the \$91,000,000 profit made by Ford in 1929 as well as the \$74,000,000 loss marked up by the Ford Co. in 1932. It serves to illustrate as well the fact that heavy investments in new machinery sometimes serve to defeat their own purpose, that is, the reduction of costs. I wonder if you would accept this qualification, although it may not necessarily explain the Ford situation. The obsolescence of a model and the loss of a market might reasonably explain Ford's difficulty, rather than his investment here in heavy production machinery that didn't yield.

Mr. THOMAS. That is another factor that enters into it, I believe; yes.

Dr. ANDERSON. Would you hold that any machinery is installed by a motor maker without having first, from an economic standpoint, determined that it will reduce cost in a particular unit where it is to be placed?

Mr. WISEHART. That is on the assumption of a certain mass production; yes.

EFFECT OF MECHANIZATION UPON SKILL

Dr. ANDERSON. I want to refer to a question of Mr. Ford's we had before you started this afternoon, and that is this one of degrading of workmen, which seems to be of real importance not only in terms of the satisfaction of the workers involved but in terms of purchasing power and general social well-being. Beyond what you have stated in this document, what do you think is occurring at the present time in the automotive industry? Are workers being degraded to the semi-skilled and unskilled level, or is there increasing use of skill in the automotive industry?

Mr. THOMAS. In the automobile industry the tendency is more toward lower skilled occupations all the time?

Dr. ANDERSON. Do you see any immediate prospect of full employment in the automotive industry?

Mr. THOMAS. I don't.

Dr. ANDERSON. What, in your judgment, is the proportion of unemployed automotive workers, either registered with unions or non-

union workers, available for labor and seeking work, in proportion to the total force?

Mr. THOMAS. Well, that is pretty hard to estimate, due to the fact that in our industry, as I said in this statement, a lot of men come into the industry from southern States and during the depression years have gone back there and we have no way to account for them now. If I would give a guess it would certainly be a very, very rough guess.

Dr. ANDERSON. In other words you have had an influx from states other than the automotive states?

Mr. THOMAS. We are in bad shape today. A lot of them have left the state.

Dr. ANDERSON. Do you know anything about the circumstances of those who left to find employment in their home states?

Mr. THOMAS. No, they can't; as far as I can learn they keep every once in a while coming back to Detroit, trying to get jobs, and I have talked to a number and they say it is impossible for them to get jobs any place.

Dr. ANDERSON. Who were those people who came from other states? Were they farmers, or people from the farms?

Mr. THOMAS. Yes.

Dr. ANDERSON. And they made—

Mr. THOMAS. They were perhaps sharecroppers and small tenant farmers.

Dr. ANDERSON. This trend toward shorter hours, do you see any evidence that that trend is flattening out? Is there any leveling off of the hours of employment?

Mr. THOMAS. In organized shops we have got it pretty much leveled off now per day, if that is what you mean. It is pretty much an 8-hour day now in the industry.

Dr. ANDERSON. Are you directing any effort toward an annual wage?

Mr. THOMAS. Well, we are trying in all our negotiations to convince management that it would stabilize the industry a lot more if they would agree to an annual wage and we also think it would help the unemployment situation. We think the automobile manufacturer is well able to afford it by establishing a 6-hour day, 30-hour week. Of course we haven't been able to sell that to the manufacturer yet.

Dr. ANDERSON. Well, what are the annual earnings, average annual earnings of wage earners in the automotive industry? Let me put it this way, is it possible to get figures from your union that will indicate, by grade of labor, the rates of pay and earnings of workers? Do you have any such data?

Mr. THOMAS. We could get a large cross section and try to strike an average on something, yes, but it would be a very difficult job.

Dr. ANDERSON. Well, in your new labor contracts are you turning increasing attention to such matters as lay-offs and dismissal pay and retirement and other social benefits?

Mr. THOMAS. Yes, but that is another thing we have made very little progress with at all. The automobile workers have been called "dead-end kids" in the labor movement. The automobile industrialists who so many years ran the industry as open shops, fight violently against any new innovation in the industry, and it is a hard job for us to make any progress at all on what we feel would be of any

economic benefit to the country at large. They would resist with their last dollar, I guess, if it became necessary. The Automobile Manufacturers Association themselves say that in the season of '38 and '39, the average was \$1,328; in '37 and '38 it was \$906.

Dr. ANDERSON. That is average full-time earnings?

Mr. THOMAS. Yes. No automobile worker—I say no; 95 percent of the automobile workers never work a full year. I don't believe I ever worked a full year in the 15 years I was in the automobile industry, that I recall.

The CHAIRMAN. What was that figure?

Mr. THOMAS. For the season of 1938 and 1939, \$1,328.

The CHAIRMAN. The average?

Mr. THOMAS. Yes.

The CHAIRMAN. And what does that include in the category of work? Does it include everybody in the automobile industry?

Mr. THOMAS. This is employees.

The CHAIRMAN. Does it include the office employees?

Mr. THOMAS. Only hourly rate employees, and it doesn't include the Ford Motor Co.

The CHAIRMAN. Now, do you regard that as accurate?

Mr. THOMAS. I think it would be very close; yes.

The CHAIRMAN. In other words, the average hourly employee, though he doesn't work a full year, earns more than \$100 a month in the year?

Mr. THOMAS. In a good year. Of course 1938 was considerably lower than that.

The CHAIRMAN. This figure, then, refers only to a specific year?

Mr. THOMAS. That is right.

The CHAIRMAN. And what would you say would be the average for the last 10 years? Of course that might be an improper question because of course you had the depression years.

Mr. THOMAS. In these figures here the season of '33 and '34 was \$749; '34-'35, \$1,014; '35-'36, \$1,294; '36-'37; \$1,399; '37-'38, \$906; '38-'39, \$1,328.

The CHAIRMAN. By and large that is a much better record for labor than would have been possible 15 or 20 years ago, probably, isn't it?

Mr. THOMAS. Yes; but I remember 15 or 20 years ago when living costs were considerably lower, too.

The CHAIRMAN. That is true, but I mean it is true, is it not, that there has been a general improvement?

Mr. THOMAS. There has been in the last several years, as I stated in my brief here; in the last several years in which we have had organization we have increased wages considerably.

The CHAIRMAN. In other words you don't deny there has been an improved condition?

Mr. THOMAS. Certainly not.

The CHAIRMAN. But contend the improvement isn't sufficient to sustain our economic system?

Mr. THOMAS. That is right.

The CHAIRMAN. And it doesn't provide employment for all who need jobs?

Mr. THOMAS. That is right.

The CHAIRMAN. You are quoting from this book of the Association of Automobile Manufacturers. Did you also bring this document to the room?

Dr. ANDERSON. I am responsible for that, Mr. Chairman. I brought it the first day and handed it to the committee, the documents that were available. This particular document, I might say, is from the Automobile Manufacturers Association; the study is considered the basic economic study in the field and so far as I know literature of this kind it is the most competent job that has been done.

The CHAIRMAN. Well, I note it begins with this sentence from Don Quixote, to the effect: "No greater knight errants have sought to exorcise the imagined devil in labor-saving machinery." I suppose you have read this document. Is that the tone of it?

Dr. ANDERSON. After the first paragraph the economists who wrote this document apparently moved into some economic analyses and forgot about the first paragraph.

Mr. THOMAS. These figures I quote here are from a study by the Brookings Institution, which they got from the Manufacturers' Association.

The CHAIRMAN. Well, I observe that the author of this pamphlet distributed by Dr. Anderson is Mr. Andrew T. Court, an economist whom you have quoted, apparently, from time to time.

Mr. PIKE. Not with the highest approval, however.

The CHAIRMAN. That is what I am getting at.

Mr. PIKE. He has quoted a good many of those same figures.

The CHAIRMAN. I am told that Dr. Court is in the room. Would it be proper to give him an opportunity to dispute Mr. Thomas?

Dr. ANDERSON. I might say, by way of explanation, Mr. Chairman, that in these hearings we have made every effort to secure all the facts available.

The CHAIRMAN. I hope so.

Dr. ANDERSON. In these hearings we have tried to get all attending parties into the room for the discussion of their particular points of view. We early asked the Automobile Manufacturers' Association to have a representative speak for them here. As a starting point we made an analysis of this document, which was their statement of the case. Since Mr. Paul Hoffman, of the Studebaker Co., could not come to testify, they decided not to have a representative at the hearings, but it was agreed that if any witness should refer to this study, we would give them an opportunity to be heard in refutation. If Mr. Court is here and would like to be heard now we would be glad to hear him.

The CHAIRMAN. Is Mr. Court present?

Mr. COURT. I am present. The questions raised mainly are technical questions between the relative usefulness of the figures from various Government departments, and I don't think I am prepared to comment on that.

The CHAIRMAN. All I want to say is, Mr. Court, if you do care to make any statement, I am sure the committee would be very glad to have you do it at your own convenience.

Mr. COURT. Thank you very much. Not at this time.

The CHAIRMAN. Are there any other questions to be asked of Mr. Thomas?

Mr. HINRICHS. I indicated earlier that I wanted to make some observations with reference to the reference to census figures in the Bureau of Labor Statistics figures. There is no essential controversy, but I think that a clearer statement of the facts might be helpful for the record. The increase from 1929 to 1937 which appears to be larger in the Bureau of Labor Statistics series than in the census figures, is due to the fact that in 1937 and before we had included the steel-making and foundry establishments in the automobile industry, and the 1937 census excluded them from its count of the industry. In 1929 those particular parts of the industry were relatively unimportant. We normally adjust our classifications to correspond with those of the census so that there won't be any difference in the two sets of figures. Our figures, however, are compiled primarily in order to show month-to-month fluctuations between census periods, and the reports come to us voluntarily from the various manufacturers.

The automobile industry was apparently unable to furnish us a break-down of their employment figures on a monthly basis. It was indicated by the census figures and in order to get comparable figures from month to month we have had to carry our figures forward. Now there is no question that there is a discrepancy between the two. It doesn't have anything to do with the reliability of one set or the other. One merely needs to know the differences in content, which in this case affects on the one hand the automobile figures and on the other hand the iron and steel figures.

The CHAIRMAN. In other words every statistician will defend his estimates?

Mr. HINRICHS. Our figures are perfectly all right, but the point of view for which they are published differs.

Mr. WISHART. We were not attacking the Bureau of Labor Statistics or the Census of Manufactures. We were attacking the comparison of things fundamentally noncomparable. As you have pointed out, the census figures and B. L. S. figures cover different sections of the industry; since the B. L. S. has not included the same things, of course, there is a discrepancy there which appeared to cover up the actual technological displacement which had occurred.

The CHAIRMAN. If there are no other questions, Mr. Thomas, we are very much indebted to you for your presence here and your testimony. The committee will stand in recess until 10:30 tomorrow morning.

(Whereupon at 5:10 p. m. a recess was taken until 10:30 Thursday morning.)

INVESTIGATION OF CONCENTRATION OF ECONOMIC POWER

THURSDAY, APRIL 11, 1940

UNITED STATES SENATE,
TEMPORARY NATIONAL ECONOMIC COMMITTEE,
Washington, D. C.

The committee met at 10:40 a. m., pursuant to adjournment on Wednesday, April 10, 1940, in the Caucus Room, Senate Office Building, Senator Joseph C. O'Mahoney, Wyoming, presiding.

Present: Senators O'Mahoney (chairman), and King; Representative Williams; Messrs. O'Connell, Pike, Hinrichs, and Brackett.

Present also: George E. Bigge, Social Security Board; Frank H. Elmore, Jr., Department of Justice, and Dewey Anderson, economic consultant to the committee.

The CHAIRMAN. The committee will please come to order.

Dr. ANDERSON. We propose today to present two witnesses, both familiar with the steel industry, to examine into the problem of technology in steel. This morning's witness is Mr. Charles Hook, president of the American Rolling Mill Co.;¹ this afternoon's witness, Mr. Philip Murray, chairman of the Steel Workers' Organizing Committee. Mr. Hook has prepared a statement and is now ready to testify.

STATEMENT OF CHARLES R. HOOK, PRESIDENT, THE AMERICAN ROLLING MILL CO., MIDDLETOWN, OHIO

Mr. HOOK. It is not my intention to attempt any theoretical analysis of the effects of technological innovations on employment. It seems to me, however, that most economists and businessmen are agreed that technological improvements tend to stimulate the demand for labor, and do not of themselves bring about prolonged periods of unemployment.

I believe it has been thoroughly established that ever since the introduction of power machinery, there has been a continuous increase in the output per man-hour in industrialized countries. This increase in man-hour output, as we all know, has been accompanied by increased employment, shorter working hours, improved working conditions, and an ever-advancing standard of living.

It is true that the introduction of a labor-saving device may cause some immediate displacement of individual workers. Likewise, workers in some trades may be displaced when new products, as was true of the automobile, appear upon the market. Such temporary dislocations are inevitable in a progressive society, and they need

¹ See Hearings, Parts 19 and 20, for previous testimony of Mr. Hook.

cause concern only when the displaced workers are unable to find other employment without prolonged delay.

It is my observation as a businessman that the time which must elapse before any displaced workers are reabsorbed into other lines of work depends upon general business conditions and the relative freedom from causes which restrict the free flow of capital. The elapsed time is brief when all factors are favorable, as during the postwar period of the early 1920's, when employment gained simultaneously with many technological advances.

The elapsed time may be longer when general conditions are unfavorable as they have been in recent years, but the experience of the last century seems to provide no evidence for concluding that technological improvements cause permanent unemployment or help to bring about prolonged depressions.

Periods of business depression always give rise to efforts to locate the focal point of infection. This is not the first time the finger of suspicion has been pointed at so-called technological improvements as the chief cause of unemployment.

The clamor against improvements in manufacturing techniques has been raised many times during the past 150 years. On such occasions the charges have been shown by subsequent events to be unfounded and fallacious. Notwithstanding these lessons of history, the old exploded theory, like Banquo's ghost, has come to life again wearing the label of "technological unemployment."

Actually it is impossible to measure precisely the broad effect of the introduction of a machine upon either employment or output per man. Many factors enter into the determination of changes in employment and man-hour output.

Technological innovations relating to blast furnaces and open-hearth processes, mechanical and electrical equipment, labor-saving devices, improvements in supervision, better working conditions, incentive systems, and so forth, are all factors which may permanently influence change in output per man-hour. To attribute a given increase in output per worker to any one of these many factors would seem to me highly theoretical and, from a practical point of view, impossible to demonstrate with any acceptable degree of accuracy.

Since I regard it as wholly unfeasible to attempt any precise measurement of the effect of technological change on employment, it is my intention, following these preliminary remarks, to present for the consideration of the committee a factual record. This record will cover changes in a large unit of the company with which I am associated and in which the continuous sheet mill represents the outstanding technological improvement.

For that purpose, I have chosen the period covering the years 1926 down to 1937, because it was during that period that all but one of the continuous sheet rolling mills were introduced into the steel industry.

Following the presentation of data relating to my own company, I shall show comparable data as to employment in the iron and steel industry for the same period. All these data show conclusively that the installation of continuous mills have not reduced employment.

With the committee's permission I will present this factual record in considerable detail with charts and tables.

FIRST CONTINUOUS SHEET MILL INSTALLED IN 1926

Mr. HOOK. Before doing so, I should like to comment briefly on some of the striking changes in the steel industry which have taken place since the invention of the continuous sheet rolling mill. Since the first continuous sheet rolling mill was put into operation, 27 such mills had been installed by 1937, representing a total investment by the industry of approximately \$500,000,000. Building that equipment has provided work for thousands of workers in the construction and equipment industries.

It has been alleged that 85,000 to 90,000 workers have been displaced by the continuous sheet-mill process. Such a claim is shown by an examination of the facts to be wholly without foundation.

In 1926 a total of 1,264 hand mills for producing hot rolled sheets and black plate were in existence. The greatest number of men that could have been employed on these mills, on 3-shift operations, would have been approximately 43,000, or only about 10 percent of the total number of workers employed in the entire iron and steel industry at that time.

Obviously, if all of the hand mills in existence in 1926 had been eliminated by the introduction of continuous sheet mills, the total number of job displacements could not possibly have been even one-half of 90,000. But actually there are still 750 of those mills in existence with approximately half in operation. That is a reduction of the number of men employed on hand mills of about 27,000. But for the steel industry as a whole we had an actual increase of working forces of 117,000 men from 1927 to 1937. Total employment in the steel industry increased from 427,000 in 1927 to 544,000 in 1937, according to figures of the United States census, an increase of 27.4 percent, while in the meantime the population increase has been 11.2 percent, according to the same source.

Mr. HINRICHS. Just one question at that point. You use the phrase "27 continuous sheet rolling mills" and then you speak of 1,264 hand mills. Are the hand mills separate enterprises?

Mr. HOOK. They are the old method, the old sheet mills which I will show in a picture in a few minutes.

Mr. HINRICHS. I see; they are separate enterprises and not a part of the factory enterprises, with 3 or 4 mills.

Mr. HOOK. No; they are not separate. We make sheets on the old steel mill, just as we make sheets on the continuous rolling mill.

Mr. HINRICHS. And the mill that you refer to as a hand mill is the machine, not a factory.

Mr. HOOK. Oh, no; it is a machine. In other words, we made sheets on these old hand mills prior to 1926, or in our case prior to 1924. Now then, we introduced to do that same job the continuous sheet rolling mill. Do I make myself clear?

Mr. HINRICHS. Quite.

Mr. HOOK. Of course it is true that when a continuous sheet mill replaces hand mills more jobs are affected than those of the immediate hand mill crew of some 8 or 10 men. Other jobs on operations back in the plant leading up to the hand mill or connected with its maintenance are affected also. But that does not mean that such jobs are eliminated. In most cases they are merely changed.

Men who were skin passers, shearmen, bundlers, oilers, weighers, picklers, and cranemen on the hand mills are doing the same kind of work on the continuous mills. I have cited only a few examples. There are many more.

Not only are such jobs held over in the continuous mill operation, but in some categories the number of men required is greatly increased.

Moreover, the continuous mill creates new jobs which do not exist in the hand mill. I will name only a few of these, such as bearing setters and helpers, welders, recoil operators, and stitcher operators.

Another factor bearing upon the record of increased employment in the steel industry is the significant increase in the production of light flat rolled products from 6,327,000 tons in 1926 to 10,793,000 tons in 1937. That required more workers in the blast furnace, the open hearth, and in all finishing, processing, and shipping departments. It must also be realized that many new technical, administrative, and selling jobs have been created by this increased volume of production.

I am sure that there is unanimous agreement among consumers of sheet steel that the improvement in quality and properties of this product, resulting from the continuous mill, has made possible extensive improvements in many widely used consumer articles. Notable among such improvements are those in the automobile, washing machine, electric and gas range, kitchen cabinet, and refrigerator industries, all of which have resulted in providing for the consumer a constantly improved product at a steadily reduced price.

Steel users not only have benefited from improved quality, which makes for possible lower fabrication costs, but they have also enjoyed the advantage of lower prices as well. From 1926 to 1939 the average prices of all iron and steel sheets realized by our company declined 31.1 percent.

ADVANTAGES TO LABOR FROM CONTINUOUS MILLS

Mr. Hook. Advantages from the continuous sheet mill process have come to labor in two important ways.

First, workers have benefited from the lightening of their task and from the improvement of working conditions in the rolling mills. As a former worker in the mills myself, I speak from personal experience when I say that the work on the old style hand mill was one of the most arduous and difficult of any in the steel industry. The continuous mills, wherever they have been installed, have completely eliminated all of the difficult and taxing manual phases of work in the rolling mill.

Second, workers have benefited from the broadening of markets brought about by the continuous sheet mills. Changes in the quality and properties of sheets made by the new process are so great as to amount practically to the introduction of an entirely new product in the steel industry. It is a product which lends itself to uses and applications utterly beyond the scope of old style sheets.

Accordingly, workers are employed in the production of large tonnages of sheet steel for uses wholly nonexistent before the appearance of the continuous mill. I could mention, for example, the steel auto top, and one-piece auto fenders, each of which is stamped at a single operation from a single wide steel sheet.

Moreover, since 1926, average earnings of workers in the steel industry have increased from 63.6 cents an hour to 84.7 cents an hour, a gain of 32 percent. Meanwhile, there has also been a substantial shortening of hours of work.

The hot-rolled production of other than light flat-rolled products in the years 1926 to 1937 shows a reduction of 11 percent, or approximately 3,000,000 tons, while at the same time the light flat-rolled products increased approximately 4,500,000 tons, requiring about 45,000 men. This number of men is more than was previously employed in all of the sheet mills in 1926. It is evident, therefore, that the introduction of the continuous rolling mill has not been accompanied by a decrease in employment, but on the contrary, since its adoption, the number of workers in the steel industry has materially increased.

Now, Mr. Chairman, with your permission—

The CHAIRMAN (interposing). Now to what do you attribute, Mr. Hook, this material increase in the number of workmen?

Mr. HOOK. I am going to show you in the charts that follow, and some of the exhibits, one small exhibit that I have here.

The CHAIRMAN. I see.

Before you turn to the charts, it just occurs to me to make this comment. I think that in the entire discussion of technological improvement and its relation to unemployment, there is constant danger of misunderstanding of the terms in which people are talking.

Mr. HOOK. That is possible.

The CHAIRMAN. There is no doubt, I suppose, that there are persons who believe and who say that the machine as such is responsible for unemployment, but I can't recall any person in any responsible position as having said that in my hearing, or of saying it in any document that I have read.

The question, I think, revolves around the actual fact of labor displacement.

Mr. HOOK. That is right.

The CHAIRMAN. Which apparently is recognized by all industrial leaders, and is apparently recognized in your statement.

Mr. HOOK. No; I think I said not displacement—pardon me, Senator.

The CHAIRMAN. This is what you say on the first page:

It is my observation as a business man that the time which must elapse before any displaced workers are reabsorbed into other lines of work depends upon general business conditions and the relative freedom from causes which restrict the free flow of capital.

Mr. HOOK. Correct.

The CHAIRMAN. Now that sentence seems to recognize that there is such a thing as displacement of workers.

Mr. HOOK. Temporary, because I say until they are reabsorbed.

The CHAIRMAN. That is right. And the question therefore, revolves around the ability of industry as a whole, business as a whole, not merely mechanical industry but the whole economy, to reabsorb persons who are displaced, because there is apparently such a thing as displacement of individuals.

Mr. HOOK. That is possible, but taking it as a whole—

The CHAIRMAN (interposing). Is it possible or is it a fact?

Mr. HOOK. If that individual is displaced, another man is employed, maybe 30 miles away.

The CHAIRMAN. That is right. That is exactly the point—

Mr. HOOK (interposing). Plus another man, probably.

The CHAIRMAN. That might be very true. That, of course, is the very point of impact. The particular person loses a job though another, or 2 or 10 jobs may be created somewhere else. And the problem of reabsorbing the displaced worker as set forth in this sentence of yours is, as I see it, the heart of this problem. Do you agree with that statement?

Mr. HOOK. Well, it is a problem and industry has been making a great many studies. For instance, the National Association of Manufacturers now, Senator, have a committee at work, just as we studied the worker over 40 and proved fallacious the general statement, that is often made, that industry was not employing the worker over 40. And that report shows that in recent years the proportion of men over 40 are greater than they were in the twenties.

The CHAIRMAN. And I think it would be proper for me to say here that my observation of this whole economic problem throughout this study has given me a great deal of encouragement by reason of the very obvious effort that is being made by men like yourselves, and by organizations like the National Association of Manufacturers, to study the very problem that we are studying, and to bring about beneficial social results. I think there can be no doubt about that. We are all working, as it were, toward the same end.

There can be no doubt, either, it seems to me, that the development of technology and the introduction of new devices like your continuous mill, which have the result of enabling you to produce your sheet at a lower price, necessarily results in making that sheet available for commodities and other industries for which it was not available at the higher price, and thereby tends to open the door of opportunity to those who didn't have the open door before.

Mr. HOOK. Correct.

The CHAIRMAN. I was curious, however, to ask you whether the re-employment of workers as indicated in your statement, of more workers than had been in the industry before, tends to keep your cost up, and if it doesn't—which apparently is not the case from your conclusion—how is it that with maintenance-of-labor costs you still can reduce the price of the commodity?

Mr. HOOK. I will show that to you, I think very clearly on the charts, Senator.

Senator KING. A temporary displacement doesn't mean a permanent one. Of course that is a question that answers itself.

Mr. HOOK. No, indeed, Senator.

Senator KING. In other words, when you introduce machinery in which you displace A, B, and C, perhaps with the new machine A would be employed and X, Y, and Z be employed.

Mr. HOOK. Correct.

Senator KING. So there would be a temporary change or transition from one position to another.

Mr. HOOK. And as I go through this explanation using facts, the actual factual records, I think many of the questions that may come to your mind, Senator, will be cleared up.

The CHAIRMAN. Of course, some of us are looking at this problem as a whole and not from the point of view of a particular industry. Unemployment is a major fact that stares us all in the face. Now, this unemployment is not by any means all industrial. Some of it is agricultural, some of it is professional, and what not. It is to be found in all lines of endeavor. But for years now Congress has been trying to make work for persons who apparently are unable to find work in normal avenues, and our problem, the problem of the National Association of Manufacturers, and the Association of Automobile Manufacturers, and the problem of Congress, is how to coordinate the efforts of all to lift this burden of making work off the Government which is doing it only by piling up debt.

Mr. HOOK. We agree with you on that, Senator, 100 percent.

EFFECT OF CONTINUOUS MILLS ON AGE OF WORKERS

Mr. HINRICHS. I would like to come back for just a moment to your statement about the possible displacement of a worker here and the employment of another worker 30 miles away, or even next door. Most of these hand mills were in operation in the early twenties, were they not?

Mr. HOOK. Correct. Some of them still are operating today.

Mr. HINRICHS. Some of them still operating. Let's start, for example, in 1923. You had a fully equipped hand-mill staff with personnel. Minor improvements would possibly reduce the total amount of labor that you needed in the mill, possibly some expansion of the mill might require you to add a few workers. By and large, however, you had, barring large fluctuation in the total volume of production, relatively steady employment from year to year.

With that group fully employed in 1923, you would have tended to hire the same people in 1924, the same people in 1925, in 1926. There were deaths, retirements, accidents, and that sort of thing, so that you did have some new hiring, but it is a tendency in any business enterprise that is fully established, for the average age of the workers in that establishment to rise from year to year, isn't it?

Mr. HOOK. Yes; as the individual company gets older, you don't—

Mr. HINRICHS (interposing). Your workers get older with you.

Mr. HOOK. Of course.

Mr. HINRICHS. Now then, you come along to 1933, 1936, and 1937, and open a new mill. Insofar as the workers in this old hand mill are displaced and not provided for in the new mill or transferred to the new mill, the workers who were in that hand mill in 1935 are a relatively old group as compared with the total working population, because a very high proportion of them were with you back in 1923, 1920, 1915.

Mr. HOOK. That's correct.

Mr. HINRICHS. When you come to open up a totally new employment opportunity as a business enterprise, you are not normally hiring a straight cross section of the working population. There, starting up a new enterprise, you are much more likely to be hiring younger workers. Isn't that true?

Mr. HOOK. No; that is not necessarily true, Mr. Hinrichs. Let me tell you just what did happen, because we don't need to theorize about it. The continuous rolling-mill process has eliminated the old back-breaking jobs so that in the plant now, the continuous mill, the fellow can work to an older age than he could under the old process because the old process was so hard, and I hope that I can persuade you to come out to Middletown and see this in operation; see the old with the new.

Mr. HINRICHS. I have seen them, but I recognize that fact. I also saw a mill in which a very high proportion of a high-school class had been hired. I wasn't theorizing when I spoke about the tendency of business, of a new enterprise, to hire younger workers. You will find, for example, if you take relatively new industries, as compared with relatively older industries, in the census figures, there is a very great difference between the average ages in the old industries and in the new industries. It may not be applicable to your particular situation, but it is not a theoretical situation; displacement in older plants tends to be of an older age group and hiring in new plants tends to be of a somewhat younger age group. The equivalents that you are setting up in this process of one worker here and one worker there is very often a problem of hiring a man of 45, or putting a man of 45 on the labor market again and hiring workers generally 25 to 45 years old (the preferential hiring ages) if you are looking forward to an establishment that you are going to have operating de novo from year to year.

Mr. HOOK. You are talking about two different things. For instance, you are talking on the one hand about a new enterprise, and what we are discussing here is the effect of a new process on those who were formerly operating and making the same product by another method. Now, they are two different things, and what I am saying to you is that this new process, having eliminated the old back-breaking jobs, has made it possible for these old men to work to a longer number of years in the plant than they could have under the old process.

Mr. PIKE. Still in the same enterprise.

Mr. HOOK. And still in the same enterprise.

The CHAIRMAN. Do you show that in your charts?

Mr. HOOK. Yes.

The CHAIRMAN. May I say, then, I must apologize to you, Mr. Hook, because last night you requested me to permit you to make your statement before the questioning, and I was the first to offend.

Representative WILLIAMS. I would like to ask a question before you leave that.

Mr. HOOK. I want to do everything I can to enlighten you.

Representative WILLIAMS. I see from your statement that the actual employment in the steel industry during the 10 years under consideration increased 177,000.

Mr. HOOK. It is 117,000, I think, Mr. Williams.

Senator KING. Was that for the whole steel industry?

Representative WILLIAMS. That was the whole industry, as I understand your statement.

Mr. HOOK. Of which we are a part—blast furnaces, steel works, and rolling mills.

Representative WILLIAMS. Of course, that is evidently not true as to other industries.

Mr. HOOK. I am only here giving you the facts with reference to the steel industry, but we have a chart at the end—by the way, we are using Department of Labor figures—which shows the results in manufacturing industries as a whole, and I think maybe we will answer the question that is in your mind, Mr. Williams, at that time.

Representative WILLIAMS. I wonder if you have the facts which would show the productivity of the industry during those 10 years, as compared with the number of increased employment. What is the relative improvement in productivity during that same period?

Mr. HOOK. We will show you that very clearly.

The CHAIRMAN. All right, then, Mr. Hook, we will allow you to proceed with your charts and we will try not to interrupt until you are finished.

Mr. HOOK. It is very difficult, I realize, to get a picture of this thing. I only wish I could get the whole committee to come out to Middletown, so you could study it for 2 or 3 days, and then I think we could make it very clear to you.

Senator KING. Mr. Hook, I was not quite clear from your statement, when you stated 117,000 persons were employed in the steel industry. Aren't there a lot more than that number employed?

Mr. HOOK. That is the increase, only the increase during that period, Senator.

OPERATION OF CONTINUOUS MILLS AT MIDDLETOWN

Mr. HOOK. Now, if you have a copy—I hope we had copies for you—of this diagram, because it is difficult eye strain for you to see it from here, but you can look at this and glance down at the diagram that is in front of you.

Dr. ANDERSON. These are to be exhibits in the record, or are these appended to the testimony?

The CHAIRMAN. Will you be good enough to see that each is properly numbered as Mr. Hook discusses it.

Mr. HOOK. I will try to the best of my ability to give you a picture of the chart.

Dr. ANDERSON. The exhibit number is 2453. If you can give it a name we can identify it as well.

Mr. HOOK. "Diagram of a complete rolling-mill plant producing sheets."

(The chart referred to was marked "Exhibit No. 2453" and is on file with the committee.)

Mr. HOOK. The object of this diagram is to show you a complete plant. This happens to be a diagram of the American Rolling Mill Co.'s Middletown, Ohio, plant showing the various departments of the plant, starting with ore and coal, right through to the finished product. And we have here a flap, because here is where the continuous mill was put in. In other words, the men who worked on the old hand mills, which are being displaced by the new continuous mill, worked in the section outlined on the chart in heavy ink, beginning with the third row of drawing. The men that worked in the blast furnaces made the pig iron that was taken to the open-hearth furnaces—we show eight open-hearth steel furnaces, where we take the

hot metal, mix it with scrap and limestone, and the product is a steel ingot. That steel ingot is taken and heated in what we call the soaking pits. In other words, the ingots are put in there to soak so that both the outside and the inside of the ingot have the same temperature. That is very important, because when the ingot comes from the open hearth over to the soaking pit, the inside of that ingot is probably in a molten state, and you see we have to let it soak so that the ingot is the same temperature all the way through.

Then that ingot is taken out of the soaking pits, and we will describe the old process first, and go through what we call the slab mill or the blooming mill. Under the old process we made a billet, we will say 8 by 8 or 6 by 6, depending on the size of the sheet bar we are going to make, and then that billet was taken and rolled through what we will call the bar mill, and when we got through we had, possibly, a sheet bar approximately 110 feet long, and ranging from, say, three-fourths or one-half inch thick up to maybe 1½ inches thick, depending upon the thickness of the sheet that you were going to roll out of it.

Well, then that long sheet bar—and we will say this is that long sheet bar—on emerging from the bar mill, was cut up into pieces. We call those the sheet bars for the sheet furnace. In other words, if we were going to roll a sheet 24 inches in width, we cut this bar 26 inches in length, because you have to allow for the scrap on both ends. When the sheet is sheared out you have a perfect pattern 24 inches in width.

Then those sheet bars—and you can remember that when I show you a picture here later—were put back and forth by hand through these old sheet mills. In this plant of the American Rolling Mill Co. at Middletown there were 22 units with 2 stands each; one is a roughing mill and one is the finishing mill. Lifting the pair into the pair-heating furnace, lifting them out, putting them on the floor plate in front of the roughing mill, swinging those bars over from the roughing mill to the finishing mill, and putting them through the mill, taking them off, putting them into the furnace, was all done by manual work, and some of those packs weighed 150 pounds. If you ever worked in a rolling mill you will know what that means.

The CHAIRMAN. This device that you are explaining, the old device, is not dissimilar to the mills by which copper wire is rolled, is that right?

Mr. HOOK. That is a different mill.

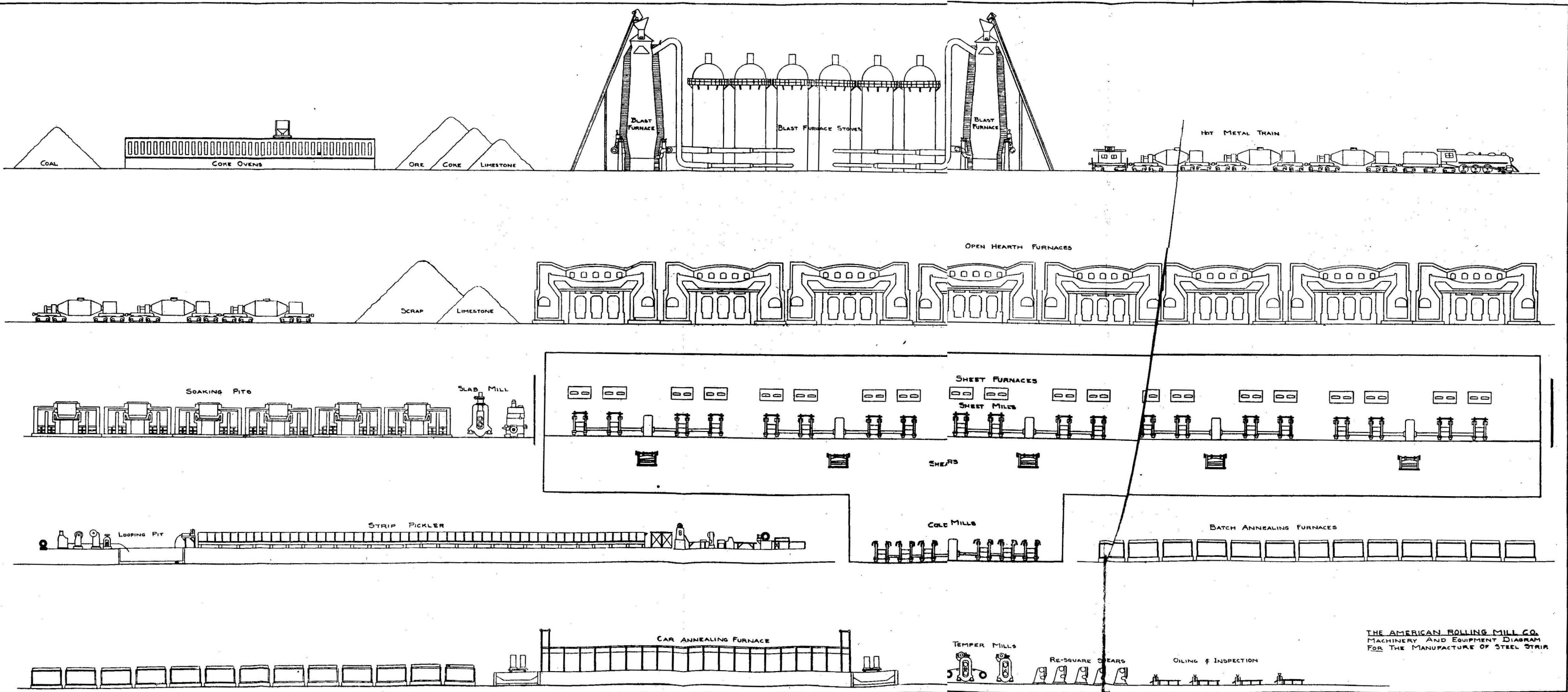
The CHAIRMAN. It is a different type, but I say it is not dissimilar. I have been in copper-wire factories out in Montana.

Mr. HOOK. The old rolling mills, where they rolled out copper sheets, are not dissimilar, because they had to make the slab and work from the slab and roll it through by hand just as we did sheets.

Then we took these short bars, as I said, and put them through these old sheet hand mills, and when we got through we had a number of sheets. We call that a steel sheet, the green steel sheet. That is finished to gage, to the thickness that you want, at this point.

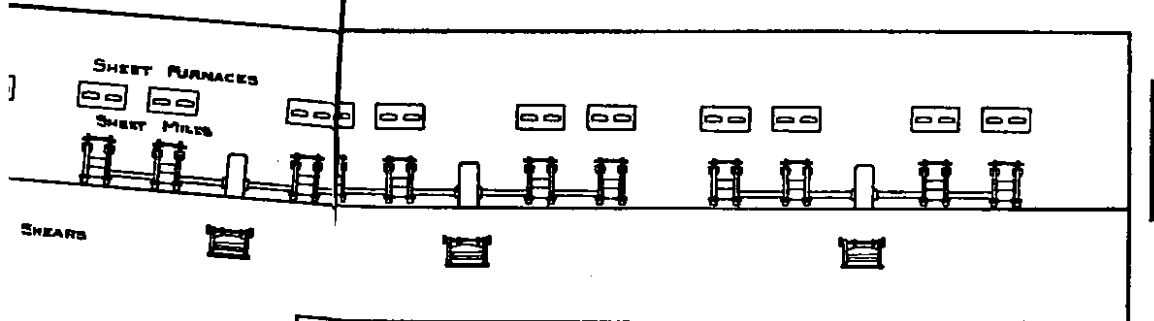
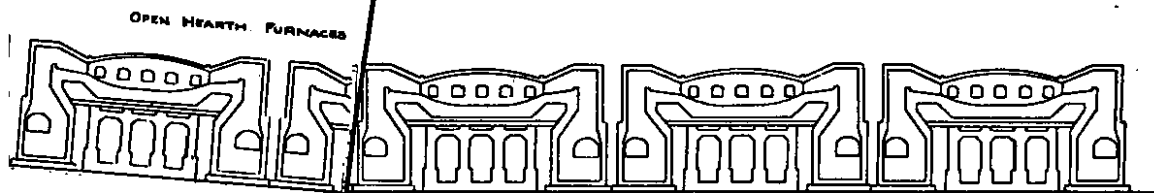
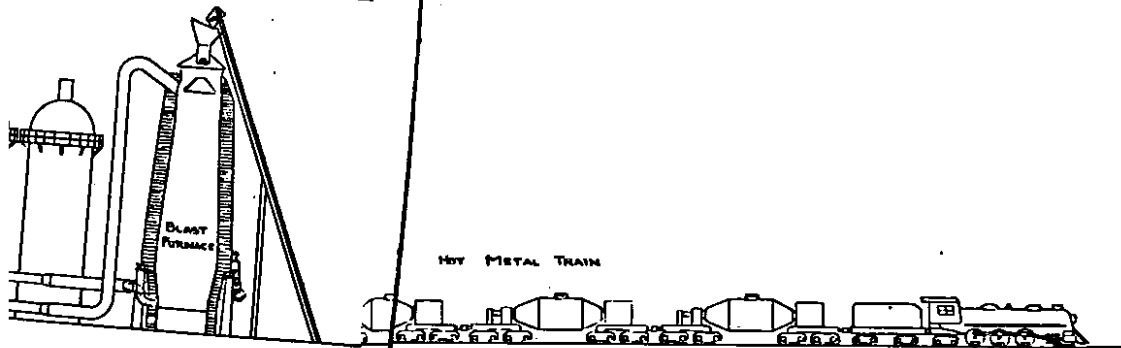
Then those sheets were taken and put through what we call two-high cold mills, simply to flatten them and give them temper. Then they were put into annealing furnaces to anneal them, or to bring the structure back to a proper state so that they can be worked, but

EXHIBIT No. 2454
 [Submitted by the American Rolling Mill Co.]
 Diagram of a complete Old Style Hand Mill producing sheets



THE AMERICAN ROLLING MILL CO.
 MACHINERY AND EQUIPMENT DIAGRAM
 FOR THE MANUFACTURE OF STEEL STRIP

J
boots



THE AMERICAN ROLLING MILL CO.
MACHINERY AND EQUIPMENT DIAGRAM
FOR THE MANUFACTURE OF STEEL STRIP

before they went in there they went through batch picklers. This chart shows the continuous mill area for pickling, but in the old process, with these 22 mills, this area took a smaller space. This is the space that the new mill takes, and this represents approximately the area we needed for annealing under the old process. This is the area that we anneal in in the continuous process, so that under the continuous process a large number of men were increased in this area here, here, and here, to the finished product.

Now, that is the old process.

Now, I want to show you that the new process affects directly only the men who were employed in the area marked out in the chart with a heavy black line.

Because some people might get an idea that this new continuous process affected the workers all over, and it was only in that rolling-mill department—

The CHAIRMAN (interposing). In order that this may be understandable in the record, I think we ought to give this slip sheet another exhibit number.

(The addition to the chart referred to was marked "Exhibit No. 2454" and faces p. 16401.)

Mr. Hook. Now, in the continuous process, we use the slabbing mill just the same, but, of course, the whole bar mill is cut out. There were very few men on that. And we start with a slab which comes through the slab-heating furnace and then it goes through without stop, right through this series of mills in Exhibit No. 2454, say; 12 four-high continuous mills, or 3 or 4 two-high, and the balance four-high, and emerges at the end, maybe 1,200 feet long, rolled up like a big roll of paper. And then that is taken, if it is to be further reduced for certain purposes, to what we call the cold-strip mill, and in some instances we take the 0.109 thickness sheet and reduce it cold, without any heating at all, in those 3 stands of mills.

Of course, that is a continuous process, whereas before you had these 22, which meant 44 distinct groups of mills, and here you have one continuous plant that does all this work and makes, oh, in that particular plant at least 3 times the tonnage that the old plant made on those 22 hand mills.

This was presented simply to give you a picture of the fact that this continuous mill only went into part of the plant, and only affected men in part of the plant.

Now, this pictures the old mill. This is what we call a roughing mill. The man put the bar into the mill and when he got through, he swung around to this mill. It was put in the furnace and heated, and here is the roller putting the pack through the old-style mill by hand. There is the hot pack on the next mill, lying on the legs ready to be taken off by the heater.

Mr. Hook. This shows the back side of the mill, with the man who had to catch the pack when it came through, raise it up, push it over to the other side, so the fellow on the other side could catch it, as this other photo shows. So you can see the kind of back-breaking work that they had.

Dr. ANDERSON. That man on the catching, what is he technically called?

Mr. Hook. Catcher, in the old mills

Now, here is a picture showing you the hot-strip mill. It shows 1, 2, 3, and 4 stands, but there are 8 others down through the plant that you can't see.

Mr. Hook. This is the cold-strip mill where I told you we would take a 12-gage sheet in a coil—see how it is rolled up there like a big roll of paper—and start it in one side and bring it out the other, a highly finished 22-gage sheet.

(The photographs referred to were marked "Exhibits Nos. 2455 to 2459" and are on file with the committee.)

Mr. Hook. The table entitled "Continuous Sheet and Wide Strip Mill Installations" is simply to show you the 27 installations and when they were put into operation; the American Rolling Mill Co. is the first one in 1924, and next is the plant of the American Rolling Mill Co., at Butler, Pa. The middle column of figures gives the size, that is, the length of the rolls. The size of sheet that you roll on those mills on those length rolls would be approximately 6 inches narrower than that length.

The last column shows the annual capacity figures, the average gross tons that those mills would probably produce.

(The table referred to was marked "Exhibit No. 2460" and is included in the appendix on p. 17326.)

Mr. Hook. The purpose of the table entitled "Estimate of number of hand workers employed in industry in hand-mill processes, including preparatory, rolling, and shearing operations" is simply to reiterate what we said in the statement, that in 1926 there were 1,264 of those old-style mills, and those 1,264 made a production of 6,327,874 tons, with 165 tons per worker on sheets and 125 on black plate, black plate being what we use for tin plate and products of that kind. The number of workers required to operate the 1,264 mills was 42,405.

(The table referred to was marked "Exhibit No. 2461" and is included in the appendix on p. 17326.)

The CHAIRMAN. That is an estimate, you say, Mr. Hook?

Mr. Hook. That is pretty accurate, because it is taken from a figure from our own records of what the men actually produced per man.

In 1940 there were 750 of these mills still in existence.

The CHAIRMAN. Let me interrupt again. You speak about the estimated number of workers. That also comes from your own records?

Mr. Hook. Yes, sir; and checked with other plants. Where do you get that, Mr. Brooks?

Mr. EARL BROOKS (statistician, American Rolling Mill Co). You have reference to those in 1926.

The CHAIRMAN. That is right.

Mr. BROOKS. Those in 1926 are derived by dividing our average production per worker in those units into the total production for the industry.

The CHAIRMAN. Then the figure is derived by a computation.

Mr. BROOKS. That is right.

The CHAIRMAN. And not by a pay-roll check.

Mr. BROOKS. That is true. Through the integration of producing facilities in the steel industry, so far as I know there is no separation of employment by department.

The CHAIRMAN. How do you determine the average production per man?

Mr. HOOK. That was from our own actual records of what the men in the mill produced at that time per annum.

The figure could vary very little from that.

The CHAIRMAN. In other words, we can accept that as substantially accurate.

Mr. HOOK. It is substantially accurate, as accurate as it can be figured. If you take 2,000 off, it wouldn't amount to much.

Mr. HINRICHS. Going back to your first diagram, this 165 gross tons, this picks the steel up in the sheet furnaces—is that right—and carries it forward.

Mr. HOOK. That is where it is produced, yes.

Mr. HINRICHS. So that you got—

DISPLACEMENT OF LABOR

Mr. HOOK (interposing). On that first, that is it. On all the mills of that type in the country, in that department, 42,405 men were required, or were at work at that time in 1926. In 1940, as I say, there are 750 still listed. Approximately half of those mills are still in operation. For instance, on the diagram which you have in front of you, we show the continuous mill displacing the old-style mills, but that actually hasn't happened. We still have in that Middletown plant about 500 men at work on the old-style mills. Part of the work is done on the continuous mills and finished on the old-style mill, because there are certain products which we have not yet been able to make finally on the continuous mill; that is, on the cold reduction mill, and that is true in another plant of ours at Zanesville, Ohio, where the old process, with some improvements in the way of tables and automatic catchers at the back of the mill—is operating pretty much as it did in 1928. It is hand work. So all together, we have over a thousand men in all our plants in the American Rolling Mill Co. I can give you the exact figure. It is over a thousand men still working on old hand mills, 1,036, Mr. Brooks says.

Now, then, assuming, and this is estimating from the number of mills that are still actually operating, we estimate that 27,405—no, 15,000 are still employed in old-style mills, so that the total displacement could not have been more than 27,405. You see, if all those other men have been displaced—

Mr. HINRICHS. (interposing). You speak of those things in operation. This last year has been, in the last months, rather exceptionally active. Are these roughly half, say, 375 hand mills, operating more or less continuously or are these essentially, in large part, stand-by equipment that comes in at a very busy season?

Mr. HOOK. The half, I think, are operating regularly, not just stand-by. You see, there are a number of companies that have no continuous mills at all, that are still operating; for instance, right near us, the Newport Rolling Mill Co. has 22, I think, or 26 old-style mills that are still operating.

Mr. HINRICHS. Some of those mills in the beginning of 1939 were closed down pretty tight, weren't they?

Mr. HOOK. Not the half that I am talking about. Half of the 705, and I should say that of course I haven't the record, but I think

that a number of the half that we are admitting that are closed down permanently, were operating in the last half of 1939. In other words, some of the plants who have the continuous mill process weren't able to make all the tonnage that they had orders for on their continuous mills, and they supplemented them with their old hand mills that had been shut down for several years.

Mr. HINRICHS. If you see an assured tonnage of that sort ahead, you build the necessary continuous mills and close down the substantial portion of the balance, don't you? Technically, it is only a limited field that these hand mills that are operating would hold in the industry.

Mr. HOOK. I am perfectly willing to say to you, Mr. Hinrichs, that I think eventually all of the hand mills will go out of existence, because it is not the economical method to use. When we find out how to make these certain products which we still have to make, at least partially, on the old hand mills, and we are hard at work on that, the old hand mill will go out of existence, and it will all be made on the continuous mills. As I say, this was simply to show the general statement that the number of men that were said to have been displaced could not have been.

The CHAIRMAN. I am interested in knowing, Mr. Hook, if you have the figures, which perhaps you have later, how many have been actually displaced.

Mr. HOOK. They haven't. We have increased—

The CHAIRMAN (interposing). You say 27,000 could have been displaced. That is the maximum that could have been displaced.

Mr. HOOK. That's right, to date.

The CHAIRMAN. What has been the actual displacement in that particular department?

Mr. HOOK. It has been increased.

The CHAIRMAN. In that department that we are talking about?

Mr. HOOK. Well, not in that department, but I mean for that operation, the total number of men that are employed in reducing the slab or the billet down to the sheet has been increased.

The CHAIRMAN. You mean—I am not sure I understand yet what you mean by that. I had in mind that there was a displacement so far as that particular work is concerned, within the sheet that we had here, the operations within this sheet.

Mr. HOOK. No.

The CHAIRMAN. The continuous rolling process?

Mr. HOOK. That's right. I don't know just what it is. Have you got that figure? I think we have the Middletown plant. We can show it to you exactly. The fact of the matter is—

The CHAIRMAN (interposing). I got the impression from what has been said here that there was a decrease in the number of employees within that particular area.

Mr. HOOK. In that particular department. I think that is true. I don't know that we have got the exact figures.

Mr. BROOKS. It is very difficult to work up any figures showing the exact amount of displacement which could be applied to any one mill; in other words, the size of the mill, the lay-out of the mill, and certain variations in producing methods might influence that. Also, the size of the hot mill unit replaced would influence it. I can give you a case example, using this Middletown plant, in rough figures.

There were roughly about 1,075 men employed in the area outlined there prior to the adoption of the continuous mill. There are roughly 250 operating men left in that particular area on the mills themselves, doing actual operating work. There are other maintenance men, of course, in addition to the 250.

Mr. HOOK. Well, that is just in the old-style hand mill. There are 500 men in that department still.

Mr. BROOKS. That's right.

Mr. HOOK. In 1929, as I recollect it, the total employment in that particular department was 1,191.

Mr. BROOKS. Discounting the fact that part of those mills are still operating, those two figures would be the relative forces required.

Mr. HOOK. But some of those men have gone over to the strip mill, so that the total number of men in that particular plant in the old department, plus the continuous mill, probably, how many are in the strip mill?

Mr. BROOKS. That is 250 on the hot and cold strip mill.

Mr. HOOK. Well, on the hot mill.

Mr. BROOKS. I don't believe I can tell you off-hand.

Mr. HOOK. You haven't got it. We give you all those figures broken down, but we are going to give you the plant now as a whole. That is what you are interested in, to know whether those men were taken care of in other departments.

Mr. HINRICHS. Was the capacity of the cold sheet mills the same as the capacity of the hot strip mill?

Mr. HOOK. Oh, my, no. Well, I think you didn't catch that. We made 20,000 tons a month on the 22 old hand mills, in a pretty good month, and we made on the hot strip mill as much as 64,000 tons in one month.

Mr. HINRICHS. So that in terms of the relationships of capacity and labor, in that limited segment, the relationship is roughly 1,075 men who could produce 20,000 tons and 250 men who can produce 64,000 tons.

(Representative Williams assumed the chair.)

PRODUCTION IN AMERICAN ROLLING MILL CO.

Mr. HOOK. Pardon me; I think you will see that when we come along, because we give you the output per man-hour, the change in the output per man-hour, which is the thing you are trying to get at.

Now, in the table entitled "Armco Production" is shown the total production of what we call the parent company. That is all of our plants. In 1926 the total production was 431,347 tons; in 1937, 1,203,736 tons, or an increase of 179 percent between 1926 and 1937.

(The table referred to was marked "Exhibit No. 2462" and is included in the appendix on p. 17327.)

Mr. HOOK. In sheets alone we produced in 1926, 428,996 tons, which represented 99.3 percent of the total production of that plant.

In 1937 we had 1,203,736 tons, of which 1,110,414 were sheets. In other words, 92.2 percent of the total production was sheets. The reason we present that picture to you is to show you that the American Rolling Mill Co. is essentially and completely a sheet-producing plant. In other words, there are not a lot of other things involved in these figures with respect to the American Rolling Mill Co., and

this continuous process has to do with the manufacture of sheets and strips only.

Now here we have taken out our Butler, Pa., plant, just to be sure that our figures are very conservative and comparable, covering the same plants. In 1926 we had 431,347 tons and 99 percent was sheets. Now, we took out the Butler plant because it is a continuous mill plant, to throw back the picture into the old parent company; this Butler plant we bought in 1927, so we have thrown it out, so that our figures would be comparable, and even after throwing it out it still shows that 94.8 percent of our total production was sheets, and the increase in tonnage, of course, went from 428,996 to 847,753 in '37, a 97.6 percent increase in those plants that we owned before we took over Butler.

Mr. HINRICHS. I was wondering why the base period of comparison with 1926 was used throughout here; 1937 was a year of very exceptional activity.

Mr. HOOK. Correct.

Mr. HINRICHS. 1926 was more nearly average.

Mr. HOOK. There was only one continuous mill operating at that time, and that was the American Rolling Mill Co.'s mill at Ashland, Ky., and all these other mills have come in since that time.

Mr. Brooks calls my attention to the fact, and we will show it on another chart later on, that the ingot production in these 2 years was approximately the same—70 percent of capacity.

Mr. HOOK. Now the table entitled "Distribution of Armco Sheet Shipments Between Continuous and Hand Mills" is interesting, to show distribution of our shipments as between the hand mills and the continuous mills.

(The table referred to was marked "Exhibit No. 2463" and is included in the appendix on p. 17327.)

Mr. HOOK. In 1926, 64.1 percent of the production was rolled on the old hand mills, whereas in 1937, only 28.2 percent was rolled on the old hand mills. Rolled on the continuous mills, in 1926, 35.9 percent; in 1937, 71.8 percent of the production of Armco.

Mr. PIKE. But you still rolled in '37 more actual tonnage on your hand mills than you did in '26.

Mr. HOOK. Exactly.

Now, to show that this displacement is going on very gradually, in any event particularly in our plant, remember that we are entirely a sheet plant, but all of that 313,136 tons was partially rolled on the continuous mill. The old bar mill is completely eliminated, but even with that, you see, we made more tonnage on the old hand mills than we did in 1926.

Mr. HINRICHS. Finished more, or made more?

Mr. HOOK. We produced more of these green sheets that I was telling you about. In that year we made 274,835 tons and here we made 313,136. That is the finished sheet.

Mr. HINRICHS. What about 1939? Would that show the same sort of picture?

Mr. HOOK. In 1939 I think the figure would be approximately the same.

Mr. Brooks. It would be slightly lower, because our total tonnage was lower.

Mr. HOOK. We can give you all that, but I hope you will come out and spend several days there.

Mr. HENRICHS. I shall.

Mr. HOOK. Of course we are talking about employment, and all these things have an effect on the employment. This table, "Armco Parent Company Employment, Average Number of Employees," shows the American Rolling Mill Co. employment. The total employment in 1926 was 6,876; in 1937 it was 13,253, or an increase of 92.7 percent. But again we take out the Butler plant, because you may say it is not fair to include it because that is an entirely new acquisition, so that we go right back to the old company basis, and we have a 51.5 percent increase in the average number of employees for '37 over '26.

(The table referred to was marked "Exhibit No. 2464," and is included in the appendix on p. 17327.)

Mr. HOOK. I think, Mr. Williams, that begins to answer some of the questions that were in your mind.

EMPLOYMENT AND EARNINGS

Mr. HOOK. Now let's see what happened to employment, wages, and hours, in this table "Employment Wages, Hours, and Production, Armco Middletown Plant."

(The table referred to was marked "Exhibit No. 2465," and is included in the appendix on p. 17328.)

Mr. HOOK. This is a rather interesting story, we think. In 1926, the average number of employees at this Middletown plant that produced nothing but sheets, and by the old hand method, was 3,278. In 1937 it was 4,327, or an increase of 32 percent.

Pay roll (wages only)—that is, those who are paid on an hourly basis—in '26 was \$5,125,208; in 1937, \$7,234,256, or an increase of 41.2 percent.

Shipments, 221,382 net tons in 1926; in '37, 403,805, or an increase of 82.4 percent.

Now the question comes to your mind, and I had better answer it before you ask me, "Well now, is that a fair indication of what happened in the industry?" I have to make an admission which we don't like to, and say we did not keep up with the industry, but as compared with that particular plant the increase of the industry was greater than ours. The increase in industry was 82 percent, sheets only.

The man-hours: in 1926, 32.5; in 1937, 19.1, or a reduction in man-hours per net ton of 41.2 percent. Of course we couldn't have got the reduction in price if we couldn't have decreased the cost, which you will see later.

Wage cost per net ton is \$23.15; in 1937, \$17.92, or a reduction of 22.6 percent.

Now let's see what happened to earnings of these men. The minimum wage rate in 1928 was 37 cents, in '37, 62½ cents, or a 68.9 percent increase. The average earnings per hour was 69.8 cents in '26, and 93.6 cents in 1937, or an increase of 34 percent.

I was rather interested in the question that was asked Mr. Ford yesterday (it hasn't anything to do with this) whether, as they had

increased the parts that went into the car, the average skill required was lowered or increased.

Well, the introduction of the continuous mill has increased skilled labor. In other words, there is a greater need for men of increased skill, because we are dealing, for instance, on these continuous strip mills, with measurements of split thousandths. When I was out in the mills as a worker, we thought a one-sixty-fourth fit was pretty good.

Mr. HINRICHS. Your skilled workers in your old mills were your rollers, were they not.

Mr. HOOK. Yes; your roller and your heater were the two men particularly skilled. The other fellows—well, we called them skilled, but it was largely knack. You got into the swing of things, but the roller was really a skilled man.

Mr. HINRICHS. How many rollers would you have had in this layout?

Mr. HOOK. Three times 22.

Mr. HINRICHS. So you would have 66 rollers.

Mr. HOOK. Yes.

Mr. HINRICHS. And at the present time, how many rollers—

Mr. HOOK (interposing). We have 27 at Middletown, in the old plant.

Mr. HINRICHS. But in the new plant, how many men do you have to correspond to your own rollers?

Mr. HOOK. Well, you have a very highly technically developed general foreman, and assistants under him, and your maintenance men have to be more skilled, and then you have your men all along the line, the roll setters and men that do the various jobs. You have an average skill in the continuous mill which is higher than the average skill in the old-style mill.

Mr. HINRICHS. That is, such skilled men as you have that take the place of these 66, have a higher skill now, on the average, than those 66 rollers?

Mr. HOOK. Well, no; I wouldn't say of those 66 rollers, because they were very skilled men. That was a real job.

Mr. HINRICHS. How many men do you have in this mill here [exhibit 2453] who are highly skilled workers? There were 66 rollers in the old process who were a highly skilled group. How many people correspond to them in the new continuous mill?

Mr. HOOK. Every man in that continuous mill is a skilled worker now. I would have to have the force report here, and again, if you come out, we will show you those fellows at work, and then you can see, get this picture.

Acting Chairman WILLIAMS. Is that average earning per hour, shown at 34 percent, largely due to the increased number of skilled workmen that you have acquired on account of this new process?

Mr. HOOK. That has had an influence. That isn't entirely the case; for instance, when we went to the shorter workweek, we increased the average rate per hour, of course, to take care of that change over, but in part, it is due to a higher average skill.

Mr. Brooks calls my attention to the fact that under the old operation we couldn't have sustained, wouldn't have stood for a labor cost of that kind. We couldn't have got enough for the sheets.

Mr. HINRICHS. Part of that increase in average hourly earnings represents a decrease in the proportion of common laborers in your force at the present time, doesn't it?

Mr. HOOK. Oh, the common laborer in the mill today is almost eliminated. It is a very small proportion, and when I was in the mill, it was a very large proportion.

Mr. HINRICHS. A third to two-fifths?

Mr. HOOK. I would hate to make an estimate. I would be guessing at it, but we could get that together.

Mr. HINRICHS. But it was very high, and now it is virtually limited?

Mr. HOOK. Years ago it was a very large proportion of the men.

Mr. HINRICHS. Even in 1926?

Mr. HOOK. Of course, by that time, the number of what we call common laborers had been reduced, but proportionately in '26, it was very much higher than, of course, it is in '37 and today.

We have shown a reduction of 21.8 percent in the average hours per week. The average earnings per week have increased from \$32.32 in 1926 to \$33.88 in '37, or an increase of 3.8 percent. And if we adjust for the difference in the cost of living to get real earnings, the real earnings in 1937 were \$38.28 as compared with \$30.99, or an increase of 23½ percent.

Now I think we all agree—and I know you do, of course—that what a man is interested in is, "What can I buy with a day's work?" That is the figure that really counts with him. It isn't the wage rate, necessarily, because it doesn't do a man any good to jump from \$5 a day to \$10 a day if he can't buy more of the things that he wants to buy and use with the \$10 than he could get with the \$5.

ANNUAL EARNINGS OF ARMCO WORKERS

Mr. HINRICHS. He is also interested in what he can buy in the year. What about the regularity of employment?

Mr. HOOK. I am glad you asked me that question. In other words, what was the annual earning of these men? We will give you that. These are our figures, actual.

The actual average earning of all the men who worked for wages in 1926 was \$1,685, and for the industry, \$1,627. In 1929, our figure was \$1,605; in the industry, \$1,746. Rather interesting there. We had a drop, and the industry went up.

In 1937, ours was \$1,766; the industry, \$1,630. In 1938, ours was \$1,398; the industry, \$1,203. In 1939, ours was \$1,893, so you can see the advance in annual earnings, and we had made no adjustment, for instance, for 1939, for the difference in cost of living. That would go over \$1,900, of course, well over that.

Dr. ANDERSON. I would like to have you supply, for the average annual earning of \$1,983 in 1939, the average number of employees that received that wage.

Mr. BROOKS. That is a total company figure. There was an average of 9,742.

Mr. HINRICHS. That would compare with 4,327 in 1937.

Mr. HOOK. That was a single plant.

Dr. ANDERSON. Let's have something that corresponds to the table. What was the average for the Middletown plant at that same time?

Mr. BROOKS. The average for that rate was 3,335. Now those employment figures up above include salary as well as hourly labor.

Dr. ANDERSON. That is total employment in the plant?

Mr. HOOK. That is total employment, but the figures from there on down are all wages.

Dr. ANDERSON. What if you squeezed out the salaried group there? What would you have, so as to make it comparable?

Mr. BROOKS. You would have roughly, I would say, about 3,025 in 1926, and in 1937, roughly 4,000. That may not be exact.

Dr. ANDERSON. Would the figure you gave me, 3,335, be correct for 1939?

Mr. BROOKS. That is correct.

Dr. ANDERSON. In other words, a reduction of approximately 700 men. This gain was made in average annual earnings from \$1,766 to \$1,893. The difference was a gain made at the expense of 700 workers?

Mr. HOOK. No; you are dealing with averages. That is not the case, Mr. Anderson. For instance, the first three quarters of 1939—it wasn't until the first of September that we got on that high operating rate in 1939, and the average number of workers was reduced as a result of not having as high employment in those periods when we weren't working at the same high rate. The 1937 average rate was higher.

Dr. ANDERSON. What you are saying is that you can't compare annual earnings here, on any basis such as we have just discussed, with the average number of employees for the years indicated.

Mr. HOOK. The fact of the matter is that the number of men who worked actually got a certain total pay roll, and if you divide that total number of men who worked into your total pay roll, you get the dollars that they earned.

Dr. ANDERSON. The point I was trying to make was whether there was a difference in the number of men who worked and enjoyed this better circumstance in terms of an annual wage in 1 year as compared with another.

Mr. HOOK. Well, we will furnish you with the exact figures.

Mr. BROOKS. At the end of 1939 there were approximately 4,000 people working in that plant, total employment.

Dr. ANDERSON. Of course year-end figures wouldn't suit the purpose either, would they?

Mr. BROOKS. Not for the determination of an annual wage, they would not.

Mr. HINRICHS. As to the method of computing that annual wage, you have divided pay roll by a certain number of employees in arriving at it, is that correct?

Mr. HOOK. That is right.

Mr. HINRICHS. And what is the average number of employees that you have taken?

Mr. BROOKS. It is the average of the day-to-day employment in that plant.

Mr. HINRICHS. That means in effect, then, that this average pay roll that you have is the amount which would be earned by a man who worked 365 days of the year, minus Saturdays and Sundays. Is that correct?

Mr. BROOKS. No; that is not correct. It is simply the total wages divided by the average number of workers employed in the plant throughout the entire year.

Mr. HINRICHS. I think you will find, if you check the arithmetic and logic of the thing, that that is effectively the amount which would be earned by a man who worked full time. Just by way of illustration, I recognize the fact that the figures are not strictly comparable and I may have made a mistake in arithmetic, but multiplying the figure of \$33.88 by 52 weeks, my rough calculation is \$1,762 as against your figure of \$1,766. So that these average earnings that you are giving are full-time earnings, and irregularity of employment—

Mr. BROOKS (interposing). No; the full-time week is 40 hours per week.

Mr. HINRICHS. Yes.

Mr. BROOKS. And we only average 36.2. In other words, we did not average in that plant the full-time hours per week in the industry.

Mr. HINRICHS. You corrected me at one point. It is not full-time in the sense that it is 52 weeks, of 40 hours each.

Mr. BROOKS. That is correct.

Mr. HINRICHS. But it is 52 weeks of work times the average number of hours per week worked by the people in your plant.

Mr. BROOKS. That is right.

Mr. HINRICHS. Now, that does not give the annual earnings, say, of a group of workers who have an irregular employment opportunity, to the extent that there is employment for 2 or 3 months and then no employment. That fluctuating employment has not entered into your average.

Mr. BROOKS. That has entered in. That may represent the average wage of men who worked any place from a week up to the full year. It may range from your minimum wage right up to \$2.50 to \$3 an hour. It is the composite of the entire plant and all the people who worked in it.

Mr. HINRICHS. On an essentially full-time basis.

Mr. BROOKS. Yes; 36.2 hours per week.

Mr. HOOK. When we are talking about the question of displacement of workers, we have got to take into consideration the number of men that were employed in the manufacture and the installation, the building of the plant, and the installation of the machinery. Now this table, entitled "Expenditures for Construction, Armco Middletown Plant," is an exact figure at this Middletown plant. Between '27 and '37, when we introduced the continuous mill in that plant we spent \$20,492,778 actually. In other words, we estimate that the man-years of employment amounted to 9,000, or we employed during that time an average of 819 men at full time at approximately \$7 a day. You have got to take that into consideration when you are talking about displacement, and, by the way, we did use on that construction a number of the men who had formerly worked in the mill when we were running the old style full time.

(The table referred to was marked "Exhibit No. 2466" and is included in the appendix on p. 17328.)

Mr. HINRICHS. Were those \$20,000,000 spent year by year, or did the bulk of it come in a limited period?

Mr. Hook. The bulk of it came from 1928. Just last year we spent \$3,500,000 of it. No; not of that \$20,000,000, but we did spend that in improving that plant which doesn't show here—\$3,500,000. Between '27 and '37—maybe we have got the figures here to give you, just how it was spent.

In the years '27 to '28, inclusive, there were \$8,059,950; in '29, \$1,512,668; and '30, \$1,050,000; '31, \$280,000; '32, \$210,000; '33, \$341,000; 1934, \$240,000; 1935, \$5,427,094; 1936, \$471,000; 1937, \$1,834,066. And, of course, when you order machinery, the machinery manufacturers start back, and they are ordering supplies, and it follows through quite a period of time before you pay the bill.

Mr. HENRICHS. That, of course, is an extremely important source of employment and we on this committee have been very much interested in the role that construction expenditures and capital expenditures have played in the maintenance of the level of business activity. But essentially those expenditures, as I listened to them, were made in 2, or possibly 3, years. The first figure that I recall is a figure of roughly \$9,500,000, I believe; then a figure of \$5,400,000; and then a figure of something over \$1,000,000. The employment that was created by this activity was a concentrated employment that occurred in those years. From our point of view, looking at the economy as a whole, it is a very important source of employment if it is continuous, if in 1 year it is being done in Armco, and in another year it is being done in another company, and so forth.

It isn't that 819 would not be comparable to the figure of 1,075 men in your hand mills. Those 1,075, barring business fluctuations, are employed more or less continuously. Those 9,000 people work roughly a year or two, or at the most 3 years, on an extensive basis. At that time the employment was even greater than 9,000. At other times Armco's activities—there is no criticism implied—were not giving rise to the employment of these particular individuals. They couldn't.

Mr. Hook. Of course, you are correct to a very large extent, but this shows when we paid the bills. Now, as you know, lots of times you wait until the installation was complete, you hold back a certain amount. It has been going on more gradually than your expenditure shows. For instance, in 1935, the order was probably given for a lot of it a year before, and the work in those equipment plants was going on, and finally concentrated with a lot of bills very suddenly. If you ask our treasurer, he will tell you about it.

(Senator O'Mahoney resumed the chair.)

Mr. Hook. This table entitled "Armco Average Iron and Steel Sheet Selling Prices," is interesting only in one respect. Of course, I discussed the question of price before this committee last November, and these same figures were presented to you, except we didn't have the 1939 figures at that time, naturally. And it is simply presented here to show that, starting back when the first continuous mill was in operation, you see the big jump in the average realized price that we received for all the sheets—what we received for what we shipped. In 1923 it was \$100.15, going right on down, of course, in that very depressed period of 1933, and before we had that big increase in wage costs, it got down to approximately \$46; in 1937, \$64.50; in 1939, \$57.31.

(The table referred to was marked "Exhibit No. 2467" and is included in the appendix on p. 17328.)

Mr. HOOK. That very great reduction in the price of the product, of course, encouraged the use, and is responsible to some extent—we don't claim it all—for the increased production which we showed you before in our Middletown sheet-production plant; is responsible for helping to increase the production which we sold, which meant more employment for the men in the mills.

CHANGE IN QUALITY OF STEEL

Mr. HOOK. In addition to the fact that we gave them the sheet at a very much lower price, the interesting thing is the difference in quality. For instance, I have here, and I can pick it up with one hand, the old Ford fender. Mr. Chairman, when I started—

The CHAIRMAN (interposing). It is interesting how much of this testimony revolves around Ford and the Ford car.

Mr. HOOK. It does, doesn't it?

The CHAIRMAN. Of course, Mr. Ford was the pioneer in the mass-production field.

Mr. HOOK. Well, in 1911 and 1912, we started to make what we called a high-finish sheet, and when we look at our present-day sheet, it was a pretty rough piece of work. I traveled to Detroit a great deal during those days trying to help find out what we had to do to a sheet to make it useful. We put as high as 16 and 17 coats of paint on that sheet in those early days.

This is the model T Ford fender. I don't know how many coats that has on there, but if you could look at that sheet you could see right through the paint how imperfect the surface was. Then look at this big sheet I am going to show you now, which is a modern Buick fender sheet. This sheet sold in 1923 for \$135 a ton, and for that sheet last year the market price, if they got the market price—they didn't always get it, as you know—was \$62 a ton.

The CHAIRMAN. How much larger is that sheet than this?

Mr. HOOK. This fender is made up of two pieces.

The CHAIRMAN. But the prices that you are quoting are per-ton prices.

Mr. HOOK. That is correct.

The CHAIRMAN. This modern \$62-a-ton sheet is how much better than the old sheet?

Mr. HOOK. Well, Senator, there wasn't any process that the steel industry knew anything about, under the old hand-mill process, by which we could produce a sheet to make that part. That is stamped out of one piece, in one operation. I can pick the Ford fender up and run all over with it. I can't do it with the new one.

In other words, if we had attempted to make one like the Buick fender in the day of the old one, I don't know whether, because I am neither a pressman nor an automobile producer, they could have done it, even if they had tried six or seven parts.

The CHAIRMAN. How many parts are in the old one?

Mr. HOOK. Two in this, and you can see what it is. That is the Ford.

Now, over here I have an old Dodge fender. I could pick this up and run away with it, too. You can see from there, I think, the weld. That is probably a repair, but right here is where they were joined. Even that fender had to be made out of two pieces, and I don't know whether you can see this bulge, Senator, but right here there is a kind of bulge which was put into the fender to give it strength, and when I was out in the mill trying to develop this better sheet we ran into trouble. We used to call it "corn meal" structure. In other words, we just couldn't get a surface fine enough, smooth enough, so that the imperfections wouldn't show through on three or four operations. We just couldn't have put only two coats of Duco on this sheet. You wouldn't have had it. Nobody would have run the car. It was a horrible mess.

The CHAIRMAN. This is most interesting testimony, and it is obvious that we are not going to be able to finish in any reasonable time now, so if there is no objection I think the committee may recess until 2:15 o'clock, and if you will be good enough to come back this afternoon we will proceed.

Mr. HOOK. I am delighted. I am at your service.

The CHAIRMAN. If there is no objection, the committee will stand in recess until 2:15.

(Whereupon, at 12:15 o'clock, a recess was taken until 2:15 p. m. of the same day.)

AFTERNOON SESSION

The hearing was resumed at 2:35 o'clock, upon the expiration of the recess, Senator O'Mahoney presiding.

The CHAIRMAN. The committee will please come to order. You may proceed, Mr. Hook.

Just before we recessed, Mr. Hook, you were illustrating the two fenders. One was the old Ford fender. What was the price per ton of that sheet of steel? I have forgotten what price you gave.

Mr. HOOK. Back in 1923, before the continuous mill came into existence, that sheet sold for \$135 a ton.

The CHAIRMAN. And the present price for the other sheet is \$60 a ton?

Mr. HOOK. \$62.

The CHAIRMAN. Do you know how much steel is now used in fenders as compared with the amount in 1923?

Mr. HOOK. Well, I can't answer that exactly, Senator. If you look at that old fender there, and look at this one, you have to make the best estimate you can. I haven't the relative weights.

The CHAIRMAN. The reason I asked the question is, this noon I happened to meet Mr. Kettering, and told him of your interesting testimony this morning, and he said, as I recall it, that in his opinion the automobiles now use at least twice as much steel as they did in 1923.

Mr. HOOK. I think that is probably true. We figure about 1,400 pounds. We have a chart showing that for the automobile industry, but it does not show the weight for the car. We have that at home; I'm sorry. I tried to think of all the things you might ask for.

The CHAIRMAN. Oh, yes; that is impossible.

Mr. HOOK. I will be delighted to send that to you, because we have got it.

DECLINE IN SHEET STEEL PRICES

Dr. ANDERSON. Mr. Hook, I wanted to ask you a question while we are on this topic of the decline of iron and steel selling prices in your plant. Would that be representative of the industry, in your mind, or not?

Mr. HOOK. Yes; for that product.

Dr. ANDERSON. For that particular product?

Mr. HOOK. Yes; that is, for sheets.

Dr. ANDERSON. Let me ask this question, then. Is this to be taken as the decline in steel sheet selling prices only?

Mr. HOOK. That's right.

Dr. ANDERSON. In other words, you have isolated, out of all the products of your plant, steel sheets, and we are comparing identically the same product all the way through.

Mr. HOOK. That's right.

Dr. ANDERSON. That is not a decline, then, in prices of your products, whatever they might be?

Mr. HOOK. Not the others; but, of course, sheets, as we showed you this morning, are over 90 percent, the lowest percentage of any one plant being about 92 percent sheets.

Dr. ANDERSON. But we are only concerned here with sheets.

Mr. HOOK. That's right. In other words, the product that is made on the continuous mill.

Mr. O'CONNELL. May I ask a question there? Speaking generally, Mr. Hook, as I recall the testimony in the other hearing we had on steel,¹ a picture of the price of steel products generally over a comparable period would be quite different from that, would it not?

Mr. HOOK. You are correct.

Mr. O'CONNELL. There has been a relatively greater decline in the price of sheets than in almost any other steel product?

Mr. HOOK. Correct.

Mr. O'CONNELL. To what do you attribute that?

Mr. HOOK. That is the technological development, the introduction of the continuous sheet mill. Not only that, as we tried to say in our opening remarks; we don't credit that drop entirely to the installation of this innovation, because management efficiency and other things that we tried to enumerate did have a part in that.

Mr. O'CONNELL. I understood you to indicate this morning that, as far as this product is concerned, it was somewhat more responsive to price reductions in terms of the volume than some other steel products?

Mr. HOOK. Decidedly so.

Mr. O'CONNELL. There has been apparently quite some controversy among people who do some thinking on the subject, as to how elastic the demand for steel is, and from what you say this morning, I take it that it is your belief that for this particular steel product the demand is to a greater extent responsive to price changes than in some of the other steel products.

Mr. HOOK. Yes. You see there was technological development with respect to other products in earlier years, from, say, 1910 to 1920. There were developments of the continuous mill for rolling sheet

¹ See Hearings, Part 19.

bars. For instance, when I started to work in our little plant at Middletown we made sheet bars, first on an old two-high break-down mill with three-high finishing mill with a lot of passes and the men did a lot of very hard physical work. That was supplanted by what is known as the continuous Morgan sheet bar mill, and that development came in, I forget when. Mr. Eppelsheimer, perhaps you remember.

Mr. EPPELSHEIMER. About 1900.

Mr. HOOK. It was about 1900 that the Morgan mill was developed, so there was a lot of change in the price of other products, the sheets having gone on for many, many years by this old method until we found a way of doing it continuously.

Mr. O'CONNELL. Speaking generally, are sheets ordinarily sold to a few large buyers as distinguished from a lot of smaller buyers?

Mr. HOOK. No; we have a chart showing the distribution of the product to the various industries.

Mr. O'CONNELL. I will be interested in that.

Dr. ANDERSON. May I refer, in this matter of prices, to the statement that you submitted to the committee, on page 5, the fourth paragraph down, we have this statement:

Steel users not only have benefited from improved quality which makes for possible lower fabrication costs, but they have also enjoyed the advantage of lower prices as well.

Then you take from 1926 to 1939, "the average price of all iron and steel sheets realized by our company declined 31 percent."

I take it that is this illustration here, and we are dealing with steel sheets only.

Mr. HOOK. That is right.

In this table, entitled "Iron and steel industry (blast furnaces, steel works, and rolling mills) employment, wages, and production," we jump from the pure sheet plant and use the American Rolling Mill Co. because we developed this continuous process. We make practically nothing but sheets. We will see what the effect on the entire iron and steel industry has been, because in this chart and others I think that will be obvious.

(The table referred to was marked "Exhibit No. 2468" and is included in the appendix on p. 17328.)

Mr. HOOK. Now, we have taken the iron and steel industry, blast furnaces, steel works, and rolling mills, and we show employment, wages, and production. The reason we use 1925 in this instance and '26 before is because here we are using the United States census figures. This is a census year. I thought I had better explain that right off the bat.

The average number of wage earners in '25 was 399,914; in '37, 502,417, or a 25.6-percent increase, during which time the population, as I noted in my preliminary statement, increased 11.2 percent.

The pay roll, which is wages only, not salaried workers, increased from \$660,297,150 to \$817,777,929, or an increase of 23.8 percent.

The steel production—this is steel ingots—increased from 45,119,113 tons in '25 to 51,599,000 in '37, or a 14.4 percent increase.

The CHAIRMAN. Mr. Hook, do those figures with respect to pay roll and wage earners indicate that the rate of wages has not increased?

Mr. HOOK. We will have that down below, Senator. Down here we have the average earnings per hour.

The CHAIRMAN. All right, I will wait until then.

Mr. HOOK. We will come to that.

The man-hours per gross ton of steel—that is all rolled products—are 23.12 in 1925 and 19.38 in 1937, or a reduction of man-hours per gross ton of product of 16.2 percent.

The labor cost per gross ton of steel increased from \$14.68 to \$15.85, or an increase of 8 percent.

You remember we showed you that in the sheet mills operating in our own plant, with the continuous process of production, we had a decrease in labor cost per gross ton, but taking the industry as a whole, there was an increase in the labor cost.

Now, had we not introduced the continuous mills, and had not the sheets and strips represented such an important part of this total steel production of 51,000,000 there, then this increase would have been considerably more.

The CHAIRMAN. This is the curious thing that suggests itself to my mind. The percentage increase of wages is less than the percentage increase of the number of wage earners, and yet the labor cost per ton has increased. How do you explain that?

Mr. HOOK. The shorter hours. You see the average workweek in 1925 was 50 hours, whereas in 1937 it was 38, so we had a reduction in the number of hours that the men worked of 23.6 percent. That accounts, too, for a large part, if not all, of the increase here of the average number of wage earners.

The CHAIRMAN. That is, the reduction in the number of hours resulted in an increase in the number of wage earners.

Mr. HOOK. Correct.

The CHAIRMAN. And do you think that was the cause of practically all of the increase in the number of wage earners?

Mr. HOOK. We have the exact figures. It covers practically all of them—not in our case; now we are talking about the industry.

Dr. ANDERSON. Might I ask a question concerning that labor cost per gross ton of steel? What is the source for such a figure? How do you get at such a figure?

Mr. BROOKS. That is simply the steel production and the wage figure.

Dr. ANDERSON. You computed it from the available data there? We don't have any source for any such thing as that for the industry.

Mr. BROOKS. You could take it out of the Biennial Census of Manufactures. Those figures are shown.

PROPOSED REDUCTION IN HOURS

The CHAIRMAN. May I ask, Mr. Hook, how do you look upon the suggestion, which is sometimes made, that increased employment could be provided by a further reduction of the number of hours which each worker would be permitted to work?

How do you look upon that suggestion?

Mr. HOOK. Well, I don't look on that favorably, because I think we have reached a point now where, with an average production—well, say you get 70 percent—in order to keep their earnings up per week and per annum you would have to have a considerable increase in the wages, in the hourly rate, and I don't—

The CHAIRMAN (interposing). What is the average week in the iron and steel industry now? Is it 40 hours?

Mr. HOOK. Yes; 40 hours. Over and above 40 hours is time and a half.

The CHAIRMAN. So what you are saying to us is that if, for example, the workweek were reduced to 30 hours, such an increase of the hourly rate would be needed to enable the worker to obtain the same income that he receives for a 40-hour week as to be uneconomic as far as the industry is concerned.

Mr. HOOK. That is my opinion, Senator; and I think you would reduce the use of the product upon which they are dependent for their work.

The CHAIRMAN. In what way?

Mr. HOOK. By increasing the cost to a point where you would begin to seriously affect its use.

The CHAIRMAN. Of course, the 40-hour week in itself was resisted by industry, looking at it as a whole. Every shortening of the workday and the workweek has been resisted as this movement has gone along from year to year. That is true, isn't it?

Mr. HOOK. Well, speaking for the steel industry, that was a voluntary act.

The CHAIRMAN. Yes, in this case; but I am now going back many years. In the steel industry at one time the 12-hour day was rather common, was it not?

Mr. HOOK. Yes, indeed.

The CHAIRMAN. And it was some struggle before that was abandoned.

Mr. HOOK. You are correct.

The CHAIRMAN. Now, what do you think is the minimum workweek that would be economic in the industry?

Mr. HOOK. I think we have reached the very minimum now, Senator. I think it would be a very serious matter to attempt to go any further.

The CHAIRMAN. Because of the increases in cost that would result to the consumer; is that the idea?

Mr. HOOK. It is bound to do that.

The CHAIRMAN. And, therefore, in cutting down the market for the product.

Mr. HOOK. I think so. I think you would limit the uses in many instances.

The CHAIRMAN. Do you see any argument against those conclusions? Is there another side to it, in other words, as you look at it?

Mr. HOOK. No; I think I see only the side that I am favorable to, I am afraid, Senator.

The CHAIRMAN. I guess that is the way with most of us.

Mr. HOOK. That is quite a study, though. I appeared before the National Industrial Recovery Board when Mr. Clay Williams was chairman, Senator, and I think my detailed testimony on the 30-hour week is a matter of record some place here in the Government files. With the break-down, which I haven't here to substantiate my position, I think we presented pretty conclusive evidence that it would be a very serious mistake to attempt to go to a 30-hour week.¹

¹ See *Employment Provisions in Codes of Fair Competition*, National Recovery Administration, January 31, 1935, Volume 2, Part I, pp. 767-804.

LABOR COSTS FOR STEEL PRODUCTION

Mr. HINRICHS. Mr. Hook, this morning you indicated that in the Armco plant the labor cost for sheets in 1926 was about \$23.15. I presume that the cost in 1925 would have been about the same?

Mr. HOOK. Yes.

Mr. HINRICHS. Now, the labor cost per gross ton of steel that you show on this chart is an average for the entire industry, \$14.67.

Mr. HOOK. That's right.

Mr. HINRICHS. Sheets had a very much higher labor cost?

Mr. HOOK. Pardon?

Mr. HINRICHS. Sheets had a substantially higher labor cost?

Mr. HOOK. Yes.

Mr. HINRICHS. It follows, therefore, with other products which had a substantially lower labor cost per ton, which I suppose would have been the heavier steel roll products?

Mr. HOOK. For instance, if you look at your diagram that you have in front of you which I used this morning, "Exhibit No. 2453," to show a steel plant manufacturing sheets, sheet bars stopped before you started in the old-style hand mills.

Mr. HINRICHS. I am not criticizing the higher price of sheets. I am criticizing this lower figure here, in terms of the significance of the change from \$14.67 to \$15.85; during this period between 1925 and 1937, the composition of the steel products going to make up those 45,000,000 and 51,000,000 tons has changed quite drastically. Sheets, you indicated this morning, had increased from some 6,000,000 to some 10,000,000 tons. Structural steel shapes, on the other hand, are less. Steel rails, I believe, would be less.

Mr. HOOK. Yes.

Mr. HINRICHS. So that the high-cost items, or let me put it the other way, the items with a high labor content and high labor costs in the steel industry, have been increasing between 1925 and 1937.

Mr. HOOK. Can I interrupt?

Mr. HINRICHS. And the low-labor costs and the low-labor-content items have been decreasing?

Mr. HOOK. May I interrupt you just a second?

Mr. HINRICHS. Yes.

Mr. HOOK. This figure is on steel ingots, which is the beginning of the operation before you begin to roll. These rails and everything else are made from that, and this labor cost is based on the first beginning of rolling; that is, before you start to roll the steel ingots.

Mr. HINRICHS. Your pay-roll figure is the census pay-roll figure, I believe?

Mr. HOOK. That's right.

Mr. HINRICHS. The census pay-roll figure covers—

Mr. HOOK (interposing). Everything.

Mr. HINRICHS. The pay rolls in blast furnaces, steel works, and rolling mills?

Mr. HOOK. Correct.

Mr. HINRICHS. And would include the pay rolls of the final rolling process, sheet pay rolls, for example? Your ingot figures are comparable figures, I presume. I don't remember the figures, but I am sure they are.

Mr. BROOKS. No, they are not, Mr. Hinrichs. Our labor costs per ton were based on finished sheets. If we had used ingot production, it would have come out lower on both ends. In other words, the 1926 figure would have been lower, and the 1937 figure would have been lower, but the relationship would have been somewhat the same.

Mr. HINRICHS. You mean to say that these labor-cost figures are specially weighted by the different rolled products? Let me ask my question in another way. If you had had this same proportion of heavy-rolled products in 1937, with reference to the 51,000,000, as in 1925, and the same proportion of light-rolled products, that figure of \$15.85 would have been smaller than the one that you have there. I don't know how much.

Mr. BROOKS. Yes; it might have been.

Mr. HINRICHS. It would have been?

Mr. BROOKS. Yes; I believe it is true that it would have been.

Mr. HINRICHS. Now that same criticism, then, applies to this 23.12 and 18.38 man-hours.

Mr. BROOKS. Correct.

Mr. HINRICHS. Those are the number of man-hours required to produce a gross ton of steel, but the steel that you are talking about is of a changing composition. It is a finer product, so that if you are trying to report the technological development as it has affected man-hours of labor, the figure that you gave this morning of a decrease from 32½ to 19.1 is a very accurate picture for sheets.

Mr. BROOKS. Sheets alone.

Mr. HINRICHS. And we don't have the same figure before us now for the steel industry as a whole, or for any other steel product.

Mr. HOOK. That is correct. You have an indicator.

Mr. HINRICHS. Rather crude! [Laughter.]

Dr. ANDERSON. The question that follows naturally from Mr. Hinrichs' question to you is whether you propose to use this to make a comparison of unlike things, this compared with your previous statement in the morning, with respect to steel sheets?

Mr. HOOK. Well, it is the best comparison that you can make with the available information that you have.

Dr. ANDERSON. In other words, at the outset, you'd say it would be a very crude comparison.

Mr. HOOK. Well, maybe we ought to admit that, that it is a crude comparison, but it is a comparison, and there has been an increase, and of course, if the relationship of the finished products in 1937 is the same as the relationship between the various finished products in 1925, then that is an accurate statement. Now just what the change in relationship has been—

Mr. PIKE (interposing). It is not inaccurate to say that the pay rolls have gone up? It is not inaccurate insofar as the wages are concerned. Some of the deductions from it may be quite inaccurate as to the gross ton of steel, if the composition has changed a great deal, but from the point of view of wage warnings, pay roll, those figures are accurate, aren't they, in the steel business?

Mr. HOOK. My attention is called to the fact that the Brookings Institution have used the same basis of figures.

Dr. ANDERSON. That is true of the Brookings Institution. I have the form in that book, but it is definitely dealing with the problem only of blast furnaces, steel works, and rolling mills. They make it that

sort of a tabular display, but they are not trying to make any comparison between it and over-all, and any part of the industry that might be included in it.

Mr. HOOK. I'm not trying—

Dr. ANDERSON (interposing). In other words, you are just submitting this as an evidence of what is occurring in these things in the over-all.

Mr. HOOK. Yes. The best figures that we could get from Brookings Institution, but it shows what has happened in the iron and steel industry in 1925 to '37 inclusive.

Dr. ANDERSON. Let me just make one comment, and ask a question that arises from it, if that is what this is supposed to show. You are taking 2 years, 1925 and 1937, and making a comparison between them, and saying that that is a trend of what has occurred between 1925 and 1937. Is that right?

Mr. HOOK. That is correct.

Dr. ANDERSON. Might I point out that I don't believe any statistical procedure would permit you to draw such a conclusion, because you have two end points only and you don't establish a trend thereby. All you have done is compare one year, 1925, and another year, 1937.

What has occurred between might be quite contrary to anything that is displayed in the last column of percentage of change; in the table from which you quoted, that is precisely drawn out. If you had taken 1938 as your end year, you'd have shown a quite different picture, or if you had selected any other base year than 1925, you'd have shown a different picture.

Mr. HOOK. Well, you know why we took this period of 1926 to 1937, in this case, 1935. It is because, between those periods, the continuous mill came into operation and it has had its effect.

Dr. ANDERSON. I tried to make the point earlier, Mr. Hook, that what we were dealing with was a single display here, and it wasn't purporting to show what did occur in the continuous sheet-mill process. In other words, to use this as an evidence of what might have occurred in your part of the industry wouldn't be reasonable because this course includes it and many other factors. It is an inclusive set of data and not one that is detailed enough to permit such comparisons.

Mr. HOOK. Well, it does show the trend within those periods, unquestionably.

Dr. ANDERSON. As a matter of fact, my point is, Mr. Hook, that you can't establish a trend by comparing 2 years. I will give you a good example of it. I just happen to have it, because of a piece of work that I have done recently. If you take agricultural gainful workers in the United States from 1870 to 1930, you establish the fact that their number has increased 77 percent.

But if you spot the intervening censal periods you find that by 1910 the peak has been reached, and that by 1930 there was an actual decline in numbers from 1900. In other words, you had a broken trend line. The figure for 1870 was lower than 1930, but it rose from 1870 to 1910, and then dropped off to 1930. That is a trend; you don't compare 1870 and 1930 and think you have a trend, just as you don't compare 1925 and 1937 and establish thereby a trend. You have to put in every intervening year. Isn't that correct?

Mr. HOOK. Let's take this. Let's be really practical. There is no question but that is what happened so far as pay roll is concerned, so if everything else is out the window the industry did increase its pay roll from 1925 to 1937 by 23.8 percent.

Dr. ANDERSON. Might I just question something at that point. Now we will put in different years and see what happened. Based on an index, 1923-25 equals 100, 1925 stood at 99, according to the Brookings figures. This is total wages paid. In 1937 the figure stood at 122.5. Put the next year in, and you have 1938 standing at 68, or decidedly below 1925. You would thereby have a decided drop in total wages paid if you used 1938.

Mr. EPPELSHIMER. What page is that?

Dr. ANDERSON. Page 299.

Mr. HOOK. They weren't comparable in operating rate. Let's put in 1939. Maybe we should have put in 1939. We will prepare a chart for you and send it back.

Dr. ANDERSON. That is right; I think any trends would require just such a procedure.

Mr. HOOK. All right; we will be glad to present and get some facts in for 1939.

The CHAIRMAN. What is the general trend as you know it? Is it up or down?

Mr. HOOK. Wages have been up. We can see that.

Mr. HINRICHS. I am sorry; I have just one more question on that chart. As I put those figures together, there is another figure which you could have used here, which was the total number of man-hours worked in the industry. You show an increase of roughly 400,000 to 500,000 workers. Then you show average hours per week on the second line of the second half of your chart.

Mr. HOOK. I think maybe we have those figures; we will see.

Mr. HINRICHS. Multiplying those two, you get figures of roughly 2,000,000,000 man-hours per week in 1925, and 1,917,000,000 man-hours—I have my decimal point wrong—in 1937.

Mr. BROOKS. I have the calculated figures.

Mr. HINRICHS. Would you include them, please?

Mr. BROOKS. The man-hours were 1,043,000,000 in 1925, and have been reduced to 99,728,000 in '37.

Mr. HINRICHS. So that the maintenance of the employment figure between 1925 and 1937 depended in very large part upon that decrease in hours per week that you show on the bottom of the chart.

Mr. BROOKS. Yes. But the sheet-producing unit, the American Rolling Mill Co., was up in man-hours. That is the point. We are talking about technological development, and where that technological development affected a plant making that product, the man-hours went up, and later on you will see some figures here that will, I think, enlighten you and you won't worry so much about that chart.

Mr. HOOK. The table entitled "Iron and steel industry, increase in sheet and tin-plate production" shows the increase in sheet and tin-plate production in the iron and steel industry. In 1926 the total hot-rolled products, 35,495,892; hot-rolled products and sheet and tin plate, 29,168,018; or in 1926 there were 6,327,874 tons of sheet and tin plate. In 1937 the total hot-rolled products amounted to 36,766,389,

a 3.6 percent increase in this period. The hot-rolled products other than sheet and tin plate went down to 25,972,079, or a decrease of 11 percent in the products other than sheets.

(The table referred to was marked "Exhibit No. 2469" and is included in the appendix on p. 17329.)

Mr. HOOK. The sheet and tinplate alone went up to 10,793,592, or an increase of 70.6 percent in the particular end of the industry where this technological development was introduced. Or there was an increase in sheet and tinplate between those periods of 4,465,718 gross tons, and we figure that that is equal to giving employment to 45,000 men.

Now, I think that is very enlightening and gives you—

Dr. ANDERSON (interposing). Mr. Hook, might I ask you now, if you did splice on the successive years, has that been a continuous trend? Increase in sheet and tinplate has been moving up since '37 as well?

Mr. HOOK. I don't know whether we have the figures, so I couldn't say definitely that that is true. I don't think that progression has kept up.

Dr. ANDERSON. That 10,000,000 tons is not a peak that represents that artificially high year of '37?

Mr. HOOK. No; '39 would show about the same as '37.

Dr. ANDERSON. It has held after that?

Mr. HOOK. For instance, in our own case I will give you the exact figures and I think we ran right along with the industry. I don't think we are any smarter than the rest of them, and in 1937 our shipments were 1,131,000; in '39, 1,033,000, so it kept up pretty much the same.

Dr. ANDERSON. If that is true, then you would say that your part of the entire steel industry is even more important today than in 1937, because the indices for total output have dropped in '38, and I suppose they are still down in '39. In other words, this would be accentuated by later figures.

Mr. BROOKS. I can answer your original question. In 1938, which is the latest break-down of figures we have, sheets were 35.8 percent of the total hot-rolled production, which is a greater percentage, I believe, than is shown in '37, when it was 29.4 percent of the total.

Dr. ANDERSON. So that is really true; it is increasing.

Mr. HOOK. It is increasing.

Dr. ANDERSON. And you would say now that sheets have become a predominant factor in the industry, making for whatever prosperity the industry shows?

Mr. HOOK. It is a very important factor in it, that is so, almost the dominant factor.

Mr. HINRICHS. Mr. Hook, you spoke, I think, of an increase of employment of 45,000. Did I hear you correctly?

Mr. HOOK. This 4,465,718 we just estimated is equal to an increase of—

Mr. HINRICHS (interposing). Forty-five thousand people?

Mr. HOOK. Forty-five thousand men all the way through.

Mr. HINRICHS. Turning to Exhibit 2461 presented this morning, an estimate of the number of workers employed in the industry in the hand-mill processes, there is a line on it, "Estimated number of

workers (sheets), 4,237,847," approximately the same figure that you have there—slightly smaller; and an estimated employment of 25,682.

Mr. HOOK. In that department alone. We have taken credit here for the employment all the way through in all the departments, not just—

Mr. HINRICHS (interposing). This is only in the mill, and stops at the strip pickler, which didn't exist, I take it?

Mr. HOOK. It is right in that group where the continuous mill was installed to take place of the old hand mill.

Mr. HINRICHS. And this thing includes the process all the way through to the railroad car?

Mr. HOOK. That is, of course, an estimate.

Senator KING. Mr. Hook, I would like to ask one question. I know that many of the witnesses who come here don't expect all the members of the committee to be here all the time, because we have other committees. I have been in other committees all day, and I am sorry when we don't have the opportunity to be here all the time to listen to you, but we will read all that is said by the witnesses who appear.

I want to ask you whether or not you are familiar with the testimony that has been given by Mr. Fairless and other respecting the development, and production, and changes in the steel industry.¹

Mr. HOOK. Fairly so, Senator.

Senator KING. Would you say that your testimony with respect to the figures which they gave as to production and employment, and so on, are substantially in harmony with those, or materially different?

Mr. HOOK. I should think they ought to coincide.

Senator KING. I wondered if you made an examination to see whether there were any coincidences or any divergences.

Mr. HOOK. I think we went through those figures fairly well, the Steel Corporation figures, and so far as I know there were no inconsistencies with respect to our figures.

Senator KING. I might add that I was present during the testimony of many of the witnesses concerning the steel production, and I am reasonably familiar with their testimony, and I am not familiar with yours because of being compelled to be in other committees today.

Mr. HOOK. That was my bad luck.

CAUSES OF INCREASED VOLUME

Mr. HINRICHS. You do very definitely connect this increase of \$4,465,000 with the decrease in your selling price from \$100 to \$57?

Mr. HOOK. Oh, yes.

Mr. HINRICHS. And we can assume that the earlier witnesses would probably indicate that there was an important relation between price and volume.

Mr. HOOK. Remember, Mr. Hinrichs, we didn't take credit for the increased volume entirely due to the price change, but to the increased quality of the product which made possible a thing of that kind that couldn't be made before.

¹ See Hearings, Parts 18, 19, 20, 26, and 27.

Mr. HINRICHS. That is, if you didn't have a better product, it couldn't have been used, but it was highly desirable in your opinion to have lower prices in order to get volume use.

Mr. HOOK. We are perfectly willing to admit that competition as other mills came in had something to do with lowering the price, because the return on the investment hasn't been what I think it should have been.

Dr. ANDERSON. But is it not the lower price that makes it possible to use the larger thing instead of the little thing that used to be used? (Referring to the fenders on exhibit before the committee.)

Mr. HOOK. Undoubtedly.

Dr. ANDERSON. In other words, when steel approaches the consumer's market, steel has to be concerned about lower prices, or as low prices as possible.

Mr. HOOK. Yes; that is what we are working for, to find ways and means of decreasing the cost of the product to make it available for larger use.

There was a question asked this morning and I think this table, "Distribution of sheet and tin plate production to consuming industries," will show it. Iron Age is the source of our information. Mr. Brooks reminds me that these totals down here don't agree with the totals which we have used, probably because they are obtained in a different way and they are distributed, but it is approximately the same. The distribution is probably fairly accurate, and this table is only presented to show the increased use of sheet and tin plate in these industries.

(The table referred to was marked "Exhibit No. 2470" and is included in the appendix on p. 17329.)

Mr. HOOK. In the automotive industry it increased 142.9 percent in that period; agriculture, 95.7. This is very enlightening—there was a reduction of 27.2 percent in the construction field—and in the export field, an increase of 68.1.

Jobbers and warehouses, an increase of 170. To those of us in the industry that is a very interesting and significant figure, because jobbers sell to the very small manufacturer and to the tinner and to the man who is making repairs, and that is a very encouraging increase to us.

The CHAIRMAN. You interpret that to mean that there has been a very remarkable increase in the consuming power for this product of small independent products of one kind or another?

Mr. HOOK. Apparently. That is what is indicated to us.

The CHAIRMAN. Is that the fact from your experience?

Mr. HOOK. Yes; it is.

The CHAIRMAN. To what do you attribute that increase?

Mr. HOOK. Well, I say the question of price and quality both come in there.

The CHAIRMAN. No; I mean how does it happen that there are more users, more small users of sheet and tin-plate? What do they use it for?

Mr. HOOK. Oh, there are innumerable purposes, Senator. For instance, there are little gadgets that are now made out of sheet steel, and this little manufacturer who only uses a few tons, can't buy by the carload, goes to the jobber and buys.

The CHAIRMAN. What does this little manufacturer do with the steel plate? And there any new industries, new products?

Mr. HOOK. He will stamp it out into articles of various kinds, maybe an ash tray. This one is made out of glass, of course, but we are trying to get him to make it out of steel.

Senator KING. The ingenuity of man manifests itself in different uses to which steel products may be put, as well as in the plastics and glass, and the other products.

Mr. HOOK. That is right.

The CHAIRMAN. These new uses are being developed by small manufacturers, independent enterprises?

Mr. HOOK. Yes.

The CHAIRMAN. And not by the large enterprises?

Mr. HOOK. Yes. For instance, Senator, I think I called your attention in November to a very unique product which we have developed and put on the market in the last 2 years, known as zinc grip, and the continuous mill made that possible in part, only, but it is a method of galvanizing sheets, that is putting a spelter coat on them, so that that coated sheet can be put in a press and stamped out without that spelter breaking off.

Now formerly, you would have to take a black sheet and stamp it, because the spelter or the zinc wouldn't stick on it, and then you would pickle that sheet and then put it in a hand-dipped operation, which was very expensive. It took a great deal of spelter.

So now the man with a sheet which only costs \$2 a ton at the present time above the price of ordinary common galvanized sheets, can stamp these articles out at very much less cost to him. Therefore, it is increasing the use of the material and makes it possible for him to sell his product at a lower price and create a wider market.

This is simply a break-down.

Dr. ANDERSON. Mr. Hook, I am curious to know because of the great importance of the construction industry and its prosperity to the prosperity of the Nation and the reduction of unemployment, why you have the construction industry there in the red with a decline in use of steel and tinplate.

Mr. HOOK. Of course, there are two reasons for that, in my opinion. The prime and important reason has been that the flow of private and corporate savings into the capital goods industry has been retarded, and I think that is one of the very important things.

Then I think that the construction industry, certain parts of the construction industry—and when we are talking about construction we must differentiate between the big construction items, big buildings, and so forth, and the home-building field—in the home-building field where there are great needs now, we believe, for additional homes, we haven't had the advance in mass production. I think we have been held back, I think unwisely, by some of our labor friends where the rate has been kept too high, and the use of that labor in the construction of homes has actually been held back. In other words, I think more homes would be built, and I think they would have had more hours of labor and work, and more earnings over the year, if that hadn't been true.

Dr. ANDERSON. In the new developments in steel, these unusual things that have occurred in the last 10 or 15 years, do you see what

would amount to an entrance of steel into the construction industry in an increasing way so as to reduce the cost of home building? What is the future in your mind of that thing?

ARMCO RESEARCH IN HOUSING

Mr. HOOK. We think so. We have been spending a good deal of money in research in that field in the last several years. We have just, for instance, finished building a little unit—not so little, 27 houses is not such a small unit—of steel houses, and dollar for dollar we think that the buyer is getting a very much better product and more value for his money; well insulated, thoroughly insulated in fact, termiteproof and stormproof, tornadoproof—very many things that we think make it advantageous to the buyer.

Dr. ANDERSON. Is the widespread use of steel for housing or domestic homes in the immediate offing, in your opinion, or not?

Mr. HOOK. I wish I could answer you in the affirmative, Dr. Anderson, but I don't know. We are trying very hard to reduce costs in that field and get a home which can be built at very low costs. We have made a lot of progress and we are building very good houses at very reasonable figures at the present time.

Mr. O'CONNELL. Mr. Hook, looking at "Exhibit No. 2470" and relating it to the question I asked a little while ago about the price behavior in the sheet portion of the steel industry, I notice that two classes of buyers, the automotive and the metal container, constitute a little over 50 percent of the steel sheet buyers, and those industries, I take it, are characterized by a few in the industry, but large units.

Mr. HOOK. Very large units. For instance, the metal container, that is largely tinsplate as you know.

Mr. O'CONNELL. Would you say that that fact, the fact that there are large buyers on that side, was a factor which helped to produce the reductions, the substantial reductions in sheet prices?

Mr. HOOK. I don't think there is any question about it.

Mr. O'CONNELL. You see, that price behavior is not characteristic of the steel industry generally as I would understand it.

Mr. HOOK. The other branches of the industry haven't had the technological improvements that made it possible for the price to be reduced.

Mr. O'CONNELL. They haven't had the large buyers, either.

Mr. HOOK. Oh, some branches have. You take in the railroads, for instance, they are very large buyers.

Mr. O'CONNELL. Lately? Not lately.

Mr. HOOK. Not what we would like to see, of course.

Mr. O'CONNELL. When we heard the story about the way the price of tinsplate was arrived at in the prior hearing,¹ it apparently was a situation in which the Carnegie-Illinois representatives sit down with the representatives of the American Can Co. and thrash out a price, which apparently from your figures has tended to be a rather low price, relatively low over the years. In other uses of steel, take structural shapes or something like that, where you have a multitude of small buyers, the price has apparently remained relatively high as compared to the price of tinsplate; isn't that true?

¹ See Hearings, Part 20.

Mr. HOOK. I am not competent to express an opinion on tinplate because we don't make tinplate and I would rather not discuss a subject that I am really not competent to discuss.

Mr. O'CONNELL. It seemed to me that the fact that there are two groups of buyers representing about 50 percent of the market for sheets might have been a very important factor in bringing about the price reductions that there is evidence of.

Mr. HOOK. Of course, they can order in large volume, and if you can get a large tonnage of one size to put through your mill, that is quite a different operating problem than if you have to take that same tonnage and divide it up into innumerable sizes.

Mr. O'CONNELL. Yes; but purely on the bargaining side I take it that a large buyer is in a better bargaining position than a multitude of small buyers.

Mr. HOOK. I don't think there is any question about that.

Mr. O'CONNELL. And that would have some effect on the price structure, wouldn't it?

Mr. HOOK. It would have some effect on that, of course. But here you see are jobbers, they are small buyers, and yet there were 1,092,000 tons to jobbers and warehouses, and that has greatly increased, Mr. O'Connell, in the last few years.

Mr. O'CONNELL. Yes; I can see that.

DISPLACEMENT OF OTHER INDUSTRIES BY SHEET STEEL

Mr. HINRICHS. Just one more question on "Exhibit No. 2470" in terms of increases of employment. You have been emphasizing the contribution which the sheet industry has been making to total employment and pointing out, quite properly, that capital construction itself is important, and so forth. There are some deductions that need to be made, too. That is not your business, but in terms of the furniture item down here, it is a relatively small item, or in terms of the automotive item on the top, the introduction of plate represents in part simply business that would not otherwise have been done, but there has been at the same time some displacement of other products, hasn't there? There is less wood used in automobiles for example, less wood used in furniture which has been displaced by plate.

Mr. HOOK. Of course I am not competent to answer that question accurately, but you take the great increase in the number of automobiles that are produced since the introduction of steel into the automobile; I question whether there has been such a tremendous reduction in the amount of wood taken as a whole. I don't know.

Mr. HINRICHS. The number of automobiles isn't—

Mr. HOOK (interposing). Maybe Mr. Ford could have answered that question for you.

Mr. HINRICHS. I thought he testified the number of automobiles in 1937 was not larger than the number of 1929, for example; about the same number or a slightly smaller number.

Mr. HOOK. Yes; but we began to use sheet steel in the automobile in large quantities before the twenties. Of course, here in recent years the metal top has come in, when we were able to produce a sheet that we could make it out of. That undoubtedly reduced the amount of wood in those tops very considerably.

Mr. HINRICHS. To some extent, textiles. I think I remember there used to be a textile finish on the top.

Dr. ANDERSON. Mr. Hook, just to put a cap on that point, you wouldn't want to say that this represents new industry. You would say, wouldn't you, rather, that in all of the points listed here there is a certain amount of replacement that is a substitution of your product for something that has been used formerly?

Mr. HOOK. Oh, to some extent, Dr. Anderson, but I don't think that has been a serious thing. I think the increased use—for instance, just see how much the automobile is using that fender; you can see with your own eyes, this old fender and the one today, multiply that by four. We have increased the actual amount of the steel because the public wanted it. Mr. Ford said yesterday, if you remember, that they spent, I think I am correct in remembering he said, about \$5,000,000 to change the face of it. This was one of the things we have done to help them change the face, when you look at the nose of that fender.

This table, "Examples of Increased Use of Sheet Steel," is presented to show you there are other industries in addition to the automobile. In electric refrigerators, we have contributed of course to some extent in the reduction of the cost, due to the cheaper, as well as better grade of steel that they are able to use in these enameled parts; and the same way in the electric washing machine. A few years ago, this tub, which is made by some of the manufacturers out of enameled material—that is, you stamp the tub and enamel it—just couldn't be made from the old sheet. We have improved it and that has made it possible for them to make a better product.

(The table referred to was marked "Exhibit No. 2471" and is included in the appendix on p. 17329.)

Mr. HOOK. They have decreased the average unit price of their product 58 percent in electric refrigerators, and increased the number of units 1,027 percent during this same period, and the electric washing machine has decreased in price 51 percent and increased in use 75 percent.

Dr. ANDERSON. Mr. Hook, how much do you think the matter of increased volume has had a bearing in reduction in price as over against the difference in use of materials?

Mr. HOOK. They couldn't get the increased volume until they were able to bring their price down so that they could get the increased volume. In other words, it wasn't only the technological development—we contributed, but all along the line the other manufacturers that were furnished them with parts had contributed, and they, themselves, have introduced more efficient methods.

FINANCING OF NEW CAPACITY

Mr. HOOK. We showed you what we spent at Middletown for the construction of this mill, and here in this chart, "Industry Expenditures for Continuous Mill Construction," is the total for the industry. We won't argue over that distribution, Mr. Hinrichs, of whether it was in 2 years or not, but the total amount of money is fairly accurate, because that is from the Institute, and then rechecked with the manufacturers who furnished mills and equipment, and so forth.

(The table referred to was marked "Exhibit No. 2472" and is included in the appendix on p. 17330.)

The CHAIRMAN. Does that represent new capital?

Mr. HOOK. Yes, sir.

The CHAIRMAN. I mean in the sense of a new contribution and not a plowing in of earnings.

Mr. HOOK. Oh, well, that depends upon the particular company. We had to borrow all ours. Now, some of the companies were more fortunate, sir, and had cash surpluses that they could use and go into their working capital, but most of the companies did financing that introduced these continuous mills.

The CHAIRMAN. Would it be fair to say that most of this was new financing either by way of borrowing or stock sales or such?

Mr. HOOK. Of course, I would be guessing at that, Senator, and maybe I oughtn't to make a statement.

The CHAIRMAN. But in your own case it was a case of borrowing.

Mr. HOOK. That was borrowing, I know that.

Mr. HINRICHS. I am not going to take exception to your statement, but I wasn't trying to be unfair to you this morning and I would like to go the other way now. Actually the chart that you introduced this morning showing mills built in '26, '27, '28, '29, '30, in fact in every year down to 1937, indicates that the industry as a whole (irregularly it is true, because the volume wasn't the same in every year) was making a net contribution during that period through the construction industry.

Mr. HOOK. That is true.

Mr. HINRICHS. This particular branch of the steel industry is pretty nearly through on this thing and it is going to be something else. My criticism now would not be on a year-to-year basis but on a decade to decade basis if I were making it, and I wouldn't want to quarrel with you on that score. You have a very legitimate point on this one that you could have made.

Mr. HOOK. You have helped me out. You see, I didn't see it quite as quickly as you did.

Mr. HINRICHS. There is one question on this though, that I would be interested in. It is along a slightly different line, having to do with the concentration of sheet mill operations.

If I figure at all correctly, the minimum ante to get into this game is in the neighborhood of \$8,000,000. The smallest mill that you listed was a little over 200,000-ton capacity, and the cost per ton of capacity seems to be in the order of \$40.

Many of those mills that you spoke of, the 1,264 mills, were in rather small establishments a number of years ago, weren't they, in the sheet business?

Mr. HOOK. No.

Mr. HINRICHS. It has always been in large—

Mr. HOOK (interposing). The relationship of tonnage hasn't changed so materially. Take the Steel Corporation, I think today (we will have to examine the records very carefully because I am guessing now which I ought not do, but I know you are not going to hold me to it) the proportion of the sheet steel production of the

country, for instance, indicates that the Steel Corporation produces today approximately the proportion it did back in '26.

Mr. HINRICHS. I wasn't speaking of it in connection with the United States Steel Corporation or the idea of concentration in some one or two companies, but rather the concentration of business in essentially large producing units, so that some 8, 9, or 10 companies come to have virtually complete control of this particular field. I am not implying an improper control, but the operations in this field have come to be concentrated in a relatively small number of operating companies, whereas formerly there was a fringe of small companies operating with hand mills. Isn't that true?

Mr. HOOK. You are correct, that it is possibly more concentrated. That is, the proportion of the total capacity of the country today is larger with respect to, say, those 10 companies, than it was in 1926. Remember, there are still a lot of the old hand-mill companies that are working profitably, because they are making special products to some extent that it is difficult to make on the continuous strip mills.

Dr. ANDERSON. Is that the explanation for their operating on a profit basis, the small hand mills? I have got the impression from this testimony that this is so distinctly an advantage from a production standpoint that I can hardly imagine small hand mills operating successfully profitably against your competition.

Mr. HOOK. They do, but some of these hand mills are still operating on the specialties which I told you we ourselves must still produce on our hand mills, and when we find out how to make all the products on the continuous mill, I am perfectly frank to admit that they will either have to go to a continuous mill process or I think they will be eliminated, just as my father was eliminated from the carriage business.

Dr. ANDERSON. Is it true that there has been a process of elimination of the hand mills going on, say, since strip mills came in?

Mr. HOOK. Oh, yes; there has been. For instance, take our old Twenty-third Street mill, which was a part of the Ashland plant when we bought it back in 1921. I forget how long we ran it—2 or 3 years, maybe 3 years. It has gone completely, and many of the old hand mills of the Steel Corporation have gone completely, and that tonnage is now made on the continuous mills.

Dr. ANDERSON. Do you have any idea as to the number of concerns that have been closed as a result of the continuous mill?

Mr. HOOK. No; I couldn't answer that question.

Dr. ANDERSON. Do you know of any such figures?

Mr. HOOK. There doesn't come to my mind any particular plant that I can think of that has actually been eliminated and put out of business entirely by the continuous mill.

Dr. ANDERSON. What really happens? What occurs if they are not actually eliminated?

Mr. HOOK. Their operations to some extent have been reduced, and, as I say, they go into the manufacture of products in small quantities. It isn't profitable to make small quantities on these big mills. That is one of the things you have got to do. The little mill can make the over-the-counter stuff, and do that more profitably than we can.

Just think of it. I told you this morning, we make a coil running anywhere from 12,000 to as high as 17,000 pounds out of one slab, just rolled up in a great big roll like a big roll of paper, and it contains from 12,000 to 17,000 pounds, from 6 to 8 tons.

Mr. HINRICHS. I am confused at one point, probably because I haven't come to Middletown yet. This morning I understood you to say that you were operating your hand mills on material which had already been through the continuous strip.

Mr. HOOK. Through the hot continuous strip, partly rolled down on the hot continuous strip, and finished on the old hand mills.

Mr. HINRICHS. So the survival of the hand mill in part depends now upon having a hot continuous strip operation in conjunction with the hand mill. Is that correct?

Mr. HOOK. Not necessarily. For instance, just 30 miles from us, Mr. Hinrichs, at Newport, Ky., is the Newport Rolling Mill Co., operating what we call improved old hand mills. In other words, we have tables running from the furnace down to the rolls so that the man needn't by main strength and awkwardness pick that pack up and throw it on the floor plate. Then in back they have mechanical catchers, and the screw is operated by the roller, who stands and operates it just as he did on the old hand mill. I think they have 26 mills.

This chart really sums up all we have been talking about, if you stop and analyze it, because this dotted line is the United States Bureau of Employment Index, blast furnaces, steel works, and rolling mills, and you can see where that has gone, using the 1923-25 average as 100.

(The chart referred to was marked "Exhibit No. 2473" and appears on p. 16433.)

Mr. HOOK. This line is the sheet and black plate production that we have been talking about that is made on the continuous mills, and this production has been very largely influenced, of course, as we have tried to present to you, by this continuous rolling-mill process.

PRODUCTION ON CONTINUOUS HOT MILLS

Mr. HOOK. This black line here is the total hot rolled production, and the production of sheet and black plate is a part of that, so when you eliminate that, then you find that you have this line of hot rolled products other than sheets. So you can see what the increase in the sheet and black plate production has done to the curve for the total, and where it would have been without that.

Dr. ANDERSON. Mr. HOOK, would it be possible to insert two more lines, breaking up the Bureau of Labor statistics, employment indexes, so that we could compare labor and production in one part of the industry with labor and production in another? If you had the two more lines there, we might have an excellent summary of your argument that this process does not, even within its own part of the industry, adversely affect employment.

Mr. HOOK. Well, maybe we can get the Census Bureau to get that. There are no available figures now.

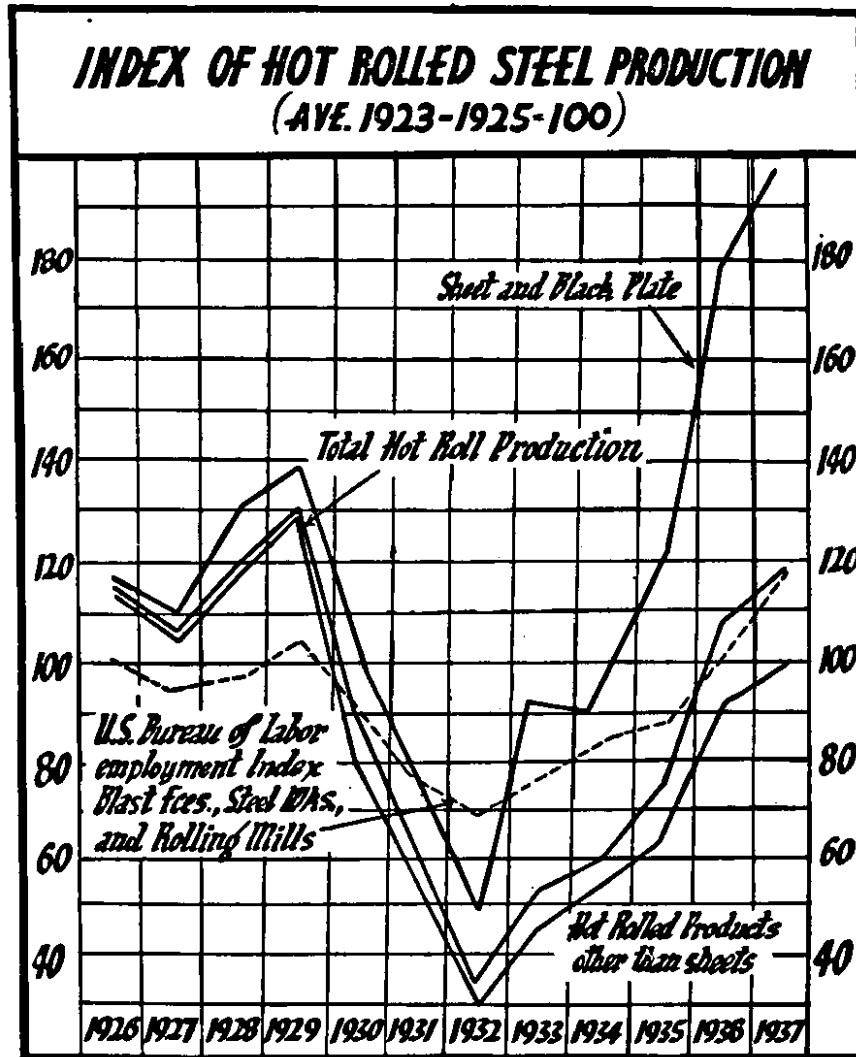
Dr. ANDERSON. I don't think they are available. I was just wondering.

Mr. Hook. I wish we could have done that for you, Doctor, but we feel that this is very significant, and really sums up the story pretty well.

The CHAIRMAN. May I ask whether that trend exhibited upon "Exhibit No. 2473" is still apparent, or has there been any change?

EXHIBIT No. 2473

[Submitted by the American Rolling Mill Co.]



Mr. Hook. Yes; you remember the question was asked a little while ago, and we looked at our figures, and we found that it had continued during this period.

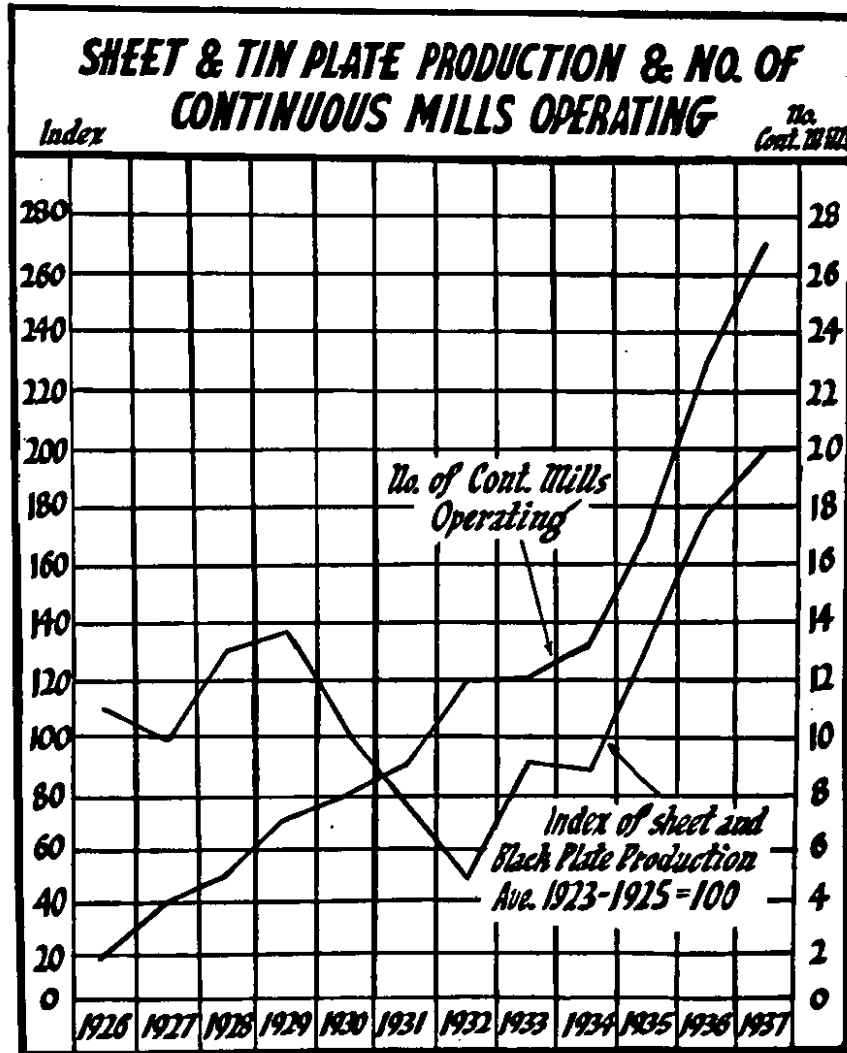
The CHAIRMAN. This ends in 1937, but it is still going on.

Mr. Hook. Yes. In other words, this has affected favorably the trend of the total production. It is continuing, in other words, to be a larger portion of the total production of rolled products. The chart "Sheet and Tin Plate Production and Number of Continuous Mills Operating" shows that these continuous mills didn't come in all at once.

(The chart referred to was marked "Exhibit No. 2474" and appears below.)

EXHIBIT No. 2474

[Submitted by the American Rolling Mill Co.]



Mr. Hook. Here is our first mill. It started in 1924, but we start with 1926. Then the next mill in '26, that was the Butler, and then the Weirton mill came in here; and if we went back to "Exhibit No. 2473," you could see how these mills came in during this period, and

it showed that the index of sheet and black-plate production came right along after this bad period in '32. It came right along with the introduction of these mills.

The CHAIRMAN. It is observable that this upward trend began apparently in 1933, didn't it?

Mr. HOOK. Yes; yes, it did. We got the first boost, you see, before 1929 was over. We got a couple of these mills installed, our mill, and the Butler mill and the Weirton mill were going before 1929, and I think the small mill at Gary, at the steel corporation, and we did get a jump in there, you see, in production during those periods, but that might have been a natural rise. In other words, I don't know that I can credit this to the continuous mill. [Laughter.]

The CHAIRMAN. On the previous chart, "Index of Hot Rolled Steel Production," "Exhibit No. 2473," there is a perfectly amazing increase beginning in 1934, of your steel and black-plate production. That line, '35, '36, and '37, is practically vertical, it runs up so rapidly.

Mr. HOOK. That is when you got the real effect of all these mills, because the majority of them came in from '33 on, where they really began to jump.

The CHAIRMAN. And the next chart, "Exhibit No. 2474," shows that the index of sheet and black-plate production has almost kept pace with the number of continuous mills operating. Now, you have been disposing and marketing the products without difficulty all this time? [Laughter.]

Mr. HOOK. I wish we could say that was true, Senator.

The CHAIRMAN. Well, let me put it this way. Has it been going into inventory or the channels of trade?

Mr. HOOK. Oh, no; it has been going into the channels of trade; absolutely.

The CHAIRMAN. So that it is an active industry and it still remains active.

Mr. HOOK. Very.

The CHAIRMAN. Expanding industry.

Mr. HOOK. Yes.

The CHAIRMAN. I hope your profits are expanding, too.

Mr. HOOK. Unfortunately, they have not. I am not particularly proud of the financial record. [Laughter.]

The CHAIRMAN. Now, to what do you attribute this increased demand for your product?

Mr. HOOK. Well, particularly to two things—the very great improvement in the quality, making it possible for the man who used it to reduce his cost because of lower fabricating cost, and the lower price at which he was able to buy.

The CHAIRMAN. Now you have told us that you were employing more persons—

Mr. HOOK (interposing). Correct.

The CHAIRMAN (continuing). During this period. Now, if all industries were showing the same results, we probably would have a much less difficult unemployment problem than we have, wouldn't we?

Mr. HOOK. Definitely.

The CHAIRMAN. Well, have you, from your observation and experience, any opinion to express as to whether or not the conditions in your industry are indicative of conditions in other industries?

LACK OF INVESTMENT AS CAUSE OF UNEMPLOYMENT

Mr. HOOK. No, they are not, because I think that the large pool of unemployment today is the result of the lack of capital financing; in other words, the deficit in capital financing which I discussed the last time I appeared before this committee,¹ and of course, as you know, I think that I have very definite views on that, and if we go back, Senator, to the report of the Durable Goods Industries Committee, which was submitted to the President on the 14th of May 1934, and you follow through what has happened, those of us who were members of that committee and who have studied the matter since, believe that the things that we pointed out are still pertinent, and other things have happened, of course, since that time, that we think have affected the flow of corporate and private savings into production and trade. I am encouraged by one part of the joint resolution, which created your committee; in section 2 it says:

It shall be the duty of the committee, (a) to make a full and complete study and investigation with respect to the matters referred to in the President's message of April 29, 1933, on monopoly, and the concentration of economic power and financial control over production and distribution of goods and services, and to hear and receive evidence thereon with a view to determining, but without limitation, (1) the causes of such concentration and control and their effect upon competition, (2) the effect of the existing price system and the price policies of industry upon the general level of trade, upon employment, upon long-term profits, and upon consumption, and (3)—

And this is the point I want to bring up—

the effect of existing tax, patent, and other Government policies upon competition, price levels, unemployment, profits, and consumption—

And then (b) says—

to make recommendation to Congress with respect to legislation—

and so forth, on the foregoing subject.

I say it is encouraging to me because you haven't started on No. 3 yet. [Laughter.]

The CHAIRMAN. You'd be surprised. [Laughter.]

Mr. HOOK. When you give business an opportunity to come down here under clause 3, and we haven't yet appeared on that subject, I think we will have quite a number of things to suggest that have militated against the flow of corporate and private savings into production and trade, particularly into the durable-goods industries, where I think your large pool of unemployment still exists.

In other words, there has been a using up of the capital assets of the country, and we haven't kept up with replacement, ordinary replacement.

Here—and I will be glad to leave this—the Machinery and Allied Products Institute have made a very exhaustive study and they said here:

The need for constant replacement of capital goods is seen when we note the decline in value of such property in daily use. A study by the National Bureau of Economic Research revealed that business capital is consumed at the rate of more than eight billion dollars per year. This amount of durable wealth in business, that is, capital goods, must be replaced each year if we are to maintain the nation's stock of durable wealth, to say nothing of expanding it for growth.

¹ See Hearings, Part 20, pp. 10305-10330.

And I believe that therein lies largely the answer to this question of unemployment. I am firmly convinced that with the proper study of the things which have militated against the flow of corporate and private savings into production and trade, the Congress can encourage business in such a way that confidence will be established and we will reinstate that flow, we will encourage that flow of capital, and that, in my opinion, is what is going to change this unemployment picture.

The CHAIRMAN. Of course, I might—

Mr. HOOK (interposing). In other words, we want to get them off the Government relief rolls and onto the pay rolls of private enterprise.

The CHAIRMAN. I might say, and it may not be beyond the bounds of propriety, that my personal views have for a long time been that Congress might, with great success, endeavor to encourage so-called private industry to take up the slack in unemployment by some form of encouraging private investment.

One thought that I had in mind was to give employers of labor some form of a credit to be measured by the number of persons employed, but it is always difficult to suggest a formula without at the same time awakening fears. Not everybody who comes before this committee comes with the same objective attitude that you bring here, Mr. Hook.

Mr. HOOK. Thank you, sir.

The CHAIRMAN. And not everyone realizes that the committee is endeavoring to discover something and not trying to make a goat out of the witnesses who come here.

Mr. HOOK. I don't feel like that.

The CHAIRMAN. I know you don't and that is why I can say it to you.

Mr. HOOK. I am, of course, quite frankly of the opinion that when we really get into a serious investigation under (3) of section 2, a lot of information can be brought here that has a very decided bearing on it, but we would have to spend a couple of days.

Mr. HINRICHs. May I ask a question at this point, please? Mr. Hook, what was the year that you were quoting there from the National Bureau of Economic Research?

Mr. HOOK. 1938.

Mr. HINRICHs. That was a year of depression. I wonder if you wouldn't like to introduce in the record later, not now, a comparison of the net additions to business capital as shown by the National Bureau for 1929 and 1937?

Mr. HOOK. Yes; I will.

Mr. HINRICHs. Just to give a year of active business.

Mr. HOOK. We will prepare those figures over a period of time, and be very glad to have that opportunity.

Mr. HINRICHs. May I ask, has the sheet industry been unusually venturesome, and are you restrained at the present time so much by fear as by the 13,500,000 tons of continuous strip capacity shown in "Exhibit No. 2460"?

Mr. HOOK. I fully expected that question to be asked some time—"Were we more venturesome than anybody else?" Well, it was a case of necessity. When a fellow comes along with a method of doing a thing that you have got to adopt to keep up with the pace, you go out and break your back to find the money to do that job,

to keep from going out of business, and that is just exactly what happened. We have proved by the introduction of this process that a quality of material could be produced that could not be produced by any other method, and if they wanted to keep in competition with the game, it was necessary to go out and put in one of these plants.

Mr. HINRICHs. Do I read your figures in "Exhibit No. 2460" incorrectly? By the end of 1929 there were 3,000,000 tons of continuous strip capacity. Between 1929 and 1932 there was some further building of strip capacity. I would assume that the capacity finished in 1930, and very likely that finished in 1931 was projected in 1929, but even including that capacity, there was only a comparatively small increase during the period when business was sliding off and you had no idea what your future volume would be. By the end of 1932 you had 5,400,000 tons.

Mr. HOOK. That is right.

Mr. HINRICHs. Of continuous capacity.

Then, in this later period, when you saw a rising volume of business and saw some security in the future, there was a very rapid introduction of continuous strip mills, so that by the end of 1937 you had 13,347,000 tons of capacity, a little more than 4 times as much as you had back in 1929.

Now, is that an incorrect reading of those figures?

Mr. HOOK. Those dates are correct. I haven't in mind, you can tell me what it is—but will you refer there to when the sheet and tube plant went into operation?

Mr. HINRICHs. Youngstown?

Mr. HOOK. Yes.

Mr. HINRICHs. In 1934, and a second one in 1935; the Indiana Harbor in 1934.

Mr. HOOK. That is when it actually was turned over. Of course they were some months breaking it in. But what actually took place, the sheet and tube technical men and operating men visited our plant many times during the period say, from 1928 particularly and 1929, up to the time when they made their decision to go ahead—and they were considering it all the time, making their estimates and finding out how they were going to raise their capital and so forth and so on, until finally they saw that it was inevitable.

EMPLOYMENT IN MANUFACTURING INDUSTRIES

Mr. HINRICHs. Didn't they also have in mind the line "All manufacturing" on this chart headed "Indexes of Employment," Exhibit 2475, or on the earlier chart, the total production, Exhibit 2473, that black line that goes sloping off from 1929, when it stood at 104.6, to 1932, when it stood at 65? That must have been also in their minds during that period when they were on the brink of considering building. Had they been maintaining employment, they would probably have been in the game very much earlier than they were; don't you think so?

Mr. HOOK. I don't think there is any question about it.

Mr. HINRICHs. And when they saw that line turn up in 1932 and 1933 about that time it began to look as though there were some sense in a businesslike investment.

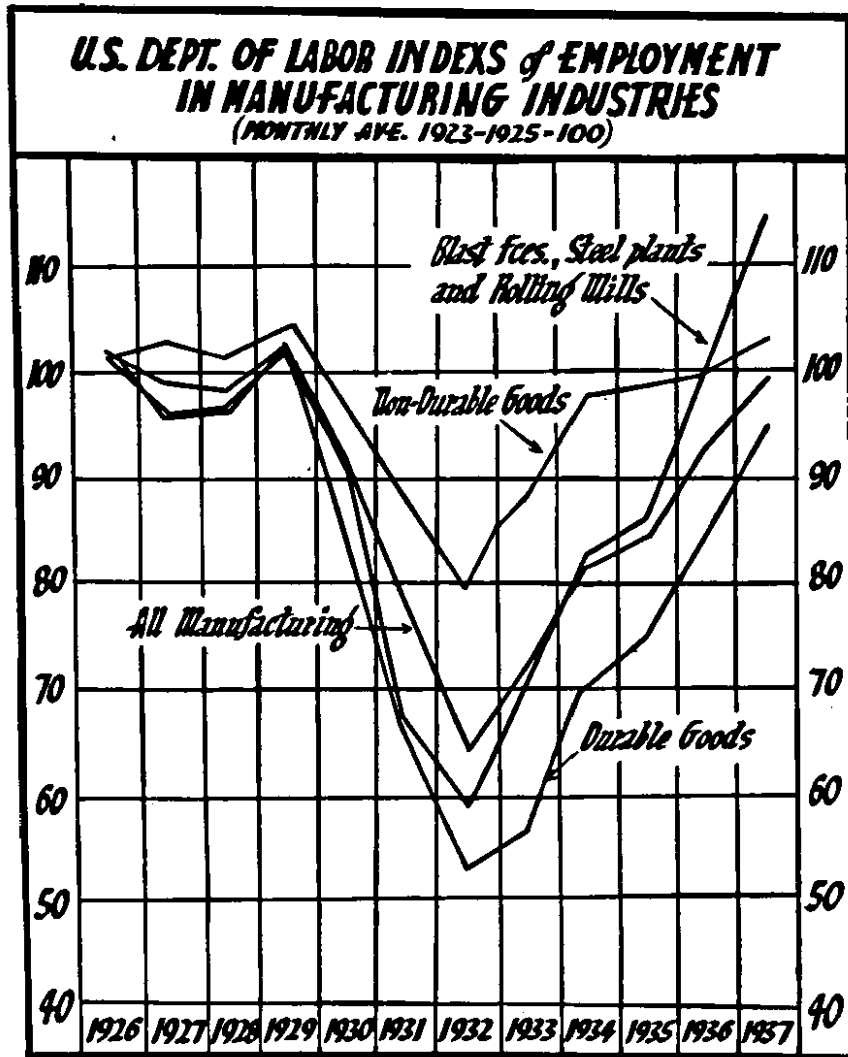
Mr. HOOK. They knew by that time that if they were going to stay in the sheet game in a big way and hold their proportion of the industry they had to do it.

The CHAIRMAN. Now, what does the chart, "United States Department of Labor Indexes of Employment in Manufacturing Industries" show? You produced that chart for a purpose.

(The chart referred to was marked "Exhibit No. 2475" and appears below.)

EXHIBIT No. 2475

[Submitted by the American Rolling Mill Co.]



Mr. HOOK. It is just comparative, that is all.

The CHAIRMAN. Isn't that the answer to the question that I asked you a little while ago?

Mr. HOOK. Yes; I think it is.

The CHAIRMAN. You feel that this chart correctly represents the condition?

Mr. HOOK. Yes.

The CHAIRMAN. Then, reading it, we find that the blast furnaces, steel plants, and rolling mills have shown the same striking increase which was shown on your other chart from 1932 to 1937, an increase which you tell us by your figures for 1938 and '39 is continuing.

Mr. HOOK. Yes.

The CHAIRMAN. I asked you a little while ago if that increase in your business of capacity and of output was comparable with conditions in other industries, and you said you weren't able to speak for the other industries.

Mr. HOOK. No; this is the steel industry only. This is all manufacturing—

The CHAIRMAN. What does that line show with respect to all manufacturing?

Mr. HOOK. Here is your nondurable goods.

The CHAIRMAN. First let's deal with "all manufacturing." What does it show with respect to all manufacturing?

Mr. HOOK. Here it is. Here is your curve of all manufacturing. It lags way behind.

The CHAIRMAN. But it shows an increase, does it not?

Mr. HOOK. It hadn't reached, in 1937, the 1923-25 base.

The CHAIRMAN. What increase does it show from 1932?

Mr. HOOK. All manufacturing? Well, it starts at, say, about 65 and goes up to less than the base.

The CHAIRMAN. It has gone up from 65 to almost 100 in the 5 years from 1932 to 1937.

Mr. HOOK. That is right.

The CHAIRMAN. Now, what has been the effect on durable goods, according to the chart which you have produced?

Mr. HOOK. Durable goods has not kept pace with all manufacturing.

The CHAIRMAN. But what has been the actual effect? It increases from what—from 55 in 1932 to what, to about 95?

Mr. HOOK. To about 95.

The CHAIRMAN. So that in all three of these items which you have produced here there has been a steady and very striking increase of production, has there not?

Mr. HOOK. Yes; there has been that.

The CHAIRMAN. The nondurable goods apparently showed a striking increase from 1932 to 1934, and then tended to level off until 1936, and then began running up slightly again. Is that not correct?

Mr. HOOK. But they didn't get the drop that all manufacturing goods, and especially durable goods, had.

The CHAIRMAN. That is right, because the nondurable goods are the consumer goods.

Mr. HOOK. Yes.

The CHAIRMAN. In other words, this chart which you have produced here shows that these substantial lines of industrial activity have had an obvious increase since 1932.

Mr. HOOK. That is correct. I don't know where we would have been if it hadn't.

The CHAIRMAN. Well, with respect to your industry, you are way above the point which you occupied in 1929.

Mr. HOOK. Correct, and that is why I showed by that other chart, Senator, "Exhibit No. 2474," that the sheet tin and black plate produced on these continuous mills affected that very largely.

The CHAIRMAN. I ask you these questions because recently I read a report by Standard Statistics which showed that in 1939 the 669 leading corporations—utilities, railroads, and manufacturing corporations—had a net income in 1939 of more than 80 percent greater than in 1937, and yet we still have the unemployment problem.

Mr. HOOK. Well, in the meantime, Senator, over this period of time, 1932 to the present time, we have had an increase in the employable men. If we had kept up the normal increase, this figure should be way beyond where it is. If we had kept the normal trend going, we had an increase between 1926 and 1937, I think we showed, of 11.2 percent in population, therefore, we should have had an increase over that same period from 1926 to 1937 to keep up with that trend.

Now, in 1926, you see, the all manufacturing and durable goods lines started at practically base. We ought to have had somewhere around 111, or something of that kind.

The CHAIRMAN. Well, this is the question that frames itself in my mind. If we had an increase in durable goods from an index of 55 to 95 in a period of 5 years, as shown by your chart, and an increase in all manufacturing from 59 to 99 in the same 5 years, an increase of production in nondurable goods from an index of 80 to 102, an increase in all manufacturing from an index of 65 in 1932 to 99 in 1937, and an increase in blast furnaces, steel plants, and rolling mills from 60 to 115, can it be said that any of these industries were suffering any lack of confidence during those 5 years?

Mr. HOOK. Well, yes; I think so, because it should have gone way beyond where it is in the natural course.

The CHAIRMAN. Of course, we never are satisfied with the expansion which we have.

Dr. ANDERSON. But, Mr. Hook, looking at the chart again and its title, you have a chart that does not depict increases in durable goods or nondurable goods, or manufactured articles, but the labor employed in such activities. You would have to put an entirely different chart on there to determine what had happened to production during these years.

Mr. HOOK. Yes.

Dr. ANDERSON. Speaking in terms of our topic, namely, technology, if you laid alongside that chart, which indicates the use of labor in a very rough way, as you will agree, because these are labor indices—

Mr. HOOK (interposing). That is right.

Dr. ANDERSON. And not actually full-time employment, a series that would depict the thing the Senator and you have been talking about, what is your guess? Would it show total technological displacement of labor as this product moved upward from the trough of the depression or not?

Mr. HOOK. No; I don't think so.

Dr. ANDERSON. In other words, you would hold that productivity per unit produced on this rising market out of the slump of the depression had not increased in the over-all?

Mr. HOOK. The labor per unit probably has gone down. If it hadn't, we wouldn't have got the increase in production. The increase of production has kept up the employment to where it is.

Dr. ANDERSON. So you recognize the item of labor per unit as a factor?

Mr. HOOK. We do.

Dr. ANDERSON. And you linked with it, in order to have an over-all increase, increasing production of such proportions as to take care of individual displacement as it occurs. That is your thesis?

Mr. HOOK. That has been the case.

Dr. ANDERSON. Mr. Chairman, might I have the witness refer back to the testimony statement for a moment or two to ask several questions that we want in the record?

Mr. HINRICHS. May I talk to "Exhibit No. 2475" for a moment? Mr. Hook, I would like to give you a chance at this point in the record to introduce a table showing the annual averages of these several lines of employment in each year from 1926 to 1937. I don't know when your chart was drawn, and I don't recognize the terminal figure. Actually, the increases of employment appear to have been greater than those that are indicated on your chart, and it may be that your chart is not adjusted to the final census figures.

Manufacturing employment in 1937 was very slightly higher than it had been in 1929, and all of the indexes for 1937 are somewhat higher than they appear to be on your chart. I am sure that there was simply some slip in possibly the old and not revised figures, and I would like to have you have a chance, at your leisure, to correct the final record on that thing.

Mr. HOOK. They were taken from the *Survey of Current Business*, as issued by the Department of Commerce. This happens to be the 1938 supplement that those figures were taken from.

Mr. HINRICHS. There are two factors that haven't been taken into account, then, I think. One is the fact that the census changed its definition of what was manufacturing. Back in 1929 they included railroad repair shops and several other industries as manufacturing that don't appear in 1937, and there are always small adjustments that the Bureau makes in its figures, which were released in September of the past year. I will be glad to supply you with those.

I was going to suggest that the chart be withdrawn, but so much discussion centered on the thing that I think I would leave the chart, unless they prefer to withdraw it and insert the table in its place later.

The CHAIRMAN. I think the chart can remain.

Mr. HOOK. I will let Mr. Brooks confer with you, and we will work it out.

Dr. ANDERSON. I know we have imposed upon you greatly today.

Mr. HOOK. You haven't imposed upon me at all.

Dr. ANDERSON. From our standpoint it is only because of the seriousness of the problem we are discussing, and your wide knowledge and comprehension of it, and this remarkable paper and presentation that you have made, that I want to probe a little bit further in order to

have certain things in the record that seem to me to be extremely important.

NATIONAL ASSOCIATION OF MANUFACTURERS' STUDY OF OLDER WORKERS

Dr. ANDERSON. One of the problems of technology that concerns everybody of late is this matter of the elimination from employment of the older worker. This morning you referred to the National Association of Manufacturers' study of workers over 40. I take it it was this document, *Men Over 40*, that you had reference to. From your reading of the document, you came to the conclusion that there was no evidence to support the charges of various groups that are mentioned here—the American Legion and veterans' organizations—that older workers are being eliminated from industry.

Mr. HOOK. They cooperated with us.

Dr. ANDERSON. Might I point out that from my own standpoint as a student of the problem, and I think this is agreed in by others who have studied it, this pamphlet in no sense, in any comprehensive way, permits that conclusion. I draw your attention to the final chapter, the final supplement, No. 3, from which most of the data are derived, and I hope later you will add something for our record on this topic if you differ with me. The table was based on group insurance statistics of life insurance companies covering the years '23, '28, and '37. The age distribution of industrial employees had altered as follows: those over 40 years of age who were covered by group policies, industrial workers, were 31.7 percent of the total in '23, 33.7 percent in '28, and 32.3 percent in '37.

In other words, from '28 to '37 there was a decline in the proportion of people aged 40 and over covered by this insurance.

That would lead me to believe that these data show nothing conclusive with respect to retaining older workers in industry generally.

Mr. PIKE. Do you happen to know, Dr. Anderson, whether the insurance companies themselves may have changed their policy regarding insuring employees in the groups over 40?

Dr. ANDERSON. Nothing is indicated in the pamphlet, which, by the way, is important because it has had wide distribution.

Mr. PIKE. During the hearings on insurance¹ we had some indications that in some instances they changed the views about the desirability of certain forms of insurance, and I don't know whether group insurance was involved.

Dr. ANDERSON. The National Association of Manufacturers did one other thing. It sent out a questionnaire to its members and got back returns for the year '37 and the year '38. I point out again that you cannot tell anything decisively from 2 successive years by way of a trend of conditions, but I simply want to add that the number of reports returned for 1937 was 2,089, those for 1938 were 1,582. I haven't read the pamphlet recently, but I remember in the reading I made of it, and I trust my memory is correct, that it does not include detailed analysis of the study, so that we do not know the exact identity of the respondents in the 2 successive years. We do not have what scientific students of the problem consider a safeguarded study.

¹ See Hearings, Part 10.

There was a difference there of 6 percentage points in the 2 successive years; on the down-sweep over the peak employment year of 1937 to '38 there seemed to be a retention of older workers in the industries. So far as I know, however, there is no substantial body of evidence in this or any other document that proves that industry as a whole is retaining its older workers, and I wanted to ask Mr. Hook if, in his analysis of the problem, he had discovered such data, and if he did have them, would he supply them to the committee for its use.

Mr. HOOK. I referred to that, Dr. Anderson, because it was conducted by a subcommittee under the employment relations committee of the National Association of Manufacturers, and it was conducted in conjunction with the service men and several other organizations. I happened to be chairman of the resolutions committee in 1937, when representatives of those various organizations appeared before our committee and argued that men over 40 were being eliminated and were not being given an opportunity. We said, "Well, come along and join with us and let's find out what the facts are. We will furnish the money and you cooperate," and if you will read what they said about the study on the very first page you will find that they were very complimentary and very appreciative of the work which we did.

I would have to go through it and study it carefully—

Dr. ANDERSON (interposing). It was not my thought, Mr. Hook, to criticize the study so much as to raise the question which it seems to me industry should be more concerned about—and I was pleased to see your own concern about it—namely, the elimination of the older worker. I was wondering whether you have data from your own plant to indicate what has occurred there.

Mr. HOOK. We have. I hope Mr. Brooks has them here.

Mr. BROOKS. I have it only back to 1929, and the percentage in 1929 and 1939 of workers over 40 is practically the same—30 percent in both years.

Dr. ANDERSON. In '29 and '39?

Mr. BROOKS. Yes, sir.

Mr. O'CONNELL. Do you have it for any intervening years, or just for those two?

Dr. ANDERSON. Let me just ask this one point, then. That is a 10-year period of time, and you know that during that period of time the proportion of older people in the population has been increasing. If that is true, and we don't have the information for those years available, it would show that there was no tendency on the part of your firm to employ older workers in preference to other workers.

Mr. BROOKS. Well, your total employment has increased in this period, I believe.

Dr. ANDERSON. Might I ask this, Mr. Hook. If we were to frame you the headings of a table that would bring out this point, could you supply us with the information from your company records?

Mr. HOOK. I think we can. We will be delighted to give you any information, Doctor, that you want and we can furnish.

Mr. PIKE. May I ask one more question along that line? It is normal, I think, for the growing business to pick its employees out of the pool which is normally becoming employable, whereas in the declining business it is also normal, isn't it, for the concern to keep on with the

men that it has, or if it has to drop people, to drop the youngest people that it has? I wonder if, in the concern that is growing, the average age of the employees would probably not increase, and might even tend to decrease it. A concern that is standing still, or contracting, such as the railroads, might find its average age of employees increasing. I would think that generally—I wouldn't say invariably—the human manager dealing with the human machine would tend to keep his old people and discharge the younger ones without family obligation. So that, since your own business has grown substantially during that 10 years, it might be that your percentage of old men hasn't increased because you have been picking them out of what is normally the large pool of those employables, that is, those coming of age.

Mr. HOOK. Correct. Unless you were making a real effort to hold your older-than-40 men in the period, the percentage would have markedly decreased, because the number that you would employ as you increased your production, of course, greatly increased the total. In other words, your older men represent a smaller percentage of the total in 1937.

Now, if your percentage remains the same, that shows that you really have employed a larger percentage of the older men. You haven't let them off, you have kept them on.

Dr. ANDERSON. That is right, you haven't let them off.

Mr. HINRICHS. What age groups have you?

Mr. BROOKS. They are in 5-year groups.

Mr. HINRICHS. What was the percentage of 30-35 in 1929?

Mr. BROOKS. It was 15 percent.

Mr. HINRICHS. And 40-45 in 1939, 10 years later?

Mr. BROOKS. It was 13.78 percent. May I explain that the distribution is changing. These are taken from group insurance records, and I might point out in 1929, that distribution covered 8,858 employees, whereas in 1939 the distribution covered 11,210 employees. Now, this is not to be confused with total employment because not all employees are included.

Mr. HINRICHS. Mr. Anderson, I wonder if instead of asking for a special tabulation, it wouldn't be helpful, at least in the first instance, to have that distribution inserted in the record, if that is a proper request. There is the information.

Mr. HOOK. This chart? Yes.

Mr. HINRICHS. If that meets our needs, nothing further may be needed in the way of a special tabulation.

Mr. HOOK. We would be glad to give you any records we have.

Dr. ANDERSON. You don't have the story of the data on new entrants?

Mr. BROOKS. I don't have it with me.

The CHAIRMAN. You do have it, then?

Mr. BROOKS. It could be gotten by going back through all of our employment records over a period of years.

The CHAIRMAN. I didn't mean to suggest that.

Mr. BROOKS. It is not tabulated.

Dr. ANDERSON. In the hiring of new employees, you make no distinction on the basis of age?

Mr. HOOK. No.

Dr. ANDERSON. That doesn't come in at all?

Mr. HOOK. Oh, naturally, for instance, you wouldn't take a man 60 years of age and put him up on a crane handling 60 tons of hot metal.

Dr. ANDERSON. But you do not have any form or anything?

Mr. HOOK. No, indeed.

Dr. ANDERSON. I want, then, to read from your statement, and, without belaboring the point that I raised earlier in the day, ask you something concerning the whole statement on this basis. You say:

For that purpose, I have chosen—

in order to determine what has happened here—

the period covering the years 1926 down to 1937, because it was during that period that all but one of the continuous sheet rolling mills were introduced into the steel industry.

Following that, your testimony has been based in display after display on these 2 years, 1926—

Mr. HOOK (interposing). Period.

Dr. ANDERSON. 1926 period; 1937 period. I wonder if it would be possible in order to get the true picture—and I think you agree that would be necessary—to get the intervening years on the same basis? Could you extend your table and just give us the table that you have here, just supply the intervening years?

Mr. HOOK. You mean give you the information for each year?

Dr. ANDERSON. Just as you have it in the tables, but each year separately.

Mr. BROOKS. Would you want that on the single plant we used as the case example or the total company? I think the single-plant illustration, since it is the only plant where the old hot-plate process was actually replaced by the continuous mill, would probably be more illuminating for your purposes.

Mr. HOOK. Otherwise you confuse other products.

Dr. ANDERSON. For example, in "Exhibit No. 2461," "Estimate of Number of Workers Employed in Industry in Hand Mill Processes Including Preparatory, Rolling, and Shearing Operations," you show 2 years, and on that basis you come to this conclusion which is so extremely interesting to me, and I know to the committee, that there was a net increase of 42,000 workers.

Mr. BROOKS. What was that statement?

Dr. ANDERSON. You say the estimated number of workers is an increase in 1926—

Mr. BROOKS (interposing). No; that is not an increase. The 42,000 workers are those who were in employment on those mills in 1926.

Dr. ANDERSON. Right; but now you get a net—

Mr. PIKE (interposing). Of 27,000 decrease.

Mr. BROOKS. A possible decrease in that number; yes.

Dr. ANDERSON. The possible decrease is on the basis of the 2 years compared is what I am trying to say.

Mr. BROOKS. That is right; it is on the basis of the total tonnage manufactured in 1926, which I believe was the greatest sheet and tinplate tonnage year up to that point.

Dr. ANDERSON. My point is this: I am led to believe by reading and study of the problem, and conversation with people engaged in the industry, that the displacement effects of the continuous sheet-rolling process are most noticeable following 1937. In other words,

I understand that these mills were introduced gradually, as you pointed out today; they finally began to have the increasing proportion of all production; and in the last 2 or 3 years noticeable changes have occurred.

Now I refer to your comment that some 90,000 people are supposed to have lost employment as the result of this continuous sheet-rolling process.

Mr. HOOK. That was the statement that has been made.

Dr. ANDERSON. And that statement has been made, as I remember, within the last year or so, and I understand it refers to things that have happened within the past 2 years. Would it be possible to carry your figures forward through '38 and '39?

Mr. HOOK. I think we can.

Mr. BROOKS. Well, it is rather difficult to carry them forward on the basis we have used, because in the year 1926 there was very little continuous-mill tonnage. There was only one continuous mill actually in operation throughout the year. Therefore, we could take the unit of production per man and divide into it and arrive at a reasonably correct figure of the total correct employment.

That is not true in 1939. The only way you could ever carry those figures through would be by a check-up with every manufacturer of sheet steel to see how many people he has employed on those mills.

Dr. ANDERSON. In other words, you have to go into estimating for such a year as '39.

Mr. BROOKS. We did make a check-up on which we based our estimate of 15,000, contacting a number of producers as to what mills they were operating.

Dr. ANDERSON. I wonder if you would be willing to go through the tables at your leisure and give us the sources, where they are not indicated, and the bases of computation where such things were computed?

Mr. BROOKS. Yes; I would be very glad to do that.

Dr. ANDERSON. Such data are lacking in certain instances and when we read these at our leisure we want to know what they are based on.

Mr. HOOK. When you come to Middletown, Doctor, and we go into this more thoroughly, we can get a lot of those figures, a lot of information.

Mr. BROOKS. Dr. Anderson, could you give me a list of those instances where you want the references?

Dr. ANDERSON. Yes; we will do that, if you will permit us to raise the questions we have been talking about here and hand them to you so you can fill them in.

Mr. BROOKS. All right, sir.

The CHAIRMAN. You testified a little while ago that reduction of price was an important factor in increasing the distribution of your product and all steel products?

Mr. HOOK. That is correct.

The CHAIRMAN. So, I take it you agree with the testimony of Mr. Ford yesterday, and of other witnesses, in response to my questions, that increasing the capacity of the masses to purchase commodities is one of the most important factors in providing for increasing prosperity, technological advance, and general welfare.

Mr. HOOK. You are right, Senator. I referred to that a little while ago when I commented on the things that I thought could be done to bring that about, in order to get the men off the relief rolls and onto the pay rolls of private enterprise.

The CHAIRMAN. Where they ought to be, of course.

Mr. HOOK. Where they ought to be.

The CHAIRMAN. Are there any other questions to be asked of Mr. Hook?

PROVISIONS FOR DISPLACED EMPLOYEES

Mr. HINRICHS. Mr. Hook, I wonder if you care to comment briefly on what you did with reference to specific workers in terms of preventing a dislocation and a displacement. Jobs were changed by this process, changed quite extensively. You commented that the over-all employment was perhaps even greater than it had been in your company.

Mr. HOOK. Well, in our particular case, I can give you exactly what we had, because I have here a copy of the notice. We called all the men together who worked on the old-style mills, in our auditorium, oh, I think it was the 4th of January 1929, and we explained to them what was going to happen, that we thought that eventually the 1,191 men (I think I remember correctly the number employed at that time in the old-style sheet mill department) would all be dismissed and we would have to find jobs for them in other departments. If we couldn't find jobs for them, we worked out a separation allowance, and I will read it to you, and then I will give it to you for the record. We posted this afterward after explaining it to them. The subject was, "Plan for handling hot-mill employees in connection with new finishing mills." [Reading:]

1. We do not expect to be able to find jobs for employees who have been with the company for less than one year.

2. Jobs will be found on new finishing mills for as many men as are necessary for their operation and every effort will be made to place as many as possible in other positions in our various plants.

The employment department will have charge of placing men.

3. Men who are not placed will be given half pay for as many months as they have years of service but not more than 6 months and with a minimum of \$50.00 per month.

4. No special payment as outlined in Paragraph Three will be given to men who are placed in any of our plants.

5. Any man who accepts a position in our plants, but decides within a period of 30 days that for some reason he is not able to go on, will receive the payments as outlined above.

In other words, he had 30 days in which to decide whether he'd take his separation allowance or keep the job which we put him on. [Continuing.]

6. Continuous service with full insurance will be carried for the period mentioned in Paragraph Three on all men who are not placed in our plants.

7. If an employee gives up a job and receives payment as above and then starts with the company later his special payments will cease and he will not receive them again if he should leave the company's employ a second time.

8. If requested, the company will be glad to assist in placing men with other companies if positions cannot be found in our plants.

(The document referred to was marked "Exhibit No. 2476" and is included in the appendix on p. 17330.)

Mr. HOOK. Now, as a matter of record, because I think you will ask me the question, "Well, how many men were employed?" Well, at Middletown, in that plant, 393 received their separation allowance. The rest of them were taken care of, and we paid those 393 \$208,233, or \$530 per man. At Ashland, Ky., and I mentioned that we shut that old hand mill down after the new continuous mill had been in operation 2 or 3 years, there were 199 men. They received \$76,660 or \$385 per man. So there was a total of 592 men. The total amount we paid was \$284,893, or an average of \$481 per man.

Now some of those men got as high as, oh, \$1,900, for instance, a roller.

The CHAIRMAN. Five hundred and ninety-two men out of how many?

Mr. HOOK. Well, at Middletown, there were 393 out of 1,191, as I recollect. Now, of those 393 who got their separation allowance, most of them are back again in the plant. They bought gasoline stations and several of them thought they'd start a little grocery store with the money that they got. They had the experience that many people have had who go into business. They failed, and so they came back and worked in the mill, so there are not very many of those men out. Some of them are now on what we call our idle-time pay roll. We do not have within our company what we call a definite pension plan. We take each case, and I forget how many men are on the idle-time pay roll now. Do you know?

Mr. BROOKS. I don't know exactly, but I'd say offhand about 110.

Mr. HOOK. Who are on the idle-time pay roll. In other words, we use that term. The men like to feel that they are still in our employ. They are doing something. We may call on them for a little service, so they are not pensioned. They are just on the idle-time pay roll. Each case is judged on its own merits. In other words, one man may need more assistance than another, depending upon whether he is married and has a family that are still dependent upon them.

Mr. HENRICHS. They are not compensated for the amount of time that they do work for you?

Mr. HOOK. Oh, no. That is just a monthly allowance.

Mr. HENRICHS. Now, these 199 men in the Ashland plant were all of the employees in Ashland. Is that correct?

Mr. HOOK. Well, no. We took some of those men. There were more men than that employed in that plant. I forget just how many were employed there, but we took men from what we called the Twenty-third Street plant, which was the old plant, now dismantled, and we took them down into the new plant as we increased the production down there. We took them out of the old plant and put them into the new, and many of those men are now working down in the new plant who were formerly employed in the old plant.

Mr. HENRICHS. They were given the same options as the people in the old plant. They had the option of staying or of taking a—

Mr. HOOK (interposing). Yes. Yes; we found jobs for them in the new plant, or they could take their separation allowance, and in that case many of those men are back.

Mr. HENRICHS. Some of those separation allowances were voluntary, I judge. With others, there was a clause in there that you

would keep them if you could. Otherwise they'd get a separation allowance.

Mr. HOOK. Correct.

Mr. HINRICHS. Now, is it fair to assume that most of these 592 men were men for whom you couldn't find jobs at the time?

Mr. HOOK. No. Quite a number of those men were offered jobs, and they preferred to take their separation allowance. A good many of them have told me since, "I wish I hadn't taken it and stayed in the mill, because I'd be further ahead now," because they have had to come back into the mill and take positions that are lower-paid jobs than they had before.

Mr. HINRICHS. So that at the time you were making the change-over, you also had to go out into the labor market and hire new people for these jobs that were available to the old people, but which were—

Mr. HOOK (interposing). To some extent, that is true.

Dr. ANDERSON. How widespread is this separation pay-roll allowance method in the industry as a whole?

Mr. HOOK. I can't answer that question, Doctor. The National Association of Manufacturers' Committee on Employment Relations has a subcommittee working on this plan, and we have been urging manufacturers throughout the country to plan ahead when they know that the technological development is going to displace temporarily a certain number of men, and try to plan ahead and train them for jobs.

Mr. HINRICHS. This took place within your own establishment and your business was expanding over this period in total employment?

Mr. HOOK. Correct.

Mr. HINRICHS. There has been some displacement in hand mills that have failed, closed down completely, I presume. Hasn't there?

Mr. HOOK. Oh, I must presume, also.

Mr. HINRICHS. Has the industry made any industry-wide effort to deal with that problem? Those are men who are not your individual responsibility, as the executive of a single company, but they are the outside casualties for the industry as a whole.

Mr. HOOK. Industry-wide, no. Each company has carried out its own program, whatever it may be.

Mr. HINRICHS. Have there ever been any discussions as to what approach of that sort is even feasible?

Mr. HOOK. Oh, there have been discussions amongst executives, naturally, as we discuss all sorts of problems amongst ourselves, but not as an organized discussion. But there has been organized discussion in the National Association of Manufacturers' Employment Committee. For instance—this hasn't anything to do with this, but I only use it as an illustration—at the present time, we have a very able committee studying the problem of regularization, and I don't know whether you have seen our latest report on that or not. I think it would be very interesting to you, particularly. If you haven't it, I hope you will get it.

Mr. HINRICHS. Casualties of that sort, the small plant that has 100 or 200 employees that closes up, would have to be handled, if at all, on the basis of an industry approach to the problem. There isn't any surviving responsibility by a responsible employer to deal with the problem, is there?

Mr. HOOK. Well, if a company actually goes out of business, why—

Mr. HINRICHS (interposing). That, however, has been a part of the process, as a reflection of this large extension of these very large units, hasn't it?

The CHAIRMAN. Mr. Hook, were you going to make another comment?

Mr. HOOK. No; Mr. Brooks was just calling my attention to the fact that there are a good many companies that are folding up for other reasons than technological development.

The CHAIRMAN. We are very much indebted to you for a very interesting day. It has been very nice to have you here.

Mr. HOOK. Thank you.

The CHAIRMAN. Tomorrow morning, Mr. Philip Murray, who was to have been called today, will be the first witness. The committee will stand in recess until 10:30.

(Whereupon, at 4:50 p. m., a recess was taken until Friday, April 12, 1940, at 10:30 a. m.)

INVESTIGATION OF CONCENTRATION OF ECONOMIC POWER

FRIDAY, APRIL 12, 1940

UNITED STATES SENATE,
TEMPORARY NATIONAL ECONOMIC COMMITTEE,
Washington, D. C.

The committee met at 10:40 a. m., pursuant to adjournment on Thursday, April 11, 1940, in the Caucus Room, Senate Office Building, Senator Joseph C. O'Mahoney, Wyoming, presiding.

Present: Senators O'Mahoney (chairman) and King; Representatives Williams and Reece; Messrs. Henderson, Pike, Hinrichs, O'Connell, Kreps, and Brackett.

Present also: Boris Stern, Department of Labor; Frank H. Elmore, Jr., Department of Justice; William T. Chantland, Federal Trade Commission; and Dewey Anderson, economic consultant to the committee.

The CHAIRMAN. The committee will please come to order. Dr. Anderson, are you ready to proceed?

Dr. ANDERSON. Mr. Chairman and members of the committee, we devoted the day yesterday to management's story in the steel industry as told so ably by Mr. Hook. Today we propose to present to the committee a witness able to discuss the problem from the side of the workers. Mr. Philip Murray, chairman of the Steel Workers Organizing Committee of the C. I. O. is the witness to be presented at this time. He has with him his technical assistant. I presume you will swear them.

The CHAIRMAN. Do you both solemnly swear that the testimony you shall give in this proceeding shall be the truth, the whole truth, and nothing but the truth, so help you God?

Mr. MURRAY. I do.

Mr. RUTTENBERG. I do.

The CHAIRMAN. You may be seated. Dr. Anderson, it would appear that Mr. Murray has a rather substantial statement to make, and in the interests of expedition, if it is agreeable to you, I will ask members of the committee, so far as possible, to refrain from interrupting the witness until he has completed his statement. If we can make our notes as we go along, then we can ask the questions after Mr. Murray has concluded, and I think probably we will get better results.

TESTIMONY OF PHILIP MURRAY, CHAIRMAN, STEEL WORKERS ORGANIZING COMMITTEE; ALSO HAROLD J. RUTTENBERG, ASSISTANT

Mr. MURRAY. Mr. Chairman and members of your committee, I welcome this occasion to present testimony to the Temporary Na-

tional Economic Committee on the social and economic effects of technology, and want to express my appreciation to the members of the committee for this opportunity.

Although the purport of my testimony is national in character, the bulk of my observations are confined to the basic iron, steel, and tin producing industry, which I shall hereafter refer to as the steel industry. The spirit in which I present this testimony is a cooperative one, as it is my understanding that the committee's function is to arrive at the essential basic facts about our economy for the purpose of devising solutions to the chronic economic ills with which it is afflicted.

The most vital of these chronic economic ills is unemployment. The crux of the unemployment problem, particularly in relation to the displacement of men by machinery and other technological improvements, seems to lie in the unwillingness of industrialists and certain of our statesmen to recognize the facts. Before discussing technological unemployment in the steel industry, I want to make a few general observations.

The upswing in business and industrial activity, which reached a peak in the last quarter of 1939 has demonstrated irrefutably that the American economy has not kept pace with the advance in technology during the past decade; and that industry is not expanding to absorb the workers displaced by technology. Last November and December industrial production in the Nation as a whole surpassed the all-time peak in 1929, with fewer workers.¹ In the great industrial district of Pittsburgh production rose 6 percent from August 1929 to November 1939, but during this period man-hours worked declined 19 percent.² It is plainly observable, therefore, that the most crucial problem confronting our economy is the failure of employment to keep pace with production. The seriousness of unemployment is demonstrated in Pennsylvania, where 24 percent of the working population was unemployed last December, the month when national industrial production was higher than in 1929.³ At the same time unemployment in the Nation as a whole was a discredit to our industrial civilization, the estimates ranging from 9,000,000 to 11,000,000 unemployed workers, men and women idle through no fault of their own, men and women no longer wanted or needed by private industry.

Occasional pronouncements from men in high places seem to be focused upon the elimination of unemployment when our national annual income rises several billion dollars above the peak year of national income. The goal of a \$90,000,000,000 to \$100,000,000,000 annual income is impossible of attainment as long as industry in America continues its present practices. To eliminate unemployment by raising the national income is getting the cart before the horse. The national annual income cannot be raised until the unemployed are put back to work. And as long as industry continues its present practices of eliminating workers to maintain profits, our national income cannot be raised above the level of recent years.

¹ Federal Reserve Bulletin, February 1940, p. 81. (Mr. Murray's footnote.)

² Pittsburgh Business Review, December 29, 1939, Bureau of Business Research, University of Pittsburgh, Pittsburgh, Pennsylvania, pp. 17-18. (Mr. Murray's footnote.)

³ Pennsylvania Public Assistance Statistics, October 1939, Department of Public Assistance, Commonwealth of Pennsylvania, Harrisburg, Pennsylvania; and correspondence between the Research Department of the Steel Workers Organizing Committee and the Department of Public Assistance. (Mr. Murray's footnote.)

The apologetic attitude of political and industrial statesmen concerning a solution of this problem of unemployment might very well be likened to the attitude of leading industrialists and Republican statesmen during the period 1930 through 1932, when they said that a policy of waiting would result in a return of prosperity. The attitude of industrialists and certain statesmen of today concerning the solution of the present unemployment problem is the same. We are told: "Let's wait and things will eventually straighten themselves out." The Nation and its people have been going through this period of waiting for more than a decade, and here we are with 11,000,000 people still idle, whilst the heavy hand of taxation, directly attributable to Nation-wide unemployment, engulfs the country and jeopardizes the perpetuity of our democratic form of government. In recent years this "Wait-and-things-will-work-out-all-right" attitude has been altered slightly by saying no one shall starve. But even this slight alteration is being abandoned, and less than a quarter of the unemployed are being given meager W. P. A. jobs.

On every hand we hear the cry of industry, and also we hear the cry from Government: "Give us greater productivity, increase our efficiency, lower the production costs of our commodities, and thereby create greater buying power, and this will afford the cure for all the unemployment evils confronting the Nation." This has been the battle cry of America for a period of almost 8 years. Labor has responded to it. Efficiency has been increased. Workers have cooperated, applied more energy, put forth greater effort, and increased productivity. What has been the reward? It has been a lower annual income for labor, a greater number of men thrown out in the streets, and a shorter work year for the workers still employed. The greater efficiency is not being passed on to consumers, but is going into corporate profits, which surpassed 1929 profits in the last quarter of 1939. All this while millions of workers are idle. Here is another case of working men and women responding to a national emergency, giving their all in reply to the battle cry of industrialists, politicians, and economists. And what has been labor's reward? In return for their cooperation, the workers of this Nation have unemployment, poverty, and all the misery that trails in the wake of both. Monopolistic controls have grabbed up the fruits of greater efficiency and turned them into the highest corporate profits in the history of America.

Almost every corporation and company in America today maintains an army of industrial engineers and efficiency experts, whose duty it is, through the process of time evaluating of jobs, to increase the productivity of the individual, and thereby lower the costs of production. The science and ingenuity of man in developing processes and methods to increase production and increase efficiency has run amuck in the United States during the past 10 years. There has been no planning, and so far as I am aware there have been no checks or restraints. As a matter of fact, every agency of government, every leader and owner of industry, and almost every economist of national repute, has loaned every effort toward the attainment of this goal of ever-increasing efficiency in American industry. Indications point to continuing improvements in efficiency and production during the years to come. Out of this situation there may develop the greatest pros-

perity or the craziest national economy ever recorded in the history of any civilized nation.

In this machine age, is this age of technological improvement going to spell the downfall of our democracy? Or are these improvements in the production facilities of modern industry going to be utilized to promote the social well-being of our national population, and thereby maintain for America the best form of democratic government we believe to be anywhere in the universe? Factual investigations conducted by responsible economists and statistical organizations reveal the very alarming fact that the trend in American industry today, due to the introduction of machines and other improvements in efficiency, is toward greater monopolistic control in all kinds of industrial and manufacturing enterprises. Technology, for example, is building a new monopoly in the steel industry.

In substance, the present program of industry, insofar as I am able to observe with relation to the introduction of new mechanical devices and other technological improvements follows this pattern: Introduce a machine or a new method; increase productive efficiency 15, 25, or 50 percent; increase hourly wage rates a fraction of this percentage; lower the number of man-hours per year considerably; lay off such other men as may not be required where the new machine or the new method for increasing productivity has been introduced; and gobble up most of the benefits of greater productivity into profits. There is the situation in American industry today. It seems, therefore, to be the bounden duty of the leaders of industry, government, banking, farming, and labor to get together under the auspices of the Federal Government and do something of a constructive nature to put more people to work, to absorb in industry the people who are now unemployed, and to give the youth of the country a chance in life, thereby increasing the national income, and alleviating the present high taxation imposed upon our people for the purpose of maintaining an impossible economy, an economy made impossible of maintenance through taxation because of the failure of private industry to employ the unemployed workers of America. I shall have more to say about this proposed national conference on unemployment in the concluding part of my statement.

The CHAIRMAN. Perhaps I may interrupt you here, Mr. Murray, because I note that you have come to the conclusion of your general observations. If any member of the committee wishes to ask any questions on the general observations, this might be an appropriate time to do it without actually obviating the rule laid down at the outset.

Dr. ANDERSON. Mr. Chairman, the general observation depends upon certain other parts of the general statement, and I have some questions that I wanted to reserve until a later time.

The CHAIRMAN. Very well, I just wanted to give everybody a chance.

TECHNOLOGICAL CHANGES IN THE STEEL INDUSTRY

Mr. MURRAY. No industry has been harder hit by technology during the 1930's than the steel industry. Before discussing the new steel technology, its social and economic consequences, I want to make the position of the Steel Workers Organizing Committee on technological changes perfectly clear. The Steel Workers Organizing Committee

does not oppose technological advances; in fact, the Steel Workers Organizing Committee approves them and conducts a continuous education campaign amongst its members in favor of technological improvements. The attitude of the Steel Workers Organizing Committee, unlike that of the run-of-mine employers, does not stop there. In approving technological changes, the Steel Workers Organizing Committee's objective is to secure the participation of labor and consumers in the economic benefits of such changes and to eliminate the devastating social consequences of such changes on workers, their families, and entire communities.

Those who choose to charge the Steel Workers Organizing Committee with opposing technological advances misrepresent the Steel Workers Organizing Committee's position for the purpose of erecting a smoke screen behind which they try to deprive workers, as well as consumers, of the benefits of technology. These parties would likewise have us believe that there is no such thing as technological unemployment, and in their attempt to prove this they try to create the impression that workers are participating in the benefits of technology when, as a matter of fact, such is not the case. My purpose in this discussion is to present the facts of the new steel technology, as briefly as possible, in their logical sequence.

The story of the new steel technology during the past decade is one of technological unemployment, the permanent displacement of workers, the elimination of skilled workers no longer young in years, the ruination of complete communities, the abrupt closing of entire plants, the cancelation of labor's contribution to national purchasing power, a constantly rising labor efficiency, the failure to reabsorb the displaced workers to create a corresponding number of jobs elsewhere, the inadequate participation of labor and consumer, and the intensification of control of steel-producing facilities in fewer and larger hands.

The largest single technological improvement of the 1930's has been the continuous automatic steel strip mill. Twenty-seven of these mills, commonly called hot strip mills, have been built to date with a combined annual capacity of 15,000,000 tons.¹ The first mill was operated in 1924, and the twenty-seventh mill was put into operation in 1938. I am submitting a list of these mills with full particulars, and the members of the committee have a copy of that exhibit.

(The table referred to was marked "Exhibit No. 2477" and is included in the appendix on p. 17331.)

Mr. MURRAY. The common contention that increased wage rates are responsible for technological improvements has no validity in connection with the automatic strip mills. The facts in this case show the opposite. All of the automatic strip mills were completed, under construction, or authorized to be constructed by the respective steel companies before steel wages were raised in 1936 and 1937. The introduction of the hot strip mills preceded the current level of hourly wage rates, and not vice versa. The introduction of these mills, therefore, cannot be attributed to higher wage rates. Mr. Charles R. Hook, president of the American Rolling Mill Co., estimates the total cost of the 27 mills at one-third of a billion dollars.² The respective

¹ Steel Facts, June 1939, American Iron and Steel Institute, New York City, p. 2. (Mr. Murray's footnote.)

² Pittsburgh Press, December 13, 1937. (Mr. Murray's footnote.)

companies have announced the cost of individual hot strip mills at figures ranging from \$25,000,000 to \$45,000,000.

The hot-strip mills produce only flat-rolled steel products. Their capacity of 15,000,000 tons almost duplicates the old-style hand-mill capacity for flat-rolled products. In 1929 the capacity of the old-style mills was 15,600,000 tons of flat-rolled products (plates, sheets, black plate, and tin plate).¹ The peak annual production of flat-rolled products on strip and hand-style mills was 16,900,000 tons in 1937. Thus the modern automatic hot-strip mills, with a capacity of 15,000,000 tons, can handle most of the demand for flat-rolled products made on the steel industry.

For technical reasons certain flat-rolled products can be rolled only on the old-style mills. But since 1929 an increasing percentage of the industry's flat-rolled production has been on the automatic hot-strip mills. Automatic strip-mill production of tin plate, for example, far exceeds the hand-mill production of tin plate at present. In 1936 only 23 percent of the tin plate was produced by the strip mills. In 1937 the percentage rose to 35 percent, in 1938 to 61 percent, and in the first 9 months of 1939 to 76 percent. In the meanwhile, the tin-plate hand mills have been abandoned with lightning speed, as I shall discuss later. It is plainly observable that before long virtually all of the tin-plate hand mills will be permanently abandoned. And within a few years only a handful of the old-style plate and sheet mills will still be operating. The automatic hot-strip mills are fully able to handle virtually all of the demands for flat-rolled products. If, at any time in the future, demand should exceed present automatic strip-mill capacities, additional strip capacity will be built instead of operating the old-style high-cost mills; this, in fact, is what has been taking place recently in the tin-plate division of the steel industry.

LABOR DISPLACEMENT IN HOT STRIP MILLS

Mr. MURRAY. The extent to which the strip mills eliminate workers is incredible. Mr. John D. Knox, a practical mill man and associate editor of *Steel Magazine*, recorded the following conversation with an official operating a strip mill with whom he discussed how much labor (the strip mills) displace technologically:²

"At the rate of 2500 tons a day and working 24 days a month," I said, "you'd deliver to the shipping end of your mill 60,000 tons monthly or exactly what a plant with eight conventional sheet mills would produce a year. In other words, on the basis of gage for gage your mill will produce 12 times the output of a conventional eight-mill sheet plant."

"Sure thing, and with a lot less men. Take your eight hand mills," he continued turning the leaves of his notebook until he came to a blank page.

"You have a crew of 112 men per turn," he said writing these figures at the top of the page. "Now add a cranesman, a sheet bar stocker and a couple of helpers, a yard clerk, and four shearmen and their helpers and you have a total of 125 men or 875 required to man the mills per 24-hour day."

"Now let's see. On the back of the heating furnaces of this continuous mill we have a heater and a couple of helpers, a furnace charger, a furnace stocker and a couple of helpers, a clerk in the slab yard and a couple of cranemen. That's a total

¹ *Directory of the Iron and Steel Works*, Twenty-second Edition, 1935, American Iron and Steel Institute; Twenty-third Edition, 1938; Annual Statistical Report of the American Iron and Steel Institute, 1939; and *Steel*, November 6, 1939. (Sources of data in this and succeeding paragraph.) (Mr. Murray's footnote.)

² *Steel*, October 22, 1934, "Continuous Mills Voracious in Cost, But How they Produce"; by John D. Knox, pp. 19-28. (Mr. Murray's footnote.)

of 10 men," he said adding up the figures he had set down after each of the occupations.

"On the mill proper we have a head roller and one assistant, a gager, a rougher and his operator and helper, a couple of rolls hands, a speed regulator and his helper, a finisher and his assistant, a looper operator, an operator for the runout table and his helper, an inspector, a recorder, a roller leveler operator, a hot bed recorder, a shear foreman and his crew of eight men, one torchman for burning cobbles and three cranemen.

"That is a total of—let's see," and adding up the column he arrived at a total of 32 men to operate his mill or 42 men per turn including the furnace attendants. "This is 126 men to handle the mill per 24 hours."

"In other words," I chimed in, "with 126 men in the slab yard, on the furnace and overseeing the mill you can turn out 2500 tons a day whereas it would take 96 sheet mills of the conventional type with a combined crew of 4512 men to produce an equivalent tonnage."

"Yes sir, that's about the set up."

This tremendous increase in production for each worker employed—that is, that 126 men in the automatic steel mills can produce the same tonnage as 4,512 men in hand mills—represents a 97 percent reduction in man-hours, according to Mr. Knox's figures. Human labor is practically eliminated on the hot-strip mills. Electrical power is substituted. Steel is rolled on the hot-strip mills at speeds approximating a half mile a minute. The large numbers of men formerly required to roll steel are no longer needed.

Such wholesale elimination of workers has been devastating. The strip mills are displacing 84,770 workers, 38,470 of whom have already been disconnected from the steel industry.¹ Just 10 days ago in Massillon 500 workers in Republic's sheet mill there were given this notice:

We regret to advise you that on account of the permanent discontinuance of operations of the Massillon sheet mills your services are hereby terminated.

Please find enclosed your copy of the "Termination Notice to Employment Office." This form should be presented to the paymaster to secure any earnings which may be due you.

Also find enclosed "Workers Copy" of Form UC 406, "Separation Report for Total Unemployment" as provided under Unemployment Compensation.

Yours very truly

(signed) REPUBLIC STEEL CORPORATION

(The chairman, Senator O'Mahoney, resumed the chair.)

Mr. MURRAY. And 500 men walked out and 500 men are walking the streets of Massillon today; they have nowhere to go. That happened only 10 days ago.

This notice was given to these 500 workers on March 29, 1940, and within the next few weeks between 500 and 600 more will receive the same notice.

In the Niles, Ohio, plant of the same company 450 more workers are also out of employment, as Republic Steel has discontinued its sheet mill there also. A public announcement of the discontinuance of the mill in Niles was published in the newspapers on March 28.

These workers have not been disconnected from the industry one by one. They have been cast out a thousand at a time. Fifteen hundred. And in one case 3,000 workers were told to go home and never to come back, as their mill would not work again. Aside from the inhuman effect this wholesale abandoning of mills has on the individual worker, look at what happens to entire communities. Property becomes next to worthless, business drops to a fraction of previous levels, families are kept in existence by W. P. A. and relief, the social fabric of the

¹ See "Exhibit No. 2479."

town is torn in shreds, and the only means of making a livelihood is taken away from workers, many of whom have never known any other way of earning a living. All this happens because technology has found a new method of production, in this case the automatic strip mill. The financial cost of a strip mill is \$15,000,000, \$20,000,000, or \$40,000,000. But the social cost of this automatic mill is far greater in terms of human misery, personal tragedy, and wrecked mankind. Look at the worker immediately displaced.

A large percentage of these technologically displaced workers are skilled men. They have spent years acquiring their skills, and now private industry has no use for them. These men are no longer young in years, though they are not too old to work. But they are unemployed, discarded by the steel industry because profits cannot be made from their skills any more. These men are capable of many more years of good work, but private industry is no longer interested in them because most of them have reached the ripe old age of 40 years.

Rather than relate the tragic circumstances of these men who are victims of the strip mills, I have brought one of these skilled hand-mill workers with me to tell this committee his own story in his own way.

Michael Russell has not been employed on one of the United States Steel Corporation's strip mills for a very definite reason. The vice president in charge of operations of a large steel firm told me that he had hired a completely new force of men for his strip mill, mostly very young men. He explained: "A hand-mill worker is used to producing from 5 to 10 tons in 8 hours, and he can't get used to seeing a thousand or more tons produced on a strip mill in the same time. We have to break in new men on the strip mills who have never seen a hand mill operate." The comparatively few hand-mill workers who have been employed in automatic strip mills—and remember 37,000 of them are out completely—are working as laborers or semiskilled workers, and are receiving wages one-half to one-third of their former daily earnings. The social effects of the strip mills are doubly devastating.

Now, Mr. Chairman, with your permission I would like to present to your committee, Mr. Russell. He typifies one of those 37,000 men who have been cast out on the streets. Mr. Hook produced for the benefit of the committee yesterday some of the new technological improvements that have been brought about in industry in the form of examples of mud guards and fenders. I want to submit for the benefit of the committee a piece of our human wreckage here, Mr. Russell.

The CHAIRMAN. Mr. Russell, do you solemnly swear that the testimony you shall give in this proceeding shall be the truth, the whole truth, and nothing but the truth, so help you God?

Mr. RUSSELL. I do.

The CHAIRMAN. Do you care to make a statement here?

Mr. RUSSELL. Yes, sir.

The CHAIRMAN. Did you want to question him, Dr. Anderson, or Mr. Murray?

Mr. MURRAY. I should like to, if you don't mind, Mr. Chairman.

Dr. ANDERSON. Will you question the witness? He is your example.

TESTIMONY OF MICHAEL RUSSELL, NEW CASTLE, PA.

Mr. MURRAY. Mr. Russell, how old are you?

Mr. RUSSELL. I am 48.

Mr. MURRAY. Forty-eight years of age. How long were you an employee of the Steel Corporation before you were summarily discharged or dismissed in 1937?

Mr. RUSSELL. About 32 years.

Mr. MURRAY. What was your occupation with the Steel Corporation prior to your dismissal in 1937?

Mr. RUSSELL. A roller.

The CHAIRMAN. A what?

Mr. RUSSELL. Roller.

Mr. MURRAY. A roller is one of the highest type of skilled craftsmen in the industry, is he not?

Mr. RUSSELL. That is right; yes, sir.

Mr. MURRAY. And therefore one of the highest paid?

Mr. RUSSELL. That is right.

Mr. MURRAY. You are a married man, are you not?

Mr. RUSSELL. I am.

The CHAIRMAN. What were you paid?

Mr. RUSSELL. Well, in the neighborhood of from \$12 to \$16 daily, depending on how much tonnage we produced, but as an average it runs anywhere from \$12 to \$14 or \$16 a day.

The CHAIRMAN. What was your average?

Mr. RUSSELL. Daily or pay period?

The CHAIRMAN. Well, let us say your average annual earning.

Mr. RUSSELL. Well, for the year of 1937 I can give you a brief statement here; I have it on a card which was given to me at the time; \$2,842.99.

The CHAIRMAN. That was your annual compensation for the year 1937?

Mr. RUSSELL. Yes; minus 19 days of November, also of December, not working. In fact it would have been more than \$3,000 if I had worked the balance of the year.

The CHAIRMAN. You worked all but 19 days that year?

Mr. RUSSELL. In November when they terminated my work. That is when we were shut down, in 1937, November 11.

The CHAIRMAN. How did that working year compare with the ordinary working year in your experience in the industry?

Mr. RUSSELL. Well, this in fact was one of the best years we had because there was a great boom on at the time.

The CHAIRMAN. What was the poorest year you had during your experience?

Mr. RUSSELL. I don't have the definite figure but it ran in the neighborhood of \$2,000 or \$2,400 yearly anyhow.

The CHAIRMAN. Then would it be proper to say that your earning in this highly skilled employment was never less than \$2,000 a year?

Mr. RUSSELL. That is right.

The CHAIRMAN. Over how many years?

Mr. RUSSELL. In the neighborhood of 20 years that I have rolled.

Senator KING. Do you have any persons working under you?

Mr. RUSSELL. Yes, sir; a roller in a hot mill is responsible for eight men besides himself.

Senator KING. Did they receive as large wages as you received?

Mr. RUSSELL. They did not.

Senator KING. What were their average wages per day?

Mr. RUSSELL. As a rougher he would average in the neighborhood of \$9 or \$10 daily; that is a roller's assistant.

Senator KING. Each of those men under you received approximately \$8 a day?

Mr. RUSSELL. Well, they would average better than that, some of them \$10 or \$11, heaters and so on.

Senator KING. Did you work for the same company all these years?

Mr. RUSSELL. I did; yes, sir.

Senator KING. What company was it?

Mr. RUSSELL. Carnegie-Illinois Steel Corporation, better known as U. S. Steel.

Senator KING. In the same mill, were you, all those years?

Mr. RUSSELL. In different mills; the Shenango and New Castle plant.

The CHAIRMAN. And was this the scale of wages throughout your experience of 20 years?

Mr. RUSSELL. They vary up and down there with different scales from time to time, you know, and some were larger in some years and some years they were lower.

The CHAIRMAN. Wasn't there a substantial improvement in wages during those 20 years?

Mr. RUSSELL. Well, yes, there were, there were some.

The CHAIRMAN. What did you get when you started?

Mr. RUSSELL. When I started first they didn't have what is known as the four-part system; there was a three-part system at that time. When I first started in the mill a roller made \$10 a day on a level, very large wages, but it gradually came up as wages came up in the industry at the time.

The CHAIRMAN. How about the number of working hours in the day?

Mr. RUSSELL. We had to put in 8 hours daily.

The CHAIRMAN. When?

Mr. RUSSELL. Every day we worked.

The CHAIRMAN. But when did the 8-hour day begin?

Mr. RUSSELL. Well, I began working 8 hours in the hot mill; they started in at midnight at 12 o'clock.

The CHAIRMAN. You misunderstood my question. In what year was the 8-hour schedule instituted?

Mr. RUSSELL. Eight hours always in the hot mill.

The CHAIRMAN. Always?

Mr. RUSSELL. Yes, sir.

The CHAIRMAN. During the 20 years, then, the 8-hour day was the rule?

Mr. RUSSELL. That is right.

Mr. MURRAY. The weekly hours, of course, prior to 1937 were 48 and 55, wasn't it, 6 days a week?

Mr. RUSSELL. That is right.

Mr. MURRAY. There is a distinction in the classifications of labor there, and the labor rates at the mill that Mr. Russell worked at November of 1937, ranging from a minimum of 62½ cents an hour for common labor, with the maximum of the rollers based upon entirely the production. They were piece workers, and those rates may have ranged anywhere from \$8 to \$15 a day, depending upon their production and their efficiency to produce in the old conventional hand-mill type of furnaces.

Dr. ANDERSON. Mr. Russell, you were on piece rates?

Mr. RUSSELL. Yes; tonnage rates; that is right.

Dr. ANDERSON. And were you at the peak of the tonnage rates of employed workers?

Mr. RUSSELL. That is right.

Dr. ANDERSON. Anybody get any more than you did per tonnage rate?

Mr. RUSSELL. Based on—

Dr. ANDERSON (interposing). In other words, you are the highest skill known in the industry in the old hand-mill process?

Mr. RUSSELL. The roller; yes, sir.

Dr. ANDERSON. And this top wage that you have just indicated, an annual earning of \$2,800, is a good year?—'37 is your peak earning? Did you ever earn any more than that?

Mr. RUSSELL. Not that I know of because I always worked on a small mill. The other mills, larger mills—in fact, they make around \$4,000 in the bigger mill, see, \$3,000 and \$4,000.

Dr. ANDERSON. A man in your class of work?

Mr. RUSSELL. Yes, sir; bigger force on the same type of mill.

Dr. ANDERSON. What do you suppose the average worker in the plant in which you have been employed was earning when you were earning \$2,800?

Mr. RUSSELL. Well, I don't understand that; you mean the average worker, lowest-paid man in the hot-mill department?

Dr. ANDERSON. You perhaps wouldn't have the figure. You got \$2,800 that good year, and I was wondering what the average worker might be earning in the same mill that year.

Mr. RUSSELL. Well now, in the tonnage part of it, some of them would average around \$7 and \$8 a day; \$7 at least.

Mr. MURRAY. We have a collection of all the statistical matter with reference to the average wages of men employed in Mr. Russell's mill, and all other mills that I know of throughout the country, and for Mr. Russell's particular mill in the year 1937 the gross average earnings of all employees approximated \$1,658.

The CHAIRMAN. We interrupted you, Mr. Murray, in the questions you were going to ask Mr. Russell. You may proceed.

Mr. MURRAY. You are a married man, Mr. Russell?

Mr. RUSSELL. Yes; I am.

Mr. MURRAY. How many in your family?

Mr. RUSSELL. Four.

Mr. MURRAY. Four children, and your wife.

Mr. RUSSELL. Four children; six in the family.

Mr. MURRAY. Were any of your family working in the Shenango and New Castle Works when you were laid off?

Mr. RUSSELL. When I was laid off there was a son-in-law of mine at work, but there aren't any at work at this time at all.

Mr. MURRAY. All off?

Mr. RUSSELL. All off.

Mr. MURRAY. How many men were laid off in your mill in November 1938?

Mr. RUSSELL. Sixteen hundred.

Mr. MURRAY. Sixteen hundred automatically displaced?

Mr. RUSSELL. That is right.

Mr. MURRAY. That is, thrown out by an order of the Steel Corporation that there was no more work for them.

Mr. RUSSELL. That is right.

Mr. MURRAY. And your two sons were thrown out into the streets with them?

Mr. RUSSELL. That is right.

Mr. MURRAY. Have you been able to get any employment since you were laid off in November 1937, any employment of any description in private industry?

Mr. RUSSELL. We tried in 1938. I had a brother-in-law living up at Erie and he wrote me a card and asked me to come up, because he thought we could get some work on the docks up along Lake Erie, the shipping docks, labor work and all that; so I took my son and another friend of mine and we drove up to Erie to investigate. There wasn't any work on the docks, so coming back home, on Twelfth Street, I noticed a plan with a sign, "Acetylene welder wanted." That is a trade I did follow for a few years, acetylene welding and cutting, so I stopped and applied for the job, went in the employment office and asked if they were looking for welders and he said, "Yes; we are," so I told him what I wanted.

He sent for the general foreman and the foreman came out and he told him what I wanted and told him to put me to the test to see whether I did know what acetylene work was about. It was all right, he took me back to the employment office and said, "The man is all right, he came out very favorably on the test."

The employment agent asked me, "What is your name?" and I told him. He said, "Where are you from?"

I said, "New Castle."

He said, "How old are you?"

I said, "47."

He said, "Hell, man, you're too damn old to start with this company now."

That is what I was confronted with right there. There was no way out, I was too old to start with.

Mr. MURRAY. What are you doing at the present time?

Mr. RUSSELL. Working on W. P. A.

Mr. MURRAY. What are you getting?

Mr. RUSSELL. \$48 a month.

Mr. MURRAY. \$48 a month?

Mr. RUSSELL. Yes, sir.

Mr. MURRAY. And you are the only one in a family of six that is working, are you?

Mr. RUSSELL. The boys are working on W. P. A., but they are married and living by themselves as individuals.

Mr. MURRAY. So that the \$48 is all that you get to provide the needs of your wife, and how many dependents?

Mr. RUSSELL. One son.

Mr. MURRAY. One son and yourself. You pay your rent—

Mr. RUSSELL (interposing). That is right.

Mr. MURRAY. And your food and medical and other obligations, and maintain your home on \$48 a month.

Mr. RUSSELL. Well, with \$48 a month we maintain paying the rent and some of the food, but as far as medical attention and clothing and so on, those are neglected. We can't afford to get it because the money won't reach that far. We have to skimp along, and as far as rent is concerned, we couldn't get a home like I had when I was working in the mill, paying \$25 or \$30 a month rental, so I had to get one of the boys and we rented a big house of 8 rooms and a 3-room finished attic, so there we split the house up together and split the rent, and all utilities so we could get by.

Mr. MURRAY. So that your married sons are now living with you?

Mr. RUSSELL. One of them is living there, and my daughter and her husband are living there. They have their own apartments but it is all in the same household, and that is how we manage to get by.

Senator KING. Did you acquire a house of your own during those years when you were working?

Mr. RUSSELL. Yes; I did.

Senator KING. You owned your own home?

Mr. RUSSELL. I owned two homes at one time, during the World War, but I disposed of them when the World War was on, and I never owned any since.

Representative WILLIAMS. At the time you were let out of employment, what reason was given for it?

Mr. RUSSELL. They didn't give us any reason at all, to be honest about it. They just told us the mill was down, and that was all there was to it.

Representative WILLIAMS. Did they shut the mill entirely down?

Mr. RUSSELL. Absolutely down.

Representative WILLIAMS. Permanently?

Mr. RUSSELL. They told us that was the end of the mill.

The CHAIRMAN. Has it ever been reopened?

Mr. RUSSELL. Never reopened; no, sir.

Representative WILLIAMS. And these 1,600 that were let out with you represented the entire force in the mill?

Mr. RUSSELL. Yes, sir.

Representative WILLIAMS. What became of them, if you know? Did they make any effort to secure employment for them in some of their other mills?

Mr. RUSSELL. Probably some of them did go about, but hundreds and hundreds in New Castle are doing the same thing as I am doing at the present time.

Representative WILLIAMS. Do you know why the mill was shut down?

Mr. RUSSELL. The only reason for it was the strip mill that is in operation that put us out of work.

Representative WILLIAMS. The old process had become obsolete, and they had by this new process of continuous rolling supplanted

the work that was being done by some other plant by that new process.

Mr. RUSSELL. That is right.

Mr. PIKE. Has the mill been dismantled?

Mr. RUSSELL. No, sir; it is still there.

Mr. PIKE. It has never been used since?

Mr. RUSSELL. No, sir; it has not.

PROVISION FOR DISPLACED WORKERS

Dr. ANDERSON. Mr. Russell, we were told yesterday in Mr. Hook's testimony, and showed evidence that when he made the change-over to the hot-strip continuous mill, he announced to the workers the condition, what was going to take place, and offered them the alternative of a dismissal wage amounting in some instances to a substantial sum, which many of them took as they were dismissed because of the change-over to the continuous-strip process.

In your experience, did anything like that happen?

Mr. RUSSELL. No, sir; it did not.

Dr. ANDERSON. When were you notified that the mill was going to close down, the day you were dismissed?

Mr. RUSSELL. No; I can give you an answer to that. It was in 1937. That year was a very good year. Mr. Sturdy, who was superintendent of the New Castle works at that time, when we first got word of that, and Mr. Hall, they took all us rollers in the office for a meeting and they explained and told us at that time that they insisted on us rollers making these men, our crews—that we see that these men got to work, because they had so many orders ahead and they held us responsible. They said, "We have been working on it since the previous year." That was in about the latter part of September. Then in November, I think just about the first part of November, we got word the mill was going to shut down, and it did shut down on November 11, and it hasn't moved since.

Dr. ANDERSON. But you didn't get any dismissal wage benefit?

Mr. RUSSELL. No, sir; nothing at all.

Dr. ANDERSON. And you had, according to your testimony, 1 or 2 weeks' notice. Was word given to you by the plant superintendent?

Mr. RUSSELL. No; it was just word out through the plant.

Dr. ANDERSON. Just a rumor?

Mr. RUSSELL. Just a rumor was what it was; yes, sir; but it did come.

Senator KING. Was a new plant constructed to take the place of the old, only changing the process?

Mr. RUSSELL. As far as I know, it was the strip mill down around Pittsburgh.

Mr. MURRAY. The Iroquois works, a new stripping mill erected at Clairton.

I think, Mike, you might have gone astray in stating you had no work in private industry following your dismissal in the New Castle work in private industry following your dismissal in the New Castle job at the Shenango works of the United States Steel Corporation?

Mr. RUSSELL. You are right; that did slip my memory. I was called back in the Shenango mill in the latter part of December in '37. We

went there, in fact all of us rollers, and they rehired us as catcher helpers on the job that I had started at 32 years ago as a boy.

The CHAIRMAN. How many of you were rehired?

Mr. RUSSELL. I should say about 200 anyhow, about that. They put me on the job where I started 32 years ago as a catcher helper. I didn't like it, in fact, to be lowered away down like that, but I had to take it or I couldn't draw compensation or get on relief to get a W. P. A. job, so I had to take that and do as I was told, and I was let out July 8, 1938.

Mr. MURRAY. You were let out July 8, 1938, in the Shenango works?

Mr. RUSSELL. That is right.

Mr. MURRAY. What happened in the Shenango works?

Mr. RUSSELL. The orders got so slack, it was a 40-mill plant and they were only operating 20 mills, so they doubled the staff up.

The CHAIRMAN. How far from New Castle is Shenango?

Mr. RUSSELL. They are all in one town, probably half a mile apart.

The CHAIRMAN. Is the Shenango mill still working?

Mr. RUSSELL. No, sir; it is not.

The CHAIRMAN. Is that closed down?

Mr. RUSSELL. It is.

Mr. MURRAY. How many men did the Shenango works employ before it was permanently abandoned by the Steel Corporation?

Mr. RUSSELL. In the neighborhood of 3,600.

Mr. MURRAY. And they were automatically displaced by the same order?

Mr. RUSSELL. That is right.

The CHAIRMAN. As I get your story, you spent 20 years acquiring a skill as a rolling mill operator.

Mr. RUSSELL. That is right.

The CHAIRMAN. The hand-mill operation.

Mr. RUSSELL. That is right.

The CHAIRMAN. And when you had reached this peak of skill as a result of 20 years of work, a new process was invented which did work that you had been doing, more efficiently and at greater speed than the hand-mill that you and your associates had been operating; could operate, is that right?

Mr. RUSSELL. That is right.

The CHAIRMAN. Therefore, the new mill which was constructed in another town took the work away from your mill and from the workers in the mill?

Mr. RUSSELL. That is right.

The CHAIRMAN. The mill at New Castle has never again been opened?

Mr. RUSSELL. That is right.

The CHAIRMAN. And the workers at New Castle who were displaced have never since obtained work at anything like the compensation they were getting when the new continuous mill came into operation and displaced them?

Mr. RUSSELL. That is right.

The CHAIRMAN. And you and many others have been compelled for the most part since that time to support yourselves upon inadequate W. P. A. wages?

Mr. RUSSELL. Yes; that is right.

The CHAIRMAN. And without the W. P. A. you would have had no opportunity to work at all?

Mr. RUSSELL. That is right.

Dr. ANDERSON. Mr. Russell, I wanted to ask a question. If you had been employed in one of the new strip mills after being laid off when the hand process was done away with, what would you have done? Your skill is not called on in the strip mill now, is it?

Mr. RUSSELL. Now you are asking something I can't answer, because I don't know anything about a strip mill. I never saw the inside of one, never got the opportunity to see inside one.

Dr. ANDERSON. Did you go and apply as a roller in a strip mill?

Mr. RUSSELL. I didn't think I could because it is a different system altogether from the hand packing.

Dr. ANDERSON. Then the only place you could dispose of the skill you have taken 20 years to perfect is another hand-process mill.

Mr. RUSSELL. That is about all.

Dr. ANDERSON. What is happening to the hand mills? Have you tried to locate work in hand mills?

Mr. RUSSELL. In fact there isn't any. They are all down. They are doing away with all the hand-packed mills.

Dr. ANDERSON. Is that the general impression among workers such as yourself?

Mr. RUSSELL. It must be, because we are always looking around and can't find any, we don't know where to go.

Dr. ANDERSON. Was there any attempt made by the mill for whom you worked to retrain you, to fit you into some other part of the mill?

Mr. RUSSELL. No, sir; none whatever.

Representative WILLIAMS. Your statement that there are none seems to be entirely in contradiction to what Mr. Hook said yesterday when he said there are practically half of them still maintained, as I remember his testimony.

Mr. RUSSELL. I don't know what Mr. Hook's intentions are. In fact I don't know; I have never seen the inside of the strip mill, I don't know anything about the strip mill.

The CHAIRMAN. Perhaps it might be worth commenting that Mr. Hook was testifying with respect to the firm of which he is the head.

Representative WILLIAMS. No, not as I understood him; I understood him with reference to the whole industry that there were practically half of them left in operation, the hand mills he was talking about.

Mr. PIKE. I think he said there were about 750 still standing and about half of the 750 or 375 were still in operation, not necessarily full operation but still used a good part of the time, and some of them as I think you said, Mr. Murray, were still necessary for certain finishing operations.

But probably not in your area, not anywhere near you.

Mr. RUSSELL. Well, yes; there was a plant there in Farrell, a hand type mill that operated part-time, but it has been down for the last 6 weeks, too. We don't know whether that will reopen or not.

Mr. PIKE. There wouldn't usually be many jobs left in the few left. The people who have got the mare going to hold onto them pretty strongly, I should think.

Dr. ANDERSON. Mr. Hook's statement was, "But actually there are still 750 of those mills in existence with approximately half in opera-

tion." That is three hundred-some-odd mills that require your skill are still in operation. Have you applied to any of those 300 mills to see if you can get a job?

Mr. RUSSELL. I don't know where they are at to get a job. I know in our district there aren't any in operation, so I wouldn't know where to go. They would probably be away off from our town, and I wouldn't have any means to get there to apply for work anyhow.

Mr. MURRAY. I think it might be well to make a distinction here, lest a wrong impression is created, a distinction between a plant and a mill. Mr. Hook said that there were some 375 mills still in operation. I think Mr. Hook might support me in saying that only affects some 40 plants, the 375 mills. And the distinction ought to be made there lest the impression be created that there are 375 huge hand-mill plants still in operation.

Dr. ANDERSON. Mr. Murray, where would those 40 plants be located?

Mr. MURRAY. I will endeavor to set that out for the benefit of the committee here during the course of my testimony. If the committee has no further questions to ask I am through with Mr. Russell.

(Mr. Russell was excused.)

GHOST TOWNS

Mr. MURRAY. The strip mills have reduced entire communities to ruin. Thriving steel towns have been converted into ghost towns overnight. New Castle, Pa., and that is the town Mr. Russell comes from, a steel town of 50,000 people, is a typical example. In the last 3 years 4,500 hand-mill workers have been permanently displaced in this town. A few years earlier 1,200 Bessemer steel workers were displaced in New Castle, a total of 5,700 victims of technology during the 1930's in a single steel town. As a consequence, private job opportunities have dried up. High-school graduates cannot find work, and are lucky to get an opportunity to go to a C. C. C. camp. Sixty-four percent of New Castle's population—7,000 families—have been receiving some form of State or Federal assistance, or have been trying to get such aid. The State and Federal Governments have been spending approximately \$3,250,000 a year in New Castle. But even as the plight of the town got worse, the Seventy-sixth Congress reduced W. P. A. wages \$5 a month and cut the number of W. P. A. jobs by more than 50 percent. I am submitting here a thorough study of New Castle made by the research department of the Steel Workers' Organizing Committee.

(The document referred to was marked "Exhibit No. 2478" and is included in the appendix on pp. 17332-17339.)

Mr. MURRAY. Other steel towns have likewise been reduced to ruin, while still others are on the verge of it. These towns are the victims of corporate irresponsibility. Boards of directors sitting in the financial centers of the Nation pass economic legislation, based exclusively on their profit-and-loss statements. In one decision they wipe out a complete mill and ruin an entire town, and they do it apparently without any thought of responsibility for the social consequences of their decision.

The record of the steel industry during the past decade in abandoning entire plants, or large departments of plants, in one knockout blow reveals an ignorance and disconcern of social conditions that

defy description. From 1929 to 1939, 53 old-style hand plate, sheet, and tin-plate plants have been permanently abandoned. Some of these plants were departments of large integrated steel works, but a large majority were separate plants. There were 38,470 workers displaced in these abandoned plants. I am submitting a list of these plants, indicating the parent firms, the location, products produced, and number of workers displaced in each plant by years. More than 50 percent of the workers were displaced in 1937 and 1938 with the result, as I shall point out later, that the effects of the strip mills on the volume of wages and employment in the steel industry have not been substantial until recently.

(The table referred to was marked "Exhibit No. 2479" and is included in the appendix on pp. 17339-17341.)

Mr. MURRAY. The strip mills are not through with their killing. Fourteen plants or departments of integrated steel producers are on the industry's death list. These old-style hand mills are scheduled to be abandoned permanently. Some of them have worked irregularly in recent years, and some are completely idle at present. Twenty-two thousand nine hundred and fifty workers are employed in these plants, soon to be thrown into the streets, to be made idle through no fault of their own, and no longer wanted by the steel industry or by private industry generally. I have a list of these plants. I feel it incumbent upon myself to refrain from adding any additional handicaps to the respective communities in which they are located, and to refrain from hastening the day of their final abandonment. Therefore I am not submitting the list of these plants to the committee, but if the committee would like to see the list I shall be glad to submit it in confidence. About the eventual abandonment of these plants, there is no doubt. Several steel employees have already discussed the abandonment of these plants with the Steel Workers' Organizing Committee. And with abandonment of these plants the number of prosperous steel towns will decline, while the number of ghost steel towns will increase. But the effects of the strip mills do not stop here.

The largest single step toward monopoly in the steel industry during the past decade has been the automatic strip mills. These expensive mills, which small companies operating the obsolete hand-mills cannot afford to install, are further concentrating the control of steel-producing facilities in the hands of fewer and larger companies. In the steel industry at present there are 18 small independent companies with obsolete hand mills, whose future is definitely limited. These companies employ a total of 23,350. Their combined capacity for flat-rolled products is 2,350,000 tons, or 15 percent of the industry's hand-mill capacity in 1929 for plates, sheets, black plate, or tin-plate.¹ Daily they are losing business to the strip-mill producers, and before long their entire business will have been gobbled up by the huge strip producers, and these small independent companies will have closed their doors for all times.

Thirteen of these 18 companies are under contract with the Steel Workers' Organizing Committee or another C. I. O. affiliate. The executives of these firms have told me and my associate officers, in the

¹ Directory of the Iron and Steel Works, Twenty-third Edition, 1938, American Iron and Steel Institute. (Mr. Murray's footnote.)

course of negotiations, that they do not expect to be able to stay in business much longer. I personally know that several of these companies would have closed their doors by now if it had not been for the revival in business of last fall. I, of course, have a list of these 18 small companies and shall gladly submit it to the committee in confidence, if the committee desires it, but I do not want to add to the credit, financial, and other difficulties of these companies by advertising their dire condition publicly.

With the strip mills firmly in the saddle, these small independent companies are doomed to extinction. The changes in the basing point system of pricing that were made in June 1938 have added to the difficulties of these companies, because their plants are located in one producing district. But even if these changes had not been made, the days of the small companies would still be numbered. The Steel Workers' Organizing Committee has not made any statement on these changes in the basing-point system of pricing, and it is not my purpose to comment on them as such. I merely refer to the observable effects of these changes in connection with the small steel firms I am discussing. The president of one of the small companies told me that the June 1938 changes merely cut a few months or years off the life of his company, that neither his company nor his competitors could hold out indefinitely against the automatic strip mills. Another president of a small company told me the only kind of business his plant has been able to get in the last several months is what the strip-mill producers will not handle. Since 1929, he told me, his company's share of the sheet business of the industry has declined more than 70 percent.

These companies are doomed, because their obsolete mills depend, in the main, upon manual power; while the automatic strip mills derive their power primarily from electricity. The difference in the cost of production is fatal to the smaller companies. Men cannot compete against electricity. This is plainly demonstrated by a comparison of the cost of producing a gross ton of tinplate, for example, on the hand mills with the automatic strip mills.

The CHAIRMAN. Mr. Murray, I must interrupt you, because that sentence, "Men cannot compete against electricity," by many would be interpreted as a statement on your part that you wanted to do away with electricity. I know you don't want to do it and I want to give you the opportunity to say so at this time.

Mr. MURRAY. Of course, I have already said, Mr. Chairman, that our committee and our organization and our whole C. I. O. movement, is in complete accord with technological advancement and progress, and the increasing of efficiency and productivity, and there is nothing here which I have made in this statement, I hope, that will create the impression in the public mind that there is any opposition being manifested by me against the introduction of electrical devices in industry today.

The CHAIRMAN. Your whole theory is that technological advance, the use of improved devices, the use of electricity, the use of all forms of power for industrial production, should be accompanied by some sort of social care for the workers and the businesses and the towns and communities which are affected by the change.

Mr. MURRAY. That is quite right. That is the basis of this presentation, as a matter of fact.

Representative WILLIAMS. Of course, what you are stating now is simply the effect that the introduction of these various modern appliances has had upon the working man in displacing him.

Mr. MURRAY. Quite true. I am trying to explain to the committee not only the devastating effect it is having upon the working man and his family, but the misery and poverty that is trailing in the wake of these things because of the manifestations of social irresponsibility indicated by these large corporations in meeting with Government and labor, and these other interested groups.

The CHAIRMAN. May I ask at this point, in your experience how many of the companies which employ the improved devices also endeavor by the payment of displacement wages or other separation allowances of any kind, to take care of the human factor?

Mr. MURRAY. There are no companies that I know of in the steel industry that are doing it. Perhaps Mr. Hook's company did that some 20 years ago; his company may be doing it today, I don't know.

The CHAIRMAN. He testified yesterday that he is doing it.

Mr. MURRAY. I understood he said he was doing so, but insofar as I am aware, I know of no single company or corporation manufacturing steel in this country today that is making provision to take care of these disappointed Americans that are being thrown out of American industry, in any way, shape, or form.

The CHAIRMAN. And with how many companies are you personally acquainted?

Mr. MURRAY. Well, I have collective bargaining agreements in 70 percent of the industry, with some 638 companies.

The CHAIRMAN. And your testimony is of 638 companies with which you have collective bargaining agreements, you know of no company which has adopted any separation allowance to take care of the displaced worker.

Mr. MURRAY. I know of none; none whatever.

Dr. ANDERSON. In the companies with which you do not have bargaining agreements do you know of any such arrangements?

Mr. MURRAY. No, I know of no such arrangements anywhere in the steel industry, none whatever.

Representative WILLIAMS. I take it you haven't any agreement with Mr. Hook's company, the American Rolling Mill Co.?

Mr. MURRAY. No, Mr. Hook is an affable gentleman when he appears before the committee but a different type of gentleman when he appears back in Middletown.

The CHAIRMAN. Now, Mr. Murray!

Representative WILLIAMS. I didn't mean that, but he said he had such an arrangement and you wouldn't know about that. That is why I said, you evidently haven't an agreement because he said he had the arrangement and you said there were no arrangements.

Mr. MURRAY. No, as far as I know, Mr. Hook has no desire to talk to me. I am quite willing to talk any time he wants to.

Representative REECE. If I may revert to page 3 which was read before I came in, I notice on line 3 in speaking of the industrial conditions existing at that time you say:

Unemployment might very well be likened to the attitude of leading industrialists and Republican statesmen during the period 1930 through 1932, when they said that a policy of waiting would result in a return of prosperity.

Then you go on and say:

The attitude of industrialists and certain statesmen of today concerning the solution of the present unemployment problem is the same.

Do you have any particular reason for designating "Republican" statesmen in one case and "certain statesmen" in the other?

Mr. MURRAY. Nothing other than the fact we had a Republican administration way back there and I was making an indirect reference to the chickens in pots and cars in garages back there, and that was about the only suggestion that was offered in those days, so far as I know, to cure the unemployment conditions of some 15,000,000 citizens who were idle then.

Representative REECE. But you say the same suggestions have been offered at this time by industrialists and certain statesmen. Now we don't have a Republican administration today and I was wondering why you used party reference in one instance and not in another, since we are dealing with purely an economic situation here in which, of course, party consideration has no relationship.

Mr. MURRAY. Well, I am sorry if the implications have created the impression in your mind that this dart was directed at the Republican Party, because I certainly did not mean it that way. I simply meant we had a Republican administration back there, and that the only cure they suggested then was to wait. Now I don't see anybody waving their arms in the Federal Congress today about this unemployment situation—just nobody at all.

The CHAIRMAN. Oh, well, look at the chairman, will you please, and say, "Yes, there is somebody."

Mr. MURRAY. Well, perhaps they are not making public the things you are saying, Chairman O'Mahoney, but I would be delighted if this Congress would get exercised about this situation and do something about it. That is how I feel about it.

The CHAIRMAN. Of course it may be appropriate to say that the organization of this committee was in itself a very definite attempt to bring about a solution of this question. I may say that as long ago as 1935 I introduced a bill in Congress which in its terms called for just such an industrial conference on unemployment and economic conditions as you mentioned a little bit earlier, and I am glad to be able to say that there are a number of Members of Congress, both Democrats and Republicans, and others also, who are not affiliated with either party, who are seriously concerned with this question of unemployment.

Mr. MURRAY. I think it might be well to say there, Senator O'Mahoney—

Senator KING (interposing). Let me supplement what was said by the chairman, if you will pardon me. I agree with what the chairman has stated, and I understand this committee is charged with the responsibility, at least I so interpret our mandate, to inquire into our economic and industrial situations and to make such recommendations for the alleviation of the situation as the evidence justifies. And I am waiting anxiously to hear what you have to suggest as an antidote for these evils, and what you have to suggest as a means to alleviate the conditions.

Mr. MURRAY. I think it might be well, Mr. Chairman, for me to say to the committee that there is nothing in this statement that can be

construed as disparaging insofar as the committee here is concerned, because I have the greatest admiration for the work which the chairman of the committee has been doing in promoting a better understanding of thousands of industries and endeavoring to ascertain through the means of these hearings what it is that groups of citizens are doing about it.

The CHAIRMAN. I didn't mean to imply you were disparaging the work of the committee, or indeed of anybody. I was merely bearing out what I understood to be your attitude, that in this reference you didn't mean to make any invidious comparison.

Mr. MURRAY. That is right.

The CHAIRMAN. We have a problem. It wasn't solved in 1932 and prior thereto, and it hasn't particularly been solved yet. As a matter of fact, we only have W. P. A. to provide a little bulwark against complete disaster for men like the human exhibit that you brought here this morning in the person of Michael Russell.

COST OF PRODUCTION IN MECHANIZED MILLS

Mr. MURRAY. I stopped at that place, Mr. Chairman, that men cannot compete against electricity. This is plainly demonstrated by a comparison of the cost of producing a gross ton of tin plate, for example, on the hand mills with the automatic strip mills. The following cost of production figures were given to me in confidence, and I cannot divulge the companies involved. The standard measurement of tin plate is a base box amounting to approximately 100 pounds. The total cost of production of a base box of tin plate on hand mills is \$4.72. Of this cost, labor amounts to \$1.52. I am submitting a table, "Cost of Production of Tin Plate on Hand Mills," giving the full details of these costs.

(The table referred to was marked "Exhibit No. 2480," and is included in the appendix on p. 17341.)

Mr. MURRAY. The total cost of production of a base box of tin plate on an automatic strip mill is \$3.91. Of this cost, labor amounts to \$0.643 per base box, a reduction of 57 percent from the labor cost on the hand mills. Other strip-mill items of the cost of production amount to \$0.067 per base box more than on the hand mills, particularly because of higher depreciation charges. Thus the strip mills can produce tin plate \$0.808 a base box cheaper than can the hand mills. This amounts to a savings on the strip mills of \$17.77 per gross ton. This difference is so great that the integrated steel companies have almost completely abandoned their hand mills, and thus four small tin plate companies with only hand-mill facilities freely admit that they will be compelled to go out of existence in the near future.

The CHAIRMAN. Do you happen to know what the employment is of white-collar workers in these mills of which you speak that are about to go out of existence?

Mr. MURRAY. The percentage of the whole?

The CHAIRMAN. Yes.

Mr. RUTTENBERG. The ratio is about 10 percent salaried and white-collar workers, one salaried or white-collar worker for nine laborers.

The CHAIRMAN. The picture you are drawing is not only of the displacement of the day worker or the hourly rate worker but also of

the displacement of white-collar workers and the injury of independent producing companies and also the injury of the communities in which they operate, so I want to know how many of these white-collar workers might be involved in this movement that you are describing.

Mr. MURRAY. That is quite true; there is, and might I follow through at that point and explain to the committee another situation that develops in connection with the maintenance of these dying hand mills or obsolete or antiquated mills. The hand mill desires, of course, to live, it wants to live, it fights to live; it knows that life to it is a question of the survival of the fittest in the great competitive field. It cannot compete and pay the same wage that is paid at the low-cost, high-producing, more efficiently managed big mill, with better machine facilities. The employer who owns the small hand mill comes in a state of desperation to the organization and says, "Give me a chance to live, won't you? Help me along. Won't you agree to a cut in our wage rates here so that we can live for another 2 or 3 months?"

Now, there is an economic repercussion that runs through this distorted competitive picture in the steel industry today that constantly confronts the workers employed in the industry, reducing their social standards, to meet these newer conditions created by the production of these large continuous mills.

Mr. CHANTLAND. Mr. Murray, if your figures are right, the hand-mill cost on a base box of tin was \$4.72 and the strip mill was \$3.91.

Mr. MURRAY. That is right.

Mr. CHANTLAND. Representing a savings between the two processes of 81 cents a box, while the savings on labor or the reduction in labor was \$1.52 and \$0.64, or 88 cents, so that the reduction of labor was 7 cents more a box than the total savings?

Mr. MURRAY. Perhaps my expert can explain that to you, but it is my understanding that in arriving at that figure he was trying to determine the difference in the actual labor cost, and the figures showed a difference in labor cost amounting to approximately 88 cents, although the over-all cost may have been only 80.

Mr. CHANTLAND. That is right. Reduction in labor is greater than total saving.

Mr. MURRAY. No; I think that the reduction in labor is a distinct situation from the one to which you make reference, and I believe that Mr. Ruttenberg can answer that.

Mr. RUTTENBERG. The total difference is between \$3.91 on the strip mill and \$4.72 on the hand mill; it is a reduction of a total of approximately 88 cents, of which 80 cents is reduction in labor costs.

Mr. MURRAY. Does that explain it?

Mr. CHANTLAND. Then your total cost of the strip mill is \$3.91.

Mr. HINRICHS. You don't give the detail in that exhibit for the costs of the strip mill, but I think that the steel cost would be the same in the two types of mill and the tin cost would be the same in the two types of mill, and the materials and supplies essentially the same.

Mr. RUTTENBERG. The reduction is almost exclusively in the labor costs.

Mr. HINRICHS. And the increase of 6 cents that you mention is almost entirely the depreciation item.

Mr. RUTTENBERG. That is right.

Mr. HINRICHS. That would mean, then, that if these hand mills were to stay in business in competition with the automatic strip mill, if the hand mills disregarded that whole depreciation item of 12 cents, which is the only capital charge in the thing, if they regarded their equipment as worth absolutely nothing and didn't charge any depreciation, but just mined it out and cut their wages more than in half, they still would not be effectively competing with the automatic process. Is that correct?

Mr. RUTTENBERG. That is so true that virtually every hand mill that produces tin plate for the integrated companies that have strip mills is down, and they are producing on the strip mills.

Mr. HINRICHS. And that process could be kept alive only up to the point where the machinery itself couldn't be used any longer if you didn't maintain any depreciation.

Mr. RUTTENBERG. They would live as long as they had any fat to live on and when they didn't have that they would have to close their doors.

The strip mills' advantage in producing sheets is even more fatal to the hand-mills. An official of a small hand-mill sheet producer told me his direct labor cost to convert a ton of billets into sheets for 13-gage sheets, which is his average, amounted to \$6.50 a ton, plus \$1.30 a ton for indirect labor costs, or a total labor cost of \$7.80 per ton of sheets. The strip mills have reduced the over-all cost of production of sheets and strip, according to Mr. Eugene Grace, president of the Bethlehem Steel Corporation, by \$6 to \$8 a ton.¹ Thus, if the entire labor cost on the sheet hand mills were eliminated, the cost of production would still exceed that of the automatic strip mills. In other words, even if the hand-mill workers donated their labor to the small hand-mill companies, they still could not successfully compete with the automatic strip mills. Certainly with such a wide difference in the cost of producing sheets, wage sacrifices on the part of the hand-mill workers will not save either their jobs or the companies that employ them. As a matter of fact, all of the 14 small, hand-mill sheet companies pay wages at present that are below the prevailing wages in the steel industry, and they cannot be reduced further.

Efforts of these small companies to reduce their costs and remain competitive have been exhausted. Several of these companies have installed three-high semiautomatic mills for the production of sheets. These mills eliminate around 1 out of every 5 workers required to produce an equivalent tonnage on the hand mills, and reduce the over-all cost of production \$4 per ton of sheets, on the average. The effect of the semiautomatic mills is to prolong the life of the companies that install them, but the savings of these mills are not enough to enable the companies that have them to compete indefinitely against the strip mills. The president of the small sheet company, which first installed semiautomatic mills, told me more than a year ago that if he could keep his company alive for another 4 years he would be satisfied.

Prior to the installation of semiautomatic mills, the small sheet mill companies, particularly during the twenties, pared their costs to a bone. As an example, I am submitting a noteworthy study of employment and productivity in a sheet-steel mill, by a thoroughly

¹ *Wall Street Journal*, July 28, 1939.

competent student, Dr. J. R. Gruener. This is the only copy we have of the book, but there is a summary in the paper.

The CHAIRMAN. We will be glad to have it for the files.

(The book referred to was marked "Exhibit No. 2481" and is on file with the committee. The document summarizing this book was marked "Exhibit No. 2481-A" and is included in the appendix on pp. 17341-17342.)

Mr. MURRAY. This is a printed volume of some 80 pages. This study, based on the company's own records, briefly summarized shows, as a result of technological improvements made from 1925 to 1929, the company eliminated 312 workers and reduced man-hours by 47 percent, but its monthly pay roll by 34 percent, or \$34,816, and still increased its production by 13 percent. In other words, the hand-mill companies had reached their peak of efficiency when the strip mills were developed, and they are helpless before the onslaught of the low-cost automatic strip producers, as hand-mill costs cannot be slashed any more.

The economic effects of the strip mills, therefore, are the elimination of the smaller companies, and the further concentration of steel-producing facilities in the hands of the few large steel companies. The new steel technology is accentuating monopoly in the steel industry.

The CHAIRMAN. It is now 12:15 and you still have some time to go, so we will postpone the rest of your statement, if you have no objection, until the afternoon session. I was going to ask, however, whether in the matter that is still to be presented you intend to deal with the statement which has been made that though there has been this big advantage in technology through the introduction of the continuous mill and workers have been as a result necessarily displaced, they have by and large been absorbed in new industry or in avenues that have been created as a result of the improvement. Do you deal with that subject later?

Mr. MURRAY. We deal with the failure of industry to reabsorb or new enterprise to absorb.

The CHAIRMAN. The committee will stand in recess until 2:15.

(Whereupon at 12:15 the committee recessed until 2:15 p. m.)

AFTERNOON SESSION

(The hearing resumed at 2:20 at the expiration of the recess, Chairman O'Mahoney presiding.)

The CHAIRMAN. The committee will please come to order. You ended just before you got to New Steel Technology Covers Industry of your prepared statement.

TESTIMONY OF PHILIP MURRAY—Resumed

Mr. MURRAY. With your permission, Mr. Chairman and members of your committee, I would like to expedite the reading of this paper by asking that with the beginning of our subject dealing with New Steel Technology Covers Industry on page 18, running over to the last paragraph on page 21, all of this matter which I won't read unless you insist upon my reading, be included in the record.

The CHAIRMAN. That is a very customary request in the House of Representatives. All you are asking is for leave to print. We will grant it.

Mr. MURRAY. Then the matter which I refrain from reading deals largely with the individual displacements of perhaps one, two, or three men on jobs, and it will be interesting, I suppose, for the guidance of the committee in their final determination of the facts to be presented.

The CHAIRMAN. That material will be printed in the record as part of your statement in the order in which it appears in the statement itself.

(The omitted portion of Mr. Murray's printed statement appears below:)

NEW STEEL TECHNOLOGY COVERS INDUSTRY

The new steel technology has been displacing labor in all branches of the steel industry, and has not been confined to the production of flat-rolled products. The cumulative effect of all the technical improvements made in the steel industry during the past decade, some small, others large, has been as severe on employment as the huge, dramatic technical improvement of the automatic strip mill. I shall not impose upon the time of the committee by relating all of these smaller technical improvements, but I do feel it is important to recite a few typical ones briefly. I have chosen the following cases of relatively small technical improvements from our files at random, as illustrative of what is happening in every one of the branches of the steel-producing industry.

Case No. 1: A large steel company, firmly established in the trade, invested \$750,000 in improvements in its open-hearth department. Sixty-two employees were eliminated in the department as a result of the improvements, which amounted to an annual pay-roll saving of \$118,000. In addition, the company effected savings in coal consumption and other savings, which amounted to \$257,000 a year. Thus the company's annual savings in cost totaled \$375,000, or enough to write off its \$750,000 investment and interest in less than 2½ years. The technical improvements enabled the men remaining on the pay roll—and recall that 62 were eliminated—to produce in 133 days the same amount of steel that formerly required 200 days. The result was that even though the men made more money per hour, their over-all annual earnings remained the same, as the number of hours of work a year was reduced correspondingly with the increased tonnage per hour. Incidentally, the company sought a reduction in tonnage rate, but the S. W. O. C. rejected the company's request for the reason stated above.

This case illustrates how the employment year of steel workers in being reduced. Increased mechanical efficiency means steel workers no longer can look forward to 5 days' work a week for 50 steady weeks a year; in fact, a steel worker is lucky if he is employed 75 percent of the year.

Case No. 2: One of the industry's largest wire companies, through technical improvements, increased the speed of its cold wire drawing machines from 115 revolutions per minute to 150. As a consequence, production rose from 2,185 pounds per 8-hour turn to 3,000 pounds per turn, or an increase of 37 percent. Here again the company sought to reduce tonnage rates from 14 to 22 percent. Production had been increased to such an extent, it was argued, that the employees involved would be able to increase their daily earnings by 7.2 percent, despite the 14 to 22 percent proposed cuts in their tonnage rates. The S. W. O. C. maintained in this case, as in the open-hearth case I have just discussed, that daily earnings are not a fair measurement, because the annual earnings of the men were reduced in direct proportion to the increase in their output per hour. Tonnage wage rates were adjusted to the mutual satisfaction of the company and S. W. O. C., recognizing the principle that workers should participate equally with the company, directly and immediately, in the benefits of technology. In another case, a wire company in its fine-wire department increased the revolutions per minute of its machines from 350 to 450, or 28 percent. Production rose from 1,200 to 1,800 pounds per 8-hour turn, or 50 percent. Here again the 12-month employment year was cut at least by one-fourth.

Case No. 3: Large numbers of men have been eliminated in the primary operations of the steel industry by the introduction of the scarfer. Scarfers.

with their acetylene torches, can burn the bad seams out of billets 3 to 5 times as fast as chippers can chisel them out with their air-pressure chisels. In the steel foundry of the Bethlehem Steel Co., Bethlehem, Pa., five to six chippers formerly worked 8 hours each to clean the scale from a certain product, at a total labor cost for this one operation of \$31.20. Now one man with an acetylene torch and one helper does this same job, at a total labor cost of \$10.08, or a reduction in the total labor cost of 70 percent. At least 2,500 workers have been eliminated in the steel industry during the past decade in the shift from the chipping to scarfing method for taking bad seams out of slabs, billets, etc.

Case No. 4: There are technical improvements that eliminate as few as 1 worker, or 3 on 3 shifts. In the blooming mill department of a large steel works 1 man was employed as a stamper on each operating shift. His duties were to place small metal numbers in the slot of a stamp hammer, and to strike the billet with the hammer to imprint the heat number for identification purposes. This job, affecting 3 men, 1 on each shift, has been eliminated. Now a small air-controlled cylinder directly above the hot billet has been installed. It is controlled by a switch placed near the shearman who operates it along with his other duties with no extra compensation. The heat numbers are changed by the production recorder, who likewise does not receive any extra compensation for his increased duties. Countless cases of this description can be related. I can cite numerous other cases, and the story is the same: 1 man here, 3 men there, 12 men here, etc., are being displaced by technical improvements. The effects of these improvements have been that fewer and fewer workers and less and less man-hours are required to produce more and more steel products.

Mr. MURRAY. Might I summarize this by beginning on the last paragraph of page 21: All this means irregular work for the steel workers who are considered regularly employed. They might work 5 days a week for a month, or for 2 months. Then they will be employed 4 days a week, or 3 days a week for a month or more. As the year goes on they might get 5 days' work a week for a few more months. Then they might be laid off for a week, sometimes for a month or more. A pick-up in business comes. They are called back, and are employed 5 days a week for a while. They might get 6 days a week for a couple of peak weeks of production. Then they go down to 3 and 4 days a week work. All this adds up to partial employment for the entire year. Steel workers who are considered regularly employed suffer periodic unemployment or slack employment every year. The number of steel workers who are employed a full 5 days a week for 50 weeks a year is insignificant. The vast majority of workers attached to the steel industry are affected adversely by the increased technical efficiency of the industry. Instead of being employed a full year, the average steel worker is idle from one-fifth to two-fifths of the year, and only employed from 60 to 80 percent of the time. Because in this time all the steel consumed for the entire year can be produced.

The CHAIRMAN. The conditions which you have just described as existing in the steel industry are very similar to those which exist in the coal-mining industry, are they not?

Mr. MURRAY. In the coal industry, of course, that industry is keyed with men enough, invested capital enough, and coal mines enough, to produce approximately 850,000,000 of coal annually, where the consumptive requirements of the Nation are reduced to something approximating 400,000,000 tons now. The coal industry on the basis of its present industry set-up only affords about half time to all of the workers employed in that industry. In the steel industry, according to our analysis of the whole thing throughout the past 10 or 11 years, we find that, due to the introduction of new machines, improvements in

efficiency, and other technological improvements, the steel industry is equipped today with men and money and plant-equipment facilities to produce approximately all of the Nation's ordinary normal 1929 requirements on about 7½ months' work each year.

The CHAIRMAN. I was about to say—

Mr. MURRAY (interposing). And that situation, of course, is becoming worse from the standpoint of the introduction of new machines constantly in the industry, providing only part-time employment for those who are kept in industry, and, of course, as I have already stated, displacing some 88,000 people from the industry within the next 2 years.

Representative WILLIAMS. That would mean an average employment of men about 7 or 8 months a year?

Mr. MURRAY. That is right, on the basis of 5 days per week and 40 hours.

The CHAIRMAN. Well, in terms of unemployment during the week and during the year I could have imagined that you were describing conditions in the coal-mining areas of my own home State.

Mr. MURRAY. Quite true. What is true in Wyoming is true in Pennsylvania, true in Illinois.

The CHAIRMAN. And when the worker who constitutes the bulk of the population, of the coal-mining population, or a steel-producing community, is unable to work but a portion of the time, his lack of purchasing power is felt not only by the businessmen of the particular community but also by your whole economy; isn't that right?

Mr. MURRAY. Quite true, and, Senator, I want you to know that the interest that we are manifesting in endeavoring to effect a cure for these bad economic conditions is prompted wholly and very unselfishly to help not only industry but the community and the State and the Nation as well. We believe what we are offering here in the introduction of factual matter dealing with unemployment in steel is not something that is promoted by my union to immediately help my union, but rather to help the industry, to stabilize the functioning end of the industry, and to help the community and the Nation as well.

The CHAIRMAN. It is all keyed into the purchasing power of the masses, as was testified here by Mr. Ford and Mr. Kettering a few days ago, and when we build up that purchasing power by stable employment at real wages we increase the market for every businessman in the land, do we not?

Mr. MURRAY. That is right.

Now with your permission, Mr. Chairman, on page 22 I should like to eliminate from the reading of the paper that portion of the paper that deals with mergers and consolidations and merely again to summarize by referring to the last paragraph of that article on page 23.

(The omitted portion of Mr. Murray's printed statement appears below:)

MERGERS AND CONSOLIDATIONS

Included in the new steel technology are savings resulting from mergers of steel companies and consolidations of subsidiaries of the larger steel producers. During the thirties United States Steel consolidated the Illinois Steel Co., Carnegie Steel Co., Lorain Steel Co., and the American Sheet & Tin Plate Co., all subsidiaries, in the Carnegie-Illinois Steel Corporation. The West Leechburg Steel Co. merged into the Allegheny Steel Co. in 1936, and 2 years later the Ludlum Steel Co. merged with the Allegheny Steel Co. into the Allegheny-Ludlum Steel Corporation. The Republic Steel Corporation absorbed the Corrigan-McKinney

Steel Co. and the Canton Tin Plate Corporation; and the Truscon Steel Co. merged with Republic. The Seneca Iron & Steel Co. was merged into the Bethlehem Steel Co. and later consolidated along with the Pacific Coast Steel Co., Southern California Iron & Steel Co., and the McClintic-Marshall Construction Co. The number of steel companies going out of existence during the thirties as a result of mergers and consolidations by the major steel producers was 18, while 8 others were merged but have kept their separate identities. Only 2 new companies were formed as a result of these mergers and consolidations, all of which are listed in exhibit No. 2482, which I am submitting.

In addition, there have been other managerial improvements, like systems of budgetary control, etc., that have been introduced in the steel industry in recent years, the net effect of which has been to contribute to a shrinking labor force. This has also been the effect of the mergers and consolidations that took place in the steel industry during the past decade.

Dr. ANDERSON. Mr. MURRAY, do you want to introduce the exhibit?

Mr. MURRAY. I want to introduce the exhibit and I want to introduce all of the other material in the record for the guidance of the committee.

Dr. ANDERSON. The exhibit then will be "Exhibit No. 2482."

The CHAIRMAN. It may be received.

(The table referred was marked "Exhibit No. 2482" and is included in the appendix on pp. 17342-17343.)

Mr. MURRAY. I endeavor at this point to impress upon the committee the fact that these mergers and consolidations that have taken place in the steel industry within comparatively recent years are in some measure, or do in some measure contribute toward the unemployment situation in the steel industry through the promotion of greater efficiencies and the centralization of the operating efficiencies of the management. I continue by stating:

The net effect of the automatic strip mills, of other technical improvements, of mergers, consolidations, and the like—in brief, of the new steel technology—has been an increasing volume of technological unemployment in the steel industry during the 1930's.

I come now to the statistical measurement of technological unemployment in the steel industry. There are two ways to measure employment. One is in total employment, or the number of wage earners. The other is in man-hours, or the number of hours worked. The latter (man-hours) is the more accurate measurement of employment, from the point of view of both the employer and labor. The number of wage earners at any given time is not an accurate measurement of employment. From labor's point of view the number of wage earners may be too high for the given production because of part-time work, as no consideration is given to the effect of sharing the work on actual working time. From the employer's point of view the number of wage earners may be too low for the given production because of overtime work, as no consideration is given to the extra days actually worked. On the other hand, man-hours, the actual number of hours worked to produce a given output, gives consideration to part-time work and overtime work. Finally, the changes in the number of hours worked per week, as these changes affect employment, can be seen only by man-hour comparisons.

Thus in measuring employment, it is obvious man-hours is a far more accurate picture of the volume of employment than is the number of wage earners. In other words, the volume of employment in man-hours in relation to production is the real way to get at the heart of the problem of technological unemployment.

I am submitting here a chart, "Pay Rolls and Man-Hours per Ton of Output."

The CHAIRMAN. It may be received.

(The chart referred to was marked "Exhibit 2483" and appears on p. 16483.)

Mr. MURRAY. This is a chart showing the trend of pay rolls and man-hours per ton of output of hot-rolled iron and steel products in the steel industry from 1923 through 1939. This chart is based on figures from the National Industrial Conference Board, a private statistical agency whose board of directors is composed of leaders of industry.¹

This chart shows that since 1923 the number of man-hours per ton of steel output has declined 36 percent. In other words a little more than 6 steel workers can turn out as much steel now as 10 could in 1923. The decline has been most severe since 1936, when the huge labor displacement by the automatic strip mills began. Almost half of the decline has taken place since 1936.

The impact of the new steel technology on pay rolls demonstrates why our economy is in a rut. Pay rolls per ton of steel produced have declined 10 percent since 1923. In other words, the labor cost per ton of steel produced now is 10 percent less than in 1923. This 10-percent reduction was made from 1924 to 1929, during which time hourly wage rates remained unchanged. The labor cost per ton of steel now is approximately the same as in 1929; that is, the index of pay rolls per ton of output on this chart stands at 89.4 in 1929 and 90 in 1939. During the same period, however, from 1929 through 1939, average hourly earnings increased 29 percent, or from 65.4 to 84.2 cents per hour.² Thus during this 10-year period total pay rolls for a comparable output remained the same despite an increase of 29 percent in hourly earnings. Technological improvements are responsible for this condition. It is plainly observable, therefore, that labor is not participating in the benefits of the new steel technology.

A full-view effect of this technology, however, on pay rolls and employment can best be had by looking at the last 4 years in the steel industry.

The CHAIRMAN. Is that statement disputed by any observer of the steel industry?

Mr. MURRAY. Might I say for your information, Mr. Chairman, that this statement which I now read is largely derived from figures produced by the American Iron and Steel Institute, the National Industrial Conference Board, and from other private and statistical agencies with whom we have no connection, and in addition to that based upon factual studies of all those matters by my own department of research in the city of Pittsburgh, which has made a current review lasting now for a period of approximately 5 months, into all of the factors having to do with this question that I now present to the committee.

Mr. PIKE. I think, Mr. Murray, that your statement is almost exactly true in dollars and cents, and I think Mr. Hook's figures yesterday bore it out pretty well, but they at least have gained in

¹ *Iron and Steel*, January 1940, National Industrial Conference Board, page 6. (Mr. Murray's footnote.)
² *Steel Facts*, February 1940, American Iron and Steel Institute, page 8. (Mr. Murray's footnote.)

EXHIBIT No. 9

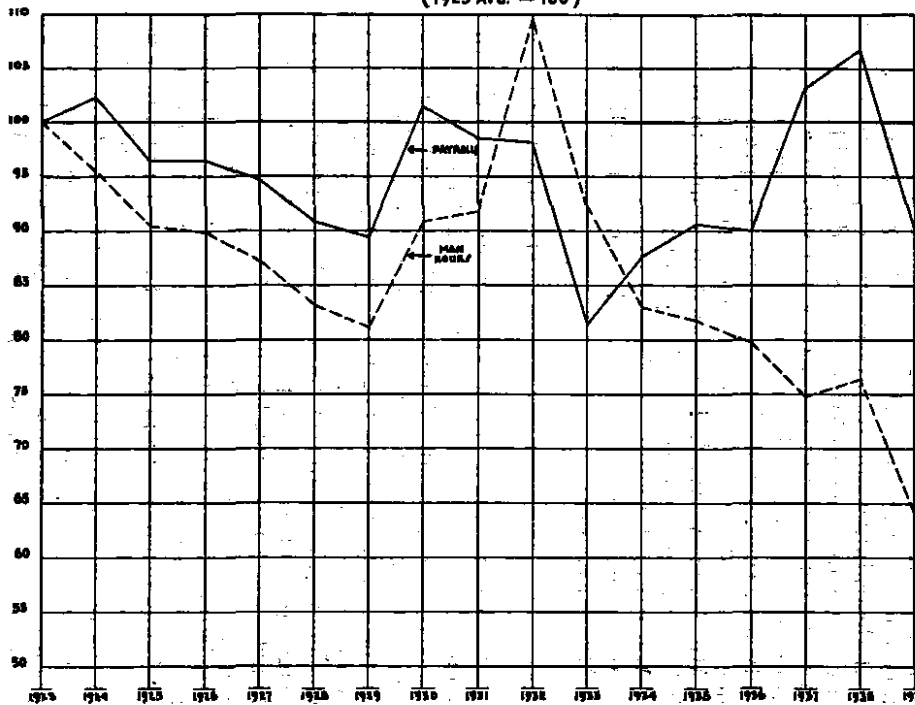
KEY: SOLID LINE - PAYROLLS PER TON OF OUTPUT
DASHED LINE - MAN HOURS PER TON OF OUTPUT

EXHIBIT No. 2483

IRON & STEEL INDUSTRY

PAYROLLS & MAN-HOURS PER TON OF OUTPUT

SOURCE: NATIONAL INDUSTRIAL CONFERENCE BOARD
(1925 AVG. = 100)



CONCENTRATION OF ECONOMIC POWER

16482

several hours a week of leisure which they didn't have before. If there is any gain, it is in more off time a week rather than in dollars and cents.

Mr. MURRAY. Of course, my complaint here is predicated upon the assumption that there is too damned much leisure in the steel industry. I don't think that they are giving them enough work. If your mind is meeting my mind, and I doubt that it is, of course we are both right.

Mr. PIKE. We would agree that 70 hours a week was much too much for a man to work over a long period, and that there was a real desirability for social reasons to pull those hours down first, say, to 60 and then to 54 and to 48 and possibly to 40, but somewhere in there comes the question of when you have got too much time on your hands and I am interested to get your point of view. Would you only ask, then, for 30 hours in order to spread the work more, and not because 30 hours would be better for the men?

Mr. MURRAY. Well, I intended of course to cover that phase of it in the later discussion of this problem.

Mr. PIKE. All right.

Mr. MURRAY. Is it all right if I shoot it in a little later?

Mr. PIKE. Yes.

GREATEST CHANGE IN EMPLOYMENT AFTER 1936

Mr. MURRAY. The most vital period during the thirties has been from 1936 through 1939. It is during this period that hourly wage rates rose more than 26 percent; that is, of the 29-percent increase since 1929, most of it took place since 1936. The new steel technology of the thirties did not begin to reduce pay rolls and employment, in substantial amounts, until 1936. It is since then that the productive efficiency of the industry increased by 21 percent. During this period wages per ton of ingots produced rose as a result of the increase in hourly wage rates, but by the end of the period, in September 1939, wages per ton of ingots produced had returned to the level prevailing before the increase in hourly earnings. From August 1936 to September 1939 technology reduced the number of man-hours per ton of ingots produced from 18.7 to 14.7, or more than 21 percent.

These facts were arrived at through careful and extensive analysis of the basic facts compiled by the American Iron and Steel Institute on monthly ingot production, total monthly hours worked by hourly, piece work, and tonnage workers, and total monthly wages (in whole dollars) received by this group of steel workers. I am submitting an explanation in "Exhibit No. 2484" of the nature of these basic facts and the method of their analysis.

The CHAIRMAN. It may be received.

(The document referred to was marked "Exhibit No. 2484" and is included in the appendix on p. 17343.)

Mr. MURRAY. I am also submitting four charts that illustrate these facts. I then make reference to the charts which are "Exhibits Nos. 2485, 2486, 2487, and 2488."

The CHAIRMAN. They may be received.

(The charts referred to were marked "Exhibits Nos. 2485 to 2488" and appear on pp. 16485-16488.)

EXHIBIT No. 2485

EXHIBIT No. 11

IRON & STEEL INDUSTRY
MAN-HOURS - PER TON OF INGOTS PRODUCED

SOURCE:
AMERICAN IRON & STEEL
INSTITUTE

ILLUSTRATION:
A TWENTY ONE AND FOUR TENTH PER CENT DECLINE
IN MAN-HOURS, FROM 18.7 TO 14.7 MAN-HOURS PER
TON, TOOK PLACE FROM AUG. 1936 TO SEPT. 1939. DUR-
ING BOTH THESE MONTHS THE RATE & QUANTITY OF
INGOT PRODUCTION WERE ALMOST EQUAL.

METHOD:
TOTAL MONTHLY HOURS WORKED BY HOURLY,
PIECE WORK, & TONNAGE EMPLOYEES
DIVIDED BY OPEN HEARTH & BESSEMER
STEEL INGOTS PRODUCED MONTHLY.

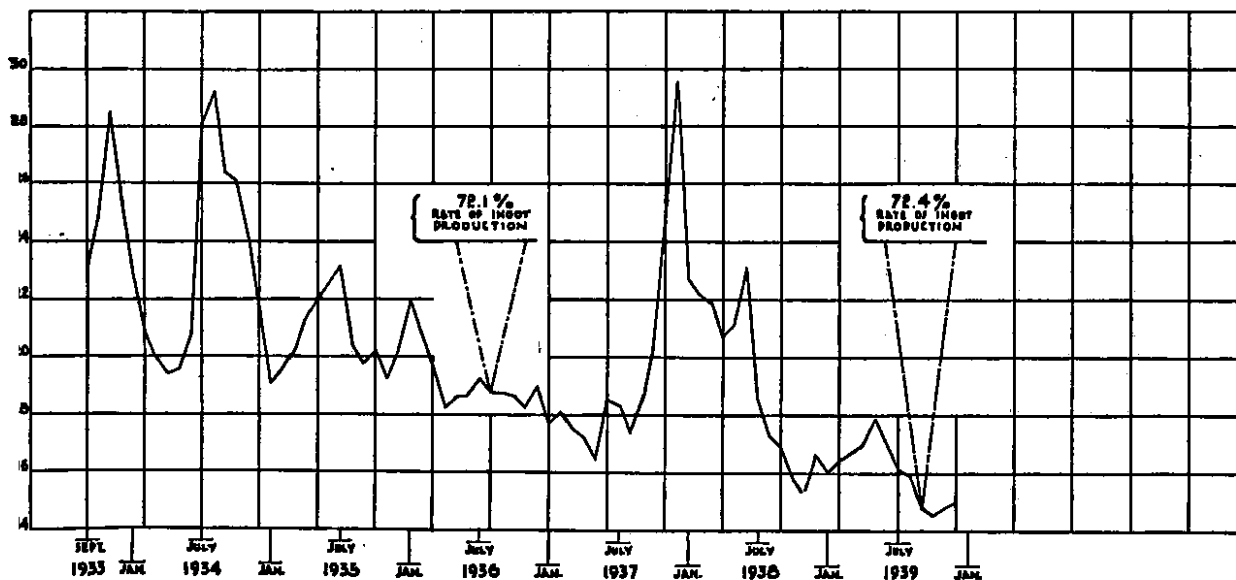


EXHIBIT No. 2486

EXHIBIT No. 12

IRON & STEEL INDUSTRY

WAGES - PER TON OF INGOTS PRODUCED

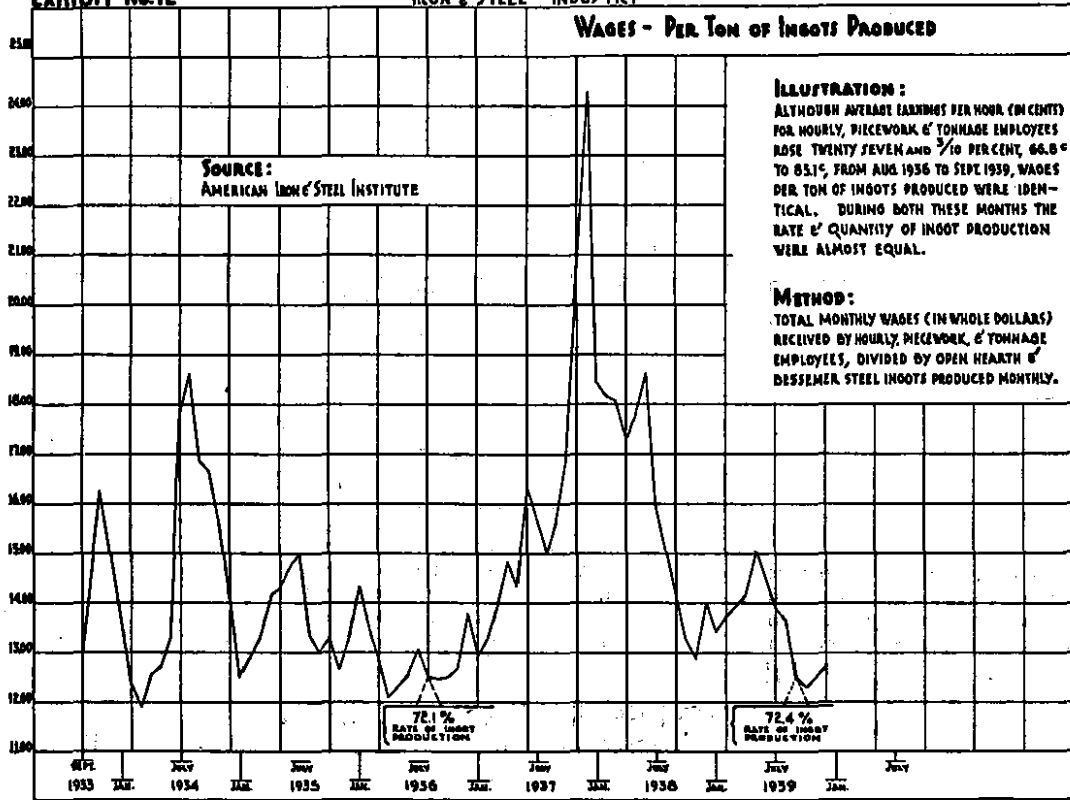


EXHIBIT No. 2487
 IRON & STEEL INDUSTRY
 RELATION OF PRODUCTION TO PAYROLLS (AT 75% TO 76% OF INST. CAPACITY)
 SOURCE: AMERICAN IRON & STEEL INSTITUTE

EXHIBIT No. 13

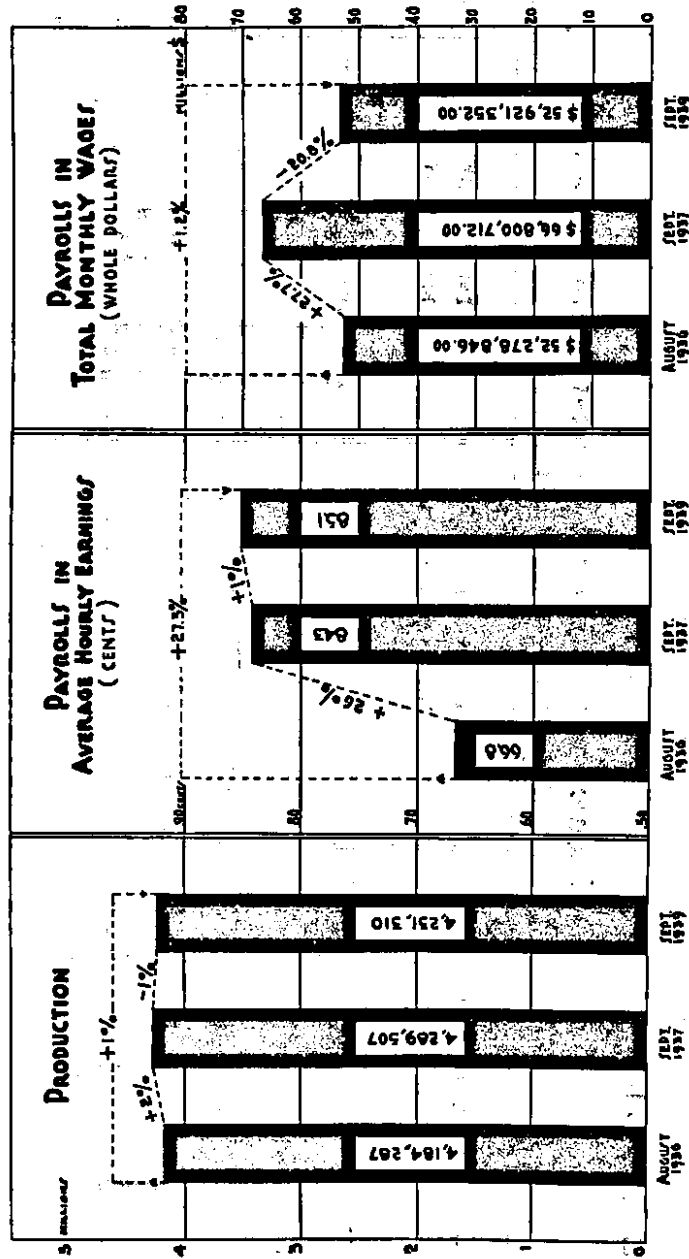
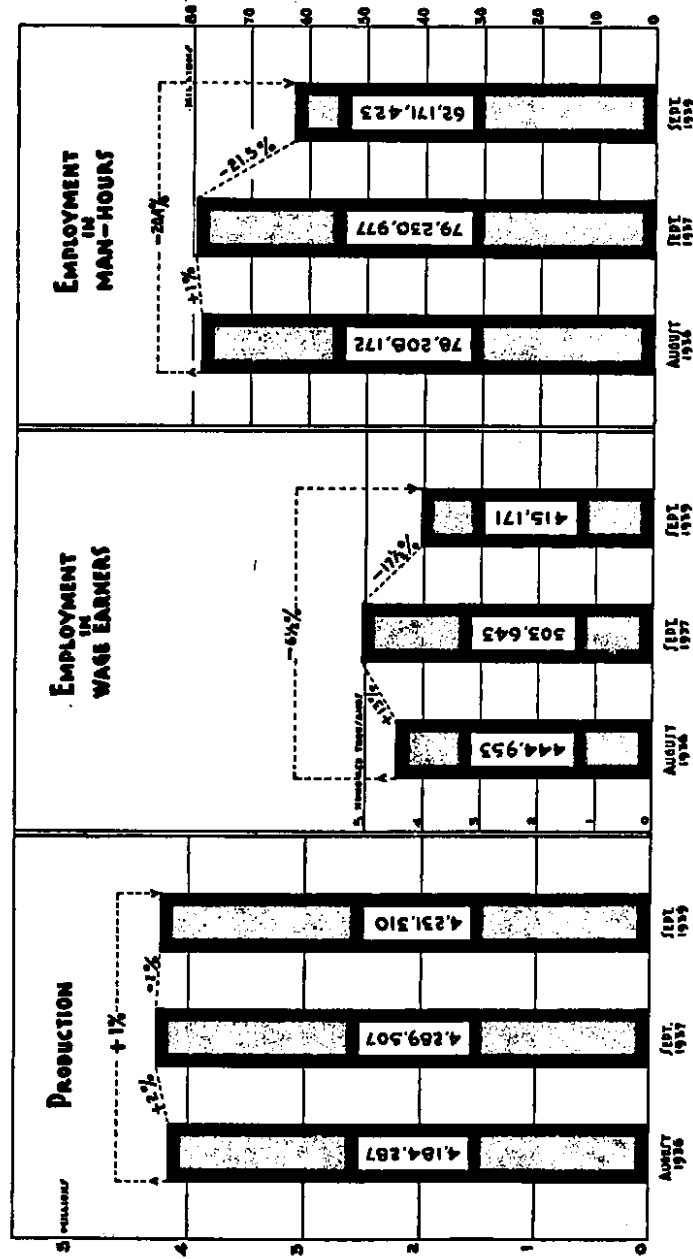


EXHIBIT No. 2488

IRON & STEEL INDUSTRY

EXHIBIT No. 14

RELATION OF PRODUCTION TO EMPLOYMENT (AT 75% TO 76% OF MAXIMUM CAPACITY)
 SOURCE: AMERICAN IRON & STEEL INSTITUTE



Mr. MURRAY. I am submitting this explanation and illustration of the facts as exhibits to avoid consuming the committee's time on technical matters, and if after looking these facts over any committee members want to discuss them with me or the S. W. O. C. research staff, we shall gladly oblige.

In connection with this body of information I want to discuss, briefly, three important questions. One is the relation of hourly earnings of steel workers to steel prices. The second is the relation of the new steel technology to national purchasing power. And the third is employment.

Might I just take the time of the committee while I present one of those charts?

(Senator King assumed the Chair.)

Acting Chairman KING. Which exhibit is that?

Dr. ANDERSON. "Exhibit No. 2488."

Mr. MURRAY. I wanted to make a comparison here because I think this is graphic and describes in vivid fashion just about what our situation is today in the industry. You will note at the left side of the chart there the August output of 1936, 4,184,287 tons. September 1937 there was an increase of 2 percent over the August 1936 production, or 4,289,507 tons. In September 1939 there was a drop of 1 percent below the 1937 production to 4,231,310 tons. Those are three fairly comparable months.

You will note here in the middle of the chart reference is made to the number of employees in those particular periods.

In August 1936, 444,953 employees produced the 4,184,287 tons. I want to explain this figure here. In March of 1937 the Steel Workers Organizing Committee negotiated the agreement with the steel industry reducing the workweek from 48 to 40 hours. That condition necessitated the employment of an additional 58,000 workers, bringing the total number of employees in the steel industry in March of 1937 up to 503,643.

Acting Chairman KING. That is the entire United States?

Mr. MURRAY. In the United States. In September of 1939, 2 years later, when the full impact of technological improvement was beginning to be felt, this force of 503,643 workers employed in September of 1937 producing a comparable tonnage to that of September 1939, we find the industry in September 1939 giving employment to 415,171 workers, or, as you will note, a reduction in the working force approximating 88,000 below the September 1937 figure.

In the last column we find 3 months in 3 separate years, August 1936, September 1937, September 1939, 3 comparable months, 3 comparable tonnage figures. How do we explain this reduction from '37 to '39? It is explained by the number of man-hours given the employees of the industry in those 3 years. In August of 1936 the employees in the industry worked 78,208,172 hours to produce 4,184,287 tons. In September of 1937, the employees in the industry worked 79,230,977 man-hours to produce 4,289,507 tons. Here again we come to the impact of the new technology. In September of 1939, the same tonnage was produced that was produced in September of 1937 and yet this tonnage was produced by 62,171,423 man-hours, or a reduction in man-hours in the industry below the 1937 figure of approximately 17,000,000.

Acting Chairman KING. What would be the difference in wages in the aggregate?

Mr. MURRAY. Well, the hourly rates—

Acting Chairman KING (interposing). I mean the entire amount which was paid.

Mr. MURRAY. In "Exhibit No. 2487," Senator, I offer an explanation of that, to show you that despite the fact that our wages have increased approximately 27 to 28 percent since 1936, the tonnage is about the same, monthly pay rolls are here recorded, showing that the pay roll for August 1936—and I again deal with the same 3 months and the same comparable tonnage—the monthly pay rolls show August 1936 \$52,278,846, in August of 1936, distributed amongst 444,953 workers.

In September of 1937, when production had gone about 2 percent above the 1936 figure, the pay roll for that month was \$66,800,712.

In September of 1939, when we had the full impact of our 27- or 28-percent wage increase, the pay roll was approximately the same as the pay roll in August of 1936, \$52,921,352.

Does that answer your question?

Acting Chairman KING. Yes, sir.

Dr. ANDERSON. Mr. Murray, referring to your "Exhibit No. 2488" for just a moment for an explanation, your three bar charts on production are what? Ingot tons? What is the production measure there?

Mr. RUTTENBERG. Open hearth and Bessemer ingots.

Dr. ANDERSON. The second set of figures then on employment of wage earners is wage earners in those particular things, in the open hearth and Bessemer?

Mr. RUTTENBERG. Wage earners in all operations in the industry.

Dr. ANDERSON. Isn't that an incomparable comparison? Aren't you making a comparison here of production, which is total tonnage ingot production?

Mr. RUTTENBERG. If we followed through and had all finished production to compare with the wages it would be the same. The standard accepted measurement of production in the industry is ingot production, and the relation of that to total employees in all parts of the industry and to the total wages paid in all parts of the industry is comparable.

Dr. ANDERSON. In other words, though these are not precisely the same and you are not making a comparison between people employed in that particular production only, you would find no difference if you did make such a comparison.

Mr. RUTTENBERG. The comparison of ingot production in each 3 months is the same as the comparison of all other types of production throughout the industry.

Mr. MURRAY. And as a matter of fact, we are using here the same yardstick to measure these things that the American Iron and Steel Institute and the National Industrial Conference Board and other statistical organizations use to arrive at conclusions.

Acting Chairman KING. Such a relation as you have stated here—

Mr. MURRAY (interposing). It is an established relationship that has been used in terms of results down through the history of the industry and we have merely followed the procedures adopted by the industry itself.

Acting Chairman KING. So they would be based upon a common denominator when you are trying to relate one to the other.

Mr. RUTTENBERG. Yes; the common denominator in the steel industry is open hearth and Bessemer ingot production. It is used throughout the hearings on the steel industry¹ that Mr. Hook referred to yesterday.

Mr. MURRAY. It has been contended before this committee and elsewhere that "substantial reduction in prices could not be effected without great reductions in wage rates."² This contention, no doubt, is based on the fact that from August 1936 to September 1939 (production being comparable in both months), average hourly wage rates in the steel industry rose more than 27 percent, or from 66.8 to 85.1 cents per hour. This increase in hourly wage rates, however, has not resulted in any increase in total wages per ton of ingots produced. The amount of wages per ton of ingots produced in August 1936, and September 1939, was the same, \$12.50 a ton.³ Thus despite a 27-percent increase in average hourly wage rates, total wages per ton of ingots produced, within a 3-year period, were not increased. This was accomplished, of course, by the reduction of 21 percent in the number of man-hours per ton of ingots produced during the same period. Through technological improvements the steel industry has eliminated the effect of increased average hourly wage rates on the labor cost of steel production. In view of these facts, derived from the figures of the industry's own American Iron and Steel Institute, the contention that price reductions can only be made with "great reductions in wage rates" is unsound and unfounded in fact.

EXTENT OF MECHANIZATION COST BORNE BY LABOR

Mr. MURRAY. The only basis for this contention is that if the money required to install the labor-saving machinery that made possible the increase in productive efficiency cannot be charged to the consumer, then labor should pay for the machinery through lower hourly wage rates. Labor in the steel industry, through the Steel Workers' Organizing Committee, will not take wage cuts to pay for machinery that displaces thousands of steel workers. And no responsible person in industry or Government should ask labor to pay for technological improvements out of its pay envelope. Without wage cuts, labor in the steel industry has paid dearly for technological improvements in the last 4 years. Thirty thousand steel workers have helped pay for these improvements with their jobs.⁴ The organized steel workers have the power, and have exercised it, to stop wage cuts, but lacking the cooperation of the industry they are unable by themselves to stop this wholesale displacement of workers. That is why, on behalf of the Nation's steel workers, I am bringing this matter to the attention of this important congressional and governmental committee.

Now, let us look at what has happened to the purchasing power of workers in the steel industry during the last 4 years. In 1936 and 1937 the Steel Workers' Organizing Committee raised average hourly earnings for hourly, piece work, and tonnage workers 26 percent,

¹ See Hearings, Parts 18, 19, 20, 26, 27.

² Verbatim Record of the Proceedings of the Temporary National Economic Committee, Volume XI, No. 6, January 23, 1940, pages 240-241. (Mr. Murray's footnote.)

³ See "Exhibit No. 2486," supra, p. 16486.

⁴ See "Exhibit No. 2488," supra, p. 16488.

or from 66.8 cents per hour in August 1936, to 84.3 cents per hour in September 1937 (both months being comparable in production). During this same period total monthly pay rolls rose in proportion to average hourly earnings—a monthly pay roll rise of a little more than \$14,500,000, or from \$52,200,000 to \$66,800,000.

This was a substantial contribution to national purchasing power of which the Steel Workers Organizing Committee has been justly proud. Having won an increase of \$14,500,000 in total monthly pay rolls, however, the Steel Workers Organizing Committee has been helpless to prevent the steel industry from taking it away through technological improvements. And that is just what has happened. By September 1939, 2 years later, when production returned to the same level of September 1937, total monthly pay rolls failed to likewise return to the level of September 1937. In fact, total monthly pay rolls in September 1939, were virtually what they had been before the 26-percent increase in average hourly earnings, or \$52,900,000. Thus from August 1936, before the increase in hourly earnings, to September 1939, total monthly pay rolls merely increased by 1.2 percent, or to the same extent as production. In other words, despite the increase in hourly earnings, the benefits of technology are not being passed on to steel workers in higher total monthly pay-rolls. The new steel technology has not added to national purchasing power through increasing the industry's monthly wage bill; but, on the contrary, has cut down the national purchasing power of consumers to the extent of a 9-percent increase in finished steel prices from 1936 to 1939.¹

At first glance, it would seem impossible to maintain the same monthly pay roll for comparable production after hourly earnings had been raised by more than one-fourth. A close look at the employment situation August 1936, September 1937, and September 1939 (all 3 months being comparable in production), however, shows how increased hourly earnings have failed to raise total pay rolls. Greater productive efficiency, resulting from technological improvements, reduced the number of man-hours worked in the steel industry and the number of steel workers employed. Consequently the higher hourly earnings are being paid to fewer steel workers, with the result that total pay rolls have remained stationary.

The Steel Workers Organizing Committee reduced the maximum workweek in the steel industry in 1937 from 48 to 40 hours. As a consequence, 58,690 more workers were required to produce an equivalent tonnage in September 1937 than in August 1936. This represented a substantial contribution to reducing unemployment. But it did not stick because of technological advances. The number of wage earners in the 2-year period from September 1937 to September 1939 dropped from 503,000 to 415,000—an elimination of more than 88,000 workers—or a decline of 17½ percent in the number of steel workers needed to produce an equivalent tonnage. Compared to August 1936, when maximum hours were 8 per week higher, the number of steel workers in September 1939 was 30,000 less.

(Senator O'Mahoney assumed the chair.)

The CHAIRMAN. Is there any dispute about those figures?

¹ Iron and Steel, January 1940, National Industrial Conference Board, p. 6. (Mr. Murray's footnote.)

Mr. MURRAY. There may be, I don't know. I suppose there might be. Mr. Hook evidently yesterday said something that would run quite contrary to what I am saying here today.

The CHAIRMAN. What is the source of your figures?

Mr. MURRAY. The source of our figures is the facts, the records of the industry, the American Iron and Steel Institute, the National Industrial Conference Board, and a complete record of the employment figures taken from almost every plant in the United States.

Representative WILLIAMS. As I remember, Mr. Hook said the increase during perhaps a period of 10 years for the entire industry had been 117,000.

Mr. MURRAY. Number of employees.

Mr. PIKE. That was '26 to '37.

Mr. MURRAY. Well, unfortunately Mr. Hook stopped with your committee in the year 1937, when, as I have already stated to this committee, the impact of these technological improvements was beginning to drive right into the heart of the industry and force people onto the streets.

Dr. ANDERSON. Let me read from Mr. Hook's statement and ask your clarification or criticism for the record:

But for the steel industry as a whole we had an actual increase of working forces of 117,000 men from 1927 to 1937. Total employment in the steel industry increased from 427,000 men in 1927 to 544,000 in 1937, according to the figures of the United States Census, an increase of 27 percent, while in the meantime the population increase had been but 11.2 percent.

Now you are discussing here what? Are you discussing the working force available for labor in steel or the actually employed labor force?

Mr. MURRAY. I am discussing the actual number of people employed in the industry in those years.

Dr. ANDERSON. But Mr. Hook was discussing the available labor force employed and unemployed.

Mr. MURRAY. Well, of course, I assume it is taken for granted there are 10 or 11 million people who are available for work in the country who are idle today and can't get jobs.

Mr. PIKE. There is not much difference in the figures. You had 503,000 in 1937 as against 530,000-odd.

Dr. ANDERSON. The other difference to be noted, if the first is not a difference, is that you carry your figures on through 1939. He stops at 1937, as you indicated.

Mr. MURRAY. That is right.

Dr. ANDERSON. If you had stopped at '37 do you presume you would have shown the increase of 27 percent in figures?

Mr. MURRAY. I don't know. I haven't prepared a statistical survey of the situation from '27 through.

Mr. RUTTENBERG. There isn't any basic controversy about the increase in total employment from 1927 to 1937. Mr. Murray did not have an opportunity to hear the information presented yesterday by Mr. Hook and he was not here when that part was presented. It brought us up to 1937. Our information substantially is the same, showing a tremendous rise in employment from '36 to '37. It is since 1937 that the high cost obsolete hand mills have been abandoned in large numbers in the industry. From 1937 through 1939 employment has dropped and the impact of these 27 continuous strip mills is observable

now in the drop, and there is no controversy or conflict in the figures; merely, these figures bring us up to date through 1939, whereas Mr. Hook left off in 1937 when employment was exceptionally high and before the total impact of automatic strip mills had been felt in the industry.

Senator KING. I take it it is your contention that if Mr. Hook had brought it down to date, to 1939 or the beginning of 1940, his figures would have been comparable to yours.

Mr. RUTTENBERG. Yes. These figures are from the American Iron and Steel Institute, sheets 1 and 2, and are supplied to all members of the institute, and they cover more than 90 percent of the industry.

The CHAIRMAN. Sheets 1 and 2, you said?

Mr. RUTTENBERG. Yes; that is in "Exhibit No. 2484" where we submit a complete explanation of the source and method of analysis.

The CHAIRMAN. Sheets 1 and 2 of what?

Mr. RUTTENBERG. The American Iron and Steel Institute.

The CHAIRMAN. Of what document? Name the document.

Mr. RUTTENBERG. It is described in "Exhibit No. 2484." It is known as the American Iron and Steel Institute, New York City, statistical sheets 1 and 2, which are distributed to companies in the steel industry which supply data to the American Iron and Steel Institute.

The CHAIRMAN. Those sheets were issued as of what date?

Mr. RUTTENBERG. They are issued monthly.

The CHAIRMAN. The particular ones you quoted from were issued when?

Mr. RUTTENBERG. Periodically each month.

The CHAIRMAN. So this is a composite figure from sheets 1 and 2 issued monthly over the period included in this survey.

Mr. RUTTENBERG. Yes.

STEEL EMPLOYMENT IN 1929 AND 1939

Representative WILLIAMS. According to your survey now let's have the plain statement, if you can make it, as to whether or not there are more men employed in the steel industry now, say in 1939, than there were in 1927.

Mr. RUTTENBERG. The actual figures we have further on in Mr. Murray's statement; he goes into the year 1929 as compared to 1939, and during that period of time total employment was virtually the same. The American Iron and Steel Institute reports total employment for 1929, the average for the year, as 419,500 employees. They report the average annual employment for 1939 at 423,000 employees. In other words a total employment in '39 was substantially the same as in '29, despite a drop of 36 percent in the average hours worked per week in the respective years.

Representative WILLIAMS. Right in that same connection have you the unit output of the steel industry?

Mr. RUTTENBERG. Yes.

Representative WILLIAMS. What is it, '29 and '39?

Mr. RUTTENBERG. The per-unit output, the figures of the American Iron and Steel Institute in "Exhibit No. 2485" only go back to 1933, and we have that here, showing how many man-hours are worked to produce each ton of ingots. As Mr. Murray observed in his state-

ment, the drop from 1936 to 1939 was 21.4 percent, or from 18.7 to 14.7 man-hours per ton of ingots produced.

Representative WILLIAMS. What I am trying to get at is what the total output was.

Mr. RUTTENBERG. The total actual output in the month?

Representative WILLIAMS. The total actual output of '29 compared with '39.

Mr. RUTTENBERG. The output of 1929 was in excess of 1939.

Representative WILLIAMS. Now, let's have the figures, if you have them.

Mr. RUTTENBERG. I don't have them immediately at hand, but we have comparable production figures for these months that Mr. Murray has explained on these charts.

Representative WILLIAMS. That chart doesn't go back to '29, does it?

Mr. RUTTENBERG. No; it goes to '36.

Representative WILLIAMS. What I am trying to get at in my own mind is the number of men that were employed in '29 compared with '39, and also the output of the industry for the same period of time.

Mr. RUTTENBERG. The output—I have just given the employment for those 2 years; the output for 1929 was greater. I can recall, I think, there were 54,000,000 tons produced in '29; '39 was several million tons below that, less than 50,000,000 tons.

The CHAIRMAN. So that the output has been decreased?

Mr. RUTTENBERG. Yes.

The CHAIRMAN. And the figures on total employment that you gave were practically the same, I understood you to say?

Mr. RUTTENBERG. Yes.

The CHAIRMAN. That is in terms of men, but that figure does not reflect the actual condition because of the change in the number of hours worked per man?

Mr. RUTTENBERG. Precisely.

The CHAIRMAN. Is that right?

Mr. RUTTENBERG. Precisely so.

The CHAIRMAN. Now, could you prepare a statement for a table which will give these figures which Congressman Williams has asked, so they would appear in the record?

Mr. MURRAY. We would be delighted to furnish you with those figures.

Dr. ANDERSON. Mr. Chairman, I have them here, handed to me in Monthly Labor Information Bulletin of the B. L. S. Production in 1929 was 54,300,000 tons ingots; 1939, 45,800,000 tons ingots; employment in the 2 years, 419,000 workers in '29; 415,000 workers in '39. I think that answers the Congressman's question.

The CHAIRMAN. Proceed, then, Mr. Murray.

Mr. MURRAY. Measured in man-hours the drop in employment is more pronounced. From August 1936 to September 1937, man-hours rose 1 percent. But from September 1937 to September 1939 man-hours declined 21½ percent, from 79,000,000 to 62,000,000 man-hours—a drop of 17,000,000 man-hours in the short space of 2 years.

Briefly summarized, the period from August 1936 to September 1939 shows that the steel industry, through the installation of technological improvements had done the following:

1. Maintained the same labor cost of production despite an increase of more than one-fourth in hourly wage rates.

2. Eliminated \$14,000,000 from the total monthly pay envelopes of the steel workers from 1937 to 1939.

The CHAIRMAN. I will have to interrupt you because I am now examining the chart from the B. L. S. to which Dr. Anderson called attention. This shows, with 1929 as a basis, a production of 54,300,000 tons ingots, which is designated 100 percent. A total employment of 419,000 workers designated 100 percent, and weekly pay rolls amounting to \$14,060,000, which is also designated as 100 percent. So the figures for 1929 represent a 100-percent base of production, employment, and pay roll. In 1937 the production was 91 percent of 1929, but employment was 120 percent, a very great increase; and weekly pay rolls amounted to 112 percent, an increase of 12 percent. In 1938 production had fallen off to 51 percent of 1929, employment to 88 percent of 1929, and pay rolls to 83 percent of 1929. Now as to 1939, production amounted to 45,800,000 tons ingots, which was 84 percent of 1929. The workers numbered 415,000, or 99 percent, and the pay roll \$12,410,000, or 88 percent, so we have this conclusion, that in 1939 in the steel industry, though the production had fallen off by 16 percent, the employment had fallen off only 1 percent and wages had fallen off 12 percent.

Mr. MURRAY. That is a very good analysis and in substance supports the contention of the organization, my own organization, with relation to—

The CHAIRMAN (interposing). But it indicates, you see, that it required more persons proportionately to produce the output in 1939 than it did in 1929.

Mr. RUTTENBERG. I think there is a footnote, Senator, that explains that chart, at the bottom of the chart in connection with the comparison of your drawing.

The CHAIRMAN (reading):

These data presented for all manufacturing industries combined and for a few selected industries are not suitable for use in measuring changes in labor productivity in these industries.

Well, of course, that is one of the difficulties I am constantly finding about statistics. The experts come in here with statistics and after you have read them, then there is a footnote in small type which says, "Pay no attention to them."

Mr. STERN. Would you mind reading the next sentence? It explains why.

The CHAIRMAN (reading):

Labor productivity is generally measured in terms of output per man per hour. The figures of employment given here cannot be used as an indication of actual man hours worked because they include total as well as part-time employment and the ratio between the two varies greatly from industry to industry, and from month to month in the same industry. Pay rolls are a better criterion of man hours worked, but they are greatly affected by changes in the hourly earnings. Until more precise information is available on actual man hours worked in the separate industries and a better method is devised to measure changes in industrial output, studies of changes in labor productivity from such data as are presented here are bound to be inconclusive and at times even misleading.

Dr. ANDERSON. Mr. Chairman, to protect my profession, I would like to comment that I didn't read the last section of that chart in presenting the data to you for the very reason that you have now discovered, and furthermore—

The CHAIRMAN (interposing). You have been holding out on me? Dr. ANDERSON. I was holding out for that very reason, because it is very plain we do not have the adequate body of data to do the thing attempted in the last part.

The CHAIRMAN. Of course, one of the purposes of this hearing is, if possible, to develop statistics upon which all can agree.

Dr. ANDERSON. And I am only sorry that Mr. Hinrichs and Mr. Lubin are not here because they are responsible for this document, and I know they would be the first to tell you that one of the great needs in the United States is an adequate body of data, of factual material upon which we can actually build national policies; and that depends upon many developments, including an adequate budget for the Bureau of Labor Statistics.

The CHAIRMAN. I have heard that story on the Appropriations Committee many times and the next time I hear it I am going to have some of these charts with me and find out why we can't get accurate information.

Mr. MURRAY. You see, Mr. Chairman, the best answer—and it doesn't require the effort of any statistical expert to get the answer—is to be found in the men that are walking the streets.

The CHAIRMAN. I think you are quite right about that.

Mr. MURRAY. That is the answer.

The CHAIRMAN. No matter what increase of production we show.

Mr. MURRAY. I just don't care how much industrialists or any others care to indulge in the magic of figures about these things. I am living among steel workers. I visit their homes. I talk to them. I meet with them. I really live with them. I know the conditions. Mike Russell appeared before the committee today as just one of 5,000 idle people in one community in the city of New Castle. I could take this committee to Martins Ferry, Ohio, to Mingo Junction, Ohio, to Elwood, Ind., to Monessen in Pennsylvania, to Braddock, to Duquesne, to Homestead, and there are the figures, but they are the figures of human beings walking the streets out of jobs.

Now there just simply isn't any statistical set-up that can deny that sort of a situation. It is there.

The CHAIRMAN. Well, there were statistical set-ups in some of the columns just a few weeks ago which undertook to prove that there were only about 2,000,000 persons unemployed now, in the entire country.

Mr. MURRAY. Of course, Dorothy [Thompson] doesn't work in a steel mill. Now with your permission, Mr. Chairman, I would like to continue here.

INCREASE IN PRODUCTION FROM 1929 TO 1939

Mr. PIKE. Mr. Murray, I think that question of Congressman Williams was well answered in your chart, "Exhibit No. 2483," which you really didn't call much attention to.

It happened at the end of 1929 and end of 1939 the pay rolls are almost exactly the same per ton, but they certainly wandered all over the place in the 10 years intervening. The man-hours you show most graphically in the last 2 or 3 years.

Mr. RUTTENBERG. This measurement by the National Industrial Conference Board was made in conjunction with the American Iron

and Steel Institute and it shows a progressive decline in man-hours per ton of output for 1929 on down through 1939, or a drop from approximately 82 in 1929 down to 64 in 1939, and this is the statistical chart that shows the story that Mr. Murray has been telling in human terms, existing in these various towns he has mentioned. It is the only one on a national basis that exists anywhere, so far as we are able to determine.

The CHAIRMAN. Now, according to this chart, the average was the condition that existed in 1932; that is your base.

Mr. RUTTENBERG. Right.

The CHAIRMAN. That is 100 percent, and it shows that in 1932 the peak of man-hours was reached at 110; that it has fallen off precipitously since then until in 1934 it was below 85.

Mr. PIKE. Below 65.

The CHAIRMAN. In 1934 it was below 85. In 1935 it was about 82; in 1936 it was just below 80; in 1937 it was at 75; showed a slight increase in 1936; and in 1939 had dropped to below 65. In other words, in 1939 in terms of man-hours the record was less than 65 percent of what it had been in 1932 and that, I take it, can be regarded as a more accurate representation of the facts than the actual number of persons employed.

Mr. RUTTENBERG. Precisely.

The CHAIRMAN. Because the persons employed may not be working as many hours as they were in previous years. Is that your point of view?

Mr. MURRAY. That is right.

The CHAIRMAN. And this chart from which I have been reading was prepared by the National Industrial Conference Board on the statistics gathered by the American Steel Institute; is that correct?

Mr. RUTTENBERG. On statistics gathered jointly by the Conference Board and the American Iron and Steel Institute.

The CHAIRMAN. Now neither of these institutions is a C. I. O. affiliate?

Mr. RUTTENBERG. Not so far as we are aware.

Mr. STERN. For the sake of the record, the chart refers to man-hours per ton, not to the man-hours worked. It is the time the labor time consumed to produce a ton of product. It isn't total man-hours worked.

The CHAIRMAN. That doesn't tell the story of employment, either, then. That doesn't tell our employment story at all.

Mr. RUTTENBERG. This tells the employment story precisely, I think. It shows the man-hours per ton. When you referred to man-hours per ton going away up in 1932 that was a reflection of a low operation, and as operations become on a comparable basis in '39 you have your precise number of hours of men you had to work to produce a given ton of output, and that measures progressively the fewer hours of work required to produce the same output.

The CHAIRMAN. That is right, but when you get to that statistical and expert formula you are getting away from the human problem in which I am particularly interested and trying to develop the fact. I am sorry, Mr. Murray; if you will proceed.

Mr. MURRAY. I am glad that you clarify those things.

3. Raised productive efficiency by one-fifth.

4. Displaced 30,000 steel workers.

5. Increased finished steel prices 9 percent. In other words, the steel industry is able to produce the same amount of steel with 30,000 fewer workers. The steel workers who are currently employed are receiving more than 26 percent higher wages per hour, but at the expense of 30,000 steel workers who have been displaced and are receiving no wages from the steel industry. And the steel workers still attached to the industry are idle one-fifth to two-fifths of the year, because the increased productive efficiency enables them to produce all the steel consumed each year in three-fifths to four-fifths of the year.

Now with your permission again, Mr. Chairman, I would like to dispense with reading the next 4 pages, and have them placed in the record.

The CHAIRMAN. All right, it will be included in its regular order in your printed statement.

(The material referred to appears below:)

Needless to add, if the Steel Workers Organizing Committee had not raised wage rates and lowered weekly hours during this 4-year period, 1936 through 1939, the situation would be much worse than it is today. As I have previously noted, the automatic strip mills were introduced into the steel industry before the birth of the S. W. O. C. The increase in output per man-hour, the reductions in pay rolls and employment, and the displacement of workers was virtually an accomplished fact before the steel workers were successful in organizing their union. Therefore, if the steel workers had not organized, as they did, in 1936 and 1937, wage rates would not have been increased to the extent that they were, nor would the maximum hours per week have been correspondingly reduced. Consequently, the net contribution, after 3 years, of the S. W. O. C. has been to prevent—

1. The reduction of the total monthly pay rolls of the steel industry by more than $\frac{1}{4}$ the amount of the increase in hourly earnings.
2. The permanent elimination of 58,000 steel workers from their jobs, or the difference in the number of workers required to produce an equivalent tonnage on a 40-hour week as compared to a 48-hour week.

In other words, the S. W. O. C. has been the only cushion to the devastating effects of the new steel technology. S. W. O. C. raised monthly pay rolls by more than \$14,500,000 a month for a period of a couple years. Technology eliminated almost all of this increase. But S. W. O. C. stopped technology from reducing total monthly pay rolls by one-fourth. S. W. O. C. saved the jobs of over 50,000 steel workers. If S. W. O. C.'s contribution had not been made, there would be today 88,000 displaced steel workers instead of 30,000, and instead of the steel industry's contribution to consumers' purchasing power remaining virtually the same, it would have been lowered by more than 25 percent.

The 10-year employment record of the steel industry, from 1929 through 1939, shows the extent to which technology has eliminated workers. The American Iron & Steel Institute reports an average of 419,500 wage earners in 1929, as compared to 425,000 10 years later in 1939.¹ As I have noted, in 1937 considerably more workers were employed as a result of the shorter workweek instituted then, but they mostly have been eliminated by technology. Thus in 1939 the number of wage earners was only 5,500 more than in 1929, or a rise of $1\frac{3}{10}$ percent in 10 years. But during this 10-year period average weekly hours declined from 55 to 35 a week, or 36 percent. Thus, instead of more men being employed to get out the same tonnage in the shorter week, the number of wage earners has remained virtually stationary. In presenting information to this committee, the United States Steel Corporation, for its own operations, computed the number of wage earners that would be required during the thirties on the basis of prevailing weekly hours in the year 1929.²

¹ *Steel Facts*, February 1940, American Iron and Steel Institute, pages 2, 3, and 4 (Mr. Murray's footnote).

² TNEC "Exhibit 1409," Actual Number of Employees And Number That Would Have Been Required on Basis of 1929 Hours Per Week, United States Steel Corporation and Subsidiaries (Mr. Murray's footnote).

The corporation did this by multiplying the actual number of employees in each year or month by the number of hours worked per week during the period and dividing by the number of hours worked per week during the year 1929.

By this method we find that on the basis of weekly hours in the year 1929, steel industry in 1939, the year just past, would have employed only 270,000 wage earners. This represents the elimination of 150,000 wage earners, or a decline in employment of 35 percent. In other words, if reductions in the maximum hours of work per week had not been effectuated from 1929 to 1939, 150,000 steel workers conceivably would have been displaced in the past 10 years. In addition, nothing has been done to expand steel employment, which is today at virtually the same levels as 1929. It is plainly observable, therefore, that technology has been at the root of unemployment since 1929, and since that time the steel industry has failed to give employment to young workers becoming of employable age without displacing older workers. On a net basis, the steel industry, the wealthiest in the country, has failed to absorb in its working force any of the increase in employable workers resulting from our rising population in the last decade. As a matter of fact, as I noted earlier in my statement, more than 40,000 steel workers now attached to the steel industry are scheduled to be displaced by the automatic strip mills. You will recall I showed by actual figures that 38,470 of the 84,770 workers scheduled to be eliminated by the strip mills have already been laid off permanently in the past 10 years. Therefore, the steel industry has failed in both respects; it has not absorbed any new workers, and secondly, it will soon be employing fewer workers than in 1929.

Dr. ANDERSON. There were no exhibits?

Mr. MURRAY. None that I know of in that whole thing.

INTERINDUSTRY COMPETITION

Mr. MURRAY. The new steel technology is not creating new jobs elsewhere to compensate for the jobs directly eliminated in the steel industry. The automatic strip mill, for example, instead of adding to total employment by creating new industries or expanding old industries to offset its devastating effects in the steel industry, is robbing jobs from old-established industries. The new jobs created through the development of new industries utilizing the automatic strip mill output, or through the expansion of old industries using the automatic strip mill output, are virtually canceled out. A major strip mill product, for instance, is tin plate. A new use developed for tin plate in recent years has been to pack beer in tin cans. But beer cans, in turn, mean fewer glass bottles and other containers, and correspondingly less employment in these lines.

Sheet steel is another major strip-mill product, and a new outlet is being developed for sheet steel in the plumbing-fixture industry. But this inevitably means the displacement of workers now employed in foundries producing cast iron enameled plumbing fixtures. Another outlet for sheet steel, still in a very early stage, is prefabricated steel housing.

The CHAIRMAN. But yesterday Mr. Hook presented a chart which showed various commodities which he said are now being manufactured which were not manufactured previously, with the product of the old hand rolling mill. That may not have been true of each one of the items which he mentioned, but among those industries which have come into existence and which are using tin plate, for example, was the electric refrigerator. Now the electric refrigerator obviously can be used in places where the old-style refrigerator, filled every morning by the iceman on his rounds, could not be used;

electric refrigerators are used in farms and ranch homes where it would have been impossible to get ice, where the cooling device was to stack things in a cellar. The development of the Delco system and of rural electrification has made possible the use of electric refrigerators where they never were before, and where they are not displacing any other commodity but are adding a new convenience to the home and for the benefit of the housewife.

I think that we must acknowledge that there are new commodities coming into existence, don't you think, which do not displace?

Mr. MURRAY. Of course, that is undeniably so. However, I am not prepared to say that I am in perfect accord with the idea that the mere introduction of an electric ice box has given more men jobs because ice boxes were substantially used in the larger centers of population in years gone by and did comprehend the employment of workers, particularly lumber workers, and the icemen that we hear talked about quite frequently are not in the picture any more. Of course in the rural districts where rural electrification has enhanced work opportunities and has perhaps put an occasional ice box in a farmer's home that was able to buy one, it has added something to the comfort of that particular farmer and perhaps given another fellow a job.

The CHAIRMAN. I may say the impression that has been made upon me in my study has been that undoubtedly advancing technology creates many new jobs. At the same time it undoubtedly displaces many workers, and the problem is the human problem, the absorption of the particular person who is displaced.

Now you brought your human exhibit here this morning in the person of Mike Russell. He was displaced. Some new job may have been created in some other and distant town, but it isn't a job for him. He must then depend upon the contribution of the Federal Government through W. P. A. appropriations to provide a most meager income for his family, and it is how we are to take care of the particular person who is displaced that to my mind is the most pressing question in this whole problem. Do you agree with that statement?

PROBLEM OF NEW ENTRANTS TO LABOR FORCE

Mr. MURRAY. Oh, in substance I do. I think that it is all right, Senator; yes. Of course, it isn't merely a question of absorbing people who are actually displaced by new technological changes. That isn't the sole factor that disturbs this Nation or upsets our economy. It is the very definite inability of American enterprise and American industry to give employment to the newer generation that is coming along. When I talk of 30,000 steel workers being definitely thrown out in the streets during the past 3 years I am merely talking about people who had jobs in this industry in 1936, but necessity compels me to think about these younger people who have been pouring out of our schools and growing up and who are physically fit, wondering what the great captains of industry are going to do about them.

I know the steel industry isn't going to do anything about them, unless there comes into their hearts and their souls and their minds the consciousness that there are some definite social responsibilities that run beyond the payment of ordinary dividends to stockholders.

The CHAIRMAN. Well, could the steel industry, or any industry by itself, meet this problem?

Mr. MURRAY. No; I don't say so. I think that in all fairness to any industry; I don't say it is a one-industry problem.

The CHAIRMAN. It is a national problem?

Mr. MURRAY. It is a national problem. I merely use the industry as one of many industries where ownership, management, have not indicated to me, and so far as I am aware, have not indicated to government any desire to do anything about it, excepting that the new technology produces new enterprises and perhaps in the days to come will give work to the coming generations, but that kind of an attitude has not been fruitful of any results during the past 11 years. Eleven years ago we heard that, 10 years ago, 9 years ago, 8 years ago, and today one of America's most distinguished leaders in the field of business, representing a great body of organized wealth and business in this country, appears before this committee and says there is nothing to be worried about, that the newer technology creates new enterprise.

My God! Ten years ago we were told that—11 years ago. I believe in the introduction of new enterprise—I hope some day it will come. Mr. Hook perhaps could lecture this committee about high taxes, free enterprise. I am here not to lecture but rather to persuade and plead with and talk to this Nation through the medium of this committee about our Government and our industries in this country and labor getting their heads together and doing something to save this Nation of ours; to save these institutions of ours in this country; to save this form of government by providing this much-needed employment to these idle people. It has just simply gone beyond the stage of guessing any more about it. I would like, Senator, and this isn't said disparagingly about you, either, because I have a great fondness for you and you have been doing a great work over here, given great study to it; I haven't been able to find any industrialist in this country that is willing to offer any solution, and I can't find the politicians that will do it because the proposition doesn't seem to have, in the language of the streets, any political sex appeal; it doesn't seem to be a very good vote getter; at least that is what they think. And as one layman—and I am a very ordinary layman, humble in spirit, who wants to do the right thing—I think our Federal Congress should lead the way.

I think the President of the United States should be asked, in the form of a congressional resolution, to draft into public service some of the important men in this country and tell them to get to work for 6 months, a year, yes—however long it may be—to settle this problem of unemployment in this country, because I get over my desk—I represent half a million steel workers—every morning pleas, prayers, from a lot of people in this country, and there isn't a single solitary thing that I can do to help them; I can't do anything. I represent a great big union. Well, I am utterly helpless because there is evidence of a lack of desire on the part of government, on the part of business, to be cooperative in providing the proper kind of solution for this situation.

The CHAIRMAN. I am glad you have made that statement, Mr. Murray. I feel, from my own experience, that much of what you have said is true, but I can tell you this: since the study of this

committee began, and that is considerably over a year ago, I have had occasion to talk with many business groups as well as with leaders of all other groups, and I have come to the very definite conclusion, and I take the liberty of conveying it to you, that a great majority of all the people in this country in every classification, whether they are industrial leaders or workers or farmers, want to see this problem settled and they are willing to settle it, and most of these, by far the most of them, express exactly the same thought that you have expressed here, namely, that they want to save our form of government, our democratic institutions. I am sorry to say that there are a small percentage of persons on the two extremes who spend so much time calling one another names that the 95 percent of the people in between don't have very much opportunity to get their thought over.

One of the hopes of this committee has been that it might prove the microphone, as it were, through which there could be conveyed to the country a sensibility of the necessity for cooperative and immediate action to put people to work in private industry so that the Government would not be under the necessity of continuing to expand and to grow and to apparently control things. I think we have both been a little bit off the direct subject.

Mr. MURRAY. We are both getting a little bit sentimental. Now, with your permission, Mr. Chairman, and, of course, again reminding you of my request to include in the record, I should like to cooperate with the committee and expedite the reading of this paper and not read "Jobs Not Created Elsewhere," and continue over to p. 41 from 33.

(The material referred to appears below:)

It is estimated that a prefabricated steel house can be produced and erected with one-fourth of the labor required to build a house by conventional methods. But any such development on a large scale would cost the jobs not only of a great body of building-trades workers, but also of brick and clay, lumber, cement, and other workers now employed to produce building materials.

The facts about our national economy attest that this vicious circle of technological unemployment, as illustrated by the strip mill, is typical of technological developments in industry generally during the past decade. In the last year of the thirties production reached the levels of 1929 and exceeded them, but total employment was below that of 1929 by 1,000,000 to 2,500,000 workers. In discussing this question the Federal Reserve Board states:¹

"The larger total volume of output currently (January 1940) than in 1929 reflects continued technical progress during the decade; the number of persons employed, excluding those working on relief projects, is slightly smaller than 10 years ago and those with jobs are working much shorter hours."

Also in this period, the Board noted, population has increased about 8 percent.

The impact of technology on our economy during the 1930's has been one of the major factors retarding a sound recovery and sustained prosperity. The problem of this technology is twofold.

First, ways and means must be found to provide for the men and women, their families, and their communities, who are the victims of technological change. Industry must assume social responsibility for the human beings who are discarded by new industrial techniques that industry owns, controls, and installs.

Secondly, ways and means must be found to distribute the benefits of technology to everyone in the country, to arrest the trend toward a declining working force, and to provide employment—the means of life, liberty, and the pursuit of happiness—to the large mass of men and women, one-third of whom are young men and women, who are today idle through no fault of their own, who are idle because of the failure of private industry to provide them with jobs.

¹ Federal Reserve Bulletin, February 1940, p. 81.

PROVIDING FOR DISPLACED WORKERS

Let us consider the first of these problems, the men and women who are displaced by technology.

The cost of technology has always been enormous socially. With every technical improvement since the beginning of the Industrial Revolution has come the displacement of labor, the upheaval of human beings, the dislocation of towns and entire regions. The history of technology in industry is a story of continual change in productive techniques and processes and the continual disregard of the human suffering caused by these changes. This disregard for the victims of technology has to be changed to solicitation for their welfare.

A half-century ago puddlers produced the bulk of iron in the United States. Today iron puddling is almost a vanished art. Huge blast furnaces, costing from \$4,000,000 to \$8,000,000 each, produce the bulk of iron at present. Technology has played a major role here. The number of blast furnaces¹ since the World War has declined 49 percent, while the average annual capacity of each furnace has increased 131 percent. The National Industrial Conference Board¹ reports:

"The installation of labor-saving devices, such as contrivances for mechanical charging of raw material—ore, coke, and limestone—and machine casting of molten pig iron has increased the efficiency of blast furnaces. The effect of these changes and the increased size of the blast furnace units have had comparatively little effect on the size of the labor force attending individual furnaces because a substantial increase in the daily output per furnace has not required a proportionate increase in the amount of labor."

Just as radically, open-hearth steel production has supplanted the bessemer steel process, which produced a majority of the steel at the turn of the century, but now accounts for less than 10 percent of the current steel output. In their wake the seamless-tube mills likewise have left many lap-weld and butt-weld tube mills obsolete and abandoned.

The social costs of each of these major technological changes in the steel industry in the past half century have been incalculable in terms of human suffering and misery. The detailed story of each one is merely a repetition of the story of the automatic strip mill. My purpose in citing the history of steel technology during this period is to show that it is a continuous process, as regular as the flow of the Ohio River. It is always taking place. At this very moment several steel companies are installing continuous butt-weld pipe mills, whose impact on employment and wages is to reduce them further.

A brief look at the continuous butt-weld mills gives an indication of how severe the new steel technology is on employment and pay rolls. The 8-hour crew on a hand butt-weld mill consists of 34 workers. On the continuous butt-weld mill an 8-hour crew consists of only 9 workers. The output per 8-hour period on the continuous mill is increased from 12 percent, for ½-inch pipe, to 60 percent, for 3-inch pipe, or from 65 tons of ½-inch pipe to 73 tons, and from 84 tons of 3-inch pipe to 135 tons.

The labor cost per ton of ½-inch pipe is reduced 78 percent, or from \$3.85 a ton on the hand mill to \$0.86 per ton on the continuous mill. For 3-inch pipe the reduction is 84 percent, or from \$2.98 a ton to \$0.47 a ton. These figures are from the records of one of the companies operating a continuous butt-weld pipe mill. I am submitting "Exhibit No. 2489," a comparison of the hand-mill and continuous-mill crews, showing the wages of each member of the crew per hour and per day, and the 8-hour wage bill for the entire crew on each type of mill. The labor cost per ton of pipe was computed on the basis of the production figures I have just cited, which were given to me by company officials as typical 8-hour performances.

A continuous butt-weld pipe mill displaces exactly 100 workers. A full force consists of 4 crews, or 136 workers on a hand mill. For the continuous mill the full force consists of 36 workers, or a reduction of 75 percent. Continuous butt-weld pipe mills are a recent innovation. Republic Steel Corporation just put 1 of these mills in operation last fall in Youngstown and is building another 1. Bethlehem Steel Co. started operations on 1 in Sparrows Point a few months ago, and is constructing another one. Another was announced to be built in Indiana Harbor last July, and Wheeling Steel Corporation announced construction of a

¹ *Iron and Steel*, July 1939, National Industrial Conference Board, p. 7. (Mr. Murray's footnote.)

continuous pipe mill for Benwood last November. The National Supply Co. is building another continuous mill, having put 1 in operation a few years ago. In other words, a total of 8 continuous butt-weld pipe mills have been installed in the last couple years or will have been installed by the end of this year.

The combined net displacement of these 8 mills amounts to 800 pipe mill workers. Like the sheet and tin plate workers displaced on the hand-type mills by the automatic strip mills, these pipe mill men, in the main, are skilled workers. They have spent years acquiring their skills, which are no longer needed, and many of them are beyond the most favored age for hiring in the steel industry.

This continuous displacement of workers by technology is an old story. It is going on in the steel industry right this moment, and it will continue to take place as long as leaders of industry are permitted to evade responsibility for the social consequences of the technology which they control.

I want to publicly inform the steel companies that are this minute installing continuous butt-weld pipe mills that the Steel Workers Organizing Committee will not stand for one single steel worker being thrown out in the street, without adequate compensation, as a result of the installation of these automatic pipe mills. I invite these companies to sit down at the conference table with the S. W. O. C. and work out, through the normal processes of collective bargaining, ways and means for taking care of the workers being displaced by the continuous pipe mills. This invitation is also being publicly extended to all steel companies in connection with the installation of technological improvements in the future.

I know of nothing more contemptible in public life than for industrial leaders to issue pronouncements that the workers they are throwing on the streets—workers they are displacing with new machinery—will some day be reabsorbed by private industry somewhere. This callous attitude toward human suffering is the cause of social upheavals, of the destruction of democracy that may trail in the wake of technology unless the people vested with the control of technology are made to assume adequate social responsibility for its consequences.

Classical economic pronouncements about the automatic reabsorption of displaced workers by private industry, whether true in the long run or not, are just so much dribble to the men and women who are deprived of their accustomed way of making a livelihood. These pronouncements can be classified with the myths of the 1920's that no intelligent person can have faith in today, in view of the striking failure of our economy in the last 10 years to reabsorb the victims of technology. Something more than pronouncements of economic theory—in this instance, demonstrated fallacious—is needed.

I join with Mr. Edward B. Stettinius, chairman of the board of the United States Steel Corporation,¹ in the idea he expressed in his lecture, *Human Factors in Economic Progress*:

"When a whole community can stumble into despair with the stoppage of a single pay roll, it is self-evident that industry has far-reaching social implications which should be matched by an equal sense of social responsibility. It is no exaggeration to say that one of the most important functions of business administration, on the large scale, is the social function. Having helped to create the modern society, the businessman will not be excused from the duty of coping with its problems."

One of these problems of modern society is the displacement of workers by technology. I invite the leaders of industry to cope with it, to put the idea expressed by Mr. Stettinius about industry's social responsibilities into practice.

I will not be sidetracked in my efforts to prevent technology from casting workers out of our economic machinery, by engaging in any debate on whether these workers will or will not find other jobs 5, 10, or 20 years hence. As a famous economist once said, in the long run we are all dead. The problem of the victims of technology is an immediate one. I say to the leaders of industry keep your economic theories in textbooks. So far as the workers of this great Nation are concerned, they want to know only one thing—when do they get jobs? When are they going to be protected from losing their jobs every time a new contraption or a new invention is discovered? When are their children, the youth of this Nation, who are roaming the streets today, going to get jobs? This is the question. This is the big problem of today. And I agree heartily with Mr. Stettinius when he says, "Having helped to create the modern society, the businessman will not be excused from the duty of coping with its problems."

¹"Human Factors in Economic Progress," by Edward B. Stettinius, Jr., Alexander Hamilton Institute, New York, pp. 5-6. (Mr. Murray's footnote.)

Here is the twofold problem of technological displacement and unemployment. Businessmen, leaders of industry, have to cope with it. The code of social responsibility for industry must be enlarged. Two decades ago industry assumed social responsibility through workmen's compensation for the workers injured in mines, mills, and factories, and for the families of workers killed on the job. In the past decade industry has assumed some measure of social responsibility for workers who are too old to work, and for workers who are seasonally unemployed through old-age pensions and unemployment compensation. In this decade another social responsibility must be assumed by industry. This responsibility is to workers who are technologically unemployed, thrown out of work by new machinery.

By what right does industry assume the prerogative to say: "Here is a new machine. It will bring benefits to society. Therefore, it is installed." By what right does industry displace workers, ruin communities, reduce consumers' purchasing power with technology before that technology can possibly bring any benefits to society as a whole? Only by the right made by power does industry bring about such social liabilities before bringing about any social gains. Why should workers and their families be thrown to the wolves today, just because industry says it has found a new machine that will benefit society tomorrow? What if it fails to benefit society? What if it does benefit society tomorrow? Today there are human beings that must be provided for. This is the crucial problem of technology. Technological unemployment is unnecessary. It must be eliminated.

No longer can we afford, as a Nation, to set our eyes on that future when specific technological improvements will bring social improvements, while at the same time we fail to see the human misery wrought in our midst by these very technological improvements. The social cost of technology, as clearly demonstrated by the automatic strip mill in the steel industry, is greater than we can bear. Unless the social cost of technology is eliminated, it will drag us into economic, social, and political ruin.

The social cost of technology must be eliminated. No longer can we afford to wait for the economic benefits of technology to offset the tremendous social cost at its inception, because the social cost of technology for more than a decade has been far greater than technology's economic benefits. This social cost must be eliminated, or else technology will cease to be a boon to mankind. Industry must assume social responsibility for technological improvements, by seeing that they are introduced under conditions that stimulate instead of retard employment, to see that workers are not displaced, to see that towns are not reduced to ruin, to see that there is no immediate social cost in terms of displaced workers, impoverished families, devastated communities, and bankrupt regions.

Dr. ANDERSON. There is an exhibit on page 36 to be included.

Mr. MURRAY. Yes; if you please.

The CHAIRMAN. That will be received.

(The table referred to is marked "Exhibit No. 2489" and is included in the appendix on p. 17345.)

Mr. MURRAY. I will conclude with the introduction of my recommendations.

The CHAIRMAN. Very well.

Mr. MURRAY. I want to discuss, briefly, practical ways in which industry can assume social responsibility for technological improvements. In many instances this can be done through the normal processes of collective bargaining. Technological improvements should be introduced without workers having to pay for them through the loss of their jobs. This can be done through collective bargaining, in many instances, along the following lines:

1. The workers to be displaced by technical improvements should be reabsorbed in the regular labor turn-over of the companies installing them.
2. The workers to be displaced should be notified at least 6 months in advance. From then until they are finally displaced, they should

be given opportunities to learn how to do other jobs where openings develop periodically. Where necessary, expert vocational guidance and training should be provided for those workers who cannot easily adjust themselves to other jobs.

3. Those workers for whom there are no openings when they are finally displaced should be employed in some capacity until regular jobs open up for them. The wages paid those workers until they are placed on regular jobs should be charged to the original cost of the technological improvement.

4. Displaced workers who suffer a reduction of 10 or more percent in their average daily earnings as a result of being absorbed on lower-paying jobs than their original ones should be paid a job compensation of 3 percent of their earnings while in the service of the company.

Mr. PIKE. That would be total earnings.

Mr. MURRAY. Up to the time they were demoted or given a job where a lower rate is being paid.

The job compensation payments should be charged to the cost of the technological improvement.

5. The displaced workers who, for various reasons, cannot be reabsorbed in other jobs should be paid a dismissal wage of 10 percent of their earnings for a 10-year period, but not less than \$500 to those workers with less than 10 years of service. The dismissal wages shall be charged to the cost of the technological improvement.

This plan will help eliminate the social cost of the technological improvements. Jobs will be found for most of the displaced workers, and those who are not reabsorbed will be compensated, in part, for the loss of their jobs; while those who suffer reductions in their earnings by being reabsorbed on a lower-paying job will, in part, be compensated for this.

This practical plan is not offered as the final solution for all the problems incident to the installation of technological improvements. Instead, I am offering these concrete suggestions for practical consideration by the parties to collective-bargaining agreements in industry; the objective being to eliminate the heavy social cost of technology.

There is no reason why this plan cannot be adopted by management generally where collective bargaining is practiced. Collective bargaining in the basic industries, however, is practiced on a company-wide basis, and therefore cannot cope with large technological improvements, like the automatic strip mill, that are industry-wide and national in character. Consequently, in the absence of universal collective bargaining, congressional regulation of the introduction of large technological changes is necessary. It is not my purpose to outline in final detail such regulations. At this time I want merely to indicate broad general outlines.

The objective of these regulations should be to eliminate the social cost of technology. This means that technological improvements should be installed at such times and under such conditions as not to displace workers, bankrupt communities, close up complete mills, and otherwise disrupt the social fabric of industrial districts.

PROPOSED REGULATION OF MECHANIZATION

Mr. MURRAY. These regulations might take the following form:

1. It should be compulsory for industry to pay adequate dismissal wages to all workers who are displaced as the result of technological changes.

2. The Federal Government should conduct a large-scale vocational-training program for displaced workers who are paid dismissal wages, so that they will be better adapted for other jobs in industry that they might be able to secure, when their dismissal wages are exhausted. It is essential that labor should participate in the administration of such a vocational-training program.

3. In addition to compulsory dismissal wages, other measures designed to have industry immediately reabsorb workers displaced by technological changes should be adopted.

In connection with the proposal that congressional measures might be enacted to provide industry with incentives to keep workers affected by technological changes on the pay roll until they can be reabsorbed in the normal labor turn-over, I want to make a few general observations. At the present time, for instance, when a technological improvement is installed that displaces, say, 100 workers, they are thrown on the streets. State relief has to be provided for them. They draw unemployment compensation benefits for a period of time. W. P. A. jobs have to be found for them. N. Y. A. and C. C. C. assistance has to be provided for their children. All this assistance industry has to pay for in the form of taxes. Here is an opportunity for industry to do something about reducing its tax bill, about which it has been complaining. Instead of throwing these displaced workers on the streets every time a technological change is made, industry should plan technological changes in such a way that the workers immediately affected are kept on the pay roll and eventually placed in regular positions in the normal labor turn-over. Thus the money that would otherwise have been paid to these displaced workers in relief grants, work-relief wages, and so forth, would be saved, and industry's overall tax bill would be accordingly reduced.

It should therefore be the policy of the Federal Government to see that technological improvements are carefully planned and properly introduced by industry so that they do not displace regularly employed workers. In this way the men and women, their families, and communities who have been the victims of technological changes in the past, would be provided for, and industry would assume social responsibility for the workers, their families, and communities who otherwise would be discarded by new production methods and processes.

These proposals are designed to prevent regularly employed workers from being added to the ranks of the unemployed, and thus only deal with part of the problem of technological unemployment. The other part of this problem—the major part of the problem of technological unemployment—is to find ways and means to distribute the benefits of technology to everyone in the country, to arrest the trend toward a declining working force, and to provide employment for the large mass of men and women who are today idle through no fault of their own, who are idle because of the failure of industry to provide them with jobs.

By making provisions to absorb displaced workers in the normal labor turn-over, idle workers and young workers becoming of employable age, who would be absorbed in the normal labor turn-over if there were no displaced workers, remain unemployed. It is necessary, therefore, that proposals be adopted dealing with the major problem, which is that of finding jobs for workers who are presently unemployed and are not being absorbed by private industry because of the rapid strides of technological improvements. In connection with this larger problem, congressional measures might be enacted which are designed to—

1. Pass on to consumers generally the economic benefits of technological improvements which are not being passed on in large enough amounts at the present time, or are being passed on too late to prevent our economic machinery from becoming jammed.

2. The maximum workweek in basic mass-producing industries which are highly developed from a technological point of view should be reduced. The performance of the steel industry in the past 10 years, as I have shown, illustrates the vital necessity for a further reduction in the maximum workweek. At the same time the population of the country as a whole has increased approximately 8 percent. Thus, despite a decrease of more than one-third in the average workweek, the steel industry, the wealthiest in the Nation, has failed to absorb any of the net increase in employables resulting from our rising population. With the present rate of technological change in the steel industry, in the course of a short period of time thousands fewer workers will be employed than at present, unless the maximum workweek is further reduced to the level of approximately 30 hours a week at prevailing earnings or more.

In conclusion I want to refer to the proposal which I mentioned at the beginning of my statement for a national unemployment conference, to be called by the President of the United States, of leaders of Government, industry, labor, and farm groups. A conference of this description would obviously necessitate a broader discussion of our whole national economy, and encompass an exchange of ideas that might develop constructive proposals to which each of the groups represented in such a meeting might subscribe. It necessarily would entail lengthy discussion that presupposes a healthy development of long-range economic planning. It seems to me that the suggestions which I have offered your committee could very well be made effective by the Federal Government, pending the outcome of the joint deliberations of the participants in the conference which I have suggested.

That concludes my statement to you, Mr. Chairman, and added to the statement, as you will note, are a number of exhibits and a great deal of material which I would like to have in the record.

The CHAIRMAN. The exhibits have been admitted as we went along.

Dr. ANDERSON. The hearings for Monday begin with railroads, two successive days of railroad hearings Monday and Tuesday. The first witness is Mr. Pelley.

The CHAIRMAN. Of the Association of American Railroads.

Dr. ANDERSON. Mr. J. J. Pelley, president of the Association of American Railroads; Dr. J. H. Parmelee, Association of American Railroads; and presumably Mr. Norris, president of the Southern Railway, will present the data for railroads on Monday. On Tuesday

we will have Mr. George Harrison, president of the Brotherhood of Railway Clerks, Mr. A. F. Whitney, president of the Brotherhood of Railroad Trainmen.

The CHAIRMAN. When the committee recesses it will recess until Monday morning at 10:30.

Before I go for a vote in the Senate, Mr. Murray, may I express my personal gratification at your presentation here today and the appreciation which is felt I know by all members of the committee. We were very glad to have you here and we feel that you made a distinct contribution to this study. It may be that some members of the committee may desire to question you a little bit further, and I will ask Mr. O'Connell to preside.

(Mr. O'Connell assumed the chair.)

Dr. ANDERSON. I have a few questions that I think are of importance, even though the hour is growing late. Mr. Murray, in your exhibits, you have a very important document concerning ghost towns, Exhibit 2478, which refers, as I take it, to New Castle, Pa., only. I wonder if you could describe for us what is occurring in this unusual phenomenon in industrial cities and towns of ghost towns caused by technological changes in steel manufacture.

Mr. MURRAY. If I may be permitted, Mr. Chairman, to offer New Castle as a typical situation of a number of towns that are commonly referred to now in the steel industry as ghost towns, the city of New Castle has a population of approximately 50,000 souls. The community is one which was almost wholly dependent upon the steel industry, some 5,000 steel workers being employed in recent years there at the Shenango and New Castle works of the United States Steel Corporation. A few years ago, approximately 6,000 were employed in the steel industry in those two works at New Castle.

The employment of those 6,000 people, pay roll, earnings, cooperated toward the upbuilding of a very flourishing community—street railways, mercantile establishments, other small business enterprises which leaned rather heavily upon the local basic industry. Large municipal buildings, churches of all denominations, reflected the pride of these 50,000 people who had been living in this community down through the years. The decision of the United States Steel Corporation, for business reasons, permanently to abandon the Shenango and New Castle works, immediately threw the entire working population of the city of New Castle out in the streets. That originally took place in November 1937 at New Castle, and later, in 1938, took place at the Shenango works of the same corporation. Since 1938 when the Shenango works closed down, 72 percent of New Castle's 50,000 people are living on relief in one form or another.

The investments of the people in that community that have grown up throughout the years have disappeared. The values of real estate have been completely dissipated and are gone. Civic bodies, political organizations, businessmen, leaders of its various churches in that community, have had committees come over to see me in Pittsburgh about what it was that we might be able to do to help them. I have conveyed them over to the offices of the Steel Corporation, with prayer on their lips that the Corporation might do something about reopening those plants and producing work.

Mr. PIKE. They might as well have put one of those strip mills back in that same town, mightn't they? Did you ever find out why they didn't?

Mr. MURRAY. I don't know.

Acting Chairman O'CONNELL. But the strip mills which resulted in the closing of these mills were built in some place other than New Castle.

Mr. MURRAY. I can describe that, of course. Only last week the leaders of business and the leaders of religion, the leaders of labor, the leaders in the field of politics, had a meeting in New Castle to see what they might be able to do through local incentive to promote local enterprise and at least give some of their people work.

Now that is one town, the city of New Castle, 50,000 people. One fell swoop on the part of the Steel Corporation has created for that community the most despairing condition that I know of anywhere in America for such an extraordinarily large number of people.

The Steel Corporation has closed its Mingo Junction plant down there close to Steubenville, Ohio. Mingo Junction is a community of some 9,000 or 10,000 people. Business houses, churches, homes—their values have all been completely dissipated as the result of the decision of the Steel Corporation to close its Mingo Junction plant now.

Martin's Ferry, the same; the Monessen plant of the Steel Corporation, the same; the Elwood plant of the Steel Corporation in Indiana, the same.

These ghost towns which have been created as the result of this mass laying off of people, mass discharge, thousands of people, constitute a very, very serious problem. I have had their committees representing the city council, the local business organizations, come over here to Washington, journey down to the Department of Labor, come over here to see their Congressmen; they have gone down to New York to meet with the executives of this corporation to see what could be done about it. The reply of the corporation has always been that competition, new skills, new efficiencies, new techniques in production, have forced them to do the things which they are doing.

Mr. PIKE. That doesn't explain why they moved away, though. Isn't there a good supply of labor? What is wrong with the locality as the place to put a strip mill? Did they ever tell you that?

Mr. MURRAY. Perhaps Mr. Ruttenberg can tell you what is wrong with the locality there.

Mr. RUTTENBERG. This question is partly tied up with the consolidations. All these plants Mr. Murray has been mentioning were formerly part of the American Sheet & Tinplate Co., which was concentrated with the Carnegie-Illinois in 1936.

Mr. PIKE. That was all corporate fiction.

Mr. RUTTENBERG. With the abandonment of the American Tinplate plants, the products they produced, sheet and tin plate, are being coordinated with Carnegie-Illinois with its other organizations. Consequently the Irvin strip mill, the most recent and largest in the industry, opened in 1938 by the United States Steel Corporation, is adjacent to the large byproduct coke ovens of the corporation that supply the gas that is used in some operations in Irvin. It is close to the plant that produces the slabs that are rolled into semifinished steel products at Irvin, and it is likewise located on the river, the Monongahela, and river transportation is available.

It is estimated that the cost of production in a strip mill at Irvin is approximately \$5 a ton cheaper than it could have been in New Castle because of the transportation to and fro of semifinished and finished products.

Mr. PIKE. They didn't make the ingots at New Castle?

Mr. RUTTENBERG. No.

Acting Chairman O'CONNELL. It was the same reason that resulted in their determination to build the plant at Irvin rather than at New Castle; in other words, it was purely a matter of business policy on the part of the company, and had to do with how efficiently they could do it.

Mr. RUTTENBERG. It had to do with bringing their plants together. New Castle is an inland town and Mingo Junction and Martin's Ferry are along the river.

Mr. PIKE. They would save a heap by this move.

Dr. ANDERSON. I would like to ask one or two questions more about the ghost town situation which you have so graphically portrayed. Is this an inevitable accompaniment of mergers due to the technological advance of the steel industry, as manifested in the continuous strip-mill process?

Mr. MURRAY. Well, it is a manifestation of what occurs when large consolidations are effected, and savings in producing costs, and so forth, result. I assume that the reason for the Steel Corporation's building of a tremendous continuous stripping mill at Irvin, near Clairton, was that it was good business on the part of the Steel Corporation from the standpoint of economics. The Irvin works gives employment to some 4,200, three shifts. These 4,200 men, plus the machinery which is provided for them there, are capable of producing a quantity of goods sufficient in size to meet the combined productive efficiencies of some 18,000 or 19,000 workers who were employed in those old hand-mills before the Irvin works was produced.

Mr. PIKE. That is almost entirely a new works, isn't it?

Mr. MURRAY. It is a new works. It went into operation in full last year. However, it isn't confined to the United States Steel Corporation.

Mr. PIKE. Of course, not.

Mr. MURRAY. I read into the record today where Republic has been doing it, Bethlehem has been doing it, and they have all been doing it from the standpoint that they contend it is good business practice.

Mr. PIKE. In Bethlehem, we might say Lebanon is practically discarded, or are you familiar with that?

Mr. MURRAY. I know there have been continuous changes taking place in the closing up of certain mills in given plants, and the centralization of their production facilities at certain other points, but the transportation that has taken place in steel is extraordinary, and the impact of it has been felt very hard during the past 3 years.

Mr. PIKE. Yes; it shows very clearly here.

Dr. ANDERSON. That leads me to the point that I wanted to get some information on, namely, with this increasing tempo of mergers, somehow linked with a different type of manufacture based on the new technology, is it your feeling that more or fewer ghost towns can be anticipated in the immediate future?

Mr. MURRAY. I think we are safe to assume that there will be more ghost towns. I didn't disclose the names of these 18 companies that I talked about here today, but I am prepared to give them to the committee in confidence, and at least 10 of those companies are the only establishments in their communities.

Dr. ANDERSON. And that means 10 ghost towns.

Mr. MURRAY. It means that there are 10 small communities that will be confronted with a state of distress akin to that prevailing in New Castle and elsewhere.

Dr. ANDERSON. That leads me to the question as to whether you have a suggestion to add to your list of suggested things to be done with respect to social policy affecting ghost towns.

Mr. MURRAY. I have suggested that the matter of final detail with reference to the introduction of new machines in industry, and particularly as those things relate to the regulation in a legislative way, is one that might very well be a subject of conference. I have suggested here that none of these things should take place in this country of ours without ample notice in the first instance, and then means of compensation provided for the directly affected communities and individuals.

INDUSTRIAL COOPERATION INVITED

Mr. MURRAY. I do think that unless industry moves to do something about it cooperatively with labor, the only answer to the situation lies in providing proper legislative enactment here, the details of which I of course will be prepared to discuss with any congressional committee at the proper time.

I might say here that our research forces at the offices of the Congress of Industrial Organizations are preparing a considerable amount of material to be presented to your committee at a later date upon the whole national economic situation, national industrial situation, and Mr. Lewis has asked me to come over here and present it for the C. I. O. at that time. No doubt that will encompass some other suggestions with relation to these legislative enactments about which I am talking here today.

Dr. ANDERSON. In your contacts and deliberations and negotiations with management and industry, would you care to say whether there is a spirit comparable to the one that the Senator manifested today, and you, with respect to the need for an immediate attack-upon this problem?

Mr. MURRAY. Well, in my confidential discussions with the magnates of industry—and I have many of them, dealing in a business way with our collective bargaining arrangements—there has been no disagreement with me that something will have to be done. They don't offer any particular remedy, but confidentially they are willing to indicate to me a desire to be cooperative at the proper time. But their fear lies evidently in the inability of any one industry to solve this problem by itself.

I have talked to leaders of the National Manufacturers Association. Mr. Howard Coonley addressed a meeting with me at Des Moines, Iowa, a few weeks ago, the Farm Institute meeting. I posed to the farmers a suggestion of a national congress to bring the leaders of business and the leaders of labor and the leaders of finance

and government and agriculture together, and while Mr. Coonley didn't suggest publicly a willingness to do those things, after the meeting was over he came around and said, "I think that is a good idea. I think we ought to get together. I think something ought to be done about it."

Now Mr. Coonley, I suppose, is an estimable fellow. It may be that he is willing to try and do what he can about it, I don't know, but he at least indicated a willingness to participate in a meeting.

I presented to the President of the United States 3 years ago a desire on the part of labor to bring all of these forces together under one roof, around one table, and talk it out, not in a spirit of selfishness or one trying to take advantage of the other, but the group to be brought together for the purpose of rendering a service to this country, doing something about it. I find no indication from the administration of any desire on their part to do anything about it, insofar as holding a meeting is concerned. Perhaps they are going to find a panacea here. They might find it here. I hope they do.

But I am constrained to believe that unless the Federal Congress moves to arouse the interest of the people of this country in the need of bringing these special groups together, working out an agreement, our situation is going to get much worse than it really is today. It simply has to be stopped, and we can't fool or temporize much longer with it, and the only way to stop it is for the service of these important men in this country to be drafted, commandeered. Tell them, "You are citizens of the United States, you have a task to perform to help reconstruct the economy of the greatest democracy in the world. You have got a job to do to save human beings," and labor should help to do that job just as unselfishly as business must. But it has got to be tackled on that basis.

Acting Chairman O'CONNELL. I would like to ask you one question which related to one of your recommendations in your statement. You referred in your statement¹ to the possibility that congressional measures might be enacted which would be designed to pass on to consumers generally the economic benefits of technological improvements which apparently you assume or believe are not being passed on at this point, or at least not being passed on rapidly enough.

What do you consider to be some of the factors which prevent the benefits of those technological improvements from being passed on at the present time?

Mr. MURRAY. I don't know. I don't charge business here with violating any law.

Acting Chairman O'CONNELL. No.

Mr. MURRAY. Or fixing any prices.

Acting Chairman O'CONNELL. I have heard that they have been known to.

Mr. MURRAY. But evidences are at hand which very well indicate that although the cost of producing steel has gone down, at least during the past 18 months, the price of steel has gone up.

Mr. PIKE. I believe we call it stabilizing, Mr. Murray.

Mr. MURRAY. There might be something akin to the word "stabilizing" being used there.

¹ See p. 16509.

Acting Chairman O'CONNELL. You were thinking in part, I take it, of monopolistic practices or the power of very large, highly integrated industrial organizations to control their prices and products, and that sort of thing, were you not, to some extent?

Mr. MURRAY. Oh, yes. I am speaking as a citizen, a taxpayer, and I am very much opposed to monopolistic tendencies or practices wherever they may develop.

Mr. PIKE. This is one of those instances, going back to the strip mill, where they have passed on quite a bit to the consumer. Really their price per ton to the customer has dropped quite substantially. I don't think there is any argument about that. At least I haven't heard any. But so many other things have happened where the saving has been much more reluctant to get on to the final consumer? In this case it looks as if there had been a good part of the saving passed on.

Mr. MURRAY. I have no argument to make here about any monopolistic practices in the steel industry with reference to the fixing of prices, or anything like that.

Acting Chairman O'CONNELL. But in part you had in mind the general desirability of either under existing law or more effective laws making competition work, I take it.

Mr. MURRAY. We believe technological advancement lends itself to increased productivity and the lowering of cost and the passing of savings on to the consumer.

Acting Chairman O'CONNELL. I think we would all agree it is very desirable and very essential that such benefits do be passed on in order to bring about the necessary increased ability to purchase on the part of the masses of people, but this statement implied that to some extent at least the benefits of technological change were not being passed on, either at all, or at a sufficiently rapid rate, and it occurred to me you had in mind the general desirability of effective legislation or enforcement of legislation involving such statutes as the Sherman Act.

Mr. MURRAY. I think the implication there might very well also be one of not expanding employment to reduce the cost, pass it along to the consumer—that there is a complete sense of social irresponsibility, I mean, in these procedures that have to do with the introduction of machines. The corporation or management under present competitive practices merely resorts to the expedient thing, the thing that will effect an immediate saving to meet the price of a competitor, somebody somewhere else that has the same kind of a machine.

Acting Chairman O'CONNELL. Isn't that almost essential, assuming a competitive situation?

Mr. MURRAY. I am not going to dwell in the realm of these mysterious things with you here today, Mr. Chairman, about what all these competitive practices might lead us into. I read a lot about them, but the more I read them, the more confused I become. My interest here today runs mostly toward this one thing of unemployment, and I unfortunately have created an impression in this implication here of something that I didn't really intend.

Acting Chairman O'CONNELL. Have you any other questions, Dr. Anderson?

Dr. ANDERSON. No.

Acting Chairman O'CONNELL. As the Chairman said, we are very grateful to you.

(The witness, Mr. Murray, was excused.)

Dr. ANDERSON. Before the committee adjourns I would like to introduce as an exhibit a description of the terms which we have been dealing with, which we have worked out, to be printed in the record for your use in the discussion of the data as it develops.

Acting Chairman O'CONNELL. It will be printed in the record.

(The document referred to was marked "Exhibit No. 2490" and is included in the appendix on pp. 17346-17349.)

Acting Chairman O'CONNELL. The committee will stand in recess until Monday morning at 10:30.

(Whereupon, at 4:30 p. m., an adjournment was taken until Monday, April 15, 1940, at 10:30 a. m.)

INVESTIGATION OF CONCENTRATION OF ECONOMIC POWER

MONDAY, APRIL 15, 1940

UNITED STATES SENATE,
TEMPORARY NATIONAL ECONOMIC COMMITTEE,
Washington, D. C.

The committee met at 10:40 a. m., pursuant to adjournment on Friday, April 12, 1940, in the Caucus Room, Senate Office Building, Senator Joseph C. O'Mahoney, of Wyoming, presiding.

Present: Senators O'Mahoney (chairman); King, and White; Representatives Williams and Reece; Messrs. O'Connell, Hinrichs, Pike, Kreps, and Brackett.

Present also: William T. Chantland, Federal Trade Commission; Frank H. Elmore, Jr., Department of Justice; and Dewey Anderson, Economic Consultant to the committee.

The CHAIRMAN. The committee will please come to order.

Dr. ANDERSON. Mr. Chairman, we open this morning with evidence on the railway systems of America, the effect upon them of technological improvements, and the two witnesses for today represent railway management. Mr. J. J. Pelley is the first witness, president of the Association of American Railroads, located in Washington, D. C. Following him will be J. H. Parmelee, with the Association of American Railroads, who will present a detailed analysis of the railway structure and its development.

The CHAIRMAN. Mr. Pelley, you haven't appeared before us before, have you?

Mr. PELLEY. No.

The CHAIRMAN. Will you be sworn, as is our custom?

Do you solemnly swear the testimony you are about to give in this proceeding shall be the truth, the whole truth, and nothing but the truth, so help you God?

Mr. PELLEY. I do.

The CHAIRMAN. You may proceed.

TESTIMONY OF J. J. PELLEY, PRESIDENT, ASSOCIATION OF AMERICAN RAILROADS, TRANSPORTATION BUILDING, WASHINGTON, D. C.

Mr. PELLEY. At the outset let me emphasize that our railroads constitute a progressive, dynamic industry, seeking at all times new means of producing more efficient, more economical, more adequate transportation service. This has been true in the past, it is true today, and it will be true of the future.

Ten years of economic depression and an even longer period of subsidized and growing competition have forced the railroad industry greatly to curtail annual capital improvement work, purchases of fuel, material and supplies, and normal employment. The handicaps with which the industry is now faced are great, but they are not insuperable. They can be surmounted, and the industry will again be in the market on a large scale for new equipment, new rail and cross ties, ballast, fuel, and many other items of materials and supplies. Improvement work requires employment of additional labor, both in the railroad industry and the industries from which it buys supplies. An increase in traffic to more nearly normal levels will also mean additional employment for railroad maintenance and operating forces.

I need point only to the year 1937 as an illustration of what I have in mind. That year represented the culmination of 4 successive years of improvement in traffic and earnings from the depths reached in 1932 and 1933. Even in that year, 1937, earnings were far from adequate for the real needs of the industry, yet capital expenditures for the year exceeded \$500,000,000, purchases of fuel, materials, and supplies approached \$1,000,000,000, while railroad employment exceeded 1,100,000 persons.

Then came the recession of 1938, and retrenchment again became necessary in order to keep expenditures within the limits of revenues. Capital expenditures fell 55 percent under 1937, railroad purchases were reduced 40 percent, while railroad employment declined 16 percent.

TECHNOLOGICAL CHANGE IN THE RAILROAD INDUSTRY

Mr. PELLEY. Technological progress has always been a factor in American railway history; it has not developed overnight. The application of steam as a source of energy to means of locomotion was one of the outstanding technical advances in the history of civilization. From the early days of the railroad down to the present time, progressive improvement has taken place in equipment, in track, in signaling, in the development of automatic devices, and in the use of coal, fuel oil, electricity, and other modern forms of power. Hand in hand with these physical betterments have gone improved organization and operation.

These factors have always been at work in the railroad as well as other industries; otherwise we would have a stationary economy. The record of railroad expansion in this country to Nation-wide proportions is one of the vital chapters in American history. It was accomplished by continuous and consistent progress in the technical field.

More recently, in the absence of technological advance, the industry would have been unable to render the efficient services required of modern transportation agencies. As it is, railroads are giving the public the fastest, most efficient, and most satisfactory service in their history.

Mr. HINRICHS. Mr. Pelley, may I interrupt at that point? I misread that thing so badly that from the point of view of the record you may want to emphasize the fact that there have been technological advances and not an absence of them, that if you had not these technological advances you would not have had the efficient service that you have been getting.

Mr. PELLEY. That is right.

The CHAIRMAN. What you meant was that more recently, without the technological advances which have been developed, the industry would have been unable to render such efficient service.

Mr. PELLEY. That is right.

Technological factors are closely intertwined with what I may call economic factors. The latter include traffic, rates, earnings, relations to the Government, and finally the extent of competition.

While there has always been a relationship between economic and technological factors, the economic factors of the past were of a different type from those of more recent years. During the earlier years of railway development the country was expanding, its population was spreading over the whole country, and competition existed to only a limited degree. The problem then confronting the railways was to keep ahead of the growing transportation demands of the country. This called for large investments and large-scale expansion of facilities, as well as purely technical improvements in plant and equipment. The principal stimulus to technological progress in those days was the urgent need for more mileage, more equipment, and more men to operate the plant. This stimulus was added to the incentive that is always present in a business enterprise, namely, so to conduct the enterprise that it will produce a return on investment.

In more recent years the problem has changed from one of rapid physical expansion to one of an intensive struggle against depression, and against growing competition. With the advance of highway and waterway construction, the latter completely and the former to a large extent subsidized by government, a great decrease in railway revenues has occurred, aggravated by reductions in rates made necessary by subsidized competition with the railroads.

In the past, today, and in the future, the railways have applied, and will continue to apply, the principle of mass production that has been so effective in building up manufacturing and producing industries. In the railway field this principle takes the form of mass transportation. In no other transportation industry, except perhaps on the Great Lakes and the high seas, is it possible to handle large aggregates of freight more efficiently and at lesser cost per unit. This principle has been sound in the past and will continue to be effective in meeting future competition.

The railroad industry has been struggling against serious handicaps in recent years. One handicap has been economic depression, which has seriously influenced the trend of railroad traffic and earnings. This situation is complicated by such economic changes as decentralization of industry, development of hydroelectric power, and substitution of fuels and other materials, all of which tend to reduce the total volume of goods transported.

Secondly, there has been increased competition from other agencies of transport. To meet these difficulties, railroad managements have adopted every possible means of operating efficiently and economically. They have reduced operating expenses in approximately the same ratio as revenues have declined. They have reduced the cost of handling the average ton of freight 1 mile and the average passenger-train cars 1 mile. This they have done by introducing specific measures of economy, by installing every possible means of improving their plant, their rolling stock, and their methods of operation, all of which constitutes technological progress.

What the industry needs in order to meet its competitive handicaps is equality of treatment by the Government as between the railroads and other agencies of transport. We believe that each transport agency should be required to pay its own way. None should occupy a position in which it receives special favors from the Government, and each should be under the same general type of regulation as other agencies.

I believe the adoption of this principle as a national policy is on the way, although its development is a slow process. But to the extent that it is adopted and put into effect, railroads will be enabled to meet their present handicaps. With these handicaps removed, the industry will go forward in its field. I, for one, do not hold the view that we have reached the ultimate in railroad development.

The railroad industry must continue to progress. The pressure of competition will exert a strong influence. We do not fear that competition if it is fair competition, for it can be met by further advances in technology. The industry will adopt and adapt itself to all kinds of improvements growing out of chemical, physical, technical, and other discoveries and inventions. To do otherwise would be to fall back in the race for its rightful place in the economic organization of the country.

To keep abreast of progress, new money will be required. New investment will be needed for further modernization, replacements, and improvements to plant. The margin of profit on which the railways have been and are now operating is so small that they must look to the money market for large sums of new capital in the future if they are to hold their own in the field of technological progress. They can secure those funds if the competitive handicaps I have referred to are removed.

Specifically, it has been estimated that the railroad industry would be justified in spending \$500,000,000 or more annually for new and improved equipment, rail, ties, ballast, machinery for shop and track work, and other capital improvements. The average capital program of the railroads over the period from 1923 to 1930 was \$843,000,000 per year; since 1931, the average has been only \$259,000,000 per year.

FUTURE PROGRESS

Mr. PELLEY. The effect of future technological progress on railroad performance and employment will be a definite one, although it is not easy to outline it in specific terms. If and when the railroad industry is relieved of the handicaps against which it is now struggling, it will be able to regain much of the traffic it has lost and should, in addition, obtain a larger proportion of the future increase in freight and passengers than it now has.

The future volume of employment in the railroad industry will depend largely on the trend of traffic and earnings. With a return to better economic conditions, and removal of the competitive handicaps now confronting the industry, railroad traffic may show so great a future increase that even with increased efficiency in handling it a greater number of employees will be required. Railway managements will be more than glad to increase their forces under such conditions.

It should not be overlooked that technological progress in the railroad field stimulates employment in other industries. Purchases of equipment, rails, ties, machinery, and other products from other industries tend to increase employment in the shops and factories of those companies from which railroads buy, and which prosper only when the volume of railroad purchases is on a high level.

I close, as I began, by emphasizing that the railroad industry is a dynamic industry, that it will continue in full force and vigor for many years to come, and that it will progress in the field of technology in the future as in the past.

That is all of my direct statement, Mr. Chairman.

Dr. ANDERSON. Mr. Pelley, before the questions which I know will come readily from the committee members, the railroad industry is a highly regulated industry, is it not?

Mr. PELLEY. Yes, sir.

Dr. ANDERSON. That is, if you propose to do anything which in any drastic way affects the number of people employed or the wage rates paid, what must you do about it?

Mr. PELLEY. Which one do you want me to answer?

Dr. ANDERSON. Let's take both.

Mr. PELLEY. We have to get the approval of the Interstate Commerce Commission for most of the things that we do.

Dr. ANDERSON. So that the railroad industry would represent something different than we have had heretofore in these hearings in that we are now looking at a highly regulated, monopolistic industry.

Mr. PELLEY. That is correct, and it is an industry that has been regulated for a long time.

Dr. ANDERSON. You have been a practical railroad man for many years, Mr. Pelley?

Mr. PELLEY. Yes, sir.

Dr. ANDERSON. And you have seen the effects of the up and down swing of the business cycle, employment and unemployment through the years.

Mr. PELLEY. Yes, sir.

TOTAL LABOR FORCE ON THE RAILROAD

Dr. ANDERSON. What is the total of persons normally regarded as railroad men in the country, have you any idea?

Mr. PELLEY. At one time there were 2,000,000; probably there are now 1,200,000 or 1,300,000.

Dr. ANDERSON. With the present volume of employment in the railroads, then how many persons customarily employed are not now engaged in railroad work?

Mr. PELLEY. Well, it is a little difficult to give an accurate estimate of that. We now employ about 1,000,000 men. Just how many of them have waited around for employment, or gone elsewhere, it is pretty difficult to say, because many of them have had to wait a long time; some of them couldn't wait, they had to seek employment elsewhere. I think it is a safe figure to say that probably 1,100,000 men are now looking to employment in the railroads.

Representative WILLIAMS. Right in that connection, when was it at its peak of employment?

Mr. PELLEY. In 1930. We had about 2,022,000 men employed in 1930, and that was the peak, Mr. Williams.

Dr. ANDERSON. Since that peak time, these workers who were normally in the regular force of railway men have gotten older, some of them have dropped by the wayside, couldn't wait, as you say. You would fix the number that is not now employed at about 100,000 to 150,000?

Mr. PELLEY. Well, I repeat, it is rather difficult. If I am correct in saying that there are 1,100,000 men looking to the railroads for employment, and are either employed regularly or waiting for their turn with an upswing in business to be called back, then there would probably be 100,000 waiting, because there are about a million working now.

Senator KING. But from the peak of 1930, 900,000 have lost their jobs?

Mr. PELLEY. That is right, Senator King. Many of them have died or retired, and many of them have gone elsewhere, and probably many of them have given up hope of ever getting back to the railroads and have taken up work in other lines of business.

Dr. ANDERSON. What is the average of railroad workers?

Mr. PELLEY. Probably Dr. Parmelee could give you a little better answer on that than I could.

Dr. ANDERSON. You recognize, gentlemen of the committee, that Dr. Parmelee is following with a very detailed analysis of the railroad plant equipment and railroad force and I don't want to move into an area that he is going to explore.

Mr. PELLEY. I think he will be able to give you a very good answer to that figure.

Dr. ANDERSON. Except that I want to raise this point as a conclusion on the previous question about the number of people available for labor and not now employed.

If by some circumstance, almost a miracle, I suppose, the railroad business should go back to its height of prosperity in the immediate future, would there be a need for recruiting new labor other than those now waiting for work?

Mr. PELLEY. There would. I think, Mr. Anderson, it might help you in your question if I were to tell you that in 1937 we had pretty good business and then the railroads were employing some men who had never before worked on a railroad; they were looking for new men. They probably gave some of their old men the call and they were employed somewhere else and did not want to give up their chances where they were to come back to what might be temporary employment on the railroad, so they had to seek the men; they even hired new brakemen. I know of some cases where they hired new men in transportation service in 1937.

Senator KING. So in 1937 you took on new men, and doubtless you would give preference to the old men, that is, to those who had been in the employ in the past.

Mr. PELLEY. That is right. We always give preference to the old men, and by agreement, for that matter, which we are very glad to do. They have the first call.

Senator KING. That situation would indicate, would it not, that between 1937 a considerable number of that 900,000 had found positions in other fields of employment?

Mr. PELLEY. Yes, sir; and some of them were so well located that they did not want to come back, consequently some of the railroads had to hire some new men who had never before worked on railroads.

Representative WILLIAMS. About how many new men were taken on in 1937? Covering the period, we will say, from the lowest depression, to what extent was the railroad employment increased, say, from '32 or '33, whenever it was at its lowest ebb, to '37, when it reached its highest point?

Mr. PELLEY. Probably 150,000 men, Mr. Williams, I should say, as a quick estimate, from the depths of the depression in '32 and '33 to the peak of '37, probably 150,000 men.

Representative WILLIAMS. And what proportion would you say of those were new men? Have you any idea about that?

Mr. PELLEY. Very few.

Representative WILLIAMS. Since that time what has happened with regard to employment?

Senator KING. Since '37?

Representative WILLIAMS. Since '37.

Mr. PELLEY. We are down about 100,000 men.

Representative WILLIAMS. Since '37 you say there is 100,000 off. What has become of those men? Where are they and what are they doing?

Mr. PELLEY. Some of them are waiting to be called, some of them probably are not employed at all, and some of them have found something to do elsewhere.

Senator KING. Some availed themselves of their retirement privileges, too, did they not?

Mr. PELLEY. Yes; quite a number of them. You could probably get in a taxicab here in Washington and find drivers who are furloughed firemen on some railroad. I have, a number of times. They find something to do—some of them; some of them don't, waiting to be called back.

Representative WILLIAMS. Is there any particular line of the railroad industry from which the majority of those were let out of employment, or was it general?

Mr. PELLEY. Pretty general. I should say more in the maintenance department, maintenance of equipment and maintenance of way, than in the transportation departments.

Representative WILLIAMS. And those were the lower paid employees?

Mr. PELLEY. Yes.

Senator KING. I suppose there is considerable reduction in the number of employees in the mechanical departments and in those departments or branches of the industry which manufactured cars and engines.

Mr. PELLEY. That is right, Senator King, and of course the time comes when the only men you could get are in maintenance; if you run trains you have got to employ men, but you can defer maintenance; that is what railroads generally do when they are forced by financial circumstances to retrench.

Senator KING. There is very large obsolescence leading to obsolescence, if I may coin that phrase, in the mechanical appliances, engines, the cars, and so on.

Mr. PELLEY. Not so much as you might think. There are some, but it is not as aggravated as it is generally believed to be. The railroads have kept up their plants pretty well.

Senator KING. But the cars, with the usage to which they are subjected, whether rough or otherwise, do not last many years, do they? That is to say, you are constantly compelled to replace the cars.

Mr. PELLEY. Replace or rebuild. A rebuilt car will be nearly as good as a new car, and a rebuilt locomotive will be, not as good as a modern locomotive necessarily, but as good as that locomotive was once.

Senator KING. A large cost is inevitable, then, in the rebuilding of the engines and the cars?

Mr. PELLEY. Yes; but before a railroad enters into a rebuilding program it works out pretty scientifically what is the wise investment. Is it wise to rebuild or buy new? No railroad starts into any sort of a rebuilding program without analyzing just what is the better investment for it, to rebuild this locomotive, to rebuild this particular lot of cars, or to go in the market and buy some new ones. There is always some rebuilding, but the turning point comes there between the rebuilding investment and the new purchase investment, and they always take the one they at least believe to be the wiser.

COMPETITION WITH OTHER FORMS OF TRANSPORTATION

Senator KING. What is your greatest competitor, the river traffic or the trucks?

Mr. PELLEY. The highway.

Senator KING. The highway?

Mr. PELLEY. Oh, yes.

Senator KING. I suppose that has cut into your earnings, into your tonnage, as well as apparently into the passenger traffic very considerably.

Mr. PELLEY. Very considerably. If you were to ask me to give you a figure as to the extent of it I probably would say that they have taken 25 percent of our tonnage and probably 35 percent of our earnings, the explanation of that being that we lost to the highways not only the tonnage that has been lost but the revenue that has been lost by reason of the necessity of reducing rates in order to stay in the traffic at all. That feature of it is very aggravated, because I do not need to tell you gentlemen that when you reduce a rate you are just taking that money out of the net income. There is no way of knowing what the total of the two together would be, but I should say it is anywhere from 25 to 40 percent.

Senator KING. The Government and the taxpayers pay for the highway, to that extent helping the trucking and the automobiles, and you have to pay your own taxes.

Mr. PELLEY. That is right.

The CHAIRMAN. You pay a lot of taxes.

Mr. PELLEY. We pay a lot of taxes.

Senator KING. It is about \$800,000,000 a year, isn't it?

Mr. PELLEY. Mr. Parmelee will give you the exact figures.

Dr. ANDERSON. Is that what you mean by establishing fair treatment with respect to the competitors in the transportation business?

Mr. PELLEY. Yes.

Dr. ANDERSON. The future of the railroads depends, according to your statement, in a large measure upon establishing parity of treatment. How could that be done?

Mr. PELLEY. Well, it could be done in this way, simply by having all the agencies of transportation pay their own way and by regulating them on a fairly comparable basis.

The CHAIRMAN. How do you propose to make them pay their own way? What are the factors which in your opinion would constitute doing that?

Mr. PELLEY. Well, Senator, I have not come up here to criticize anybody, and far be it from me—

The CHAIRMAN (interposing). Any answer you give in response to a question by a member of this committee certainly can't be interpreted as criticism, and I think we ought to be able to take a little criticism if necessary.

Mr. PELLEY. Well, you get a lot of it; probably much of it isn't justified.

The CHAIRMAN. Just eliminate the word "probably," will you?

Senator KING. Use the word "deserved," perhaps.

The CHAIRMAN. Let each man speak for himself.

Mr. PELLEY. I didn't come up here to argue our case. I came here to tell you about railroad employment, and since I am asked a question, you asked me how this could be brought about. I suppose you gentlemen know that you appropriate large funds here to develop these inland waterways, to take traffic off the railroads.

The CHAIRMAN. We appropriate a lot of money for inland waterways and a lot of money for highways.

Mr. PELLEY. That is right. I think I had better analyze this just as I see it. I will attempt to put the responsibility where I think it belongs and I hope you will accept it as what I believe to be a fact.

The Congress has gone quite a distance to meet what my views are, at any rate, regarding regulation. They passed a motor regulatory bill about 4 years ago; trucks and busses are now under the Interstate Commerce Commission.

You have a bill passed here at the last session of Congress by both Houses, now in conference, regulating the waterways, and I would just like to pay my compliments to you on that, because I think you have done very well in recent years in trying to stabilize this industry insofar as Congress is concerned.

I doubt if there were ever two committees in Congress that have worked more diligently, more intelligently, than Mr. Lea's committee and Senator Wheeler's committee in working out the transportation problem. At the last session of Congress those bills were passed, and they are now in conference, and we are hopeful that at this session some law will come out of it, and the regulation of waterways is in both of those bills.

There is another feature in the two bills that I prize rather highly. There is a declaration on the part of Congress that all of these agencies of transportation shall be treated equally insofar as regulation is concerned; that declaration of policy, I believe, is in both bills, and

no doubt will be in the law. It is the first time that Congress has ever so declared itself.

Senator KING. The regulation would include rate-making, as well?

Mr. PELLEY. Yes, sir.

Senator KING. So when you speak about the regulatory provisions of the bill you include, obviously, the power to make rates for the waterways, and perhaps of highways?

Mr. PELLEY. Yes. The Commission now has the power to make rates with reference to highway traffic. Congress passed a law—I think it became effective in '35—and you are now about to pass, I hope, a bill that will give the Commission authority to regulate waterways.

Senator KING. Without taking any credit to myself in reference to the highways, I offered a bill many years ago for regulation of the busses and trucking, because of the obvious competition and the necessity of some form of regulation over the interstate transportation.

Mr. PELLEY. Now, to finish the national aspect of the waterway thing—and this is the important thing, as we see it—if the Congress is going to continue to appropriate large sums of money to develop inland waterways that are really not needed to handle the transportation of the country, and will result in taking that much traffic off the railroads, whatever it may amount to, we think that you ought to impose a toll or some basis of payment so that the Government will be reimbursed to some extent for all of this money. I don't think it is fair to our industry, and we do not think it is fair to the taxpayer, to be frank about it, to spend all this money and get none of it back, because these users of the highways which these funds are used to build and maintain, do not pay anything. I think in passing, I have some figures which might be of interest to you, and I think they are exactly correct.

The Government has spent in maintaining the 12-foot channel of the Ohio River about \$145,000 per mile of that river, and you spend about \$4,000 a year maintaining it.

Senator KING. Per mile?

Mr. PELLEY. Per mile. Now, I would just like to contrast that with the railroad situation. The average mile of railroad in the United States, fully equipped, cost \$62,000 a mile, against \$145,000 for this Ohio River, and it costs us an average of about \$2,000 a mile to maintain that railroad.

Now, we say this added transportation really is not needed in the outset, but if you gentlemen differ with that and want to provide it anyhow, then we think the users ought to pay for it.

That is the one big thing that Congress has to do with, in my opinion.

Mr. PIKE. May I ask this question, Mr. Pelley? In making that comparison, do you have the ton traffic on the Ohio, as compared to the typical mile of railroad you mentioned?

Mr. PELLEY. Not just in my mind, I haven't, but you know yourselves, I am quite sure, that the greatest use of it is made by large industries, and they don't pass it on to the consumer.

Mr. PIKE. Steel and fuel, very largely?

Mr. PELLEY. Very largely.

Now, this money is spent under the guise of cheap transportation to the consumer, and the people who are supposed to be the beneficiaries

of this cheap transportation don't get it at all. The large industries, many of them, use it, and they charge the consumer just the same as if it had been shipped by rail, the higher rate. So it is supposed to be cheap transportation, and it is transportation with a lot of hidden costs that are not generally disclosed, and the consumer doesn't get the benefit.

Senator KING. Is it true with respect to the steel industry, using it in a broad way, that on the greater part of the transportation—that is, from the Mesabi Range over the lakes and over the railroads which are owned by the steel companies—there is no subsidy from the Government?

Mr. PELLEY. No; not on the Great Lakes. I speak particularly of inland waterways. Now, I am still stating facts and not criticizing. Not only does the Government spend this money to provide these waterways, they have gone into the business themselves, operating on the Mississippi and Warrior Rivers. I think I can—

Senator KING (interposing). That is what General Ashburn has been handling for many years since the war?

Mr. PELLEY. Yes; inaugurated, I was told at the time, in 1919, to help the railroads handle the business and inaugurated as an experiment, with the intention of selling it to private interests later on. Nothing of that kind has ever happened, and it is being expanded. We think that the Government ought to go out of that business.

Now, that is supposed to be cheap transportation. I am told that a very large percentage of goods that move into Mobile, Ala., for illustration, move in by barge, and the retail prices in Mobile are higher than they are in the outlying districts which it is impossible to reach by the barge line. I mention that only to point out that the consumer really does not get the benefit of it.

Mr. O'CONNELL. How would it help the railroads if that barge line were sold to private enterprise?

Mr. PELLEY. I think it would help them in this way: It would be put on a true basis, then, if private industry could operate the barge lines at a profit.

Mr. O'CONNELL. Has General Ashburn's organization operated at a loss?

Mr. PELLEY. Well, yes.

Mr. O'CONNELL. I understood the contrary.

Mr. PELLEY. I know; but I say yes.

Senator KING. The capital has all been furnished by the Government, and that is all loss.

Mr. PELLEY. I wouldn't say General Ashburn would agree to that, but the facts are it has been operated at a loss.

Representative REECE. Is there any shortage of transportation facilities in this area proposed to be served by the conflicting project?

Mr. PELLEY. There is not. There is not any shortage of transportation anywhere in the United States of that kind. There is a large surplus everywhere.

Dr. ANDERSON. Moving then to a conclusion—

Mr. PELLEY (interposing). Would you mind—I wanted to answer Senator O'Mahoney.

The CHAIRMAN. I don't think we have reached a conclusion yet.

Mr. PELLEY. My conclusion is, either stop appropriating money to develop the waterways that are not needed, or make the users pay.

On the highways, I don't see a great deal that Congress can do about that.

The CHAIRMAN. But you regard the highway appropriations as in part at least Government subsidy for a railroad competitor?

Mr. PELLEY. We do, Senator, but we have never gotten into the position, and probably never will—at least, I won't—of opposing highway construction. Some highway construction I might oppose, but generally people want good highways—I like them myself—and we don't want to get in that position.

The CHAIRMAN. The reason I asked you the question, of course, was because of your statement that what the industry needs in order to meet its competitive handicaps is equality of treatment by the Government as between the railroads and other agencies of transport.

Mr. PELLEY. That is right.

The CHAIRMAN. So, obviously, you were dealing with more than the waterways.

Mr. PELLEY. That is right. Did I say "the government" or "government"?

The CHAIRMAN. You said "the government."

Mr. PELLEY. I meant all government.

Now the highway problem is very much a State problem. The State decides what they shall pay, not the National Government, and therefore it is a matter that has got to be handled in the various States, and what we say is that we ought to make them pay what they should pay for the use of the highways, and then restrict the sizes of these motor busses and trucks to dimensions that the other 25,000,000 users of the highway feel is fair and right, and that is all.

The CHAIRMAN. Did you happen to hear or read the recommendations that were made to this committee last Friday by Philip Murray, head of the Steel Workers Organizing Committee?

Mr. PELLEY. No, sir.

The CHAIRMAN. I think you might have been interested in them because the thought that comes to my mind is that you and he are taking just about the same position, but with respect to a little different problem.

Your position is that the Government, both State and national, should do something to help the railroads against the competitive handicaps which are imposed upon the railroads by reason of technological advance in the construction of waterways and highways, and that these new advances, competitive modes of transportation, should be made to pay their own way. Now Mr. Murray's position was that the steel worker is suffering because technological advance in the development of the continuous steel mill has displaced him. He is suffering from the handicaps of competition just as the railroads are. So Mr. Murray suggested to us that we make the technological advance, namely, the continuous steel mill pay its way, just as you suggest that we make the highways and the waterways pay their way.

Now, his suggestion, of course, is that the displacement of labor by the continuous mill should be regarded as one of the costs of this technological advance, so that human labor would not have to bear so much of the brunt, that is particular human labor. Your position is that the railroads themselves should not be compelled to bear the whole burden of this advance.

Mr. PELLEY. That is right.

The CHAIRMAN. Do you think that this comparison is out of line?

Mr. PELLEY. Well, I don't know, Senator. Maybe the steel companies are bearing it now. I really don't know.

Dr. ANDERSON. Mr. Pelley, with respect to—

The CHAIRMAN (interposing). I was going to ask another question.

Mr. PELLEY. May I elaborate a little more on this thing and I think I will clear it up. In these States I said some progress is being made. You know, we say the highway people don't pay what they should. Some of them say they do. Not all of them, but some of them say they do. We go along and don't get very far with it. You may or may not know that this Committee of Six that was appointed by the President suggested that a temporary board be appointed to determine just that factor. There is nobody to determine it. Nobody says who is right. We say that they don't pay, and they say, some of them, that they do.

The reason I am encouraged about it and think we are making some progress, the States have begun to look into it. They are spending all these millions of dollars and not getting it back, and the time has come when they have got to look at it and see where the money is coming from. In two States—Illinois and Missouri—the State authorities on their own account have made a very comprehensive study to determine whether or not the commercial use of the highway is subsidized, and in each case they found that the commercial user is subsidized.

I feel if these other States would make the same sort of study, they would find the same facts. And then it is their job, it is the respective State governments' job to regulate that, and I think they are going to be forced to soon because they just can't keep on paying out, spending many millions more each year than they get back for the highways, and I think necessity will force them to do that.

The CHAIRMAN. Have you finished that statement?

Mr. PELLEY. Yes.

The CHAIRMAN. When I was called to the telephone, I understood you testified that the peak of labor employment by the railroads was reached about 1920?

Mr. PELLEY. That is right.

The CHAIRMAN. And how many persons were employed then?

Mr. PELLEY. The exact figure I would say is about 2,022,000—say 2,000,000 men.

The CHAIRMAN. And employment fell off thereafter, reached a low, and then picked up again and reached another high point in 1937?

Mr. PELLEY. Yes.

The CHAIRMAN. It was then how much?

Mr. PELLEY. About 1,100,000.

The CHAIRMAN. Now, today, what is the employment?

Mr. PELLEY. About 1,000,000 men, in round figures.

The CHAIRMAN. Now the railroads have recognized, have they not, the importance of taking care of displaced labor in the so-called Washington agreement?

Mr. PELLEY. Yes.

The CHAIRMAN. Briefly, what is that agreement?

RAILROAD LABOR POLICIES

Mr. PELLEY. Senator, I think I should explain that. Since you brought that up, the natural question here is, What can the railroads do about this labor? Of course, there are some things we can do and there are some we can't do, and I wish I had something constructive to suggest to you that might be done, but I can tell you what we do in taking care of our employees. I believe the railroads are the first to have a voluntary pension plan. My information is that the first voluntary pension plan in this country was made in 1882. Now, the railroad I worked for for many years established a voluntary pension plan 39 years ago, in 1901, and these pension plans have been fairly liberal. For every year that he was in the service, a man would get 1 percent of his average salary during his last 10 years in the service. To state that precisely, if a man had worked 40 years and had averaged \$100 a month, he would get \$40 a month pension as long as he lived.

Well, some 90 percent of the railroads, probably 95, had these voluntary pension plans. A few had none, and, of course, the men wanted a pension on all roads.

The CHAIRMAN. When you speak of a voluntary pension plan, you mean that the railroads themselves adopted the plan voluntarily?

Mr. PELLEY. Voluntarily, and paid all the costs.

The CHAIRMAN. And the workers were not required to pay any part of that cost, is that a correct understanding?

Mr. PELLEY. That is right, they were not required to pay anything.

The CHAIRMAN. In any of the plans?

Mr. PELLEY. In any of the plans that existed prior to the enactment of this law. It was all voluntary, all supplied by the railroad management.

Then, as you very well know, the men wanted a law giving them a pension and many of us couldn't quarrel very much with them about that. This was a voluntary thing and they could visualize that the railroad might get into such financial difficulty that they wouldn't be able to pay it. After they had worked all these years, it might be shut off. So as you gentlemen know very well, we agreed with them on a pension plan and we now have one under the law.

We also have an unemployment insurance plan, a law that was passed here that costs us about \$60,000,000 a year. This pension law costs us about \$60,000,000 a year—3 percent of, say, a \$2,000,000,000 pay roll. There is about \$120,000,000 in round figures that the railroads are being taxed each year for the benefit of their men.

In addition to that is the thing you mentioned, Senator. We made an agreement with the men, the so-called Washington Agreement, that covers men displaced by reason of an act of two or more railroads. If two railroads get together and consolidate a facility, those men are provided for under the Washington Agreement. There might be 8 or 10 railroads involved in it. That is a rather liberal arrangement. For instance, if a man is displaced by reason of a consolidation or coordination, under the Washington agreement if he has been in the service for 15 years, he will get 60 percent of his salary for 5 years, which certainly gives him a chance to adjust himself, and it may be that he can get employment elsewhere. The chances are that he can because the youngest men on the road are always displaced.

The CHAIRMAN. Now, the railroads are far ahead of other industries in this regard, are they not?

Mr. PELLEY. Some individual industries may have done as much. I would say generally, yes, Senator; and we feel this way about it, that while we regret as much as anybody could the necessity of displacing men, we are now doing for them about all, or maybe a little more than, the traffic will bear.

The CHAIRMAN. What is the necessity of displacing men? To what extent is that a problem?

Mr. PELLEY. Well, I don't know just how you want that answered.

The CHAIRMAN. You say you regret the necessity of displacing men. Now, obviously there is this problem of labor displacements.

Mr. PELLEY. Yes.

The CHAIRMAN. Otherwise, you wouldn't have made that Washington agreement. Now to what do you attribute this displacement? The combination of railroads or the substitution of one facility for more than one would have that result. Are there any other factors?

Mr. PELLEY. Well, of course, the railroads have built up a plant to handle probably twice as much business as they have got. I say twice as much; I don't think that is overstating it. They haven't got it, so they must pull in in every way they can, reduce their expenses in every possible way to meet the increased costs of operation we have had, the increased prices of material, and more taxes—this \$120,000,000; much of that is—

The CHAIRMAN (interposing). In other words, to maintain this plant which is double the capacity of the business that you get, it becomes necessary, in the effort to economize, to curtail the number of employees?

Mr. PELLEY. Well, the loss of revenue has brought that all about, but to answer you fully, there have been a great many instances where railroads could join together, use one facility and eliminate another.

Senator KING. Use the same roundhouse and machine shops.

Mr. PELLEY. Yes, and in that way you would eliminate some men. That is what I meant by coordination and consolidation of facilities. In one instance they abandon some service and the other railroad does the business for both railroads.

The CHAIRMAN. How about the improvement in locomotives?

Mr. PELLEY. We have had a tremendous improvement in locomotives which is all technological, as I pointed out.

The CHAIRMAN. And that has resulted in longer trains, and because of longer trains we have had these various bills to limit the number of cars to be hauled by one locomotive.

Mr. PELLEY. Well, that has had something to do with it, but it looks as if that has reached the limit and might be going down. We have speeded up our trains so much, and in many instances many freight trains are running like some passenger trains used to run. That long-train problem, I think, is probably on the wane. That has reached the peak in my opinion.

The CHAIRMAN. I wasn't talking about that. I was wondering whether this improved rolling stock, enabling you to use longer trains and faster trains, has had any effect upon employment.

Mr. PELLEY. Well, yes; it has.

The CHAIRMAN. It has reduced employment.

Mr. PELLEY. Oh, yes; and the construction of the locomotive itself, better material, better design, has eliminated a great deal of repair work, which has eliminated some men.

Senator KING. You have improved your tracks, too, with heavier rails so that has caused a great deal of expense, but in the long run it has cut down some of the expenses for maintenances.

Mr. PELLEY. Yes.

The CHAIRMAN. So that here is a definite case illustrating that technological advance has displaced human labor.

Mr. PELLEY. There isn't any doubt of it.

The CHAIRMAN. What is the mileage, the railroad mileage, today as compared with mileage in 1920?

Mr. PELLEY. Oh, I would say that we have abandoned probably 19,000 miles since then, 18,000 or 19,000 miles.

The CHAIRMAN. What percentage would that be of the total?

Mr. PELLEY. The maximum was a little over 250,000 miles.

The CHAIRMAN. The maximum reached when?

Mr. PELLEY. In 1920.

The CHAIRMAN. And to what extent has abandonment of line contributed to labor displacement?

Mr. PELLEY. Well, some, not a great deal. Of course it is always a branch line that never did employ very many men that has been abandoned. That hasn't made a very large difference.

Senator KING. Did the large railroads have much invested in the short-line railroads, rural railroads? They had so many in Illinois and Indiana. We have some in our State that have been abandoned as I understand. I was wondering if they were controlled or owned or operated to any extent by the railroads.

Mr. PELLEY. You don't mean the electric lines.

Senator KING. The electric lines.

Mr. PELLEY. Very little, perhaps the New Haven owned more than the rest put together.

Senator KING. Of course, there has been a great loss there.

Mr. PELLEY. I think the Southern Pacific has one electric line and outside of that I wouldn't know where to tell you to find any others except on the New Haven; they had a great many of them up there, in fact practically all of them.

The CHAIRMAN. Would I be correct in assuming that the railroads as a whole have more equipment now than they ever had?

Mr. PELLEY. No, sir; they have less.

The CHAIRMAN. How much less?

Mr. PELLEY. Dr. Parmelee will give you those exact figures, but we have about 700,000 fewer cars and a good many fewer engines.

Representative WILLIAMS. How much less carloadings and transportation business do you do, and passenger traffic, comparing 1937 with '20? During the loss, we will say, of a million men in the employment, how did the general business of the railroads compare?

Mr. PELLEY. The general business dropped down about 50 percent when it was at its lowest. It was cut just about in half.

Representative WILLIAMS. Let's take it in '37, if you have that, the late peak of employment.

Dr. ANDERSON. Much of the ground that is being covered by question and answer will be given in very considerable detail by Dr. Parmelee.

Representative WILLIAMS. I just wanted that general picture, if you

had it, with reference to the amount of business that was done during those years in comparison to the number of men who were employed.

Mr. PELLEY. You asked for a particular year?

Representative WILLIAMS. I asked at the peak and in '20 when you said there were 2,022,000 men employed and then in '37 when it dropped off practically 1,000,000.

Mr. PELLEY. You won't mind if Dr. Parmelee answers this. It happens that this chart starts with 1921.

Representative WILLIAMS. Well, the best you have.

Mr. PELLEY. I think your question is a better question, though, because business was better in 1920 than it was in 1921.

Dr. PARMELEE. Can we work this out and give it to you?

Representative WILLIAMS. Yes.

EFFORTS TO INCREASE BUSINESS

The CHAIRMAN. Let me ask just one more question, Mr. Pelley, and I will turn you over to Dr. Anderson. What has been the policy of the railroads toward increasing traffic upon the roads? What do you do to build up business?

Mr. PELLEY. Well, of course, first of all we solicit all we can, and then we make rate adjustments if it is necessary to get business or to retain business. If we see we are about to lose business to a competitor because of a rate situation we try to meet it.

Senator KING. But you have to go before the Interstate Commerce Commission to get the rate.

Mr. PELLEY. Yes; but I will say we don't have much trouble getting that; we don't have a great deal of trouble getting authority. Sometimes we do because they might think that it is not in the public interest to reduce the rate, but those are the two things that we can do. And, of course, we offer better service, we improve our service, and try to give any kind of service that will get the business.

Dr. ANDERSON. Do you find any difficulty, Mr. Pelley, in obtaining immediate reductions from the Interstate Commerce Commission?

Mr. PELLEY. Oh, I think probably I would have to say not a great deal. The Commission cooperates pretty well.

Dr. ANDERSON. So rate reduction as a procedure for attracting new business is the real way to go ahead?

Mr. PELLEY. You know there may be some cases where the Commission might feel that it is not in the public interest.

Senator KING. Frequently or occasionally applications are made; for instance, you get a market in the East for a strawberry crop or peach crop or some perishable crop and you can't keep it indefinitely (in my State we frequently get markets in the East for superior vegetables, and so on). By the time that you convert it, and you easily convert it because you want the traffic, and we get the Interstate Commerce Commission converted, the crop is wasted. I have in mind a peach crop. It is lost before you can get the rate which you are willing to give us carried into effect under the direction of the Interstate Commerce Commission. I ought to say, though, that they are very responsive and do all they can, but still you have that hurdle to cross whenever you want to cut a rate.

Mr. PELLEY. That is true, but I would say that they cooperate very well.

Representative REECE. Would you say, Mr. Pelley, that technological advancement is the major cause of the decline in railway employment?

Mr. PELLEY. No, sir.

Representative REECE. It is loss of business.

Mr. PELLEY. Loss of business.

Representative REECE. The railroads are the servants of business and not its masters.

Mr. PELLEY. Yes.

Representative REECE. There must be business before there is any major increase—

The CHAIRMAN (interposing). Loss of business may be attributed to some extent at least to unemployment, I suppose. All the factors that enter into a depreciation, that is the cause of loss of business.

EFFECT OF TECHNOLOGY ON EMPLOYMENT

Representative REECE. That has to do with the other phase of the question I was about to ask. How does the number of people employed in the transportation industry today compare with the number of people employed in the transportation industry in 1920 in relation to the amount of traffic moved?

Mr. PELLEY. I would say there are more employed in the whole transportation industry today than in 1920. I haven't that—

Representative REECE (interposing). I realize you are speaking in a general way.

The CHAIRMAN. Do you mean the whole transportation industry?

Representative REECE. Yes; in relationship to the amount of traffic being moved.

The CHAIRMAN. You weren't speaking of the railroads alone?

Representative REECE. That is right. I was including bus and water.

Mr. PELLEY. I would say, Congressman Reece, that there are more men employed in transportation today in relation to the tons moving than in 1920.

Representative REECE. Then, Mr. Pelley, how would you account for your statement that loss of employment is due to technological advancement?

Mr. PELLEY. Oh, it is; some of it, a great deal of it is.

Representative REECE. But when you take the transportation industry as a whole, is that true?

Mr. PELLEY. Well, the fact, Mr. Reece, that there might be more men employed in transportation as a whole, if you consider the character of the work done by these various agencies, and the way they do it, it wouldn't necessarily follow that none of our men have been displaced because of technological reasons. For instance, just visualize 5 men on a train, if you please, handling as many tons as probably 100 fellows on trucks would handle; you have to have a driver for every truck, and some of them have 2, one to relieve the other.

Representative REECE. Yes; and you would say the loss of your 5 men was due to technological development, that is motor truck, but on the other hand it resulted in the employment of 100 people in another phase of the transportation industry at the same time. The net result was an increase of employment in this particular instance.

Mr. PELLEY. Not because of technology. We just lost this business, that is the reason they put their men to work, and it takes more men to handle the same tonnage in trucking than on the railroads, so there would naturally be an increase in employment there.

Senator KING. The technological development to which you referred, which was included in your answer to the Congressman, referred to the waterways and to trucks.

Mr. PELLEY. I was confining my statement to the railroads only.

Mr. O'CONNELL. On that line, Mr. Pelley, my attention has been called to an exhibit that was introduced before this committee last week as Exhibit No. 2441,¹ and it refers to the volume of traffic on class I railroads in 1920 and in later years, and the volume of employment in the same years, and it might be interesting to note that on an index basis the volume of traffic in 1920 was 105.3, and in 1937, 84.9, about a 20-percent reduction. Now, if we take employment figures during the same year, we find employment in 1920, 118.4, and in 1937, 62, so that with the 20-percent reduction in volume of traffic you have a little more than 50 percent reduction in the volume of employment, and I take it that the difference would represent roughly at least the extent of technological change.

Mr. PELLEY. Well, and possibly deferred maintenance, but certainly a big fraction of that would be technological improvement.

Mr. O'CONNELL. I don't quite see how deferred maintenance would figure. Volume of traffic is physical volume of traffic and employment is wages.

Mr. PELLEY. Well, you have got all the costs there. Maintenance means—

Mr. O'CONNELL (interposing). It is all employment of course. I see; you mean you might have cut down on your maintenance force.

Mr. PELLEY. Mr. Williams, I believe that answers your question.

Representative WILLIAMS. Yes; largely. That is along the line of it.

Mr. PELLEY. Dr. Parmelee will give you that figure.

Mr. PIKE. I think it is true that in 1920 you were making up a lot of previous deferred maintenance that was deferred during the war, so that you had really an excess number of employees at that time on maintenance. That would be my memory. You were just coming out of Government hands?

Mr. PELLEY. Well, there was some maintenance deferred because it was difficult to get men to do it.

Mr. PIKE. Labor efficiency wasn't very high at that time.

Mr. PELLEY. It wasn't very high, and the plant had been pretty well used up.

Mr. PIKE. You had really deferred maintenance in there that you were trying to make up at that time as I remember.

Mr. PELLEY. I think that is right. In other words, you think, Mr. Pike, that this 2,000,000 men was somewhat inflated.

Mr. PIKE. That is what I mean, beyond normal for the technological status at that time.

Mr. PELLEY. No doubt about that; yes, sir.

Mr. HINRICHS. Did that stepping up of activity to overcome the old plant concentrate in 1920 or did it begin more particularly in 1923—1922, or '23?

¹ See appendix, p. 17310.

Mr. PELLEY. It started in 1920 with reference to maintenance, but in 1923 the railroads entered into a plan to fix it so there never would be any more railroad shortage of transportation in this country. They bought a great deal of equipment and they built larger and better terminals and improved the equipment and the general line situation a great deal, and spent about \$7,000,000,000 in doing it, so the real campaign started, as you suggest, in '23.

Senator KING. So the railroads had run down a little bit during the war.

Mr. PELLEY. Well, they were pretty severely used, Senator King, during the war; yes.

Senator KING. You had to employ in many instances, or did employ in many instances, persons who had not been skilled in labor. You employed young men, and older men and women in some of your activities.

Mr. PELLEY. That is right.

Dr. ANDERSON. Your thesis is, Mr. Pelley, as I get it from this statement that the railroads of America are a dynamic industry.

Mr. PELLEY. That is right.

Dr. ANDERSON. That being dynamic they can take advantage of any chance there is to go ahead in terms of increased volume of business, increased employment, better times leading to prosperity in that industry generally.

Mr. PELLEY. That is right.

Dr. ANDERSON. And you point out in the beginning of your statement an example of it.¹ You say that after the trough of '32-'33, you need point only to the year 1937 as an illustration of what you have in mind.

Mr. PELLEY. That is right.

EFFECT OF INCREASED BUSINESS ON EMPLOYMENT

Dr. ANDERSON. I would like to read you some figures from Mr. Parmelee's own compilation in order to bring out a point that may be of crucial significance to this discussion of technology. I am taking data directly from his compilation that he will present to us this afternoon, in comparing 1933 with 1937. I took total mileage operated, total tracks rather than that first figure given, and it showed in comparing '33 with '37, now, decline of about 3 percent.² Freight ton-miles shows an increase, and this does show the dynamic quality of your industry, from the trough in '32-'33, or '33 here, to '37, of 45 percent.³ Passenger-miles showed an even greater increase, or 51 percent.⁴ The number of employees used, however—and this I take it is average number of workers engaged in the industry, it doesn't talk about full-time employment—increased only 15 percent.⁵ That is, the volume of freight ton-miles and passenger-miles increased 45 or 50 percent. The number of employees increased, however, only 15 percent. The total hours worked increased somewhat better, considerably better, 25 percent.⁶ The total compensa-

¹ See p. 16518.

² See "Exhibit No. 2491," appendix, p. 17350.

³ See "Exhibit No. 2501," appendix, pp. 16570, 17355.

⁴ See "Exhibit No. 2502," appendix, p. 17469.

⁵ See "Exhibit No. 2517," appendix, pp. 16582, 17362.

⁶ Ibid.

tion paid almost kept pace with the freight- and passenger-mile increases, namely, 41 percent, but your unit cost of operation actually declined with this 45-percent increase in freight ton-miles. There was a decline of 1 percent in unit cost of freight operation, and an increase of only 6 percent in passenger unit costs.¹ Now, the question I would like to ask, if these figures are correct, is, Is it likely, even with an upswing of business of such proportions as indicated by these figures, from '33 to '37, that this is the characteristic trend with respect to employment, that employment will not be comparably increased with the volume increase of business of the railroads?

Mr. PELLEY. I think that is a fair deduction. You understand that unless business is very heavy, some more business can be taken on with very little cost. That is, you have got an organization set up to handle a certain volume of business that fluctuates, so therefore, if you take some more business, you can handle it at very little added cost, and with very little need for more men up to a certain point.

Trains run full. You have got a certain fixed number of employees you can't dispose of, even though your business may be at very low ebb, and when the business comes on you don't add employees to that particular switching yard, or whatever it may be. There are just many fixed men around whose number doesn't fluctuate, so therefore, when your business increases, you can handle it without adding a great many more men. It does not always follow that if you have a 10-percent increase in business you are going to have a 10-percent increase in employment, because many of your men are fixed, and they are there to handle big business or little business, and their expense does not fluctuate at all.

Dr. ANDERSON. So that if we thought in terms of a much expanded railroad industry, in terms of volume of freight- and passenger-miles, and volume of business, we must be very careful, must we not, not to assume immediately that this dissipates the whole problem of unemployment in railroads?

Mr. PELLEY. That is right.

Dr. KREPS. I should like to continue the line of reasoning that Mr. Pelley was following a moment ago. I recollect that in the hearings on the Works Financing Act of 1939, Mr. Pelley testified that even in 1937 there was a capacity to take care of 25 percent more traffic than was being taken care of at that time.

Mr. PELLEY. What time is this?

Dr. KREPS. In 1937. He said in his statement that—

We could take on about 25 percent more business than we now have with this equipment that is now ready, and by repairing different cars we probably could handle more business than we are handling now.

That is on page 72 of this print.

Pursuing Dr. Anderson's line of questioning, it would take something in excess of 25-percent increase in the railroad traffic over 1937 before you would begin to get proportional additional employment to traffic; is that correct?

Mr. PELLEY. I wouldn't say that far; I would not say 25 percent more. You see, you are going to have some added employment immediately; you are going to run more trains, you are going to employ more men to run them.

¹ See "Exhibit No. 2518," appendix, pp. 16586, 17862.
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Dr. KREPS. I am still correct, am I not, that according to your own figures and estimates that you were operating even in 1937 at something like 75 percent of capacity?

Mr. PELLEY. Oh, yes.

Dr. KREPS. Therefore, there could have been a considerable expansion in volume of traffic over 1937 without much increase in additional employment. As you have testified to Dr. Anderson just a moment ago, the increase from 1933 to 1937 did not result in corresponding increase in employment because you had the capacity already there, and you had to have men in 1933 to keep the plant in a stand-by condition. I am trying to get, you see, an estimate of the amount of increase in railroad traffic that would be necessary, (a) before we would get more additional employment, more than a proportional increase in employment, and (b) before we would get any substantial increase in employment.

Mr. PELLEY. Now, any sizable increase would bring some additional employment.

Dr. KREPS. But not proportionally?

Mr. PELLEY. No; I wouldn't think so.

Mr. O'CONNELL. May I ask this question right there, Mr. Pelley? During the same hearing to which Dr. Kreps has referred there was some discussion with regard to the existing plant of railroad companies, particularly rolling stock, as to whether it was in good shape or whether there was need of replacement.

Mr. PELLEY. What hearing is that?

Mr. O'CONNELL. The works-financing bill of last year, before the Senate Banking and Currency Committee. You testified and Mr. Eastman testified. There was some extensive discussion about just how obsolete, or how much need of replacement there was in the rolling stock of the various railroads. A little earlier you indicated that the physical plant of the railroads was in general in much better condition than is popularly supposed. It seemed to me in that same hearing that there was some testimony to the effect that rolling stock was relatively old, from which I would derive two things: that a substantial amount of it was in need of replacement, and that the operation of the equipment now being used probably results in a higher maintenance cost than were the equipment replaced.

Mr. PELLEY. Yes. I think the latter is particularly true.

Dr. ANDERSON. Mr. Pelley, I wanted to pursue this point from the standpoint of a downward swing in the volume of business and see what the effect is upon the labor force employed.

I did the same thing, took Mr. Parmelee's figures and made a comparison now, between '29 and '39. Freight ton-miles were reduced 25 percent;¹ passenger ton-miles, 27 percent;² number of employees employed in that reduced business, 41 percent;³ and unit cost of freight operations, 9 percent; and passenger operations, 15 percent.⁴

Now, it would appear from these figures that either on the upswing or downswing of railroad business, labor fares badly. Just as you pointed out that on the upswing of business there is considerable likelihood that labor will not share proportionately in increased business,

¹ See "Exhibit No. 2501," appendix, p. 17355.
² See "Exhibit No. 2502," appendix, p. 17355.
³ See "Exhibit No. 2517," appendix, p. 17361.
⁴ See "Exhibit No. 2518," appendix, p. 17362.

so on the downswing labor is displaced more rapidly than the volume of business drops. Would you explain that?

Mr. PELLEY. Well, of course, when the business goes down, the railroads have got to put the expenses down with the business, and with the wage bill being 60 percent of total expenses on a railroad, it is just impossible to reduce expenses a great deal without touching the men. You have got to reduce your employees, that is all. Some of it is better methods—you find cheaper ways of doing things—and some of it, of course, is simply deferred work.

You see, you couldn't do much with your expenses on the railroad unless you get into the men; it is unfortunate, but it is true, because some 60 percent of all of our expenses are the men.

Dr. ANDERSON. Now, that leads to a question of great concern, it seems to me, from the standpoint of this problem and the railroads' dilemma.

On page 16519, you make the contrast between problems of the railroads in the past, when the big problem, I take it, the principal stimulus to technological progress in the early days was the urgent need for more mileage, equipment, and more men to operate the plan. That was during the days when you were developing the transportation system of the Nation?

Mr. PELLEY. That is right.

Dr. ANDERSON. Would you say the transportation system of the Nation, overall, in the gross is adequate at the present time? I am thinking now in terms of mileage of track, of facilities available for anything like a reasonable increase in business over present business.

Mr. PELLEY. Yes.

Dr. ANDERSON. Then you say, "In more recent years, the problem has changed from one of rapid physical expansion to one of intensive struggle against depression, and against growing competition." We developed that thought a while ago. In this new problem, is it true that since labor is such a large proportion of the total cost, and the railroads are forced to face intensive price competition, railroad labor is likely to be more adversely affected than it was formerly by changes?

Mr. PELLEY. Well, I don't know that I would say "more adversely," because in the past 10 years, the railroads have had to do everything they could do to reduce their number of employees and therefore reduce their expenses.

Now, it will probably be just as severe in the future as it has been in the last 8 or 10 years, but I doubt if it would be more so.

DISTRIBUTION OF RAILWAY EARNINGS

Dr. ANDERSON. I wanted to get your judgment on one other point, Mr. Pelley. This new book of the Brookings Institution treats of railroads in several instances. I read this statement from page 35 of Spurgeon Bell's book *Productivity, Wages, and National Income*:

Wages declined as a percentage of total income in contrast to salaries and earnings to capital. The relative trends of the several shares as percentages of total income in years of comparable prosperity are indicated in the table which follows:

It will be seen that wages as a percentage of income declined materially in the 20's. The percentage in '36-'37 was appreciably below that of the early '20's; salary as a percentage of income declined somewhat in the '20's, but rose

in the '30's to a figure above that of the early '20's. Earnings on capital in relation to the total income increased markedly in the '20's, and then declined sharply in the '30's. In '36-'37 the percentage was, however, above that of '23-'24.

I realize that hurried reading of that kind makes it difficult for you to follow, but the point made is that wages declined as a percentage of total income in contrast to salaries and earnings of capital.

Mr. PELLEY. In what period?

Dr. ANDERSON. The twenties and the thirties are being compared. Does that seem to you to be a fair statement of the situation? It is true that in these two periods under review, wage earners' income did not follow the same course as salaried workers' income, in relation to total earnings? In other words, did salaried workers profit more by the conditions that are now operative than wage earners?

Mr. PELLEY. I had not thought that that was true in the twenties. I don't question it, but I had not thought that that was so. I thought the wage earners kept up pretty well.

Dr. ANDERSON. Do wage earners and salaried workers in the railroads industry receive the same treatment with respect to these problems of employment and unemployment, that you have been indicating earlier, such as retirement and other privileges?

Mr. PELLEY. Oh, yes.

Dr. ANDERSON. There is no difference?

Mr. PELLEY. No. Now, that wouldn't apply at all times to the salaried officers, but pretty generally, it does.

Dr. ANDERSON. Well, is it true that in the period of declining employment they are affected equally? Put it this way: is the salaried labor force more stable than the wage-earning labor force, or less so?

Mr. PELLEY. Probably, yes; a little more stable. I should think so.

Mr. O'CONNELL. I have one collateral question that relates to what you had to say earlier in your testimony about the degree to which competing methods of transportation have been subsidized in one way or another. Are you familiar with the report of Mr. Eastman's committee which is referred to in the morning press as just having been released on that same subject?¹

Mr. PELLEY. I have not seen the finished report. I have had more or less information about it from time to time, as the report was being made. But I really haven't seen the finished report, and don't know exactly what it says.

Mr. O'CONNELL. The news report or article indicated it had been widely circulated in draft form to the various interested people. I thought you might have seen it.

Mr. PELLEY. I have seen the draft of it sometime back. In fact, 2 or 3 years ago when the first draft came out. But I don't know how the finished product looks.

Mr. O'CONNELL. Unless it is wrongly reported, it seemed to me that the report comes to a somewhat contrary conclusion from that reached in the statement. I don't think we can discuss it, but I thought the existence of the report ought to appear in the record, and as I understand it, it comes to a somewhat different conclusion than you do.

¹ Joseph Eastman, *Public Aids to Transportation*, Government Printing Office, Washington, 1940.

Mr. PELLEY. If the final report is anything like the draft I once saw, then it differs a great deal from my view.

Dr. ANDERSON. Mr. Pelley, we referred earlier in the hearings to the period of '21-'22, when the railroad industry was taking back its enterprise and beginning to operate again after a period of Government operation. This same Brookings treatise argues that at that time unionization had flourished, under Government encouragement, to a point where labor would be able to maintain the gains realized during the period of Government control. Then this statement follows, which I would like very much to have you comment on:

This rise in the wages of labor had a stimulating effect on the development of labor-saving devices and the improvement of labor management so that labor costs might be brought more into accord with wage costs prevailing before the Government secured control of the railroads.

Mr. PELLEY. I think that is a fair statement.

Dr. ANDERSON. And that is exactly what occurred, was it?

Mr. PELLEY. I think so, yes, sir; I would say that is a correct statement.

Dr. ANDERSON. Would you say that it is generally true that when wage rates are moved upward by some agreement in the railroad industry, railroad management makes every effort to nullify the effect on total cost by technological improvements?

Mr. PELLEY. Yes, sir; I think any other answer would be less than frank. I think they do.

Mr. PIKE. You wouldn't just narrow that down to railroads?

Mr. PELLEY. Well, I wouldn't care to comment on industries that I do not know much about, but I know that that is true of the industry that I have spent my life in.

Mr. HINRICHS. In that connection, Mr. Pelley, even under conditions of stable wages, isn't the railroad industry making continuous efforts to decrease labor costs?

Mr. PELLEY. Yes, sir.

Mr. HINRICHS. In your judgment does that situation change very sharply at a time when a wage increase is granted?

Mr. PELLEY. Well, I don't know that I would say very sharply, but it changes, there isn't any doubt about it.

Mr. HINRICHS. Can you illustrate it concretely, because it is at variance with some of the experience that we have found in other industries, some of the heavy manufacturing industries, for example. Can you illustrate out of the railroad experience where this time relationship between a wage increase and increased efficiency of labor has been demonstrated?

Mr. PELLEY. No; I couldn't, but certainly it stimulates management to look about to see what they can do in the way of reducing the number of employees to meet as much of that increase as they can, and it at least brings them to a very careful looking over; they are looking all the time for reductions in expenses, but it certainly at least brings on a special campaign to reduce the number of employees as much as possible to offset the increase in wages. I think that is about as much as I can say about that.

EFFECT OF DISPLACEMENT ON AVERAGE AGE OF WORKERS

Mr. HINRICHS. While I have interrupted, may I ask another question? When displacement occurs on the railroads, it is not the older worker on the railroad that is affected, but the younger. Is that correct?

Mr. PELLEY. That is correct.

Mr. HINRICHS. So the complaint which we have heard frequently with reference to other industries as to the peculiar disadvantages of technological displacement to the older worker would not be true of railroads?

Mr. PELLEY. No, sir.

Mr. HINRICHS. That is a provision of your various collective agreements, is it not, and has been developed by the railroads in conjunction with the unions?

Mr. PELLEY. That is correct.

Mr. HINRICHS. That situation holds for the transportation workers. Does it hold in the shops in the same way?

Mr. PELLEY. Yes, sir.

Mr. HINRICHS. How about maintenance of way?

Mr. PELLEY. The same way.

Mr. HINRICHS. It holds true throughout the entire realm of railroad work?

Mr. PELLEY. Yes, sir; if the man is qualified to do the work, the senior man gets it. I don't know of anybody who was ever disqualified.

Dr. ANDERSON. Mr. Pelley, do you think that is an impediment to efficient operation or not?

Mr. PELLEY. Well, sometimes that is questioned, but we feel that it is right, and if it does bring about some deficiencies here and there, we feel that we ought to absorb them.

Dr. ANDERSON. In other words, in your industry management has some regard for ethics in this respect. By "right" you mean moral right?

Mr. PELLEY. We think it is fair treatment to the men to give the senior men the work, and otherwise we have generally felt the seniority rule was the men's rule, and we think it is fair. We are criticized sometimes because probably we have some of our older men on passenger trains or meeting the public. Some of our patrons might prefer to see some snappy young man in the job, and we get a little criticism of that kind, but not much. We feel that the traveling public generally are very much in sympathy with these older men having the jobs because they have had much experience, and they know that they are efficient, sober men and that they are in good hands when they get on trains manned by men of that type. We just think it is right; we agree with the men 100 percent on the seniority rule. We offer no objections to it at all. In fact we are for it.

The CHAIRMAN. Have you finished with Mr. Pelley?

Dr. ANDERSON. Mr. Pelley has kindly consented to come back this afternoon and be with Mr. Parmelee to answer any questions that might arise in the discussions that will follow the presentation of Mr. Parmelee's figures.

The CHAIRMAN. Mr. O'Connell referred awhile ago to the report of Mr. Eastman. Of course, I think that that deals with a little differ-

ent subject from what we are handling here, namely, technological improvement and labor, but it occurs to me to suggest, Mr. Pelley, that perhaps in the interim between now and this afternoon you might care to look at some of the press reports on Mr. Eastman's four-volume study which apparently has just been made public, because he deals with this whole question of public aids to transportation, including highway transportation, waterway transportation, and air transportation, and apparently he makes an attempt to evaluate the total amount of public aid to the railroads from the period of construction down to more recent aids by way of R. F. C. and P. W. A. Likewise, he attempts to evaluate the Government aids to waterways in construction of the waterways, and to the air lines in various subsidies, mail contracts, and the like, which have been extended to them. Whether it would be appropriate to go into the matter I do not know, but since we opened it this morning perhaps somebody may want to ask you some questions this afternoon, although it may be more desirable to keep our attention upon the question of employment and technological advance.

Mr. PELLEY. I will be very glad to answer any questions I can. I will have a look at it. I have seen the draft, Senator, some time back, but I have not seen the finished report.

The CHAIRMAN. Of course, to me the significant thing about it is this. I don't want to go into any attempt to analyze the correctness or lack of accuracy in this report or any other report, but it is significant that throughout the history of the Government, ever since the Constitution was drafted and the First Congress sat, we have been appropriating public money for the aid of business of one kind or another. Congress has never ceased appropriating money to stimulate business since it first began to appropriate for rivers and harbors. When the railroads came they constituted a technological advance that put the canal companies out of business. Of course, now the railroads are having their little troubles with waterway and highway transportation again. But the whole problem, so far as those of us sitting on this side of the table see it, is how the Government may aid all forms of business and what adjustments of one to the other can be made so as best to provide full employment for the masses of the people now living, and living each year.

Mr. PELLEY. That is right.

The CHAIRMAN. The committee will stand in recess until 2:15.

(Whereupon, at 12:25 p. m., the committee recessed until 2:15 p. m. of the same day.)

AFTERNOON SESSION

The hearing resumed at 2:20 o'clock, Senator O'Mahoney, the chairman, presiding.

Dr. ANDERSON. Mr. Pelley is with us for an answer to a question you asked him just prior to the luncheon hour.

Mr. PELLEY. Mr. Chairman, that was quite an assignment you gave me during the lunch period, but I want to say that I had seen a draft of this report, and it seems the final report is somewhat similar to the draft. They find some rather astonishing things. The first is that they take the position that governments of all kinds ought to pay 60 percent of the cost of maintaining highways and that the users

of the highway ought to pay only 40 percent, and with that assumption they find that the highways are not subsidized. They call it aid. I call it what it is, subsidy. And that is the basis on which they conclude that the users of the highways are really paying a little bit more than they ought to pay.

We don't agree with that at all. When I say "we" I don't mean the railroads necessarily.

I think I ought to tell you this, that when this draft came out we had a look at it and we employed three very outstanding highway engineers in this country, no one of whom ever earned a penny from a railroad: Dr. Breed, who is the head of engineering of M. I. T., supposed to be one of the best technical schools in the world; Mr. Downs, who is a highway engineer in West Virginia; and Mr. Clifford Older, of Illinois, the father of slab highway construction, one of the most eminent highway engineers in the world. And they wholly disagreed with that. They say that the users of the highway ought to pay about 75 percent instead of 40, and that Government ought to pay about 25 percent.

You can see what a wide difference that would make. This first draft that I saw covered a period of some 11 years. I didn't have the time to check just what years they were, but they were the last 11 years for which figures were available at the time this study was started.

The CHAIRMAN. I suppose it may be said that the users of the railroads pay the entire cost of the railroads.

Mr. PELLEY. That is right.

The CHAIRMAN. And all of the construction charges of the railroads are assessed against that revenue?

Mr. PELLEY. That is right; yes.

The CHAIRMAN. But, of course, it is true that through the years, Government has aided and even subsidized the railroads in their construction program.

Mr. PELLEY. Yes. I say "yes"; I mean no. I will tell you about that just a little later.

The CHAIRMAN. I know your point of view, Mr. Pelley.

Mr. PELLEY. If you want me to—

The CHAIRMAN (interposing). I was going to lead up to this: I realize, of course, that the Government in consideration for that may have been able to obtain a lower freight rate on certain shipments.

Mr. PELLEY. That is right; yes.

The CHAIRMAN. And that is a substantial item and has been through the years. Whether or not that is covered by Mr. Eastman's report, I don't know, but on the other hand, the increased traffic which comes about as a result of the development of highways inures to the benefit of the railroads, at least to some extent—how great an extent, I don't know. That is true, isn't it?

Mr. PELLEY. Oh, yes; it makes a lot of business for the railroads in raw materials that go into the manufacture of automobiles, the finished product itself. Oh, yes; it has made a great deal of—

The CHAIRMAN (interposing). I observed from the report of Mr. Eastman's study this morning that reference was made also to R. F. C. and P. W. A. contributions. What the analysis of those was, I don't remember. But the sum total, as I recall from the newspaper

account was that Government has contributed about \$1,433,000,000 to the railroads in one way or another.

Now, what there is to offset that, of course, I don't know, because I have not read the report.

Mr. PELLEY. I think the railroads got \$1,449,000,000. It is very interesting to analyze his figures, however, when you analyze it and take out of it what ought to be taken out of it, why, it is an entirely different figure altogether.

Now, to get along with this highway thing, I wanted to finish this statement to show you just how far apart we are. In that 11-year period I mentioned, Mr. Eastman's report indicated—and I think the figures are correct, so far as I know—that about \$19,000,000,000 had been spent on highway construction and maintenance during that period.

Well, he said that the users of the highway had paid \$124,000,000 too much; the final report changes that a little. These 3 experts that we employed—and I repeat, no one of them has any interest in the railroads—said that the users of the highways had paid about \$9,750,000,000 too little, so if you would add \$9,750,000,000 to \$124,000,000, you see how far apart these people are, and that only emphasizes the importance of finding out what the real facts are by some authoritative body that is absolutely disinterested except to get the facts, and let the people know what the facts are.

Now, Mr. Eastman says that these large trucks are paying too much, and he gives a scale of how much too much they are paying. As I said to you this morning, only two States have ever made a real study of it, and it was made by the highway departments of those States, Illinois and Missouri. In Illinois they found that these larger trucks were subsidized to the extent of \$966 per truck per year, and in Missouri—and I am sorry Mr. Williams is not here to hear this—they run up to about \$650 per truck per year. The sum total of what I am saying is that this report on highway subsidies doesn't seem to be of very much value.

Mr. PIKE. There is certainly a very wide difference of opinion.

Mr. PELLEY. Of course you see what brings about that wide difference is that these people say that the State ought to furnish 60 percent of the highway, whereas these other people who made this study for us say that they ought to furnish 25 percent.

Mr. PIKE. Of course, you could never get together on a set of facts as long as you started your premises so far apart.

Mr. PELLEY. That is true.

The CHAIRMAN. As I read this story, if I may interrupt, it apparently is just a preliminary to another study.

Mr. PELLEY. I should think so. It couldn't be more than that.

The CHAIRMAN. Because it appears that Mr. Eastman has recommended in this report that a three-man board should be set up by the President to investigate the whole problem of inequities in public contributions to the various transportation agencies revealed by the newly published data.

Mr. PELLEY. I think that is very sound.

The CHAIRMAN. That opens up the whole field and it is probably outside of the scope of the T. N. E. C.

Mr. PELLEY. That is a very sound recommendation.

Mr. O'CONNELL. Mr. Chairman, I apparently precipitated this discussion, and it does take us pretty far afield. I should just like to say that my only reason for mentioning the report was that in Mr. Pelley's statement he was somewhat dogmatic to the effect that other means of transportation were in fact being subsidized to the disadvantage of the railroads, and it occurred to me that the record ought to show at least that there is a very wide difference of opinion between interested people on that particular point. I am perfectly willing to concede that this is not the place for us to discuss the merits of the two positions, but I think it should be noted that there are two positions.

Mr. PELLEY. That is all right. It is pretty generally known that there are two positions, and of course we don't agree at all on this railroad subsidy. I could prove it to you here and now that the Government has made more money out of advancing these so-called subsidies to the railroads than we have, and they have been making about \$7,500,000 a year out of it.

The CHAIRMAN. Thank you very much.

(The witness, Mr. Pelley, was excused.)

Dr. ANDERSON. Mr. Chairman, the second witness for railroad management today is Dr. J. H. Parmelee of the Association of American Railroads. Mr. Parmelee is presenting to you the basic material that is so important in judging this problem, and he is doing so in a booklet that he has prepared for the committee, which we should like to have introduced. We have made exhibit numbers for each one of the displays in the book.

The CHAIRMAN. Then as the witness proceeds with his discussion, if at the appropriate time you will suggest a number—

Dr. ANDERSON (interposing). I think we have given them numbers.

The CHAIRMAN. You want these exhibits to be introduced as he explains it.

Dr. ANDERSON. That is right. This is done so that we will have them in the record. I did want to say by way of compliment to Dr. Parmelee that it is an unusually able, comprehensive statement of the situation. I have never seen so compact an array of data discussing the various ramifications of the railroad problem, and I personally want to thank him for having spent the time on getting such material together for our use.

The CHAIRMAN. Do you solemnly swear that the testimony you are about to give in this proceeding shall be the truth, the whole truth and nothing but the truth, so help you God?

Dr. PARMELEE. I do.

TESTIMONY OF J. H. PARMELEE, DIRECTOR, BUREAU OF RAILWAY ECONOMICS, ASSOCIATION OF AMERICAN RAILROADS, WASHINGTON, D. C.

Dr. PARMELEE. My name is J. H. Parmelee. I am the director of the Bureau of Railway Economics, and have been director of that bureau since 1920, the bureau being one of the units or departments of the Association of American Railroads.

As Mr. Anderson has stated, the bulk of my statement to the committee this afternoon—

The CHAIRMAN (interposing). May I interrupt to ask you what your functions are as director of the Bureau of Railroad Economics?

Dr. PARMELEE. I think our bureau, Mr. Chairman, could be described as the economic and statistical headquarters or clearinghouse of the steam railroads of the United States.

The CHAIRMAN. Maintained by the railroads?

Dr. PARMELEE. Maintained by the railroads as a division of their national trade association. The slogan, if you call it that, or the instructions which the bureau has from the railways which maintain it, are to make as far as we can do so a completely scientific study of transportation problems.

CHARACTER OF THE RAILROAD INDUSTRY

Dr. PARMELEE. My statement to the committee will be largely an explanation, with some analysis, of this booklet to which Dr. Anderson has referred. Before I enter upon that analysis, however, may I make one or two general statements about the railway industry as a sort of background for the presentation of this material? I do not need to call the attention of the committee to the fact that the steam railway industry in the United States is the only Nation-wide carrier of general commodities. It has a Nation-wide network over the whole country; it serves all the cities and all the States and a great portion of the smaller cities and towns, and it enters into 96 percent of all the counties of all the States of the Union. It is the one indispensable carrier of freight serving every day regardless of weather conditions, climatic conditions or otherwise; and it is always called upon with unusual emphasis at times of emergency, in times of flood and other natural catastrophe or in times of national, political, or social emergency.

Despite the rather heavy competition with which the railroad industry has been confronted in recent years, it still handles more than 60 percent of the total commercial freight traffic of the United States and more than 50 percent of the total commercial passenger traffic of the United States. In addition to being the outstanding commercial traffic agency of the United States, it is, as has been pointed out to the committee, already a large employer of labor, having 1,000,000 or more men in its employ at the present time; it is a large purchaser of the commodities produced by other industries. For example, it purchases some 25 percent of the total coal produced in this country. It produces and uses some 20 percent of the total steel and iron products of the United States. It utilizes 60 percent of the steel-rail output, which is, of course, to be expected.

It utilizes some 20 percent of the total timber cut in this country, and it utilizes smaller proportions of a large number of other commodities, cement, and other items that are used in operation or in construction.

It has been estimated that for every man employed directly by the railroads through their purchases of supplies they furnish employment indirectly to at least one other man. In other words, that for the million men who are employed by the railways there are probably at least another million men whose employment indirectly depends upon the purchases made by the railways.

The railway industry in addition is a large taxpayer. Its taxes last year amounted to about \$1,000,000 a day, or \$365,000,000, and all of those taxes, as has been pointed out to the committee, go directly for governmental purposes. In other words, none of it goes back to the railroads for the purpose of maintaining their own highways, the highways over which they operate.

There are some differences, however, between the railway industry and other industries. Some of these have already been mentioned in your previous discussion, and I can mention them, I think, rather briefly and pass on. The railroad industry is one of the most completely coordinated industries in the United States. Although several hundred different units, corporations, operate the railways, all having a separate legal identity, they do operate more or less as a common system. This comes about through the fact that they have a standard gauge of track, they have completely interchangeable locomotives and cars, not only as to the complete units of equipment but also as to the various accessories, two of the most important of which are the standard coupler and the standard air brake, which are interchangeable on all cars; and finally they have an arrangement by which freight cars travel, regardless of their ownership, over the lines of all railways freely from one end of the country to the other. Under the arrangements laid down by the Interstate Commerce Commission, they operate on joint rates and routes so that freight and passengers can be shipped or travel from almost any one point in the United States to almost any other point on a joint rate.

For these reasons the railway industry can be looked upon in a certain sense as a coordinated industry, working as a common unit for a common end.

Again, the railway industry is a service industry. That fact was also mentioned this morning. Being a service industry it may not produce its product and store it in advance, as many other industries may. It produces its product, which is the service of transportation only, as and when demanded. One result of that situation is that the railway industry may not build up a surplus of product over a given period, perhaps employing labor for that purpose, and then close down or relax its efforts during a period of slight demand, but it must continue to operate, regardless of the demand, 24 hours of the day, 52 weeks in the year.

It must always be ready to serve any demand which may be made upon it.

Again, the railway industry is, as has been stated, a strictly regulated industry, probably more so than any other single industry in the United States. That leads, among other things, to a certain amount of reduction in managerial discretion, and also to a certain inflexibility in its rate structure, which is its price structure, which makes it difficult to pass certain added costs on to the public.

Finally, the railroad industry has been and is confronted with this very perplexing problem of competition, to which the committee has already given considerable attention, and I need not dwell on that point further.

Now the railway industry of this country is classified by the Interstate Commerce Commission into two general groups—what the Commission calls line-haul railways, which operate between terminals, and

the so-called switching and terminal companies, the latter being what may be considered to be the small links in the large network to which I have referred. They do the switching work in and around terminals, they are the connecting links between railroads in terminals, and to some extent they operate bridges and ferries. In the general statistics which the Interstate Commerce Commission uses, switching and terminal companies are seldom included, not because they are not an important part of the railroad system, but because the very nature of their work makes it difficult to secure comparable statistics to those of the line-haul railways.

Attention is usually devoted to the line-haul railways, the second large group, those which operate between terminals.

Now, there are in this country a total of 896 operating railway companies as reported by the Interstate Commerce Commission, of which 244 are switching and terminal companies. Deducting that figure from the total, we have a remainder of 652 line-haul companies. However, of those 652 companies, only 136 are classified as class I companies; that is, companies whose annual revenues are in excess of \$1,000,000 per year each. They are sometimes known as million-dollar railways.

The CHAIRMAN. How many of them?

Dr. PARMELEE. One hundred thirty-six, Mr. Chairman, and those companies operate 94 percent of the total line-haul mileage and take in 97 percent of the total line-haul revenue. So that while they are less than one-fourth in number they are from 94 to 97 percent in terms of traffic and mileage importance.

The CHAIRMAN. Is there any interrelationship among them?

Dr. PARMELEE. Control, you mean? Yes; in some cases there are companies which have 50 percent, or more or less, interest in other companies.

The CHAIRMAN. Have you made any study or calculation which would enable you to say how many groups there were in terms of control among the 136?

Dr. PARMELEE. No; I have not in just that way. The Interstate Commerce Commission publishes each year a list of all the railway companies in the United States and does just what you suggest. That is to say, where there is any common relationship between railroads they put them all in one group and indicate exactly what is the nature and extent of the relationship between them.

Dr. ANDERSON. Mr. Parmelee, do you remember the last figures from the Interstate Commerce Commission? Out of those 136 roads, how many independent class I roads would we have, considering affiliations?

Dr. PARMELEE. I don't believe that I could answer that question specifically. I would say, however, that the number would not be greatly reduced. There are some affiliations among the larger companies. There are more affiliations, however, in the sense that some of the larger companies control some of the smaller ones, and in that way have created what we consider to be a railway system.

Dr. ANDERSON. Is the trend in the direction of further concentration, through control either of other class I controlling affiliates or of class II railroads? Is there a trend?

Dr. PARMELEE. I would say the trend is not very marked at the present time, largely because of the consolidation provisions in the

Transportation Act of 1920, and partly because of the depression during the past 10 years.

Mr. PIKE. Things are in reverse really at the moment, aren't they, Mr. Parmelee, with some of the 1920 purchasers turning out to be no control at all, Missouri Pacific, Erie, the New Haven, to some extent? Those common shares are either going to disappear or represent such a small amount of control that the control is going back to the public.

Dr. PARMELEE. To the extent that the stock is being wiped out as it is in a number of these reorganizations.

Mr. PIKE. Two of those organizations will be wiped out entirely, and the third one—

Dr. ANDERSON (interposing). What you are saying is, isn't it, Mr. Parmelee, that the reason for the failure of the trend toward concentration is that certain legal enactments and other noneconomic artificialities are preventing it?

Dr. PARMELEE. I don't like to put it in quite that language. It is a fact that the Interstate Commerce Commission has for a number of years recommended to Congress that the consolidation provisions of the Transportation Act be repealed, at least that part of those provisions which set up the general plan. The economic depression of the past 10 years has done these two things which have been mentioned: It has slowed down for obvious reasons any desire to build up larger systems, and it has, as Mr. Pike indicates, or is having, at least, a trend toward wiping out the present common, and in many cases even the preferred, stockholder.

Now, with that brief introduction, Mr. Chairman, may I turn to this statement which is before you?

The CHAIRMAN. Now, your introduction has had to do principally, however, with the general phases of the railroad industry, the general problem, hasn't it?

Dr. PARMELEE. I was trying to give you a very brief picture of the industry as we have it spread before us, Mr. Chairman; yes.

The CHAIRMAN. Now, before you begin to comment upon your various tables and exhibits, would you care to make any general statement about the relationship of the technological advance of the railroad industry and the problem of employment?

Dr. PARMELEE. May I answer you this way, Mr. Chairman? I was about to say in introducing this statement, that one of the things that I think it will show the committee, and I think it speaks eloquently on that subject, is that there has been over a period of years a very marked advance in technology.

After I get through with the statement, I was going to turn, if I may, to some of the specific things which have been done in the railroad industry which have brought these technological advances about, not going into detail, of course, for that would be out of the question. Time would not permit, and I am not a technical expert, but I was hoping that after that had been shown to the committee, if there were any questions as to some of these more general matters, we might discuss them at that time.

Mr. O'CONNELL. May I ask two questions with reference to your general statement? One was a statement to the effect that it had been estimated that an indirect employment of about a million men was generated by the operation of the Bureau of Industry. How is that computation arrived at?

Dr. PARMELEE. That is a rather general estimate. I can only tell you who is responsible for the estimate: the officers and some of the research people of the Railway Business Association, which is a trade association of those who manufacture railroad supplies, equipment, and so forth. They have made their own studies, and have arrived at that conclusion, which is purely an estimate and can be nothing else.

Mr. O'CONNELL. In looking at one of your tables, I noted that in the past 8 or 10 years, the amount spent for equipment and on roadways, construction, and so forth, was very substantially less in amount per year than had been the case during the twenties.

Dr. PARMELEE. Yes.

Mr. O'CONNELL. That would seem to me to indicate that whatever indirect employment was being created during these recent years was probably not as great relatively as it had been during the previous decade, when much more money was being spent for maintenance and new equipment.

Dr. PARMELEE. That is true. Those figures fluctuate up and down, and they are in line with the volume of purchases and the volume of capital expenditure.

Mr. O'CONNELL. But that indirect employment consisted in large part, at least, of employment created in producing such things as new rolling stock and equipment, and so forth.

Dr. PARMELEE. Equipment, steel rails—2,000,000 tons of steel rails in the course of a year make a good deal of employment—production of ties and ballast, fuel, and any one of the 70,000 different items the railroads purchase.

Mr. O'CONNELL. Then the other question I had was about the statement you made to the effect that the price structure, so to speak, or the rate structure, was somewhat inflexible, partly, at least, because of Government supervision, and you indicated that that made it somewhat difficult to take into account increases in cost, since the inflexible rate structure made it difficult to pass on increases in cost. That would also put you, you say, on the downswing. Would it be as difficult to pass on decreases in cost, because of the inflexibility of the rate structure?

Dr. PARMELEE. Well, the competitive pressure on the railroads to reduce their rate is so great and has been for some years, that, generally speaking, it is much easier to secure a reduction than an increase. I am speaking of rates. And the reductions have been made in a great many commodities, hundreds of them, in fact, over recent years, when it would probably be very difficult to get increases on the same commodities and to the same extent.

Mr. O'CONNELL. You mean that an application for reduction in rates would be more apt to be favorably handled by the regulatory agency than an application for an increase?

Dr. PARMELEE. An application for a reduction, generally speaking, is not complained of by anyone, and about the only time that it would be even suspended and considered would be when there was a complaint, possibly by some other railroad.

Mr. O'CONNELL. Or by some of the competitors?

Dr. PARMELEE. Or by some interested shipper, or if some member of the Commission staff felt that a proposal was being made to effect

a cut which might go below the reasonable minimum and might upset the rate structure with respect to that particular commodity.

The committee does occasionally step in and in effect establish a minimum below which it will not permit a carrier to go. But those are occasional instances.

Mr. O'CONNELL. Just a question on procedure. When the railroad proposes to increase or change a rate-structure, either in the upswing or the downswing, what do they do, file a new tariff schedule?

Dr. PARMELEE. The tariff is filed with the Commission, and it remains on file 30 days. If no objection is raised or no suspension is made by the Commission itself, it goes into effect automatically. It may be suspended, however, and of course, if a complaint is filed, the Commission usually suspends it and has a further investigation.

I said a moment ago, Mr. Chairman, that I thought this little booklet would speak eloquently of the progress of the railroads in the field of technology in recent years, and when I use the word "technology"—I am going to use it frequently—I am willing to adopt the definition submitted to the committee last week by Dr. Kreps.

So far as the railroads are concerned, I think we might use the word "technology" as merely everyday language, meaning "progress in the art of good railroading." I think the committee would understand what that means in all of its aspects.

PHYSICAL PLANT OF THE RAILROADS

Dr. PARMELEE. May I direct your attention first, Mr. Chairman, to page 7 of this booklet, which has been submitted to the Committee under the general title of *Railways of the United States, Their Plant, Facilities, and Operation*, and is dated 1940.

Page 7 is submitted as "Exhibit No. 2491," the upper half of the page. I think there is little comment needed on this exhibit, Mr. Chairman, except to point out that the peak of miles of road, so far as the period covered by this table is concerned, was in 1929 when 260,570 miles of road were operated in the United States.

(The table referred to was marked "Exhibit No. 2491," and is included in the appendix on p. 17350.)

Dr. PARMELEE. This table, by the way, applies to all line-haul railways, not just the Class I railways. In 1939 that total had been reduced to 246,800. The reduction, however, in the final or right-hand column, "Total, all tracks," has not been so great. "All tracks," the committee will understand, include not only miles of road—that is, mileage extending between termini—but includes the second main track, the third, fourth, fifth, and sixth main track, each counted as a single mile, and it includes also the so-called yard tracks and sidings, yard tracks being the tracks within terminals, and sidings being sidings out on the road, mostly for the purposes of one train passing another.

Senator KING. There are many miles of tracks in the large stations, are there not? For instance, take the station here in Washington. When you look at the tracks, you would think you have far too many sidings of tracks; they parallel each other there. I would imagine it would be 40 or 50 tracks.

Dr. PARMELEE. That is true in the larger terminals, and you will notice that the yard tracks and sidings total 121,000 miles throughout

the United States, a considerable mileage. What I was about to say, Mr. Chairman, is that the percentage reduction in the total tracks has not been so great as in the miles of road. So that to some extent the industry, while it has been abandoning and cutting down some of the branch lines, has on some of its main lines been actually in some cases increasing its second and third main tracks, what you might call its subsidiary tracks. In other words, its growth has been in a sense intensive within the industry, and not extensive.

That will be brought out, I think, by looking at the lower half of page 7 of the booklet, "Exhibit No. 2492."

(The table referred to was marked "Exhibit No. 2492" and is included in the appendix on p. 17350.)

Dr. PARMELEE. That shows the miles of road constructed and the miles of road abandoned in each year from 1921 to 1939, together with a total for the period. You will observe that during the period as a whole, 19 years, 7,377 miles of new line were constructed, whereas 22,180 miles were abandoned, indicating a net loss of about 15,000 miles.

Senator KING. Did the new lines extend from one city to another where there had been no railroad communication previous to that time?

Dr. PARMELEE. If there had been no prior railroad communication; yes, sir; but in some cases, Senator, a proposal to add lines between cities where communication already exists has been turned down, either by the I. C. C. or by some State commission, on the grounds that there was adequate service already in that particular section.

Senator KING. What I was trying to get through my mind is whether "new lines" meant into fields which had no lines, or whether it included parallel lines between two points, added because of increased service or for reasons which seem best to the user of the line.

Dr. PARMELEE. If it happened to be a new company putting in the field a paralleling line, that would be counted. I was trying to point out that there would be very little of that sort of thing, mostly new lines in new territory, I think, and you will notice from the footnote these figures do not include adjustments, reclassifications, relocations, and so forth, within the industry; they are actually new lines of railroad.

Now, this loss of 15,000 miles during that period may seem to be serious, but when it is considered that that 22,000 miles of abandonment is practically all branch lines, and all of it has been subjected to careful investigation by the Interstate Commerce Commission before the abandonment may take place, all those facts taken together indicate that the abandonments were economically justified and that on the whole, they probably strengthened rather than weakened the railroad structure as a whole.

The railroads have not abandoned any of their main stems of railroad mileage in recent years. That, I think, is a point of sufficient importance to emphasize to the Committee.

Dr. ANDERSON. Dr. Parmelee, the question I wanted to raise was a trend in abandonment. In your table, the heavier years of abandonment coincided with the trough of the depression, more than half the 22,000 miles of abandonment of roads occurred from 1932 to 1939.

I was wondering whether you would care to comment on whether it is an economic procedure that forces abandonment, or what.

Dr. PARMELEE. I would say it is a cumulative procedure which grows out of both the impact of competition and the depression. Sometimes abandonment is proposed and either suspended or actually denied by the Commission. Then it is brought in again a year or two later, and at that time secures a favorable response.

In other words, these things accumulate as you go along, and I would say, speaking rather generally, that it was a cumulative procedure.

Dr. ANDERSON. Well, if that is true, how do you account for the fact that the second column, '31 through '39, shows about double the rate of abandonment as the first column, 1921-30, representing relatively good years.

Dr. PARMELEE. I think that follows from what I said. The second column to which you refer is the period of this depression as against the first column, which was a period on the whole of rather good business. But as the depression went on, and also as the competition was increased, which has been true of the last 10 years, you have this cumulative effect and the cumulative stimulus to abandon mileage and economize.

(Senator King resumed the chair.)

Dr. ANDERSON. Now a further question. There seems to be little or no diminution in the yearly rate of abandonment except for 1933. Would you care to hazard a guess as to what the future holds in terms of abandonment of railroads?

Dr. PARMELEE. I don't think anyone could make a guess on that. I would say that a certain amount of abandonment is necessary, even in good years, as business shifts. In some cases abandonment is due to the fact that a particular forest area is cut over, or some other natural product is exhausted, or something of that sort. Businesses move from one place to another and business conditions bring it about that certain lines of railways lose a large part of their traffic. All those things go on at all times so that I would say it is very hard to answer.

Mr. PIKE. It is possible, isn't it, Mr. Parmelee, that it is easier to effect an abandonment of a road if it has gone into receivership than it is when the parent road is in good financial condition, is able to take losses in a general pinch? I was thinking particularly of a reorganization plan brought out for the New Haven over this last week end. In that plan the lease by which the New Haven controlled the Old Colony is disavowed. If it goes through, the Old Colony disappears from the New Haven system, and there is substantial doubt as to whether it can exist as a separate road. If the New Haven were not in receivership it could not disavow the lease. I think there might be some time during receivership where a road with a great many miles of light-traffic branches could make its willingness to abandon more effective than if it were in a good financial position.

Dr. PARMELEE. Yes; I think it may be that in the process of reorganization an abandonment may more easily be brought about. However, I think that public resistance to abandonment is no less in the case of a reorganization than if the carrier is a prosperous one.

Mr. PIKE. It is merely that the receivership road can say, "Well, we are not going to keep this lease. As far as we are concerned the abandonment is effective. The child now is on your doorstep, not on ours."

Acting Chairman KING. While it isn't pleasant to point out our losses and business failures, have you any evidence tending to show losses to those who have invested, primarily, in the construction of railroads, and, secondarily in their stocks and bonds, during the past 10, 15, or 20 or 30 or 40 years?

Dr. PARMELEE. Losses from what source, Mr. Chairman?

Acting Chairman KING. Losses by those who have constructed railroads, put up the capital for their construction; the railroad has gone into the hands of the receiver, and the original stockholders lose all they put in; the bondholders lose perhaps all they advanced. Is there anything to indicate the aggregate losses sustained by those who have made investments directly and indirectly in our railroad system? It goes, perhaps, into hundreds of billions and much farther.

Dr. PARMELEE. I know of no figures on that, Mr. Chairman, but as you say it must be up in the billions.

Acting Chairman KING. Is there any capital available now of a venturesome character, or any character, for the construction of railroads?

Dr. PARMELEE. Mr. Pelley touched on that this morning. I might say very briefly I think I know what was in his mind. He said he thought that if some of these handicaps which he outlined were removed, new capital would be available, not of the stock variety perhaps but loan capital on very favorable rates of interest. That is true today so far as our equipment obligations are concerned. A railroad in receivership or in the hands of trustees the other day sold an issue of equipment trusts at a net figure of 2 percent per year. They were in the hands of trustees, if you please, and some of the more prosperous railroads have done better than that. Now, the mortgage bonds are in a little different class, of course, but even there, Mr. Chairman, when the conditions are somewhat more fully stabilized they will be able, in our opinion, to continue financing on a conservative basis.

Acting Chairman KING. Then the receivers' certificates would have a greater value than the stock or the bonds in some of these roads which are in the hands of receivers?

Dr. PARMELEE. By value I assume you mean security—a prior lien, in other words.

Acting Chairman KING. Marketable value.

Dr. PARMELEE. Yes; probably, because they have a prior lien.

Acting Chairman KING. You have indicated there that receivers' certificates would be sold at 2 percent interest?

Dr. PARMELEE. Oh, but that isn't a receiver's certificate, Mr. Chairman; that is an equipment trust obligation; that is a mortgage on the equipment, and that was put out by the company, by the corporation, not by the receiver.

Now, the people who bought those certificates evidently expect that company, that particular company, to come out of the hands of trustees in a short time, and make enough money out of their operations to meet the payments on the equipment.

Acting Chairman KING. Well, I assume there are sometimes multiple indebtednesses; the indebtedness to the original stockholders, then the indebtedness to the bondholders, then the indebtedness to the mortgagees, and then indebtedness to the receivers, and then indebtedness such as you have just described, so there would be several layers of indebtedness.

Dr. PARMELEE. There are several layers over layers on some of the properties.

Dr. ANDERSON. Mr. Parmelee, one more look at this construction side of the chart. I take it that construction of new railroad miles means use of labor?

Dr. PARMELEE. Yes; of course.

Dr. ANDERSON. And therefore of materials?

Dr. PARMELEE. And materials, and a radiating influence.

Dr. ANDERSON. So that anything that could be done to stimulate railroad construction to bring it back to the period '21-'29 would be most beneficial to labor?

Dr. PARMELEE. Yes; there is no question about that.

Dr. ANDERSON. If you will note the period from '21 to '29, you will see that the range was considerable, from something around 946 miles of road in the peak of '28; with a decided drop in '31-'32, to 149 in 1937, which Mr. Pelley indicated was an unusually dynamic year in the railroad industry. Do you care to hazard a guess as to what the future might hold by way of a reasonable year-by-year occupation of the field? Could it correspond to the period '21-'29?

Dr. PARMELEE. I wouldn't even like to hazard a guess on that because a great deal depends on the development of certain kinds of traffic in new territories, and things of that sort. The development of oil in the Texas field made a good deal of business for some companies. I haven't any doubt that that mileage in the Texas field is included in this 1921-30 group that you speak of. To what extent we will have things of that kind in the future I am unable to say.

Dr. ANDERSON. In your studies you undoubtedly have gone into detailed analyses of miles of new road constructed. Have you come to any conclusion, from past experience, as to the type of new roads likely to be constructed?

Dr. PARMELEE. I would say it would be very largely in new fields.

Dr. ANDERSON. Dependent upon the general business situation.

Dr. PARMELEE. Oh, yes; almost entirely, and particularly new enterprise.

Acting Chairman KING. Well, those new enterprises that you have in mind would be largely in the present manufacturing and industrial centers, would they not?

Dr. PARMELEE. Not entirely, Mr. Chairman. Going back to my Texas oil fields illustration, there was development of a natural product, an exploration. The Texas fields, I understand, are the largest fields in the world now. That would not have been suspected a few years ago.

Mr. PIKE. If I am not mistaken, Mr. Parmelee, most of that mileage that was built down there was in the Lower Rio Grande Valley by the present subsidiaries of the Missouri Pacific and up in the Panhandle by the Santa Fe, mostly to get at the prospective wheat lands of western Kansas and the Texas Panhandle. I think if you look at

it you will find really very little actual extension of mileage built to serve oil fields. The Texas & Pacific goes through most of them, but there was very little real extension of mileage, as I remember.

Dr. PARMELEE. There has been some.

Mr. PIKE. Oh, some, but I don't think very much. I think you will find most of that was agricultural.

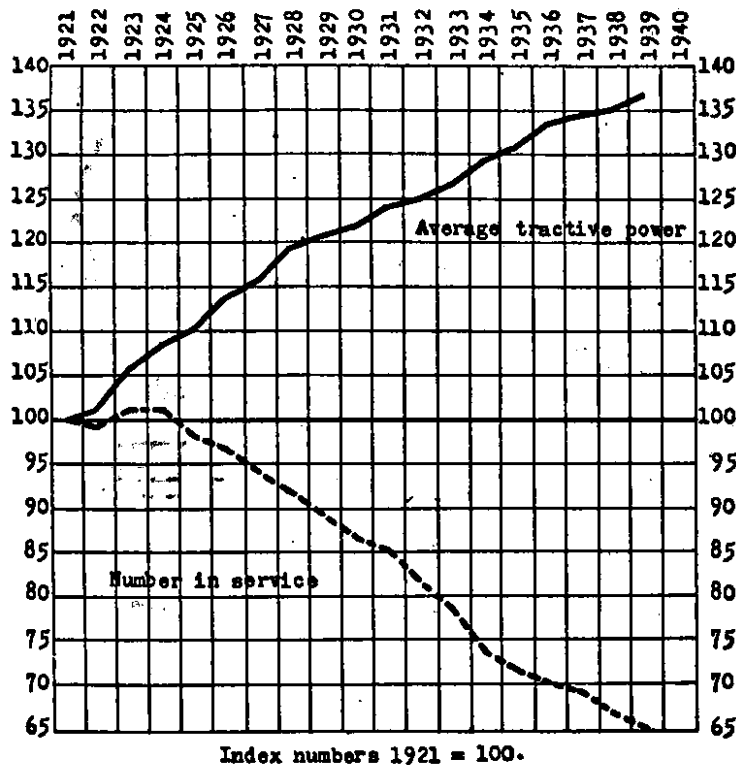
Dr. PARMELEE. I was using that as illustrative.

I would like to turn your attention, Mr. Chairman, to the chart and supporting table on page 8.

(The chart referred to was marked "Exhibit No. 2493" and appears below. The statistical data on which this chart is based are included in the appendix on p. 17351.)

EXHIBIT No. 2493

LOCOMOTIVES - NUMBER AND TRACTIVE POWER,



NUMBER OF LOCOMOTIVES IN SERVICE

Dr. PARMELEE. That shows the number of locomotives in service of railways of class I at the end of each year 1916 and 1921 to 1929, and the average tractive power of steam locomotives in pounds per unit. I would direct your attention primarily to the chart, which shows that whereas taking 1921 as 100 there was an almost

steady and rather sharp decline in the number of locomotives in service down to about 65 in 1939; there was also a rather sharp upward trend in the average tractive power, from 100 in 1929 up to 137 in 1939.

Acting Chairman KING. Was that increase due in part to the development of the Diesel engine?

Dr. PARMELEE. Very little. These are just steam locomotives.

Now the net result of the smaller number and larger tractive power of locomotives was that the aggregate tractive power, which is perhaps the important thing to think about, declined 11 percent in that period. Someone may say, "Well, did you have enough power? Did your business drop off during that period, and did you have enough locomotives with that 11 percent drop in locomotive power to take care of the business?" Between 1921 and 1939 there was actually a decline of 4 percent in the business—when I say business there I am including the freight and passenger business in terms of traffic units—so that you had a decline of 11 percent in power and a decline of 4 percent in business. The answer to the question whether you had enough locomotive power in 1939 is found, I believe, in the fact that during the whole of 1939 you had a very good surplus of locomotives in serviceable condition, a large number of them in white lead, that is, joints painted with white lead and put away as a reserve against the need for more power. Now the maximum number of locomotives so stored during the year 1939 was 3,845. The minimum number was 1,507.

Mr. PIKE. You had to pull them out pretty fast in September.

Dr. PARMELEE. The minimum, I was about to say, came during the peak traffic in the fall. The average throughout the year was 2,828. That would seem to give the answer to the question about power in the year 1939.

The same general answer, I think, would be made to the question with respect to freight-carrying cars shown in the chart and supporting.

(The chart referred to was marked "Exhibit No. 2494" and appears on p. 16559. The statistical data on which this chart is based are included in the appendix on p. 17351.)

Dr. PARMELEE. Here, too, you will observe, looking at the chart, that the number of freight-carrying cars in service declined rather rapidly from 100 in 1921 to 70.5 in 1939. At the same time, the average capacity of the freight-carrying car in tons was increasing, reaching a total of 117 in 1939 as compared with 100 in 1921.

The net of those two trends was a decline in aggregate tractive power of 14.7 percent. The freight traffic showed a decline over the same period of 8.7 percent, that is ton-miles, so that we have a decline in traffic of 8.7 percent and a decline in capacity to handle the traffic of 14.7 percent. Was there enough capacity to take care of the business in 1939? The answer there, too, is found in the figures of freight-car surplus during the year. There was no appreciable car shortage during the year, although on a few occasions there were a few hundred cars short at one or two places, the shortage being, I think, in every case taken care of within a period of 24 hours, so that speaking generally it may be said that there was no car shortage in 1939. There was a surplus of cars at all times during the

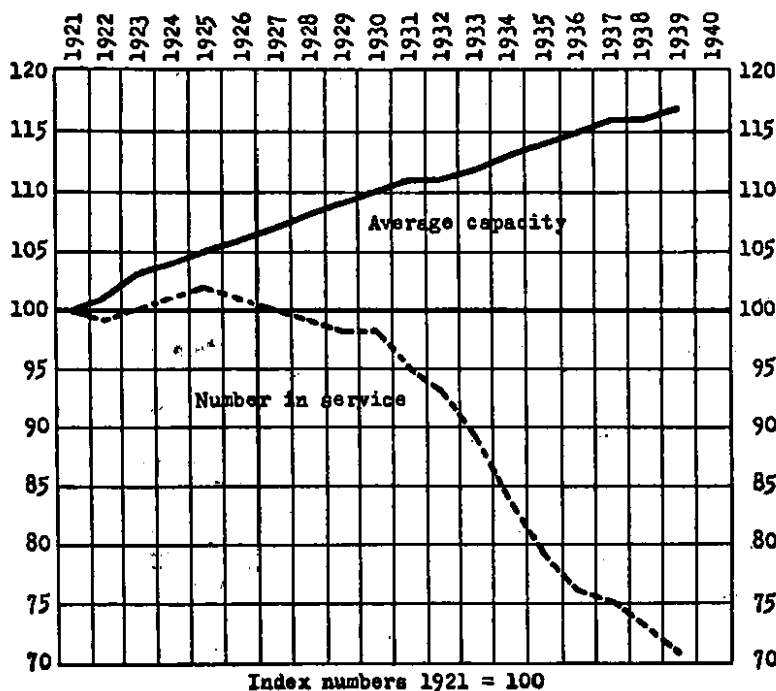
year, the average for the year being 194,000 in round figures, with a maximum of 291,000 and a minimum of 84,000, even at the time of peak traffic.

Acting Chairman KING. I don't quite follow your last statement. Where do you find the figures or proof on page 9 in support of what you have just explained?

Dr. PARMELEE. Those figures do not appear on the page. I was simply giving them to the committee as an answer to the question as to whether in view of the trends shown on this chart there was or was not adequate freight-car capacity in 1939.

EXHIBIT No. 2494

FREIGHT-CARRYING CARS



Mr. HINRICHS. Is 1939 a critical year as a test of the adequacy of capacity? Anticipating slightly on page 17 of your report, you show the tons of revenue freight originated as 1,016,000,000 in 1937, 902,000,000 in 1939. As a whole 1939 was a year of rather low business, and I thought that it was in 1937 that railroads received some test of the pressure of relatively full volume against capacity. The question that is asked with reference to railroad capacity now is not so much whether it adequately handled the traffic originating in 1939 as whether it could handle the sort of expansion of business that might reasonably be anticipated beyond 1939 levels.

Dr. PARMELEE. I think that is a very proper question to ask, Dr. Hinrichs, and I might answer it this way: You can speculate a good deal about these things; I think we all appreciate that. I think the test for railroad traffic came last fall during the 4 months from Sep-

tember 1 to the end of the year. From August to October, as you know, we had the largest relative rise in freight traffic that we have ever had in that same 2 months, and the actual freight traffic for the last 4 months of '39 was slightly greater than for the last 4 months of '37. It was at that time that the real test of railroad capacity came and the railroads, with the slight exceptions I have mentioned, met the test.

Mr. HINRICHS. But now let's see; the last 4 months of 1937, in terms of business activity, showed a general falling off. That decline became very sharp in October, at just the time that the railroads are ordinarily called on to meet the seasonal peak in the movement of agriculture. That is, you squeezed through 1937 partly because a decline in manufacturing volume occurred when you were meeting your usual seasonal peak in agriculture. Was that so?

Dr. PARMELEE. Yes, that is true; the peak almost always comes in October. I did not mean to enter into an argument with the committee as to whether we have enough equipment in hand, that is, freight cars, to take care of possible future increase of business; but I am simply using the last year we do have here on this chart, '39, and answering that question as to '39. Now, the important thing is to have equipment enough to meet the peak in each year. You don't have to worry very much about the rest of the year if you can meet your peak traffic demand. That is why I compared the peak in 1939 with the peak in 1937. Now, at the same time, we should recognize that on January 1, 1940, the railroads had more freight cars on order, new cars, than they have had on January 1 for a number of years. I haven't those figures in front of me, but that is a fact, so I think we can take that into account in this evaluation of the freight-car capacity of the railroads at the present time.

Acting Chairman KING. I want to ask, in view of several questions which have been asked, have you sufficient facilities now to meet not only the present demand but the immediate future demand for freight and passenger cars so far as you can judge what the future will bring for it?

Dr. PARMELEE. I wonder if you are willing to let Mr. Pelley answer that question.

Mr. PELLEY. Yes; we have, Senator, enough equipment and can get enough in time to meet any transportation emergency that might arise. To answer Mr. Hinrichs a little further, I think, last fall there was a great deal of apprehension as to whether or not we could handle the business because nobody knew where it was going to go. As the doctor said, we had the most precipitous rise in railroad traffic, August to October, that has ever occurred on the American railroads.

Acting Chairman KING. In the same time.

Mr. PELLEY. Yes, sir; the same period of time. It went up more quickly than ever before. Of course, the war was on and everybody who was around here during the other war began to think right away, "Will the railroads be able to handle it?" There was much interest, proper interest too, for that matter, and some apprehension, I think, that was due more to experiences of certain shippers and certain company officers during the previous war, but at no time was our capacity threatened, and we would have taken care of it if business had kept on going up; I wouldn't say how far, but we were not alarmed about it. We were very sorry that it quit going up. My com-

plete answer to you, Senator, is that we can meet any transportation emergency that might arise, no matter what the conditions are, whether we should become involved in this turmoil or not. There would be no apprehension on the part of the railroads as to whether or not we would be able to meet any situation that might arise.

Acting Chairman KING. That rather precipitous rise in demand for transportation grew out of the situation abroad, did it not?

Mr. PELLEY. Absolutely, I think partly in anticipation of price advances; people bought before they were quite ready, and deliveries were made before they were supposed to have been made; and partly because of anticipation of delay in receiving what one might order. The two things put together, I think, caused this precipitous increase. We moved goods in November and December that might otherwise have been moved in January and February. I have had shippers tell me that. I know that is true.

Mr. O'CONNELL. Does your organization have any figures or have you made any study as to the physical characteristics or age distribution of such things as your freight cars? I have heard it said that most of the freight cars or a very substantial amount of your rolling stock was quite old, say, 20 years or more. Do you happen to have any study on that?

Mr. PELLEY. We have figures but we haven't got them here. We could get them for you.

Mr. O'CONNELL. I think it was testified before the committee considering the financing bill last year that 40 percent of all the freight cars in the country were more than 20 years old and that only 3 percent of the locomotives now in use had been built within the past 10 years, and other testimony along that same general line. It occurred to me that the ability of the railroads to meet a continued high peak of operations would depend somewhat upon the ability of the existing equipment to stand the gaff over a period of time. Wouldn't that be a problem?

Mr. PELLEY. Yes; but, as I said this morning, a rebuilt locomotive is as good as it was, practically so, when it was new. The same applies to a rebuilt car. We have not as much obsolescence of equipment as is generally felt to be true. I haven't the exact figures in my mind, and I don't know that Dr. Parmelee has them, but we would be glad to submit them.

Acting Chairman KING. I understood Mr. Pelley's testimony this morning to be that your locomotives were practically as good as new, if they were not entirely new, because of your maintenance expenses and charges, and the same with your cars, so that your cars were all in good condition.

Mr. PELLEY. I wouldn't say that, Senator, but as a matter of fact someone quoted some figures from me this morning, I think, concerning the percentage increase in business that we were able to handle, that we could handle 25 percent more than last year, and by repairing the locomotives and cars in bad order we could handle 45; I think we probably said 40 this morning. Of course this acceleration in business last fall brought about some very extensive repair programs. Some railroads reduced the bad orders to a minimum, hoping that this business would continue, so our bad-order situation is much better than it was a year ago, and it is very well in hand.

We would like to have an opportunity to run a race with this business and see if we couldn't keep ahead of it.

Dr. PARMELEE. Right on that point, Mr. Chairman, it may be interesting to the committee to know that between August and January, which is the latest month for which we have figures, the railroads reduced their percentage of unserviceable or bad-order freight cars from 12.2 percent down to 8.6 percent. An average of about 6 percent is regarded as normal. You always have certain cars in the shops and so on, so you can't reduce your percentage to zero, but if you have no more than 6 percent of your cars in bad order you are considered as being in very good physical condition.

I would like to proceed, if I may, with some of these exhibits, moving along as rapidly as possible, because your time is running short.

Turning to page 10, "Exhibit 2495" shows the number of locomotives of different classes and the number of freight-carrying cars installed in each year from 1927 to 1939.

(The table referred to is marked "Exhibit No. 2495" and is included in the appendix on p. 17352.)

INSTALLATION OF NEW EQUIPMENT

Dr. PARMELEE. I would like to call the attention of the committee at this point to a factor which I shall refer to again, which has already been referred to, that the somewhat improved business of 1937 had a heartening effect on a great many different activities of the railroads.

You will notice looking at this exhibit that the number of steam locomotives installed in 1937 showed a considerable increase over those of the next preceding 4 or 5 years, and was greater also than in any year since. And the same thing is true of the freight cars.

The table at the bottom of page 10 is a statement of the number of passenger-train cars in service, class I railways, each year down to 1939.

(The table referred to was marked "Exhibit No. 2496" and is included in the appendix on p. 17352.)

Dr. PARMELEE. Now, there, too, I would like to make the comment in passing that between 1921 and 1939, while the number of cars in service declined about 30 percent, the business in terms of passenger-miles went down about 39 percent. So that the demands on the passenger-car capacity declined faster than the capacity itself.

Page 11 also shows a chart and supporting figures. It shows the number of long tons of rails laid each year from 1921 to 1938, and the number of wooden ties laid, classified as treated and untreated. You will notice that here, too, the number of tons of rail and the number of ties laid in 1937 showed an increase over preceding and over succeeding years.

(The chart referred to was marked "Exhibit No. 2497" and appears on p. 16563. The statistical data on which this chart is based are included in the appendix on p. 17353.)

Acting Chairman KING. That table doesn't show 1939, does it?

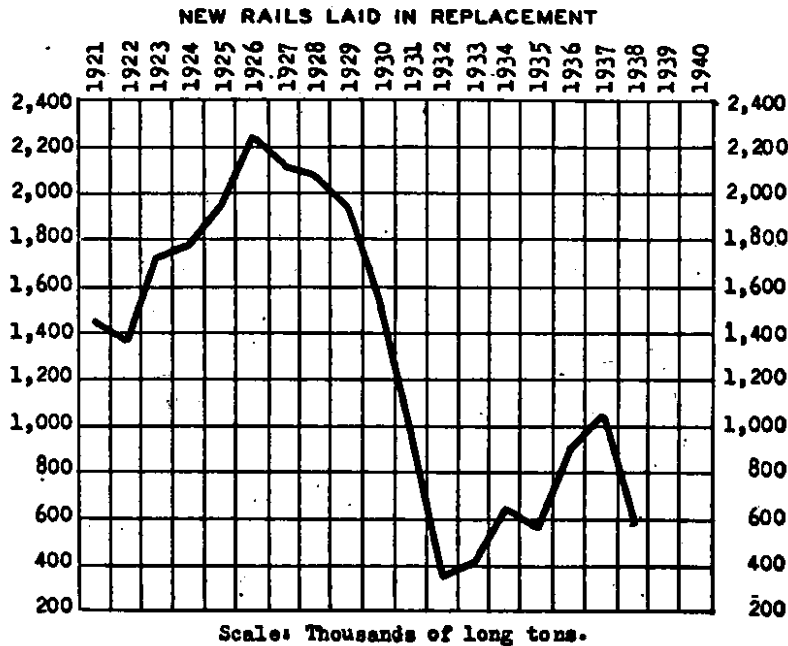
Dr. PARMELEE. It doesn't. I am sorry to say we haven't those figures complete as yet, Mr. Chairman.

Acting Chairman KING. Would they be substantially the same as 1938?

Dr. PARMELEE. We think there will be an increase although we haven't the exact figures. One interesting thing in connection with the ties is a point to which I shall refer later, and that is that there has been a very marked increase in the number and percentage of treated as compared with untreated ties. That is one of the forward steps in technology on the railroads.

Briefly stated, during the first 4 years of the period covered by "Exhibit No. 2497," the average percentage of treated to total ties was 48.2 percent. In other words, less than one-half of the total ties installed were treated. In the last 4 years shown in the table, 1935 to 1938, inclusive, the percentage of treated ties was 78.5 percent; had gone up from less than half to more than three-fourths. Treated ties, of course, last a great deal longer than untreated ties and while they cost more by perhaps 50 percent, they last probably three times as long.

EXHIBIT No. 2497



Dr. ANDERSON. What is the life of a treated tie?

Dr. PARMELEE. It is believed to be somewhere between 20 and 25 years, although they haven't been in the tracks long enough to reach an exact figure.

Dr. ANDERSON. And the difference would be that an untreated tie had to be removed say in 7 or 8 years?

Dr. PARMELEE. In about 7 to 8 years, depending upon the character of the tie and kind of wood it was, and the place where it happened to be, and the amount of traffic, and all the other considerations.

Dr. ANDERSON. Has there been any movement in the direction of even a more permanent tie than the treated wooden tie?

Dr. PARMELEE. Yes; steel and concrete ties have both been tested, but so far they have found nothing better, I believe than a treated wooden tie.

Acting Chairman KING. Creosote is still the best treatment?

Dr. PARMELEE. Creosote and zinc chloride.

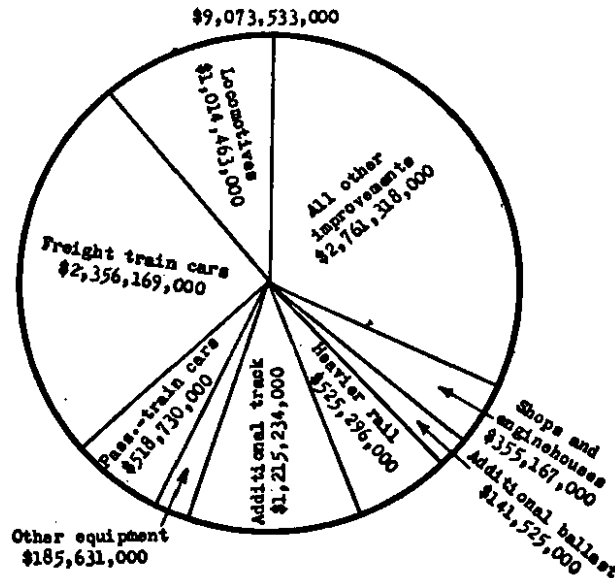
INVESTMENTS IN RAILROADS 1923-39

Dr. PARMELEE. The chart and supporting table on page 12 shows the amount of money spent by the railroads in capital improvements, what are known technically as additions and betterments, charged to capital account each year from 1923, when their improvement program began, to which Mr. Pelley referred this morning, and 1939. This shows that over the 17-year period covered by the table and the chart the annual average of capital expenditures for the various purposes indicated was \$534,000,000.

(The chart referred to was marked "Exhibit No. 2498" and appears below. The statistical data on which this chart is based are included in the appendix on p. 17353.)

EXHIBIT No. 2498.

GROSS EXPENDITURES FOR ADDITIONS
AND BETTERMENTS - YEARS 1923 TO 1939, BY ITEMS



Acting Chairman KING. I don't see that.

Dr. PARMELEE. I have obtained that figure, Mr. Chairman, by dividing the total of \$9,073,533,000 by 17, which is the number of years covered.

Acting Chairman KING. I see; yes. May I inquire whether any of that was new capital, or was it borrowed money?

Dr. PARMELEE. It came from various sources, Mr. Chairman. Some of it was borrowed money; some of it was out of depreciation reserves,

some was out of net earnings, and from whatever source it might come. Part of it was new capital, borrowed money.

Acting Chairman KING. No part of it was what might be denominated as original investment, was it?

Dr. PARMELEE. Original in the sense that you were borrowing new money; yes.

Acting Chairman KING. Well, was any part of that received for sale of stock?

Dr. PARMELEE. A part of it. During the better years of that period, in the later twenties some stock issued by some of the railroads was sold for cash, but that was a comparatively small proportion of the total.

Acting Chairman KING. By and large, the greater part of that capital investment was borrowed money?

Dr. PARMELEE. A considerable part of it; yes.

Dr. ANDERSON. Do you have any idea as to what proportion of the total was borrowed money?

Dr. PARMELEE. I couldn't answer that question, Mr. Anderson. I think you had some figures put into this very hearing by Mr. Barriger, if I remember rightly, on that very subject.¹

Dr. ANDERSON. Do you know whether the railroads went into the market to borrow that \$262,000,000 in 1939, or did they find it within their own reserves and depletion accounts?

Dr. PARMELEE. My answer there would be that most of the \$133,000,000 in the "Equipment" column, which is about one-half of the total, was borrowed under equipment trust certificates. As to the remainder, \$128,000,000, I am unable to answer your question.

Dr. ANDERSON. Would you hazard a guess as to the size of a normal borrowing, when the railroads are in the relatively healthy condition they found themselves in, say, in the twenties?

Dr. PARMELEE. Mr. Pelley made the statement this morning that the railroads could easily in fairly normal conditions expend \$500,000,000 a year or more on their property in the way of improvement work.

Dr. ANDERSON. And if they sought \$500,000,000 a year?

Dr. PARMELEE. To what extent that would have to be borrowed depends a good deal on the circumstances which were in effect at the time, of course.

Dr. ANDERSON. I was going to put it this way. If they sought that much money annually, what prospect is there of their finding the money within their own coffers, or of having to go into the open market for it?

Dr. PARMELEE. That would depend entirely on the degree to which their net earnings came back and that, of course, is a very difficult question to answer in advance.

Acting Chairman KING. Many of the railroads would find something like the lean place which old Mother Hubbard found when she wanted something for herself or her dog? I don't want to be critical.

Mr. PELLEY. Senator, you are interested in the amount of these capital expenditures, that had securities issued against them? Well, I should say that 60 percent of these were made out of earnings; not

¹ See Hearings, Part 9, pp. 3561-3576.

many of them capitalized by roads now paying interest on them; probably 60 percent was spent right out of money they made.

Acting Chairman KING. Earnings which ought perhaps to have been applied to liquidating obligations matured or unmatured, and denying any dividends whatever to stockholders?

Mr. PELLEY. Well, in some instances the money was spent rather than pay dividends, probably, but they either had to make the improvements out of earnings or finance them and issue securities against them in order to improve their plant, keep abreast of the business; it was a perfectly proper thing to do and a very laudable thing to do, and we probably would be in better shape—I know we would—if we made all of them out of earnings.

Acting Chairman KING. Those earnings were in part due to draining various resources which perhaps ought to have been retained or ought to have been applied for additional development.

Mr. PELLEY. No; I don't follow that. The railroads were reasonably prosperous in the twenties, and they were expanding their properties; they entered into this big program in 1923, and spent about \$7,000,000,000 before they finished it, and much of that was done right out of the earnings of the property.

Acting Chairman KING. I had in mind when I made that former observation the fact that I had received some letters from stockholders, some from mortgage holders, during the past few years indicating that they thought that instead of utilizing some of the earnings for the purposes you have indicated there ought to have been some payment in the discharge of obligations and in paying some dividends to the stockholders.

Mr. PELLEY. Yes; since you raise that I would like to clear up a point, if I may. You know many people think that our debts have been increasing; they haven't; they have been decreasing. Thirty years ago the railroads owed \$606 for every \$1,000 invested in their property. Today they owe only \$429 for every \$1,000 they have invested, so instead of our debts increasing, they are really decreasing, contrary to the general public feeling about them.

Acting Chairman KING. Proceed.

Dr. PARMELEE. Just one other comment on "Exhibit No. 2498," Mr. Chairman. Again I call attention to the fact that in 1937, which was one of the better years of the thirties, the best year since 1930, the amount expended for additions and betterments showed a very large and very healthy increase and has since fallen off. "Exhibit No. 2499"——

Mr. HENRICHS (interposing). May I ask a question for just a moment? Taking these last exhibits, 2495 to 2498. They all show a very substantial level of capital activity, capital accretion, in 1937; freight-carrying cars average about as many as you had from 1927 to 1930. Your total expenditures for equipment are about up to the averages of the 1920's, in contrast with the situation where, for example, in 1932 or 1933 you added only 1 steam locomotive and 13 electric and oil, gas, and electric locomotives. Now does that seem to you to indicate that you get capital investment in the railroads when, and only when, you begin to approach reasonably close to capacity operations, that your program hasn't been controlled essentially in terms of whether there was a general feeling of confidence, but

rather in terms of the very specific feeling that you now had reached a point calling for additional equipment for prospective traffic?

Dr. PARMELEE. I don't think it is quite so simple as that, Dr. Hinrichs. You remember that 1937 was the fourth in a series of years, each of which showed some increase in traffic and earnings over the next preceding year. In other words, it was the end, in a sense, of a cumulative period of improvement and betterment in earnings. Now I haven't any doubt that some of the railway managements would have been glad to make some of these capital improvements in some of the earlier years, but it was a financial restriction that was on them. But as you got an increase year by year over a period of years, the psychological effect would be that perhaps we were now on a permanently upward trend, or at least a trend that would continue for some time in the future. Therefore we can afford to go out and do some of this improvement work which we have wanted to do for some time. As a matter of fact, they guessed wrong and things turned down very sharply in '38, and we have only come part way back in '39 and '40.

But I think the psychology of the situation was more important than any other one factor.

Mr. HINRICHS. More important than the fact that your freight-car loadings were down to within 10 percent of the levels back in the 1920's, possibly 13 percent?

Dr. PARMELEE. That partly underlies the psychological factor, of course. But there are two factors in this business: partly what you need, and partly what you think you can afford to pay or what you have to pay with.

Acting Chairman KING. Would it be your view that notwithstanding the fact that hundreds of millions, and perhaps billions, have been lost in railroad development for various causes not necessary to enumerate, some of which probably would be charged to control by the Government, others to competition from subsidized organizations, you still think that there is a good future for the railroads and that regardless of the losses which have been sustained, there has been great good to the country in the development of the railroads?

Dr. PARMELEE. I think there is no question about the last remark you made, Mr. Chairman. Now about the future, I would make two general remarks and I don't want to get into too much detail. In the first place when we talk about the railway industry we ought to recognize that there are a number of railroads in the country which are prosperous; they have more than made their fixed charges right through the depression period every year, so that there are a number of companies which can finance reasonably on a sound and fairly low interest basis at any time. They always have and they probably always will, so far as we can look into the future. That is one answer.

The other is that people are looking for safe investments at low rates of interest, and their judgment as to buying the securities of any particular company, whether prosperous or not at the moment, will depend entirely on their forecast of the probable earnings of that company in the future. Those forecasts would be very carefully, probably rather conservatively, made, but if they conclude, as they will in some cases, that there is security in the future earnings for that particular investment, they will buy.

Acting Chairman KING. Well, I had in mind on that question the fact that so many railroads have been in the hands of receivers. Some have gone through very dark days, such as the New Haven and Union Pacific in its earlier days, the Rio Grande, the Western Pacific, and Rock Island, so that there is a considerable pessimism on the part of some persons as to the future of the railroads. But from your statement, and the statement of Mr. Pelley, it seems to me that the clouds are breaking and we have reason to believe that this very important part of our economy is to be preserved and to continue rendering very effective and important service for the benefit of the people.

Dr. PARMELEE. I think that is a very sound position to take, Mr. Chairman. I think that is in line with what Mr. Pelley said this morning and I certainly am in accord with it.

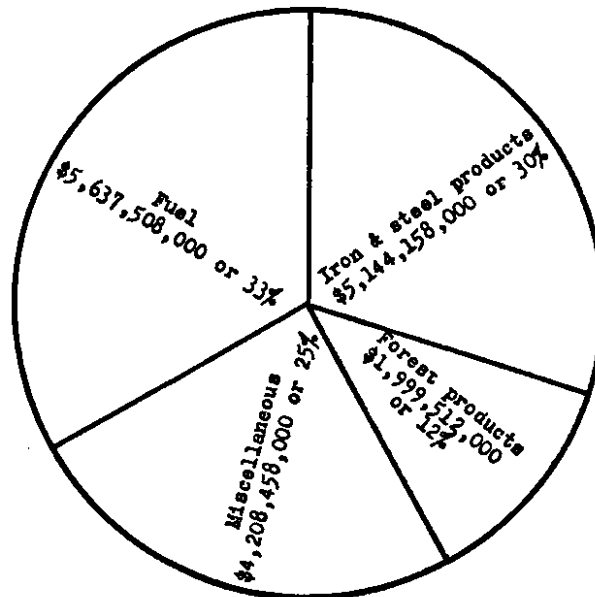
RAILROAD PURCHASES OF SUPPLIES

Dr. PARMELEE. I think I have reached now, Mr. Chairman, page 13, "Exhibit No. 2499," chart and supporting table on material purchases. The only comment I think I need make on that is to point out that in a period of 17 years the railroads expended approximately \$17,000,000,000 for fuel, for forest products, for iron and steel products, and for all the miscellaneous items which they buy from other industries. That is an average of approximately \$1,000,000,000 per year over good and bad years. And again you will notice that in 1937 they came very close to that billion dollars—\$966,000,000.

(The chart referred to was marked "Exhibit No. 2499" and appears below. The statistical data on which this chart is based are included in the appendix on p. 17354.)

EXHIBIT No. 2499

RAILWAY PURCHASES - 1923 TO 1939 \$16,989,636,000



Acting Chairman KING. Well, would that include capital investment?

Dr. PARMELEE. These are just purchases of materials and supplies, the great bulk of which, Mr. Chairman, are used in operations. They are either consumed, like fuel, or used like steel rails, and other things, in their operations.

Dr. ANDERSON. Mr. Parmelee, I wonder if it would help to expedite matters if we could move quickly through the next two sections and get over into the part that concerns some technological developments, with your comment on anything that occurs to you in these two sections so that we could run through them and not lose what you wanted to give us by way of a connected account.

Acting Chairman KING. When you say "section" you mean pages 17 and 18?

Dr. ANDERSON. I am thinking now of pages 16 to 38. That deals with freight and passenger traffic and revenues, expenses and income of the railroads, and moves over to the section concerning employees and their compensation, which will be Mr. Parmelee's introduction to this technological topic as such. Would it be possible to do that?

Dr. PARMELEE. I will try to move as rapidly as possible, Mr. Anderson. On page 17, Mr. Chairman, there is a table labeled "Exhibit No. 2500," which shows the originating tonnage of freight on the railways of class I on each year from 1931 to 1939.

(The table referred to was marked "Exhibit No. 2500" and is included in the appendix on p. 17354.)

Dr. PARMELEE. I think the only points that need to be made in connection with this exhibit are first that from 1921 to 1939 there was a decline of 4 percent in the total freight tonnage, but that that decline was quite different as related to different groups of commodities. There was a decline of actually 65 percent in the so-called l.c.l. freight, or less-than-carload package freight, the final column in the table. There was a decline of 38 percent in animals and their products, such as livestock, which now largely moves by truck; there was a decline of 34 percent in products of forests, lumber and timber products; there was a decline of 20 percent in products of agriculture; there was a decline of less than 3 percent in the products of mines, which shows where the railroads are still practically supreme in their particular field, and there was an increase of 35 percent in manufactures and miscellaneous. Those are largely the miscellaneous classes of manufactured goods.

A very important and significant increase.

Dr. PARMELEE. "Exhibit No. 2501" is a chart, with supporting data, showing the freight traffic over the same general period in terms of tons originated and revenue ton-miles.

(The chart referred to was marked "Exhibit No. 2501" and appears on p. 16570. The statistical data on which this chart is based are included in the appendix on p. 17355.)

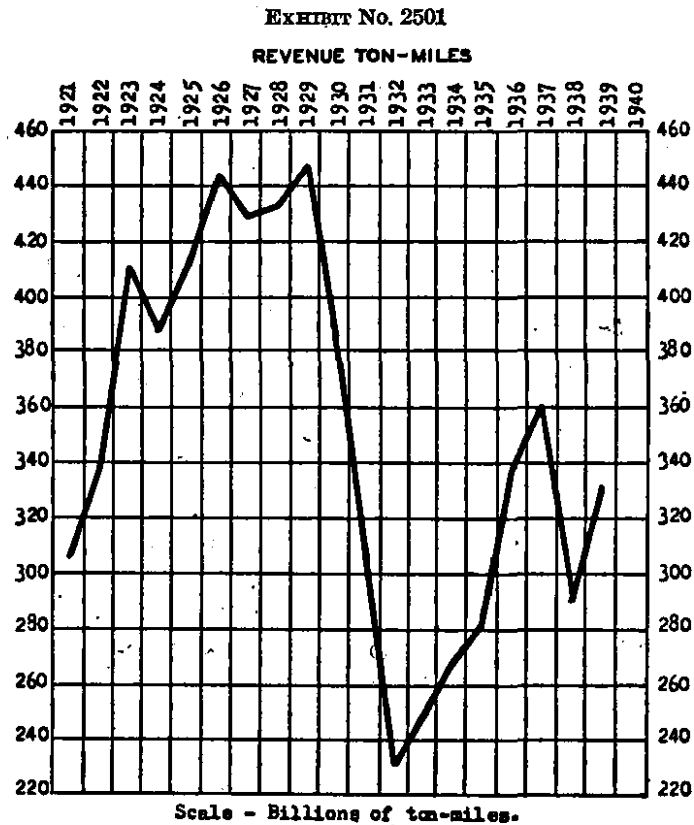
The same general picture is shown for passenger traffic in the chart, with supporting figures on "Revenue Passenger Miles."

(The chart referred to was marked "Exhibit No. 2502" and appears on p. 16571. The statistical data on which this chart is based are included in the appendix on p. 17355.)

Dr. PARMELEE. Here, however, the passenger traffic showed a decline of a little more than one-half, and has recovered about one-third of that decline.

"Exhibit No. 2503" on revenues per ton-mile shows the gradual decline in price of freight transportation on the railroads in terms of average revenue per ton-mile.

(The chart referred to was marked "Exhibit No. 2503" and appears on p. 16572. The statistical data on which this chart is based are included in the appendix on p. 17355.)



Dr. PARMELEE. I want to say that this is not an exact measure, because the average revenue per ton-mile depends on several factors, one of which is the actual rate per ton-mile. However, it is an approximate measure, and the committee will note the general downward trend.

Mr. HINRICHS. That chart has been drawn in such a way as to show relatively small changes. It appears to be a very precipitous decline. Actually, you start with the post-war period of a generally high-price level, and relatively high freight rate back in 1921. You come down to the end of the 1930's with a rate of about 1.08 cents per ton-mile, and that declines so that through the period from 1934 to 1939 it is in the neighborhood of 0.98 cent per ton-mile.

The decline is about a 10 percent decline during that period, as indicated by your table. Is that correct?

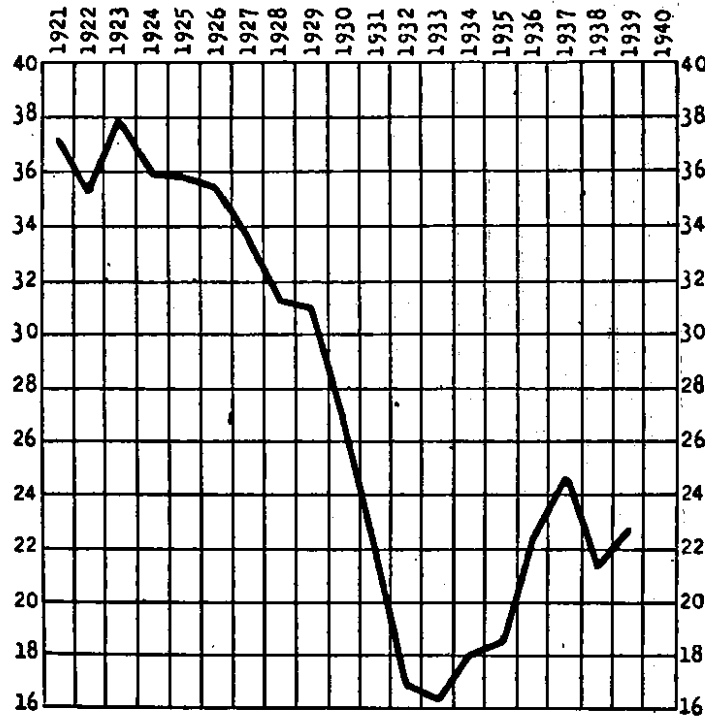
Dr. PARMELEE. I didn't get the years you were comparing.

Mr. HINRICHS. The period 1926-29, and the period 1934 to 1939, with an unusually low point in 1937 that I suppose reflects, among other things, the composition of the freight loadings in 1937.

Dr. PARMELEE. It represents that in part. In part, the latter part of that year, in November and December and in March '38, there was an increase in certain of the freight rates. Those increases are re-

EXHIBIT No. 2502

REVENUE PASSENGER-MILES
Railways of Class I



Scale - Billions of passenger-miles.

flected, of course, in 1938 and 1939 averages, but do not appear in the 1937 average.

Mr. HINRICHS. But in general, contrasting the late twenties and the period since 1934, there has been approximately a 10-percent change.

Dr. PARMELEE. About 10 percent, roughly.

Mr. HINRICHS. A 10-percent change in the revenue per ton-mile.

Dr. PARMELEE. Yes; that is correct.

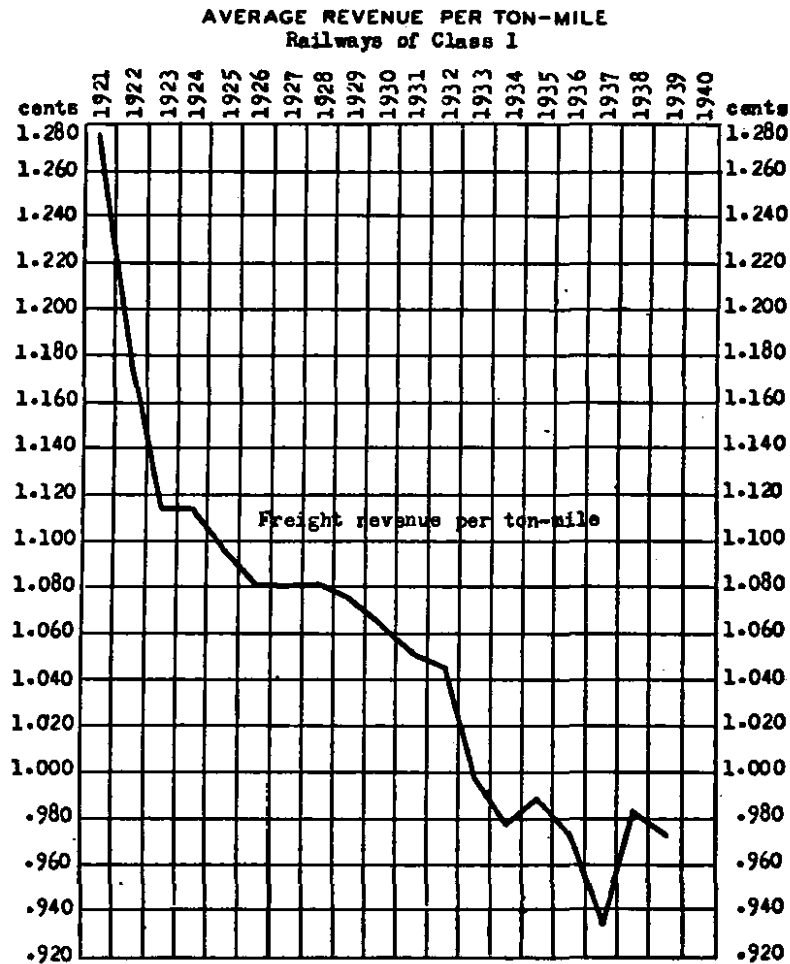
Mr. HINRICHS. While the general price level would, of course, decline considerably more than that.

Dr. PARMELEE. I have some figures on the prices railroads pay or have paid, a little later on in this same statement.

The passenger figures are shown in "Exhibit No. 2504."
 (The chart referred to was marked "Exhibit No. 2504" and appears on p. 16573. The statistical data on which this chart is based are included in the appendix on p. 17356.)

Dr. PARMELEE. That shows an even sharper decline in terms of average revenue per passenger-mile than was the case in terms of

EXHIBIT No. 2508



average revenue per ton-mile; in fact, during the last 5 years, the average revenue per passenger-mile has been the lowest in the history of the American railway.

DIVERSION OF TRAFFIC FROM RAILWAYS

Dr. PARMELEE. "Exhibit No. 2505" is a comparison in chart form of the trend from 1928 to 1939 of an index of general distribution,

with an index of railroad shipments. The index of distribution is the upper or the dotted line, while the index of rail shipments is the lower or heavy line.

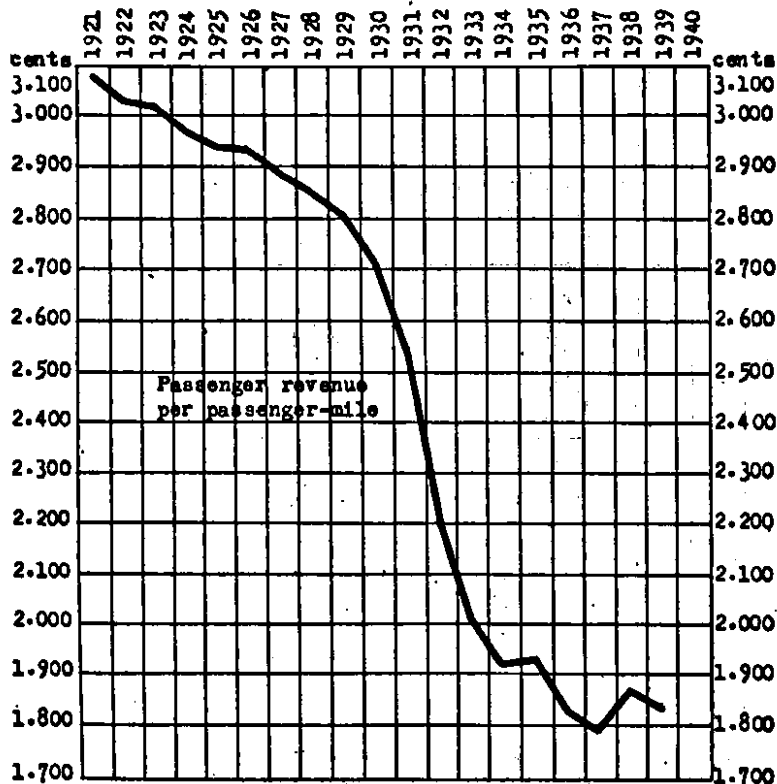
(The chart referred to was marked "Exhibit No. 2505" and appears on p. 16574. The statistical data on which this chart is based are included in the appendix on p. 17356.)

Dr. PARMELEE. In each case, the figure for 1928 was taken as 100, and the entries for the remaining years were plotted on the basis of that as 100.

EXHIBIT No. 2504

AVERAGE REVENUE PER PASSENGER-MILE

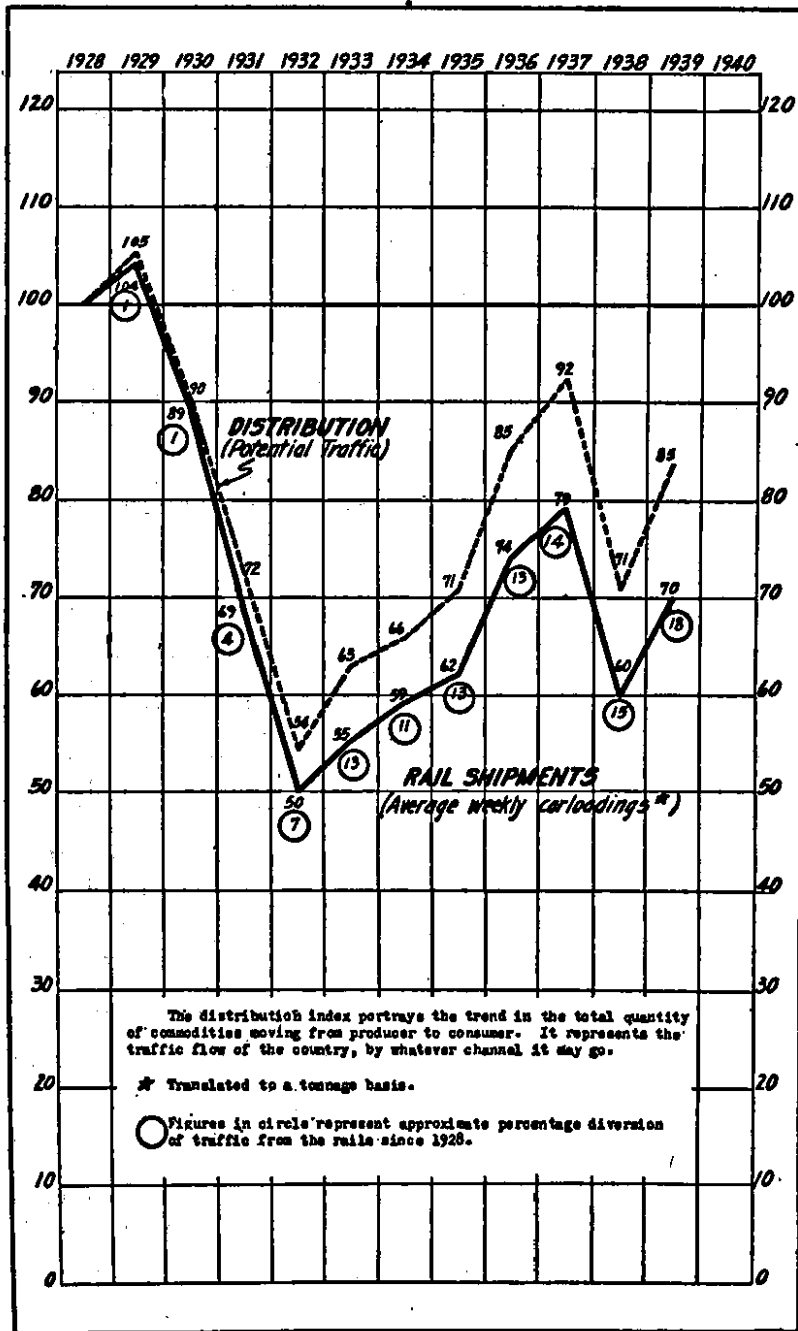
Railways of Class I



Distribution is worked out on the basis of those commodities which in 1928 moved by rail, weighted according to the actual distribution of traffic in 1928. The important thing from the point of view of the Committee, I think, is to look at the figures for 1939. You will notice that the entry for distribution is 85, which means that in 1939 actual distribution of commodities in this country that moved by any and all forms of transportation was 85 percent as great as it was in 1928.

The actual movement by rail in that year, 1939, was only 70 percent as great as it was in 1928. The difference between 85 and 70 is

**INDEXES OF DISTRIBUTION AND RAIL SHIPMENTS
1928-100**



the spread or diversion of rail traffic to other forms of transportation. In other words, it is that part of the total movement of freight which, had the railroads carried the same percentage of the total in '39 as in '28, would have gone by rail.

Now, 70 is 18 percent less than 85 as a matter of percentage relationships. That 18 is shown in a round circle on the chart which seems to indicate that so far as the thing can be measured at all, 18 percent of the traffic which since 1928 might have moved by rail, has actually been diverted and has gone to other forms of transportation.

Mr. PIKE. That is a pretty general list; it covers a wide spread of commodities; does it not?

Dr. PARMELEE. Yes; and of course the Committee will understand that even in 1928 the railroads had lost a good deal to other forms of transportation, so the 18 percent does not give the whole amount of loss to competitive forms, but only that portion which has been lost since 1928.

"Exhibit No. 2500" is a condensed income account of the railways of class I from each year after 1929 to 1939.

(The table referred to was marked "Exhibit No. 2506" and is included in the appendix on p. 17357.)

Mr. HINRICHS. Going back, Dr. Parmelee, for a moment to "Exhibit No. 2505," you have filed with the Committee a technical memorandum as to the way in which those various indices have been constructed. Have you a copy for the record?

Dr. PARMELEE. I have it here, and if the Committee would like, I would be glad to submit it.

Dr. ANDERSON. It can be marked "Exhibit No. 2507."

(The document referred to was marked "Exhibit No. 2507" and is on file with the Committee.)

Dr. PARMELEE. That is entitled *Railway Freight Traffic Trends*.

Senator KING. Would you like to have the exhibit printed, or would you just have it filed?

Dr. ANDERSON. I understand it will have to have an exhibit number; it need not necessarily be printed, but we will take it as a file exhibit.

Mr. HINRICHS. In connection with the figures on diversion,¹ there is a very rapid jump that occurs in 1933. From 1933 through 1938 there was not a very great change in your diversion ratio.

It is possible that that increased diversion that occurred between 1929 and 1939 was due to the relatively slow movement downward of freight rates during that period. The big drop occurred between 1932 and 1933, but up to 1932, which is when general prices had been going down considerably, there had been only a very slight movement in average revenue per ton-mile.

My first question would be, therefore, do you think that the development of that spread is related to the maintenance of freight rates during that earlier period of depression?

Dr. PARMELEE. I think that is rather a hard question to answer, Dr. Hinrichs, because the oncoming of the depression during that period was of course a feature which overwhelmed all other economic factors. Now, whether the relative level of the freight rates had anything to do with it, or to what extent they affected it, it is very hard to say.

¹ See "Exhibit No. 2505," appendix, p. 17356.

I do know this, if I may add to that, that as the traffic was being gradually diverted away from the rails, the carriers naturally were stimulated to further reductions in their rates, which brings about the so-called erosion in freight rates, the nibbling away of a rate in order to retain or regain traffic on the rails.

(Mr. Pike assumed the chair.)

Mr. HINRICHS. Those are separate problems, almost, are they not, the retaining and the regaining, in a very considerable measure? Business relationships and ways of doing business persist from year to year, and will stand considerable strain before a change-over of process or of methods of doing things is undertaken. Once that transition has been made, it becomes much more difficult to induce the businessman to swing back to the older method, and the problem of retaining traffic is somewhat simpler than the problem of regaining it, wouldn't you agree?

Dr. PARMELEE. I agree thoroughly, but I would also say that the railroads have been trying to do both. They are trying to retain their traffic and in many specific cases they are also trying to regain traffic which they hope has been lost to them only temporarily.

Mr. HINRICHS. To go back to the period 1929-32, you show in your table that the potential traffic was cut almost in half. The index stands at 54. During that same period, in "Exhibit No. 2503" you show that the average revenue per ton-mile was 1.08 cents in 1938, and was 1.046 cents per ton-mile in 1932; that is, there had been a reduction in the revenue per ton-mile of approximately 2 percent.

Now, what were the devices that the railroads were using most energetically during the period 1929-32 to retain their share of the freight traffic of the country?

Dr. PARMELEE. There are two, I would say, in particular. One is this erosion of rates or the gradual reduction of rates, here and there, over specific routes, and on specified commodities in order to offset the effect of competition, and the other is, of course, an effort to improve operations, particularly in the matter of speedy transportation—more speedy service.

I will show you figures later on which will show that during that period, as well as before and since, there has been a marked increase in the average freight transportation.

Mr. HINRICHS. Would it be your impression that a net reduction in rates of 3 percent during that period was effective competition against the reduction of rates that were being offered by truckers, for example?

Dr. PARMELEE. That average was made up probably of a great many larger and smaller reductions in specific cases, and it is very hard to generalize on the basis of an average. I would say that many reductions which were made were greater than that average.

Acting Chairman PIKE. If there is any way to dodge over to page 36, I think we might try to do it.

Dr. ANDERSON. Mr. Chairman, I am very thankful to you for the suggestion, because, as you know, we have a heavy schedule and we are trying to hear two witnesses a day.

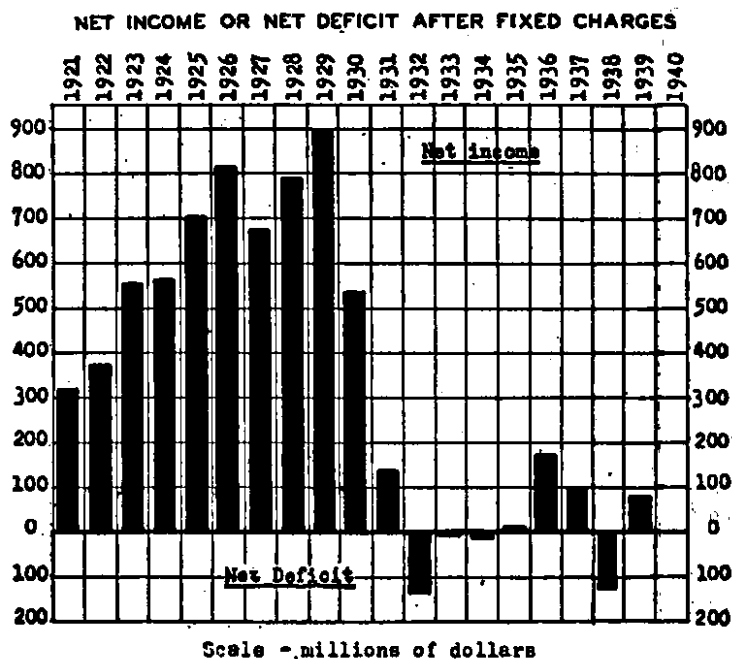
Acting Chairman PIKE. It does seem to me that the material in between where we have just been and page 36 or 37 is very interesting, but I don't think it bears quite as directly on the topic the committee

is working on as from page 37 on. I wonder if we might print the material between there in the record.

Dr. PARMELEE. I might then briefly refer to the exhibits which should be noted on each page and pass on.

(The charts referred to were marked "Exhibits Nos. 2508 to 2516" and appear on pp. 16577-16581. The statistical data on which these charts are based are included in the appendix on pp. 17358-17361.)

EXHIBIT No. 2508



Dr. PARMELEE. I would like, Mr. Chairman, just a minute to call attention to the price figures in "Exhibit No. 2516," which are indexes of the price the railroads pay for the commodities they buy. We use May 1933 as 100 only as a matter of convenience, because we happened to start our index on that date. In December 1926, the only previous year for which we have any figures, the index was approximately 150; it dropped to 100 in May 1933, which was about the bottom of the depression, and has since come back to approximately 133. In other words, the price has gone up about two-thirds of the way it came down from 1926 to 1933.

TREND OF EMPLOYEE COMPENSATION

Dr. PARMELEE. I think some comment should be made on "Exhibit No. 2517," which deals with the general trend of employees, hours, and compensation of employees of railways in class 1.

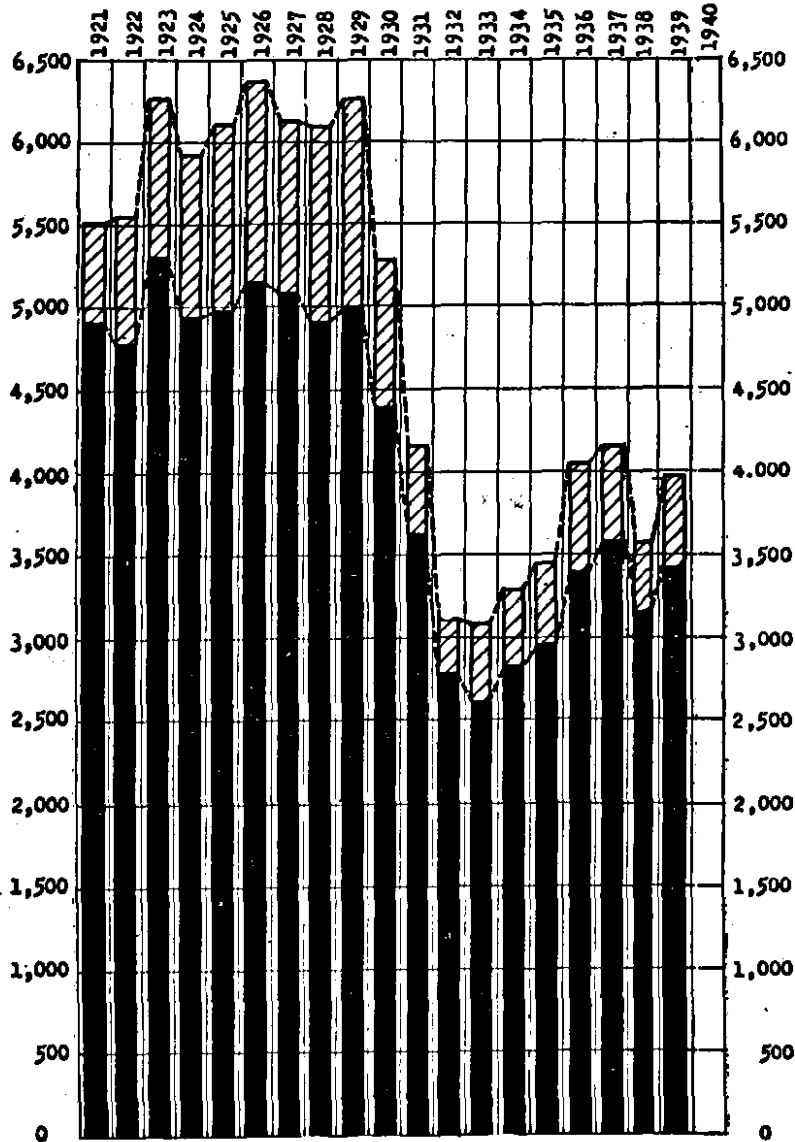
(The chart referred to was marked "Exhibit No. 2517" and appears on p. 16582. The statistical data on which this chart is based are included in the appendix on p. 17361.)

EXHIBIT No. 2509

TOTAL OPERATING REVENUES, TOTAL OPERATING EXPENSES AND NET RAILWAY OPERATING INCOME

Railways of Class I

Scale - Millions of dollars



Black portion represents Operating costs, and taxes.
 Shaded portion represents Net Railway Operating Income.
 Entire bar represents Total Operating Revenues.

EXHIBIT No. 2510

RATE OF RETURN

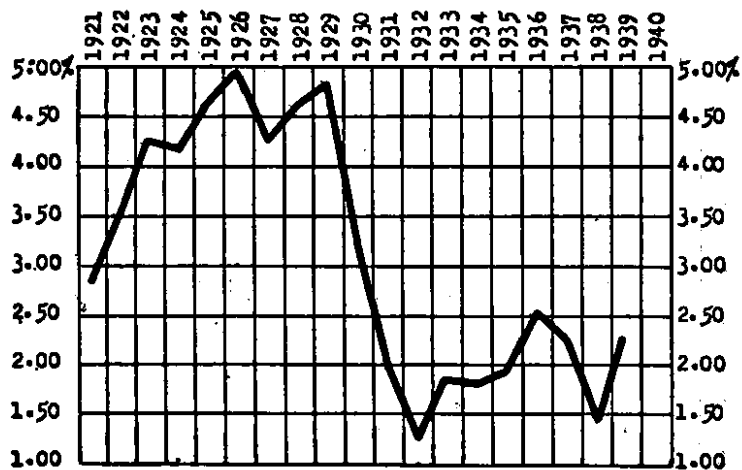


EXHIBIT No. 2511

[Submitted by the Association of American Railroads]

1939 AND 1916 RAILWAY DOLLAR COMPARED

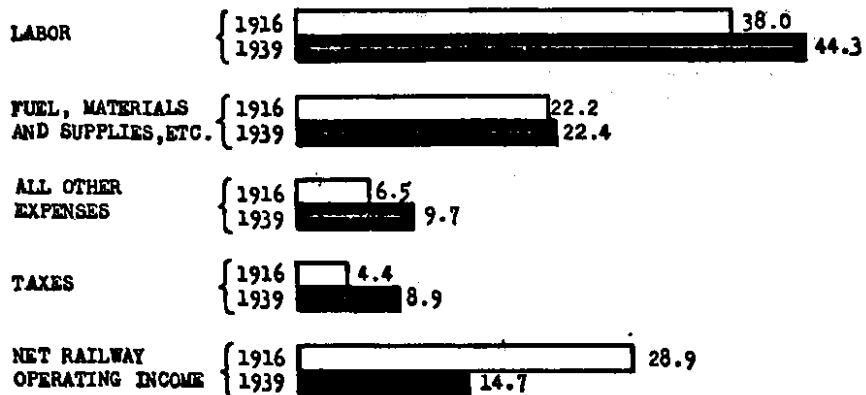


EXHIBIT No. 2513

[Submitted by the Association of American Railroads]

MAINTENANCE RATIO

(Ratio of total maintenance expenses to total operating revenues)
Railways of Class I

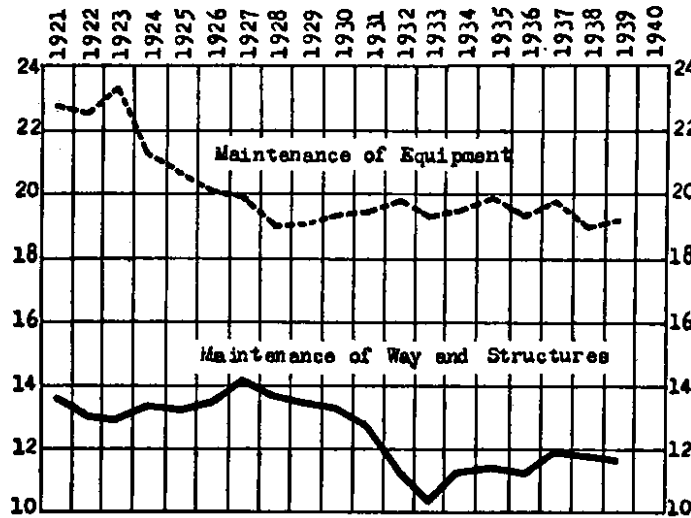


EXHIBIT No. 2514

[Submitted by the Association of American Railroads]

FIVE YEAR AVERAGES COMPARED WITH YEAR 1916

□ Cents per dollar of total operating revenues
■ Cents per dollar of net railway operating income before taxes

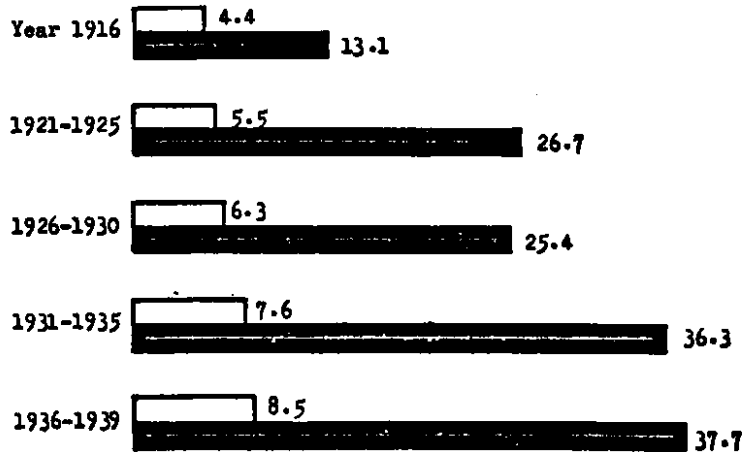


EXHIBIT No. 2515

[Submitted by the Association of American Railroads]

PER CENT OF TOTAL MILEAGE OPERATED BY RECEIVERS OR TRUSTEES

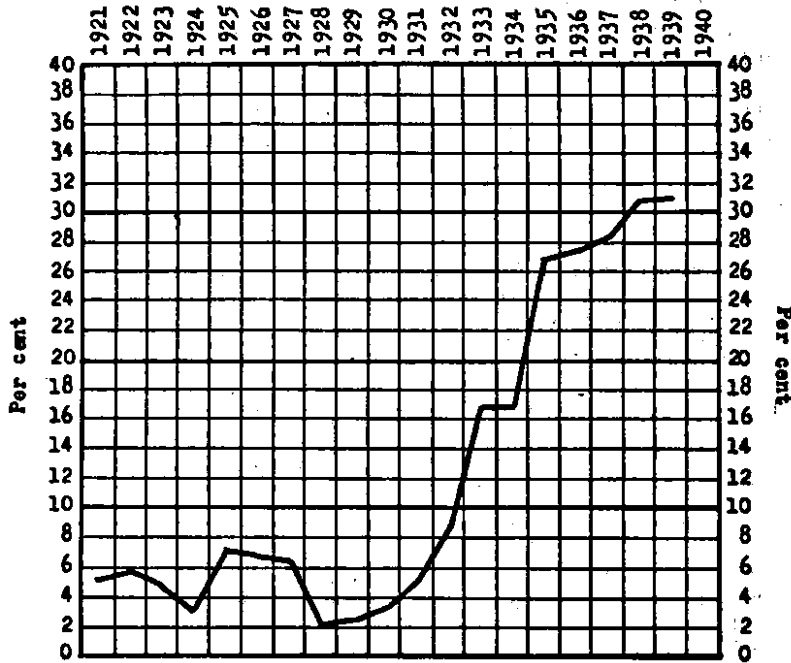
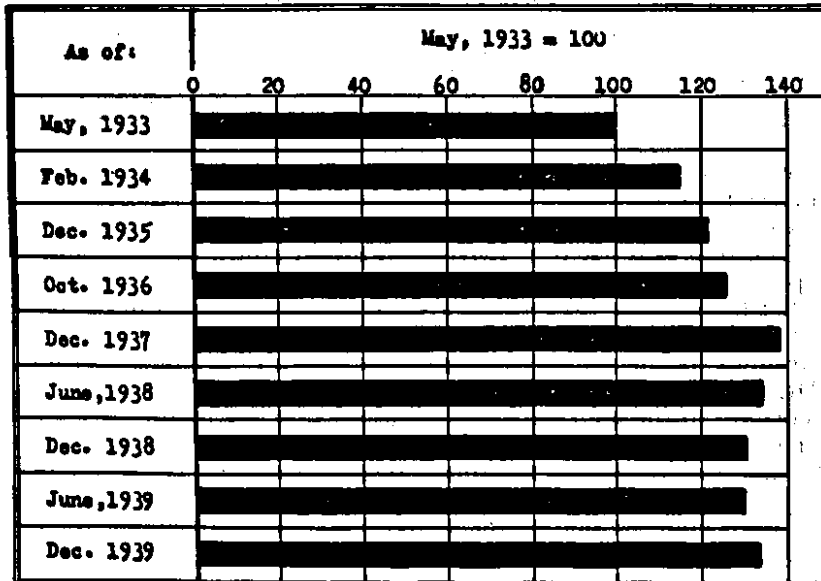


EXHIBIT No. 2516

[Submitted by the Association of American Railroads]

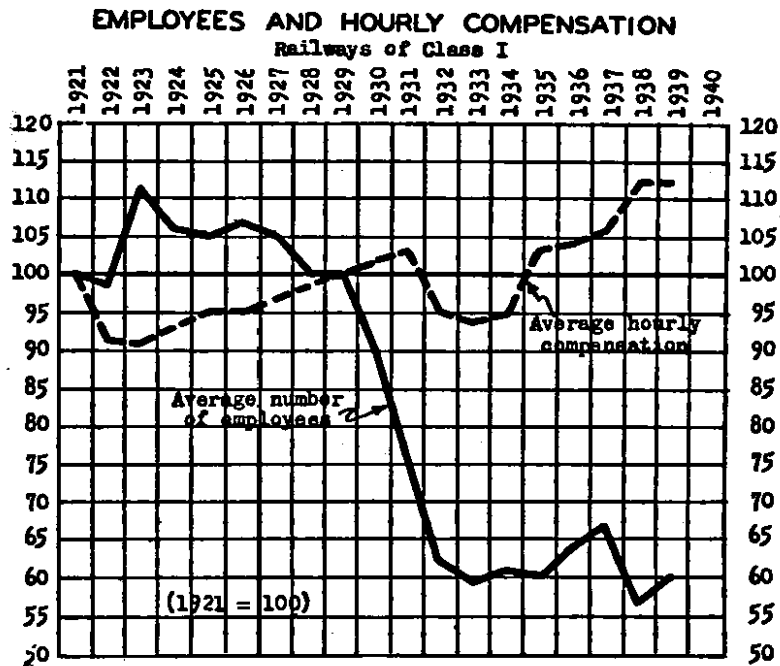
TREND IN RAILWAY SUPPLY COSTS SINCE MAY, 1933



Dr. PARMELEE. In 1916, prior to the entry of this country into the war, the average number of employees on this group of railroads was 1,647,000. Mr. Pelley has stated, the peak of 2,022,000 was reached in 1920, which was largely a year, or at least in part a year, of Federal control or Federal guaranty. In 1921, you will notice a figure of 1,660,000 in round figures, with some ups and downs following in part the increases and decreases in traffic. That figure remained between 1,600,000 and 1,800,000 from 1923 to 1929, when it was still 1,660,000. It showed a sharp drop in 1930, when the traffic also showed a sharp decline, another drop in 1931, another one in '32, and still an-

EXHIBIT No. 2517

[Submitted by the Association of American Railroads]



other one in '33, when we thought it had reached the bottom of the depression period, 971,000. There was an increase in '34, a slight decrease in 1935, another increase in 1936, when a subsidiary peak of 1,115,000 was reached in 1937. Following, however, the precipitous drop in business we had in 1938, the number dropped to 939,000, a smaller figure than was reached even in the year 1933, with some come-back to about 988,000 in 1939.

Acting Chairman PIKE. Not quite as low in total number of hours.

Dr. PARMELEE. I was coming to the hours in just a moment.

Turning to the hours, it will be noticed that the hours per man per year very generally show a rather sharp decline over the period, from 3,150 hours in 1916 down to around 2,500 hours in the last 4 or 5 years. However, between 1938 and 1939 there was a slight increase in the number of hours, which means more regular employment for the men,

some of the men going from 4 days a week to 5 and from 5 to 6, and things of that sort, the increase, however, not being a very large one.

Turning to the average compensation in the last two columns of the table, both on a basis of cents per hour and dollars per employee per year, the story, except for the period of the temporary deduction in wages from 1932 to 1935, is a story of almost steady increase, both average per hour and average per year. As a matter of record, I should perhaps say that on February 1, 1932, the employees took a voluntary deduction of 10 percent in their wages, and that ran, by a succession of agreements between managements and men, until July 1, 1934. On that date the deduction was changed from 10 percent to 7½ percent. In other words, 2½ percent was restored. On January 1, 1935, another 2½ percent was restored, and on April 1, 1935, the remaining 5 percent was restored.

I should perhaps say at this time that while that deduction did not apply to higher-salaried forces, most of the forces that received higher salaries received cuts much in excess of 10 percent; several of them got 3, 4, and 5 successive cuts that in the aggregate amounted in some cases to as much as 50 percent. Some of those cuts have not yet been restored.

Mr. HINRICHS. I am not sure that I altogether understand this table. How is that average number of hours per employee figured? That is an annual average?

Dr. PARMELEE. That is an annual average, based on the total number of hours paid for, so far as the aggregate hours are concerned. The average number of employees is, of course, the average of the midmonth count 12 times a year, added together and divided by 12. That average in turn is divided into the aggregate of hours to get the average number of hours per employee.

Mr. HINRICHS. But how does it get up as high as 2,500? What would be full-time hours?

Dr. PARMELEE. The average number of men is probably men in full-time positions, which would be somewhat fewer or smaller in number than the total number of men employed at any time during the year. The number of men shown here is really what might be called the standard number of positions, working positions.

Mr. HINRICHS. These are the number of men actually at work on a particular day.

Dr. PARMELEE. On the 15th of each month or the nearest working day, if that day happens to fall on a Saturday or Sunday.

Acting Chairman PIKE. Are any of these hours constructive hours?

Dr. PARMELEE. Yes; they may be; it is what is known as the hours paid for.

Acting Chairman PIKE. You say you have 8 hours paid for on a 3-hour run.

Dr. PARMELEE. Why, if they operate only 3 hours and are paid for 8, the 8 go in there.

Mr. O'CONNELL. What is the average workweek in the industry? What number of hours is customary?

Dr. PARMELEE. Forty hours, Mr. Pelley thinks.

Mr. HINRICHS. On a full-time basis that is 2,080 hours.

Acting Chairman PIKE. Some of it must be constructive, more hours paid for than hours worked.

Dr. PARMELEE. They are, Mr. Pike.

Acting Chairman PIKE. Some work 55 hours a week on the average, 50, anyway.

Mr. O'CONNELL. A 50-hour week for 50 weeks of the year would produce 2,500 hours, and the average number per employee is 2,520 in 1939. I have a little difficulty in squaring that with the 40-hour week.

Dr. PARMELEE. Remember that the railroad works 7 days a week. That doesn't mean, of course, that the average man works 2,520, but I explained that this was really a count of the normal number of positions.

Acting Chairman PIKE. Then the average man did not receive \$1,886.

Dr. PARMELEE. No; it is the average per position, not the full-time positions but the normal number of positions. A position might not run for the whole year, but it is the average number of positions which are counted on the 15th of the month.

Dr. ANDERSON. Mr. Parmelee, do you have any data that show by actual record the full-time earnings of persons employed in railroads?

Dr. PARMELEE. I think the best thing of that sort is made by the Railroad Retirement Board for the years 1937 to 1938. I haven't those figures before me, but they show the number of men who in each of those years received pay in each of 12 months. Even that doesn't mean necessarily full-time employees, but a man receiving pay in each of the 12 months throughout the year comes pretty close to being a steady, regular, full-time employee, and they show the earnings of those men.

Dr. ANDERSON. Do you remember what it is?

Dr. PARMELEE. They come about to the \$1,886 or very close to it.

Dr. ANDERSON. That is, the average compensation per employee here you think is about normal for a full-time employee.

Dr. PARMELEE. I think it is a little less than a full-time position. In other words, these are not quite full-time positions.

Dr. ANDERSON. Do you remember the B. L. S. study on the earnings of 1,000 railroad employees? ¹

Dr. PARMELEE. No; I do not think so.

Dr. ANDERSON. I have a little break-down of it that came to my attention, and I remember that of the thousand employees—I have forgotten his complete controls—Goodrich got 980 railroad men at work in 1932 normally employed railroad workers, and for that group he found 38 percent of them earned less than \$1,000 in that year, 66 percent earned less than \$1,500, and 18 percent earned \$1,750 or better. I wonder if you have any comparable figures, or figures that show something contrary to that for average full-time earnings.

Dr. PARMELEE. I don't know of any special study that has been made in the industry that would compare with or parallel that.

Dr. ANDERSON. You would say that these average compensation figures per employee would give us the average, and a moment ago you said it was very difficult to generalize from an average. I wonder what the median would look like on the same distribution.

Dr. PARMELEE. On that I would suggest that you take the rather detailed studies of the Railroad Retirement Board and work out a

¹ Carter Goodrich, *Earnings and Standards of Living of 1,000 Railway Employees During the Depression*, Bureau of Labor Statistics, Washington, D. C., 1934.

median on the basis of 6-, 8-, 10-month men, men who worked in each 6 months or 8 months or 10 months of the year. My recollection—and I am not quite sure about this—is that the Railroad Retirement Board showed for the year 1937 an average for what you might call the 12-month men of \$1,815, or about \$1,800. The figure here is \$1,781.

Mr. PELLEY. I am afraid the committee may have the wrong impression about the workweek. Of course, the railroads have made some efforts to spread the work as much as they can, but pretty generally now maintenance-of-way men are on a 5-day-week basis. The workweek is ordinarily about 48 hours, but many men work as many as 7 days a week; I think that possibly 48 hours would be about a normal week, or 6 days of 8 hours each, laying off on the seventh day.

Acting Chairman PIKE. Do you take the whole 7 days?

Mr. PELLEY. Generally 6 days a week.

Acting Chairman PIKE. That is still above the figure. You wouldn't get 2,520 hours a year.

Dr. PARMELEE. The committee will recall that the railroads are not under the hour provisions of the wage and hour law.

Mr. HINRICHS. May I suggest that Dr. Parmelee be allowed to insert in the record at this point a brief explanation of what these differences are? Obviously there must be some explanation, partly the statistics technique.

Dr. PARMELEE. What do you mean by differences? I would be very glad to explain how these figures are arrived at in a somewhat more adequate way.

Mr. HINRICHS. A brief interpretation of what that 2,500 figure really means in terms of the average hours that these men work do receive, because no explanation so far seems to fully account for it.

Dr. PARMELEE. I would be very glad to do so if the committee would like to have that done.

Acting Chairman PIKE. I think there should be a sort of explanation there. There are two or three places where there seem to be obvious inconsistencies in the figures as presented, which are probably not inconsistencies at all, but which probably need a little elaboration. I think it would be a very sensible thing to do.

(Senator O'Mahoney resumed the Chair.)

RAILROAD COSTS OF OPERATION

Dr. PARMELEE. "Exhibit No. 2518," shows the unit cost of operation to the railroads in the freight service per 1,000 revenue ton-miles, and in the passenger service per passenger train car-mile.

(The chart referred to was marked "Exhibit No. 2518" and appears on p. 16586. The statistical data on which this chart is based are included in the appendix, on p. 17362.)

Dr. PARMELEE. The table you will notice ends with the year 1938, the latest year for which information was available at the time this booklet was printed. However, knowing that the situation in 1939 was somewhat different than in 1938, and making a special tabulation of some 90 percent of the railroads—that is, railroads handling some 90 percent of the general traffic in 1939—I am able to present to the

committee at this time for 1939 some preliminary figures which are open to some slight possible change in the future. I would like to read into the record the entries for 1939 on this table. Under freight expense total, 6.36; transportation 3.12; under passenger expense total, 0.259; transportation, 0.124. Those lines could easily be extended on to correspond to these figures I have presented.

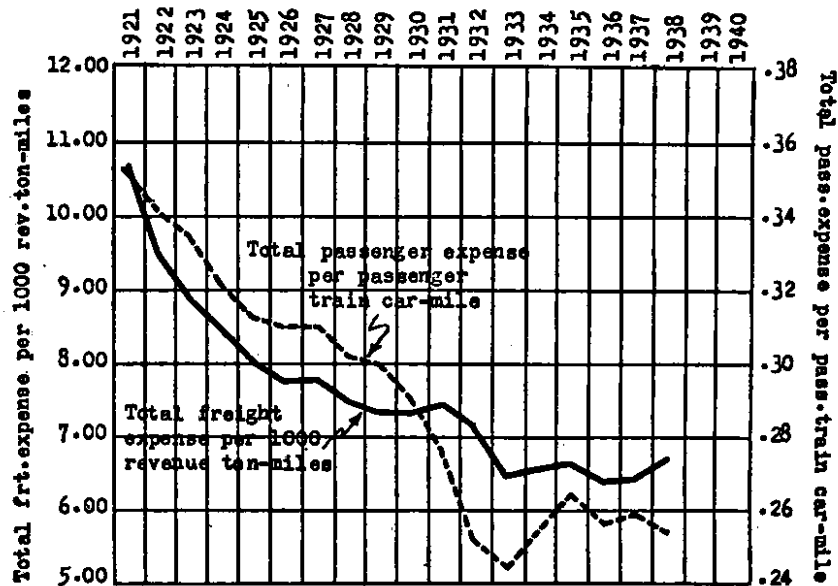
Mr. HINRICHS. In spite of the very substantial increase in hourly rates between 1932 and 1939, the transportation freight expense is about the same as it was in 1933.

Dr. PARMELEE. Slightly less than in 1933; that is right, and that has been brought about very largely, in my opinion, by technology, which is shown in some of the later exhibits in this statement.

EXHIBIT No. 2518

[Submitted by the Association of American Railroads]

UNIT COST OF OPERATION



In Exhibits Nos. 2519 to 2521-A, for example, are shown certain freight-operating averages for the years 1921 to 1939.

(The charts referred to were marked "Exhibits Nos. 2519 to 2521" and appear on pp. 16587, 16588. The statistical data on which these charts are based are marked "Exhibit No. 2521-A" and are included in the appendix on p. 17362.)

Dr. PARMELEE. These five averages or series of averages are by no means all that might have been presented to the committee. They are, however, believed to be fairly representative and significant. They relate to freight-train speed in miles per hour between terminals, and that figure incidentally, of course, includes all delays on the road and all hours spent in intermediate yards representing the actual average.

EXHIBIT No. 2519

[Submitted by the Association of American Railroads]

FREIGHT TRAIN SPEED
MILES PER HOUR BETWEEN TERMINALS

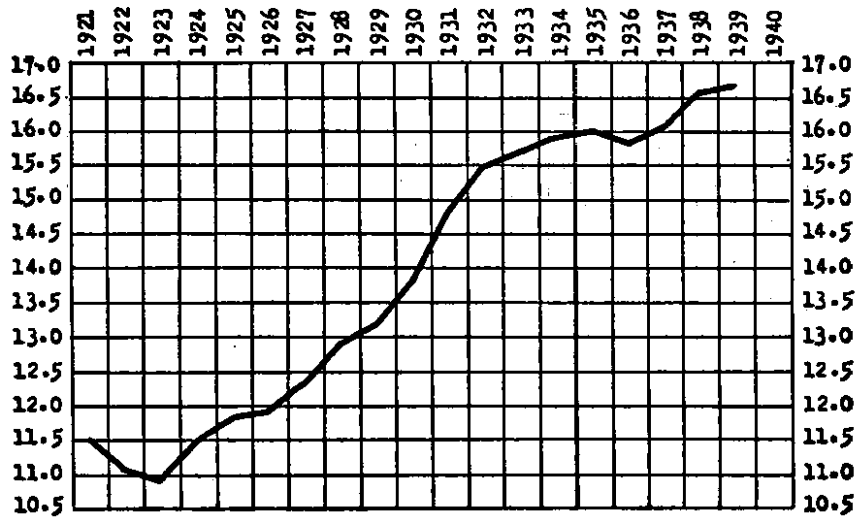


EXHIBIT No. 2520

[Submitted by the Association of American Railroads]

FREIGHT CARS PER TRAIN

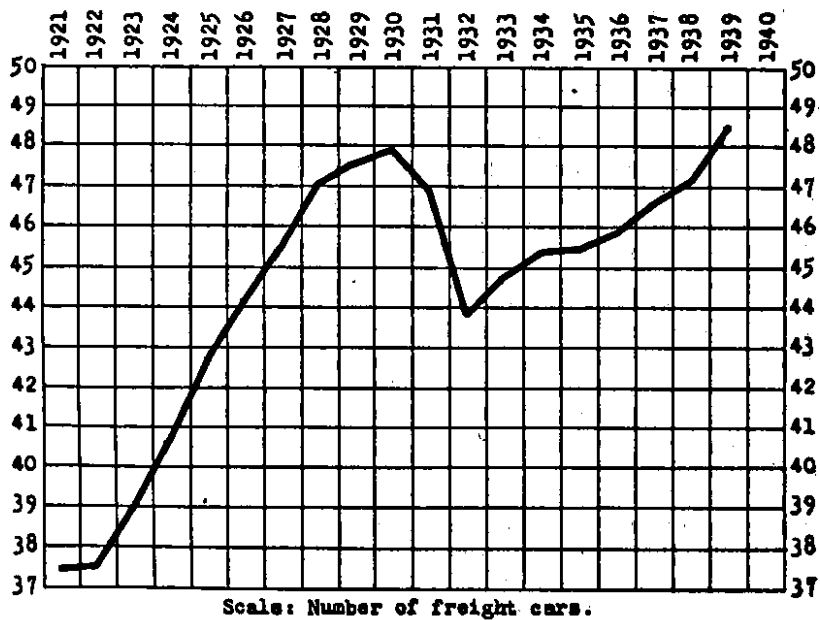
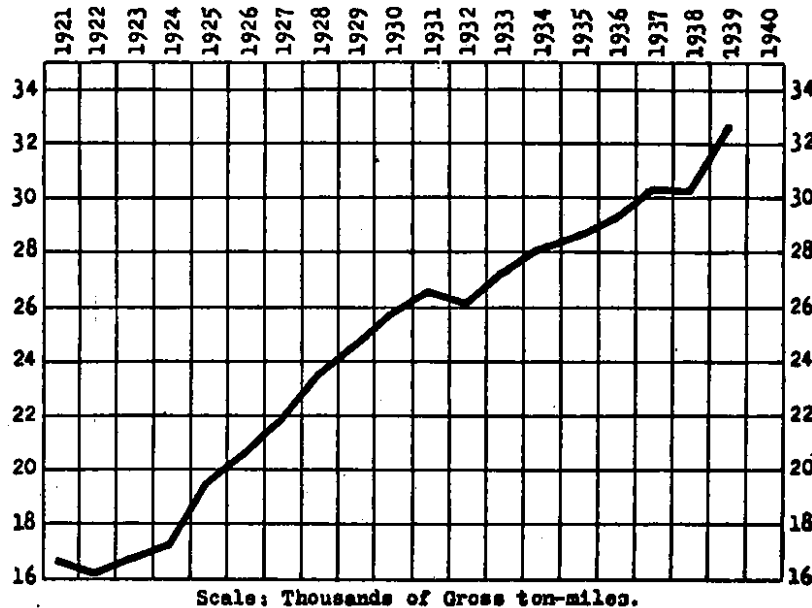


EXHIBIT No. 2521

[Submitted by the Association of American Railroads]

GROSS TON-MILES PER FREIGHT TRAIN-HOUR



The CHAIRMAN. The freight train, according to this exhibit, is moving at a much faster rate than it used to move 10 years ago.

Dr. PARMELEE. That is true, Mr. Chairman. That is the product, generally speaking, of two factors working together; one is actually higher speeds while in motion, and second a very great reduction in the amount of delay between terminals.

The CHAIRMAN. Both those factors are the products of technological advance.

Dr. PARMELEE. Both of them; yes, sir. Delays, for example, may come about through break-downs of equipment. If you have better equipment and take care of it better through technological methods, you have fewer break-downs and fewer delays.

The CHAIRMAN. Of course, the better your equipment the fewer your repair jobs

Dr. PARMELEE. That is true; and if your track is in better shape that, too, enables you to get along with fewer delays.

Freight cars per train, the average number of cars in the train, also has shown some increase.

Net tons per train; the word "net" in that title means the revenue plus the nonrevenue company freight in the train but does not include the weight of the train. It is the tons of freight, whether revenue-producing or non-revenue-producing.

The CHAIRMAN. These three exhibits portray a striking fact to me; namely, that the general advance of freight-train speed and the general gain of gross ton-miles per freight train-hour proceeded upward without interruption by reason of the depression, but with

respect to freight cars per train, beginning in 1930, coincident with the depression you had a sudden sharp drop for 1931 and 1932. Freight cars per train had reached a peak of 48 in 1930, and a depression low of less than 44 in 1932, but the number of freight cars per train had been constantly increasing since. How would you explain this effect of the depression upon the number of freight cars per train, while it had no effect upon the technological advance which is to be seen in the other two charts?

Dr. PARMELEE. Some of these factors, Mr. Chairman, do have as one of their component elements the volume of the freight handled, there is no question about that, and the factor to which you have called special attention, freight cars per train, does have that element in it. In other words, if your freight traffic demands drop off very suddenly and very precipitously as they did in 1932 and 1933, what it means is that you have to run a certain number of trains in any event, but if there isn't the freight there to handle you reduce the number of cars on the train and to that extent the result is not affected by technology, but by what is called depression.

The CHAIRMAN. Lack of business?

Dr. PARMELEE. It is only, however, in times of very steep and very precipitous decline in traffic that that factor does play a very large part, and that is very well exhibited in this chart to which you have called attention,¹ "Exhibit No. 2520." Now you will notice, if you continue along that same line on that same chart for 1938, we had a rather sharp decline in traffic demand in 1938, and yet your average number of freight cars per train continued to go up. There apparently your operating methods, improved operations, and continually increasing technology, was able to overcome the effect of the decline in traffic and your average kept on going up. I wouldn't draw that analogy too close, but that is what actually happened in that year.

Now the last two columns of the supporting figures,² if I may return to them for a moment, are rather important from the operating man's point of view, although not perhaps so much from the public point of view. A gross ton-miles-per-freight-train-hour is the movement of a gross ton—the tonnage of freight in the train plus the tonnage of the train itself, excluding the locomotive and tender, a distance of 1 mile, and the net ton-miles per freight-train hour, which is the next and last column, is the movement of the total amount of freight in the train a distance of 1 mile, divided by the number of freight-train hours.

Now those two columns, one of which is gross and one is net, are, generally speaking, the product of increased speed of movement, plus increased weight of the train, in one case the total train including the freight, and in the other case the freight in the train.

The CHAIRMAN. That would indicate that the capacity, as reflected gross ton- and net ton-miles, has practically doubled between 1921 and 1940?

Dr. PARMELEE. That is true.

The CHAIRMAN. And that, of course, is strictly technology?

¹ See "Exhibit No. 2520," supra, p. 16587.

² See "Exhibit No. 2521-A," appendix, p. 17362.

Dr. PARMELEE. That is technology almost entirely, I would say, Mr. Chairman, and I call your attention to the fact that every one of these five factors shown here shows a higher or a better figure in 1939 than in any preceding year in railway history.

Mr. HINRICHS. Now the crews and the number of man-hours per train-hour change comparatively from year to year, do they not?

Dr. PARMELEE. I don't know whether that would be true per train-hour; it would be true per trip, of course, but your train-hours may vary per trip from year to year.

Mr. HINRICHS. But you would expect to find if these things had been plotted in terms of man-hours instead of train-hours very similar curves as far as continuity is concerned?

Dr. PARMELEE. That would depend a little, I suppose, on whether you took it in terms of number of men per train-hour, which I think would follow a comparatively even line, or number of man-hours per train-hour, where there might be some change.

Mr. HINRICHS. Well, if the number of men per train-hour is about the same, the hour is the same whether it is for the train or the man, isn't it?

Dr. PARMELEE. Yes; I think you are right, as a mathematical proposition.

MECHANIZATION AND WAGE CHANGES

Mr. HINRICHS. Then I would like to go back to a question which I asked you earlier about the relationship between these technological changes which have been quite marked, and the changes in wages. I shan't attempt to quote you exactly, but in general, if I remember, you said that when there was an increase in wages there was a marked stimulation of efforts to economize in the use of labor. Now I would like you to look at the freight-train speed-miles per hour between terminals or the gross ton-miles per freight-train hour and just reading from the chart, at those places where there was a sudden improvement in technology, tell me where you think some wage changes occurred.

Dr. PARMELEE. Well, I don't think that you can figure it out quite so closely as that. Your changes in employment, of course, apply not only to your transportation men but to your maintenance men as well, maintenance of way and maintenance of equipment. You have three large groups, large general groups of railroad employees who might be affected.

Mr. HINRICHS. That is, with respect to transportation men as one of the three large groups you would be willing to say that the progress from year to year has been remarkably steady and almost independent of any change in wage rates, either up or down. That you ought to be able to read from the chart, shouldn't you, Dr. Parmelee?

Dr. PARMELEE. Yes; it is a fairly steady increase, if that is what you mean; yes. The trouble with most of these lines or trends is that there are so many factors involved in all of them that it is pretty hard to isolate any one. I think you agree with me on that.

Mr. HINRICHS. But there is no evidence in the chart as a superficial exhibit at least of the relationship between wage changes and technical changes that we spoke of earlier?

Dr. PARMELEE. Yes; I think that is true, so far as this particular chart is concerned, which deals with one phase alone of railroad activity and performance.

Now passing on rather hastily—

Dr. ANDERSON (interposing). Just one interruption, Dr. Parmelee. You have been over the Brookings study?¹

Dr. PARMELEE. You mean the book; yes.

Dr. ANDERSON. I would like your comment on the attempt to measure what is called man-hour productivity in the railroad industry last month. Indices of active wages paid divided by index of physical volume, divided by traffic, multiplied by 100 was the method used. Cooperating wages have been used for this computation. The index of wage cost per traffic unit in '38 would have been 38.6 instead of 82.6, so the assumption of the author is that operating wages could have been used as a method of computation.

Now the other method was used, with 1923-25 used as 100. In '30 the index stood at 115; in '35 at 133; in '37, 143; in '38, the end of the series, 144. At no time during the successive years indicated did productivity indices drop. They moved steadily through the depression; they carried out precisely the point you made earlier with respect to these charts. Now, would that be a reasonable observation to make with respect to man-hour productivity in the industry?

Dr. PARMELEE. If I understand your question it is as to whether the productivity per man-hour has been rather steadily increasing?

Dr. ANDERSON. That is right.

Dr. PARMELEE. My answer would be "Yes," but I would like to put in a demurrer, as the lawyers say, on the use of the words "productivity per man-hour." I think probably Dr. Bell uses that phrase in the ordinary accepted meaning, which is not so much productivity per man-hour but output per man-hour, recognizing, of course, that the output is the joint product of several factors working together, not only the efficiency of the individual man but also the efficiency of management, that is, organization, and also the investment in the plant as a whole. I would like to make it clear that that is what I understand by the phrase productivity per man-hour.

"Exhibit No. 2522" appears on page 44, Mr. Chairman.

(The chart referred to was marked "Exhibit 2522" and appears on p. 16592. The statistical data on which this chart is based are included in the appendix on p. 17363.)

Dr. PARMELEE. This shows a very marked increase in full conservation per unit of movement in both freight and passenger service. What interests me in this exhibit is that the gross ton mileage in 1939 per ton of fuel was 17,779. That figure doesn't mean very much, at least to me, until I break it down and divide that figure by 2,000,

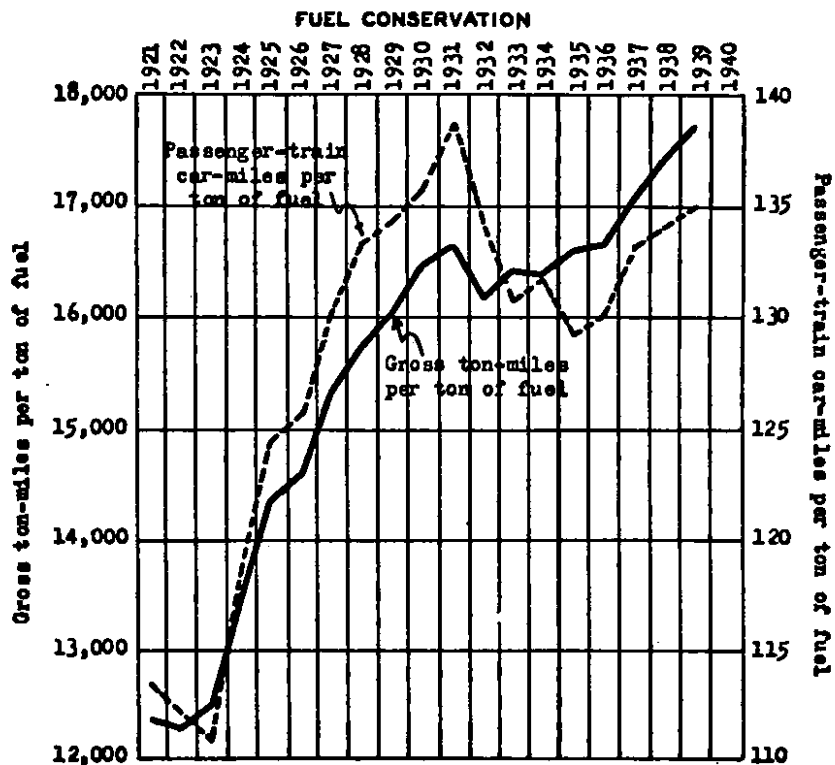
¹ Spurgeon Bell, *Productivity, Wages, and National Income*, Brookings Institute, 1940.

which is the number of pounds in a ton of fuel, from which I discover that on the average in the freight service the railroads moved 8.9 tons of weight 1 mile for the expenditure of 1 pound of coal, or its equivalent, or, carrying it down still further they moved 1 ton of weight 1 mile for the expenditure of 1.8 ounces of coal, a comparatively small piece of coal.

Now since there was considerable increase in that factor from 1921 and the factor again was higher in 1939 than in any other year in history, I think that can be ascribed only to an increase in technology,

EXHIBIT No. 2522

[Submitted by the Association of American Railroads]



better locomotives, better methods of fuel handling and selection, and better actual consumption of the fuel in the locomotive.

I think I can perhaps go over the next four exhibits rather quickly.

(The charts referred to were marked "Exhibits Nos. 2523 to 2526" and appear on pp. 16593-16595. The statistical data on which these charts are based are included in the appendix on pp. 17363-17365.)

Dr. PARMELEE. They relate mostly to what may be called the various elements of waste, loss, and damage expenses. "Exhibit No. 2523" shows various types of expenditures to make good either a complete

loss of freight or damage to freight, or damage to property, baggage, or what not. You will notice a very marked reduction per dollar of revenue in that factor down to 1939, which is very low. "Exhibits Nos. 2524 and 2525" show a very marked decline in casualty rate of accidents on the railroads. Accidents to employees are shown in "Exhibit No. 2524" and to passengers in "Exhibit No. 2525." In connection with this latter chart, I find in the National Safety Council Bulletin for 1938 this comparison of the casualty rates for fatalities as between railroads, automobiles, and busses, and scheduled air lines. Automobiles and busses refer only to the passengers in the

EXHIBIT No. 2523

[Submitted by the Association of American Railroads]

LOSS AND DAMAGE EXPENSES
PER DOLLAR OF FREIGHT REVENUE

Year	Cents per dollar of freight revenue						
	0	.40	.80	1.20	1.60	2.00	2.40
1921	2.35	[Bar extending past 2.40]					
1922	1.15	[Bar extending past 1.20]					
1923	0.92	[Bar extending past .80]					
1924	0.95	[Bar extending past .80]					
1925	0.81	[Bar extending past .80]					
1926	0.71	[Bar extending past .40]					
1927	0.73	[Bar extending past .40]					
1928	0.71	[Bar extending past .40]					
1929	0.74	[Bar extending past .40]					
1930	0.76	[Bar extending past .40]					
1931	0.73	[Bar extending past .40]					
1932	0.71	[Bar extending past .40]					
1933	0.57	[Bar extending past .40]					
1934	0.62	[Bar extending past .40]					
1935	0.66	[Bar extending past .40]					
1936	0.64	[Bar extending past .40]					
1937	0.68	[Bar extending past .40]					
1938	0.71	[Bar extending past .40]					
1939	0.55	[Bar extending past .40]					

a Partially estimated. * Not yet available.

automobile or the bus, and, of course, the same is true of your air lines.

Now, the death rate per 100,000,000 passenger-miles in 1938 on your scheduled air lines was 4.5.

The CHAIRMAN. From what table are you reading now?

Dr. PARMELEE. I am giving you some figures in the record, Mr. Chairman, from this National Safety Council bulletin. For automobiles and busses combined it was 3.9 deaths per 100,000,000 passenger-miles. For the steam railroads it was 0.36, or less than one-third of 1 for 100,000,000 passenger-miles.

The CHAIRMAN. For what period is this?

Dr. PARMELEE. That was the year 1938, the latest year for which they have published distances:

The CHAIRMAN. The commercial aviation companies have just finished a year without any loss of life at all.

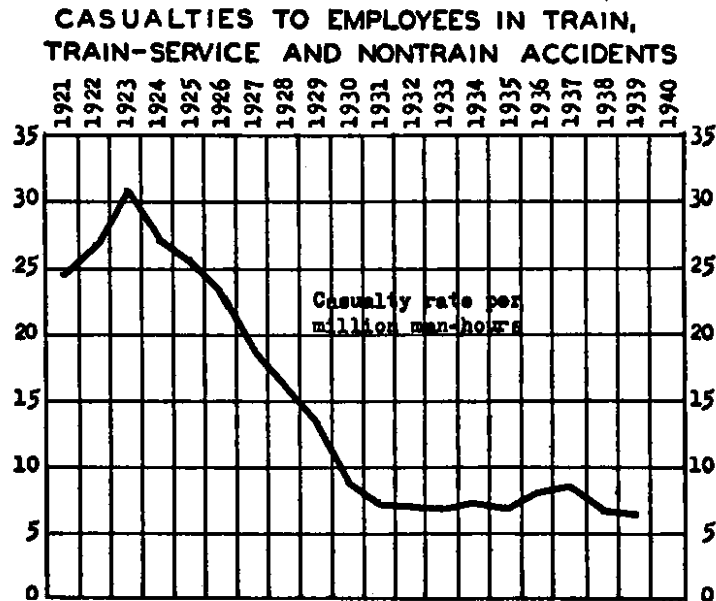
Dr. PARMELEE. That is true, Mr. Chairman; we hope they will keep it up.

"Exhibit No. 2526" is a general bringing together of these loss and damage and injuries to persons expense growing out of handling of freight and baggage and out of casualties to employees and passengers, with a showing of the extent to which that cost per dollar of revenue has been reduced to a comparatively low figure in 1938. Unfortunately, we do not have 1939 figures on that score.

That completes, Mr. Chairman, a very brief analysis of some of the exhibits shown in this statement.

EXHIBIT No. 2524

[Submitted by the Association of American Railroads]



The committee may be interested, however, in considering some of the actual or detailed steps taken by the railways in their maintenance work, in their operations, in their communications field, and others of their activities looking toward this increased technological progress, the results of which are shown quite clearly in this statement.

DETAILS OF LABOR DISPLACEMENT BY MECHANIZATION

Dr. ANDERSON. Mr. Chairman, I wish to introduce at this time, as a file exhibit only, because of its size and character of the exhibit, a very

EXHIBIT No. 2525

[Submitted by the Association of American Railroads]

CASUALTIES TO PASSENGERS ON TRAINS IN
TRAIN AND TRAIN-SERVICE ACCIDENTS

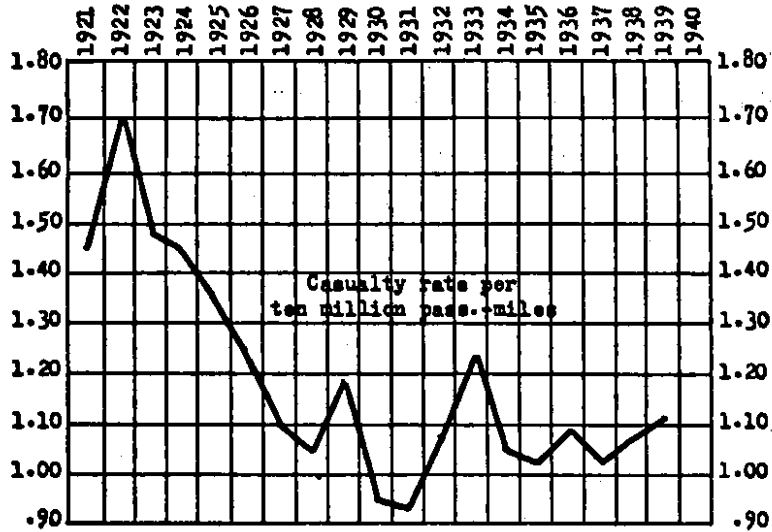


EXHIBIT No. 2526

[Submitted by the Brotherhood of Railway Clerks]

TOTAL LOSS AND DAMAGE AND INJURIES TO PERSONS
EXPENSES PER DOLLAR OF TOTAL OPERATING REVENUES

Year	Cents per dollar of Total Operating Revenues			Loss & damage and Injuries to persons					
	Total loss & damage	Injuries to persons	Total	Loss & damage	Injuries to persons				
				0	0.5	1.0	1.5	2.0	2.5
1921	1.9	0.6	2.5	[Stacked bar chart showing 1.9 for loss & damage and 0.6 for injuries]					
1922	1.0	0.6	1.6	[Stacked bar chart showing 1.0 for loss & damage and 0.6 for injuries]					
1923	0.8	0.7	1.5	[Stacked bar chart showing 0.8 for loss & damage and 0.7 for injuries]					
1924	0.8	0.7	1.5	[Stacked bar chart showing 0.8 for loss & damage and 0.7 for injuries]					
1925	0.8	0.7	1.5	[Stacked bar chart showing 0.8 for loss & damage and 0.7 for injuries]					
1926	0.7	0.7	1.4	[Stacked bar chart showing 0.7 for loss & damage and 0.7 for injuries]					
1927	0.7	0.7	1.4	[Stacked bar chart showing 0.7 for loss & damage and 0.7 for injuries]					
1928	0.6	0.7	1.3	[Stacked bar chart showing 0.6 for loss & damage and 0.7 for injuries]					
1929	0.7	0.6	1.3	[Stacked bar chart showing 0.7 for loss & damage and 0.6 for injuries]					
1930	0.7	0.7	1.4	[Stacked bar chart showing 0.7 for loss & damage and 0.7 for injuries]					
1931	0.7	0.7	1.4	[Stacked bar chart showing 0.7 for loss & damage and 0.7 for injuries]					
1932	0.6	0.7	1.3	[Stacked bar chart showing 0.6 for loss & damage and 0.7 for injuries]					
1933	0.6	0.6	1.2	[Stacked bar chart showing 0.6 for loss & damage and 0.6 for injuries]					
1934	0.6	0.6	1.2	[Stacked bar chart showing 0.6 for loss & damage and 0.6 for injuries]					
1935	0.6	0.6	1.2	[Stacked bar chart showing 0.6 for loss & damage and 0.6 for injuries]					
1936	0.6	0.6	1.2	[Stacked bar chart showing 0.6 for loss & damage and 0.6 for injuries]					
1937	0.7	0.6	1.3	[Stacked bar chart showing 0.7 for loss & damage and 0.6 for injuries]					
1938	0.7	0.6	1.3	[Stacked bar chart showing 0.7 for loss & damage and 0.6 for injuries]					

important document which has been used by the railroad carriers. It is a brief presented before the Railroad Carrier Industry Committee, under provision of the Fair Labor Standards Act. I want to introduce it here because it is the most graphic portrayal I have seen, a detailed analysis of technological advance in the railroad industry with respect to maintenance of way. Just to illustrate, if you will turn to page 8, you will see portrayed the effects of a portable power track nutter, displayed in the picture on page 9.

(The document referred to was marked "Exhibit No. 2527" and is on file with the committee.)

Dr. ANDERSON. Do you want to continue the discussion, Mr. Parmelee?

Dr. PARMELEE. Yes. May I say, Mr. Chairman, that this exhibit was filed by a trained railroad engineer, the assistant chief engineer of the Pennsylvania Railroad, Mr. Robert Faries, in the recent hearings before the Wage-Hour Industry Committee, which has now under consideration the matter of a minimum wage in the railroad industry. I would like to make it clear first that its presentation here is in no sense an effort to bring that controversy into this committee, and, second, that I am not a technical expert and can discuss these in only the most general way.

Mr. Faries produced in this exhibit before the committee a series of rather illustrative pictures and statistics with respect to certain types of maintenance-of-way machinery, all of which have been introduced on his railroad, the Pennsylvania Railroad, in the last few years, and all the statistics regarding which have been carefully compiled by him from actual tests on the railroad over a period, in some cases, of months, and in some cases, years.

Now, the picture, as Mr. Anderson has said, of the portable power track nutter is shown on page 9 and the statistics at the bottom of that page show how the introduction and use of that machine has saved or curtailed employment.

The CHAIRMAN. Now, of course, a track nutter, for the uninitiated who may read the record, is a machine which screws on the nuts?

Dr. PARMELEE. That is right, Mr. Chairman; you got it right the first time.

Those statistics at the bottom of page 9 are then transferred to page 8 and shown in graphic form. So for the purpose of this very brief statement, perhaps if you will look at the chart on page 8, the picture will be shown there.¹

There are six upright columns on that page, you will notice, three sets of two each. Let us look at the first two of these tall red columns; the heading over the two is "With labor at 30 cents per hour," the minimum wage now statutorily effective in the railroad industry. The first one states that the amount of work done by two of these portable power track nutters in a season's work of 160 days could be done by a foreman and 20 laborers.

The CHAIRMAN. That gang would be working without the machine?

¹ See "Exhibit No. 2528," *infra*, p. 16599.

Dr. PARMELEE. By hand labor. The red part of the column represents the labor cost of that work by hand. The little barred figures at the top are the other things which go into the figure, the pension cost for these men, any amount of repairs on tools, and things of that sort. You will notice at the bottom, at the left, the various items which go into that upper part. Now, if, however, you put two machines to work, you then have the expenditures which are shown in the second column under the general head of "Machine work." Your labor cost, you will notice, the red part of the column, drops very materially. Instead of having a foreman and 20 laborers, you have a foreman, 2 operators, and 12 laborers, a total of 15 men as against 21.

The total wage cost decreases according to the reduction in that red column.

There are certain additional costs which come in because of the use of the machine, and those are shown above the red column in the second column. Some of these are interest on the moneys used to purchase the machines, some of them are repairs on the machines, and some are depreciation of the machines. But the total length of the two columns represents the relative cost of doing this work by hand or by machine.

That there are six men displaced by the two machines is indicated here, and there are \$628 in curtailment of total expenditures.

Now, the machines cost, as shown at the top, \$1,658. They will save \$628 at 30 cents an hour during the working season of 160 days, or they will pay about two-fifths of themselves in the course of a season.

Now if the labor happened to be at a rate of 35 cents an hour instead of 30, the saving on these two machines, instead of \$628, would be \$1,170, whereas with labor at 40 cents an hour, the last two columns on the sheet, the saving would be \$1,713 for the season.

In other words, if wages were 40 cents an hour, those two machines would pay for themselves in the course of a single season.

Now, Mr. Faries showed this same type of information for a large number of machines which I don't need to go into, but the general plan followed throughout was to set up the figures in this form, showing how many men would be displaced and what would be the saving on a given machine, or a set of machines, to do a certain piece of work over a season.

The CHAIRMAN. Mr. Hinrichs suggests we might at least put this single chart in the record.

Dr. ANDERSON. I have been informed, Mr. Chairman, that we can have anywhere up to 10, if you choose, duplicated in the record. There is a variety of them.

The CHAIRMAN. The discussion of this particular chart would be made much more clear if this particular exhibit were in the record. I think it would be well to have it in.

Dr. ANDERSON. That will be "Exhibit No. 2528."

(The chart referred to was marked "Exhibit No. 2528" and appears on p. 16599.)

Dr. PARMELEE. The committee will notice there are a considerable number of machines as to which the same general showing is made, and those are by no means all the machines that might have been shown.

Dr. ANDERSON. Dr. Parmelee—

Dr. PARMELEE (interposing). They are selected as representative.

The CHAIRMAN. How many of them are there?

Dr. PARMELEE. I think Mr. Faries showed here about 20, but I don't know that anyone can answer how many there are in the field.

The CHAIRMAN. But in this booklet from which you were testifying there are about 20 charts illustrating labor displacement by machines of one kind or another.

Dr. PARMELEE. In maintenance-of-way work, only. He was testifying only as to the maintenance-of-way work; that is, work on the track.

Mr. HINRICHS. I don't question for a moment that the chart indicates quite conclusively the reasons for mechanization of this particular operation, but coming back to this question of this relationship between wage rates and the introduction of machinery, this exhibit that you have put here is a fair illustration, I suppose, of that sort of a situation?

Dr. PARMELEE. Yes.

Mr. HINRICHS. Now, as you portrayed it, as I see it, starting with that picture of labor at 30 cents an hour, there is already the possibility of a 33 percent return on an investment in these two machines. An increase in labor cost under those conditions does nothing more than increase the rate of return.

Next you assume a rate of 35 cents, and get essentially a 66 percent return on capital investment. But wouldn't you expect from this record to see the introduction of this machinery, even in the face of a return no greater than 33 percent a year on new capital investment?

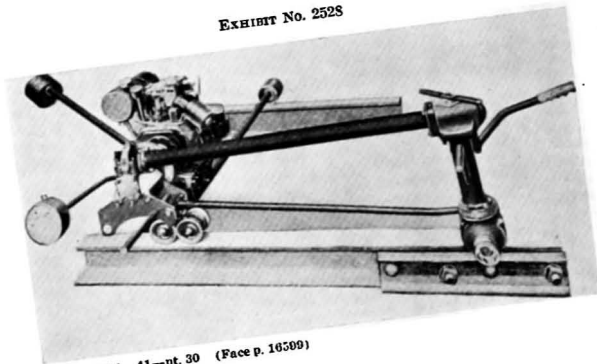
RESISTANCE TO TECHNOLOGICAL CHANGE

Dr. PARMELEE. What you have to consider there, Dr. Hinrichs, is always the element of human inertia working. If you have labor receiving a certain rate, and it has been receiving it for a certain time, and you have a certain number of men on your force, even though you might figure theoretically, as you could from a showing of that kind, that you could get a return of 30 or 40 percent on an investment in machines, you might hesitate to make a change.

However, if you had an increase rather suddenly, and perhaps an enforced increase in your wage up to 35 or 40 cents (I am trying to keep away from this controversy) and that stimulated you to sit down with your pencil and refigure the whole thing, and you found the return was going to be 50 or 60 or 70 percent, instead of 30 or 40, you might then overcome the inertia in your mind and the psychologically strong objection you have in your mind to replacing or displacing your men. There is always that that you have to consider.

Mr. HINRICHS. You don't mean that in order to overcome the inertia of railroad engineers who are advocating a saving of 8 percent

EXHIBIT No. 2528



124401—41—pt. 30 (Face p. 16509)

in the total cost, it is necessary to introduce a 20-percent wage increase, do you?

Dr. PARMELEE. I don't want to use that word "inertia" in a critical sense. I hope I won't be misunderstood on that. I meant the inertia in the minds of all of us when any question of change comes up. We have to be pretty definitely shown that the change will be an economic one, and that it should be made. And when you join with that the very natural and very proper disinclination of a railroad manager to displace men, he will wait a long time before he makes a change. He will try to avoid it if possible.

But if the relative saving from a given introduction of machinery goes up and continues to go up, he finally gets to the point where both inertia and psychological disinclination are overcome, and he makes the change, and the point at which the change comes depends on the circumstance that it is generally believed if you can get a 20-percent return or a little less from a given change, it is a good change. But that does not mean it will always be made at the 20-percent level.

Mr. PIKE. Isn't it true, as near as you can remember it, that an engineer will say, "You get your money back in 4 years," and the manager will say, "Yes, but before I have had it 2 years, you will be in with another gadget that I have got to buy."

Dr. PARMELEE. That may be part of the inertia.

Mr. PIKE. I have seen it in operation. The engineer will come in with a carefully figured saving of substantial size, and if the money is available, which is another thing in railroad management, the thing would without question be introduced. Well, through long and bitter experience, you find that these savings on paper do not always carry through to the actual operation, and the manager is for that reason reluctant to put it in. An additional bit of evidence like this will, however, finally push him over the hill.

Dr. PARMELEE. That is true. All these factors enter into it.

Dr. ANDERSON. Referring to the morning's testimony by Mr. Pelley in which he indicated a marked difference between the problems which the railroad industry is facing today, and those which it faced during the period of over-all great expansion, he pointed out—and I probed him a bit on it—that the problems had changed from one of rapid expansion to one of intensive struggle against the depression and against growing competition.¹

Now, is it your feeling that as a result of this change in the problem confronting the railroads, technology like that mentioned here overcomes more quickly the inertia or the doubt in the minds of railroad managers, and that the engineer now has his way more frequently and more readily than he had in the past?

Dr. PARMELEE. I don't know that I can answer that question in definite terms, because I don't know enough about it. I do know this, that engineers today and railway operators and managers are extremely alert to possibilities, to all the possibilities of increasing and improving the condition of their plant and their operations.

Undoubtedly, there has been some stimulus to them from the depression conditions of the absolute need for economy which has been forced upon them, and there has been some stimulation because they

¹ *Supra*, pp. 10537, ff.

had to meet this competition in some way, and improve their service and reduce its cost.

The CHAIRMAN. Dr. Anderson, I wonder if you would turn to page 14 and ask the witness to make a little description of this chart also. It seems to be a rather striking one.

Dr. ANDERSON. I asked him a moment ago; this is much more striking than page 12.

The CHAIRMAN. Would you discuss the burro crane?

(The chart and photograph of the burro crane were marked "Exhibits Nos. 2529 and 2529-A" and facing p. 16600. The statistical data on which the chart is based were marked "Exhibit No. 2529-B" and are included in the appendix on p. 17366.)

Dr. PARMELEE. Yes. The picture of that is on page 15, so I do not think any particular description is needed. You will notice that it does a number of things. It loads and unloads material, it does ditching, and helps out in rail laying, moving rails from place to place, and does a good many things during the working period averaging 180 days a year. The machine costs \$8,023. With labor at 30 cents per hour, the first two columns on the table show that without the crane the amount of work that would be done by a crane and its crew could be done by a foreman and 12 laborers. There would be very little cost of supplies, although there is a small item at the top of that column which represents supplies of various kinds. With the crane and with this investment of \$8,023, the total cost is about cut in half. However, the labor cost is cut by three-fourths, because only 1 man is required on the crane as an engineer and 1 laborer to help him, 2 men instead of 13. You do have an increase in certain other costs, of course, the cost of operating the crane itself, fuel, depreciation, supplies for the machine, and so forth, but even after adding in all of that additional cost you still save about one-half of the cost. There are 11 men displaced, a curtailment of force at the 30-cent rate, and of expenditures of \$3,133, or about 40 percent of the capital cost of the crane; at 35 cents an hour, you would save about 50 percent of the cost of the crane, and at 40 cents an hour about 60 percent.

Mr. PIKE. Any device like this which runs into substantial capital you must put where there would be a good deal of work for it during the year in order to justify it. Here you estimate it is going to be busy half the time.

Dr. PARMELEE. About 9 months of the year.

Some of these are sets of machines which cost a considerable amount of money, and some are single machines.

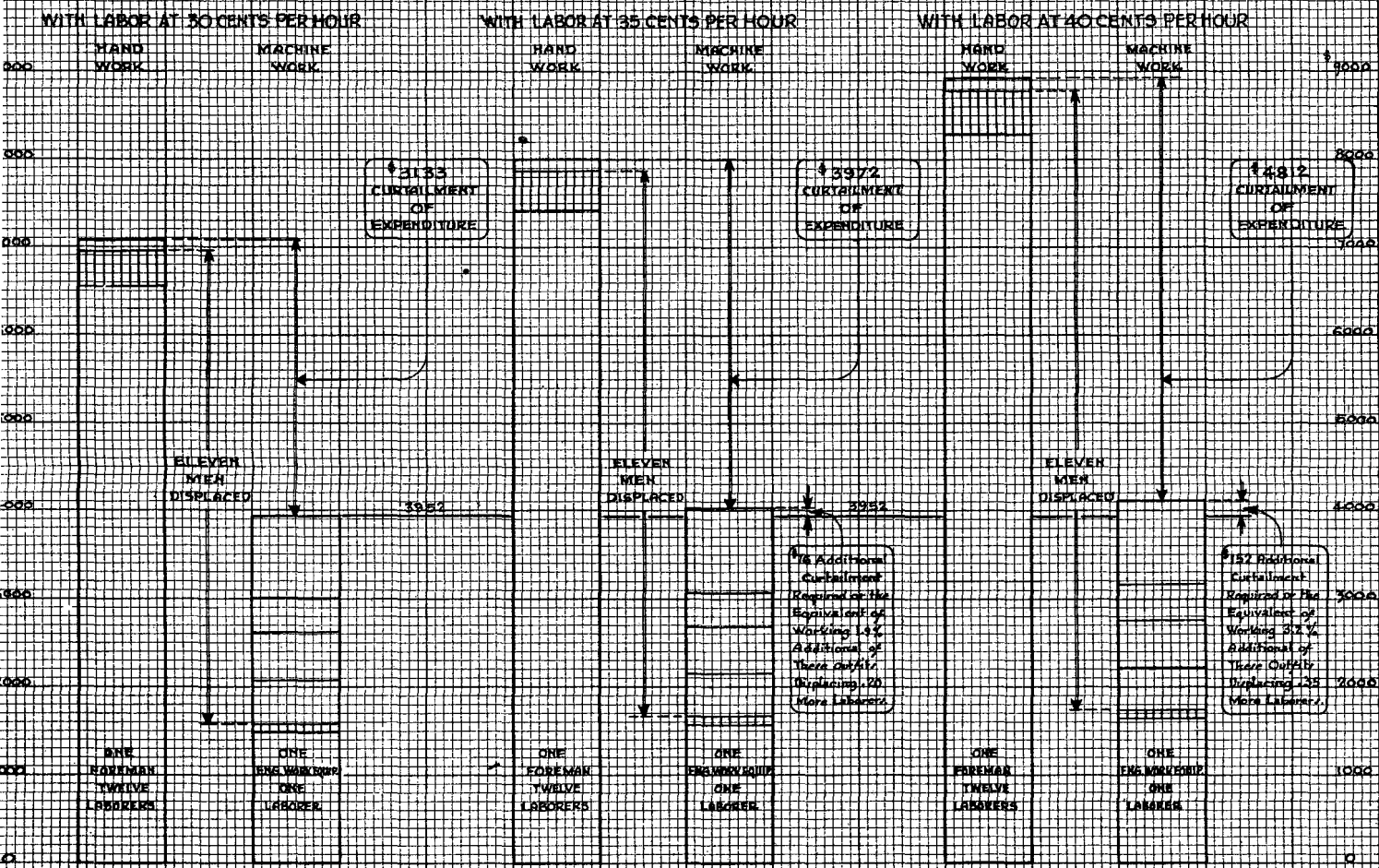
The CHAIRMAN. Would you make any general summary of what all of these exhibits show?

Dr. PARMELEE. Mr. Robert Faries made a summary on page 49 which is perhaps the best place to refer you to. He brought a number of these machines together on a typical railroad with 1,200 miles of main track, and he reached a general summary and average conclusion that an investment of approximately \$600, or \$603 invested in maintenance of way machinery would be equivalent to displacing one man, or, to put it differently, each \$600 invested would dispense with the service of one average track laborer. I was not going through all the details of the table by which he arrived at that, but this is a combination of various exhibits shown earlier in the statement.

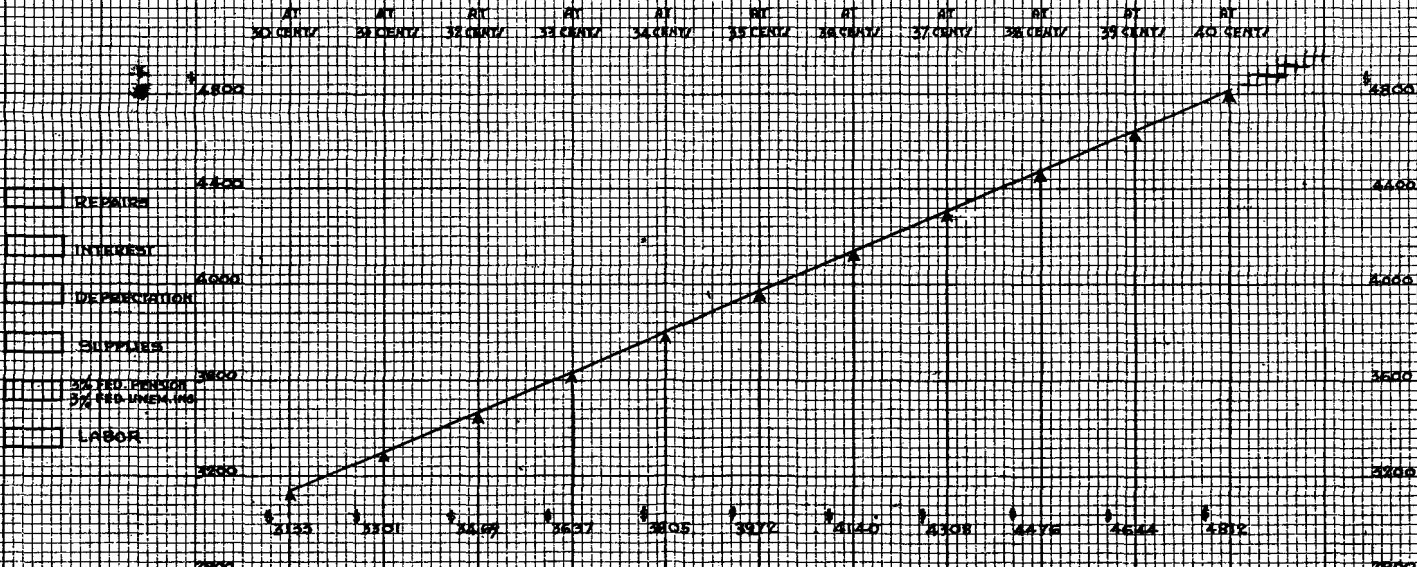
BURRO CRANE

CURTAINMENT OF FORCE AND EXPENDITURES THROUGH USE OF 1 MACHINE IN LIEU OF HAND OPERATION FOR LOADING AND UNLOADING MATERIAL, DITCHING, RAIL LAYING, ETC. DURING WORKING PERIOD OF 180 DAYS (9 MONTHS) PER YEAR

FIRST COST OF AN OUTFIT OF 1 MACHINE \$8023
 ELEVEN (11) MEN DISPLACED BY USE OF ONE OF THESE OUTFITS



VALUE OF ONE OUTFIT FOR CURTAILING EXPENDITURES



KEUFFEL & ESSER CO. NEW YORK.

Експліт No. 2520-А



124401—41—рт. 30 (Face p. 10600) No. 2

Dr. ANDERSON. A total of 267 men would be displaced by that mechanization.

Dr. PARMELEE. Yes; by this list of 12 or 13 which he has.

The CHAIRMAN. The second column from the end adds up to more than 267 men.

Dr. ANDERSON. Are those net displacements in the second column?

The CHAIRMAN. The second column from the end.

Dr. PARMELEE. I think you are right, Mr. Chairman. I think he reduces that to the equivalent men in terms of one man working a full year. You will notice he says 255 working days per year on a 5-day week basis, but in some cases these men would be working only 60 days in the year, or 52 days in the year, or what not.

The CHAIRMAN. Perhaps it might be well to insert this table in the record.

(The table referred to was marked "Exhibit No. 2530" and is included in the appendix on p. 17367.)

Dr. ANDERSON. Tying our thinking now with respect to these specific examples of displacement to your table 2517, "Employees, Hours, and Compensation,"¹ I wonder if you could give us a break-down of employees, hours, and compensation with the headings that you have in that table, based upon some vertical arrangement of workers or some classification of workers in the railroad industry which would indicate to us workers in the various parts of the industry and their proximity to technological changes. I take it that workers in maintenance of way are particularly close to technological changes indicated by this booklet.

Dr. PARMELEE. Yes; that is true.

Dr. ANDERSON. Is that so true of trainmen, for example?

Dr. PARMELEE. Maintenance-of-equipment men are also fairly close, and transportation men to some extent, but probably not so close.

Mr. PIKE. Station agents and so forth hardly so.

Dr. PARMELEE. Crossing watchmen are affected, and men of that kind. They are in train operation.

Dr. ANDERSON. Is it possible to get a break-down in such classifications as you have been indicating for "Exhibit No. 2517"?

Dr. PARMELEE. I would rather do that by taking the transportation groups and showing it separately for them.

Dr. ANDERSON. Would it be possible to indicate in any specific manner the technological occurrences, with respect to these workers?

SUMMARY OF TECHNOLOGICAL CHANGES

Dr. PARMELEE. I think it would be rather difficult to do that. I would like to do this, Mr. Chairman, if I may: read into the record very briefly some of the things that have been done in these various departments of the railroads as elements of their technological program. This is very much a layman's untechnical summary.

Take the maintenance of equipment—we have talked about that in connection with "Exhibit No. 2528". A few illustrations of the sorts of things that have been done and are being done in technology

¹ See "Exhibit No. 2517," appendix, p. 17361.

in the maintenance of equipment are: Chemical treatment of water supply for locomotives, which has reduced the number of leaking flues and has also reduced the need for washing out of boilers. Both of those, of course, have reduced the number of men employed on those jobs. More recent welding processes are being used for stripping the equipment, for repair and replacement of parts, and for salvaging parts of obsolete and worn-out equipment.

There is a greater and greater use of the oxy-acetylene and electric welding method for specific repair use.

Washing and painting of equipment has been reduced by substituting spraying machines for the hand brush.

The new air brakes which have been recently developed and put into effect, the so-called A. B. brakes, require attention at only 36-month intervals, whereas air brakes of the older types required servicing every 18 months. This reduces the number of times over a given period that the brakes have to go to the shop, and of course the repair work in the maintenance department is reduced.

Scheduling and routing methods are used in handling locomotives and cars through the shops, reducing the time spent on such jobs and very much stimulating and increasing the use of labor-saving devices. Some of the larger shops have adopted the so-called assembly line by which the cars, when being either built or repaired, go through on a track, as in the case of the automobile plants, and are moved through from job to job instead of moved from one shop to another.

In the field of communications and control of trains, there have been very marked technological improvements. I might mention only the installation and development of automatic block-signal systems, automatic train control, development of interlocking plants and remote control, centralized traffic control (a system for manipulating by central control board all main-line-track switches and signals in a given district or even an entire division). The obvious reduction in force required to handle that kind of a system is very clear.

I have presented to the committee some figures which show a very marked increase in fuel economy. A number of factors have contributed to that, such as longer boiler tubes in the locomotives to transfer the heat more efficiently; improvements in the fireboxes which permit better draft and better combustion; the use of superheaters which raise the temperature of the steam and give it greater expansive force; the use of steam separators or so-called desaturators which reduce the moisture in the steam and permit easier superheating; the installation of special heaters which preheat the feed water into the locomotive boiler; and the reduction in the dead weight of locomotives and of cars, which, of course, means that you can handle more weight in the train at quicker speeds with roller bearings at the expenditure of less fuel.

Mr. O'CONNELL. May I interrupt? Is that last improvement you mentioned a prospective improvement?

Dr. PARMELEE. A considerable amount of that is prospective. There has been a considerable increase in the use of aluminum and alloy steel in locomotives, particularly passenger locomotives, and to some extent in passenger cars. It is being experimented with now in connection with the freight cars.

Mr. O'CONNELL. But it is not in very extensive use in either?

Dr. PARMELEE. Not very. There are some experimental freight cars now in service which are being watched and studied with care to decide whether the use of one type of alloy or another type, or one method or another method, is the better. The question of getting the cost down, of course, is an important question at the same time.

In train operation, just to mention a very few, I have spoken of the automatic block signals, interlockers, and so forth. Installation of track scales has been quite general, for the automatic weighing and recording of weights while freight cars are in motion. Devices are in service which use gas, oil, and electricity for melting snow and ice at switches.

A very important improvement in the yards is the so-called hump yard where the cars are classified onto the tracks by being taken to a hump and then sent down an incline by means of gravity. At the same time, in a good many of these yards they have installed so-called car retarders, by which men in the signal tower at a distance can control the movement of these cars from the hump down onto the various classification tracks. A car retarder is nothing more than a brake applied to the wheel of a car from the side, the brake mechanism being installed along the track. The brake is applied to the side of the car wheel as it moves, being controlled from a distance. The introduction of all-steel boxcars and the more general use of all-steel open-top cars; the practical elimination of wood from all of our passenger cars and a large portion of the freight cars has led to greater lightness and fewer repairs.

I have spoken of the introduction of the modern A. B. automatic brake; wrought steel wheels in passenger service; rolled steel; the use of roller bearings which are being put into effect on many of the passenger trains. On the track the drainage methods have been very much improved. There is more and better ballast; heavier rail is being used. The average weight of the rail per yard is going up every year, it is now 94 pounds per yard as against about 87 10 years ago. Larger and better tie plates are being used. There is a great improvement in track fastening, and there has been a gradual replacement of a great many of the wooden bridges and trestles by either creosoting wooden structures or making permanent structures.

Changes in organization, especially in maintenance of way; the tendency is to use large mechanized gangs for maintenance-of-way work; instead of having a small gang scattered at different points over the system, or rather over the division, they have larger gangs and move them more rapidly from one point to another. One thing that has helped in that respect is, of course, being able to move them rapidly by motorcars—power motorcars.

Materials are being conserved to a greater extent than they were. Application of the gas torch and electric arc in the building up of battered rail ends gives longer life of rail and, incidentally, better safety. The application of welding processes in the repair of manganese trackwork; great increase in salvage work by which steel, wood, and other types of materials are brought into central points, are there salvaged, in many cases parts being taken out and reused for other equipment, or in other cases saved and sold as scrap, and reclaimed in that way.

In the accounting department there has been a very marked increase in technology. We do not hear about that, but there is a large reduction in the number of clerks.

Dr. ANDERSON. Do you have the number that has been reduced? Would it be possible to give us a table for our file that would show the effect of technology on clerical workers by grade of workers, type of work done, and displacement?

Dr. PARMELEE. Clerks are classified in three groups, A, B, and C, and I think chief clerks and then stenographers and typists; we can give you those classes, we will be glad to do that.

The CHAIRMAN. The whole story resolves itself into this conclusion: that by reason of the technological advance a great deal more work can be performed with fewer persons.

Dr. PARMELEE. That is exactly what is being done in the railroad service today, Mr. Chairman.

The CHAIRMAN. And of course as the amount of work is increased, if it is increased, then more people relatively will be employed, but the displacement factor is always evident, and that may be overcome only to the degree that new or additional work of some kind or another is created to absorb those who are displaced.

Dr. PARMELEE. You are right, I think, Mr. Chairman. I think there are two things we have to take into account; first, that within limits you can increase your traffic without the necessity of increasing your force, because you are increasing your technological advance all the time. Then there comes a point where even with the improved technology you have to take on more people, you need them. Mr. Pelley spoke of that this morning. Now there is the other feature, and I think we should not omit it from our consideration, and that is that in installing these various machine and power devices, and so on, you are indirectly giving employment to men in other industries. Now that does not help the railway man very much, it is true. It doesn't help him to throw him out of a job if some man who is engaged in building this machinery gets a job, but to look at the picture as a whole that feature is involved.

The CHAIRMAN. The unemployment problem to the man who is displaced is just as acute and just as keen as is the competitive problem to the railroad which finds itself losing business to the waterways or to the highways.

Dr. PARMELEE. Absolutely, and I don't want to give any impression that we don't consider that his position is a very serious one from his point of view, and properly so.

Mr. HINRICHS. Turning to "Exhibit No. 2530", which shows \$603 invested in machinery per man displaced, at least so far as these exhibits of capital invested are concerned, the labor created in the machinery is almost incidental. There is some labor that has been created there, but it certainly is not a very important factor insofar as these exhibits are concerned, is it?

Dr. PARMELEE. Wouldn't you say, Mr. Hinrichs, that the process of producing a machine is made up of labor in the last analysis? Everything produced, in the last analysis, is the product of labor somewhere in some process.

Mr. HINRICHS. I wouldn't grant you that this is entirely labor, but just for the sake of argument, let's assume that this \$603 has

been spent entirely for machine labor. They were making the machines. Labor of that sort would have averaged, would you like to say, 70 cents an hour, or a little more? It divides more easily if we say 60 cents an hour, it makes more labor for you. That is 1,000 hours of labor in these machines (under exaggerated conditions) per man-year of displaced labor. These machines have a useful life, I presume, of anywhere from 4 to 20 years—

Dr. PARMELEE (interposing). You can get that out of the depreciation rate there.

Mr. HINRICHS. The depreciation rate seemed to be relatively low, and to indicate a relatively long life, so that this labor is created in the first year and then does not recur as a matter of course.

The CHAIRMAN. Of course, I think both of you are right, if I may interrupt. There isn't any doubt that the manufacture of this burro crane, of which we had some testimony, is a new industry because 20 years ago there was no such thing as a burro crane, but it is very likely from the picture that that burro crane was not made by hand labor. It was undoubtedly made by machinery, and by hand labor, too.

In modern technology, we have tremendous machines that are needed to make machines, is that not correct?

Dr. PARMELEE. That is correct, Mr. Chairman. I didn't mean to give the impression, if I did, that your labor increase in the machinery-producing industry was exactly equal to the labor displaced on the railway. I don't mean to argue that at all; I simply pointed out there is that factor to be taken into account.

The CHAIRMAN. The problem presented to Government in providing appropriations to take care of the unemployed sort of demonstrates that there is a sum total of labor displacement, though undoubtedly new industries are created and new jobs are made. By and large, when the whole thing is summed up, there is the total unemployment which the Government has to take care of under our present inadequate approach to the subject.

PROSPECTS FOR EMPLOYMENT

Dr. ANDERSON. Mr. Parmelee, might I ask then the question I asked Mr. Pelley this morning? It appears from your own figures that on the upswing of business in the railroad industry, labor, the number of workers, did not increase at the same rate or in proportion to the increased volume of business, and that on the down swing labor displacement was also substantial, indicating that either in good or bad times, the railroad industry seems to have come to the place in its technological development where the number of workers engaged in the industry does not follow in any way with the increasing volume of business.

Now, would it follow from that sort of reasoning that here is a fairly well-established industry with rather rapid technological changes, which cannot, or will not, absorb an adequate number of workers?

Dr. PARMELEE. I don't know that I quite agree with your first premise, Dr. Anderson. Let me put it this way and see if we are on common ground: We have been going through so violent a series of changes in

the last 10 years that it is very hard to generalize and assume that the same thing will go on in the future; it is true, nevertheless, that between 1929 and 1937, if you follow the trend of railroad revenues down—I would rather use revenues than traffic because, after all, the revenues are what you pay your wages out of—if you follow your railway revenues down and then follow your total number of employees down, you find that in every year after 1929 there was a smaller decline in number of employees from 1929 than in revenues.

Or, putting it differently, the decline in revenues was greater than the decline in the number of employees. Now, there was one exception, I believe, to that general rule from 1929 to 1937. From 1937 to 1938 to '39 the reverse was true. Your revenues went up to some extent, up and down both, and your employees in each case went up and down, up less than the revenues and came down a little more. Now that opens up this same controversial question which I prefer not to raise now as to whether this wage increase in 1937 had anything to do with that or not. I would rather leave that question out, but over the last 10 years I think you can say rather generally that the number of employees hasn't gone down in the railroad industry as much as the revenues have declined, and the revenues after all mark the outer limits or boundaries of your pay roll; they are bound to, they must do so. Now, whether that trend will continue as we get back onto a more normal and better economic level it is very difficult to say, but it is true that the minute you get an increase in railroad revenues you will find that there is an increase in the number of employees and an increase in the total pay roll—although not necessarily at the same rate of increase.

Mr. HINRICHS. We take two bites at that question. Exhibit No. 2517¹ showed 1,660,000 employees or more back in 1929. At the present time you are just under 1,000,000. Can you visualize any set of circumstances which within the next, shall we say, decade would produce as much employment on the railroads as you had back in the decade ending in 1929?

Dr. PARMELEE. I hope you are not going to drive me to answer that question, are you?

Mr. HINRICHS. Well, I am not asking you to crystal-gaze, but is there any precedent that you know of in railroad history for an expansion that would give you that level of employment?

Dr. PARMELEE. I would refer you to Mr. Pelley's answer this morning, to a question somewhat similar where he spoke of the possible increase to 1,250,000 or 1,300,000; something of that sort.

Mr. HINRICHS. That is, the limits of employment that you have been talking about are limits a little above a million or a little below a million, depending upon the combination of changes in traffic, revenue, and technology, but the railroad industry appears now to be on a different employment level than it was on a decade ago.

Dr. PARMELEE. It seems to me, Mr. Chairman, that all of these facts that you have been trying to bring out about technology in the past 10 or 15 years in a sense bear on Dr. Hinrich's question. If we went back to 1,600,000 or 1,700,000 in the near future, it would mean that either you would have such a tremendous increase in traffic which would overwhelm the effect of technology and go way beyond

¹ Appendix, p. 17361.

now what seem to be the reasonable boundaries, or else that you were just throwing away the effect of the improvements that you have made.

The CHAIRMAN. Or else that you had overcome the competition from the waterways and motortrucks?

Dr. PARMELEE. That is what I mean when I speak of an overwhelming increase in traffic. It seems to me that question almost answers itself.

Dr. ANDERSON. Mr. Chairman, I wonder if we could ask Mr. Parmelee to state his conclusion on the labor question in terms not only of his own data on revenues and number of employees but in terms of the Brookings Institution data which seem to come to a different conclusion? We would like to have a reconciliation of the two.

The CHAIRMAN. Mr. Hinrichs a moment ago wanted to take two bites. Your testimony is, of course, very interesting and most stimulating, Dr. Parmelee, and I think we really could stay here all night. Do you want him to prepare a statement, Dr. Anderson?

Dr. ANDERSON. I can see him afterward and make arrangements with respect to the data and see that they include Mr. Hinrich's two bites.

The CHAIRMAN. Suppose we compromise on that.

Dr. ANDERSON. The first witness tomorrow, Mr. Chairman, is Mr. George Harrison, president of the Brotherhood of Railway Clerks, to be followed by Mr. A. F. Whitney, president of the Brotherhood of Railroad Trainmen.

The CHAIRMAN. Thank you very much.

Dr. PARMELEE. May I thank you, Mr. Chairman, for your patience and consideration.

The CHAIRMAN. We all enjoyed this. The committee will stand in recess until 10:30.

(Whereupon at 5:50 p. m. a recess was taken until 10:30 a. m. on Tuesday, April 16.)

INVESTIGATION OF CONCENTRATION OF ECONOMIC POWER

TUESDAY, APRIL 16, 1940

UNITED STATES SENATE,
TEMPORARY NATIONAL ECONOMIC COMMITTEE,
Washington, D. C.

The committee met at 10:45 a. m., pursuant to adjournment on Monday, April 15, 1940, in the Caucus Room, Senate Office Building, Senator Joseph C. O'Mahoney, Wyoming, presiding.

Present: Senators O'Mahoney (chairman) and King; Representative Williams; Messrs. Lubin, Pike, O'Connell, and Brackett.

Present also: William T. Chantland, Federal Trade Commission, and Dewey Anderson, Economic Consultant to the committee.

The CHAIRMAN. The committee will come to order.

(Representative Williams assumed the chair.)

Acting Chairman WILLIAMS. Do you solemnly swear that the testimony you shall give in this proceeding shall be the truth, the whole truth, and nothing but the truth, so help you God?

Mr. HARRISON. I do.

TESTIMONY OF GEORGE HARRISON, PRESIDENT, BROTHERHOOD OF RAILWAY CLERKS, CINCINNATI, OHIO

Dr. ANDERSON. Mr. Chairman, today's witness represents railway labor. Mr. George Harrison is president of the Brotherhood of Railway Clerks and he speaks for the Brotherhoods and the Railway Labor Executives Association, some 20 organizations representing considerably in excess of 1,000,000 persons. There will be two labor representatives, Mr. Harrison today, and Mr. Whitney, if time permits.

Mr. HARRISON. Mr. Chairman and honorable members of the committee, at the outset I should like to express my appreciation on behalf of railway labor for the opportunity of appearing before this honorable committee in connection with the technical advance that has been made in railroad transportation and the various results created by that progress. I don't have a prepared statement. I thought perhaps the committee might get more value out of what I want to say if I made a general explanation of the progress that has been made in the industry with particular reference to producing transportation, and for that purpose I have divided the industry into four branches. The first branch that I wish to discuss is that known as the train and engine service, the actual operation of the trains.

TECHNOLOGICAL CHANGE IN RAILROAD OPERATION

Mr. HARRISON. In that portion of railroading, there has been a tremendous improvement since 1920 which has made it possible to reduce the cost of operation, and to improve the service to railroad patrons. It is the opinion of the workers that the tremendous increase in the power and the design of the locomotive was responsible for that improvement. The new type locomotive, constructed of more durable and lasting materials, together with the increased power, has made it possible to haul longer trains and a greater amount of freight in a train.

The reduction of grades affecting the track level and the elimination of curves have been contributing factors in that direction. The efficiency of the locomotive has been greatly increased by the new devices that have recently been applied, such as stokers, oil burners, power reverse gears, superheating of the water, and feed water heaters. The movement of the trains between the terminals has been expedited by the installation of the electric interlocking plants, improved signaling devices, and improved dispatching in issuing of orders because of improvement in telephone communication, repeating telegraph machines and automatic printers.

There has also been an increase in the steam pressure of the locomotive, permitting the exertion of greater power—from about 180 pounds 20 years ago, to 325 pounds at the present time.

The water and coal-carrying facilities of the locomotive, otherwise referred to as the tender, have been greatly enlarged, eliminating operating stops heretofore necessary to take on water and coal.

The locomotives have been equipped with flangers for the purpose of removing snow and ice in the wintertime and bad weather, and the tracks have been cleared recently by the introduction and utilization of rotary snow plows.

Twenty years ago most of our freight trains operated over divisions of approximately 100 miles in length. The locomotive was separated from the train at these division points, taken into the roundhouse and given what we call running repairs, and then returned to take out another train later on. Because of the great improvement in the design and the materials in locomotives, it is now possible to operate a locomotive as much as 1,000 miles without taking it in for ordinary service and running repairs. The theory of automobile lubrication has been applied to the locomotive and that has eliminated much of the necessity theretofore existing for servicing the locomotive every 100 miles.

That gives you a general idea of the improvement in mechanical power. Of course, various new types of power have been introduced in the last 20 years, notably the electric locomotive and the Diesel—electric switching engines, road freight engines as well as road passenger engines. That has had a tremendous effect on the efficiency of the plant by making possible greater speed, shorter schedules, and the elimination of much of the auxiliary or supporting organization ordinarily required to service that character of operation.

In the telegraph and dispatching group, the nerve center that controls the movement or the flow of railroad operations, the most substantial and far-reaching advance has been the installation of centralized train control. It is a device located at a central office which

flashes signals up and down a large area of railroad track, indicating by electric lights when the trains can move and when they shall stop, and generally controlling the movement of the trains. Before the introduction of that tremendously efficient device we had telegraph operators located at stations 5 or 10 miles apart on the railroad line, and a dispatcher in the central office issuing orders to the operators located at those stations who in turn gave the orders to the members of the train crew.

In that connection, the telephone has been utilized for the purpose of increasing the efficiency of operation. Oftentimes members of the train crew will stop at a telephone that is provided out in the country along the right of way, call up the dispatcher and get their orders, and then will set ahead for quite a distance devices known as manual block signaling devices. That, too, has had its effect upon the efficiency of the movement of trains over the railroad.

In the yards where cars are switched, there has been introduced what we call the hump yard. The hump is what the name would seem to imply; it is a hill. They utilize a large mallet type locomotive to push the cars to the top of the hill and then by gravity they run down onto the various branch tracks where they are controlled by what we call a car-retarding device. It is a mechanical contrivance that puts pressure on the inside flange of the car wheels by expansion between tracks and is operated electrically by telegraphers in a tower on top of the hump. That device has greatly improved the breaking up of the trains, classifying the cars into several units of trains, and has resulted in the displacement of a large number of workers.

In addition there have been many consolidations of terminal operations, where two or more railroads agree to combine their terminal operations. That has expedited the movement of freight through the consolidated unit and has displaced a large number of men. Likewise, in passenger-train operation between given points, two or more railroads have pooled their operations, thereby permitting reduction in the number of trains operating between those particular points, with the release of a large amount of equipment and personnel.

Of course, there have been quite a few changes in the office work ordinarily handled by the dispatching and telegraphing forces, but there has been no great mechanical improvement in that direction out on the line of railroad. There has been in another branch of service to which I shall call attention just a little later in my testimony.

MECHANIZATION IN SHOP SERVICE

Mr. HARRISON. Leaving that branch of the industry and going to what we would call the garage or the shop service, where the mechanics maintain and build the rolling stock, both locomotives and cars, we think the greatest advance in that direction has been the new type of machinery that has been installed in the shops.

In that connection I would call attention to the multiple planer where they can now dress 15 or 20 locomotive side rods at one operation while 20 years ago they could only machine one locomotive side rod, and they have applied the principle underlying the huge planer to the drill presses, tapping machines, and threading machines. They have introduced mechanical forging machines where locomotives and car parts made out of steel and wrought iron can be heated and put

into a machine equipped with dies. They were all forged by hand 20 years ago with little exception.

The introduction of the steel car and the combination steel-wood car, has resulted, of course, in the elimination of much maintenance and has increased the life of the vehicle or the unit tremendously.

Many of the steel cars are made of rust-resisting steel, and this has eliminated much of the servicing and painting and also prolonged the life of the car.

The new-type locomotive, as I have indicated, requires less servicing and lasts longer, and consequently it needs less servicing in the shops.

Our mechanical craft representatives say that the most substantial change in that direction has been the advance in the treating of the water used in the locomotive boiler, eliminating much of the scale and corrosion formerly occurring on the tubes and the lining of the boiler, and the introduction of roller bearings, together with the new type of lubrication, as I mentioned a moment ago.

That represents in a general way the progress made in the shops.

Now, along the line of railroad, what we call the right-of-way or the maintenance-of-way department, we are of the opinion that the greatest advance in that direction has been the introduction of the 130-pound, 39-foot rail in substitution for lighter weights and shorter lengths, assisted with rock ballast in place of cinder and other types of ballast, and treated railroad ties.

There are no exact figures available on the life of a treated tie; we have not had enough experience to learn what that is. From the best information we think it is about 21 years as compared to a period of 7 or 8 years for an untreated wood tie.

In the last 20 years there has been a tremendous shift from the untreated wood tie to the treated wood tie. When we reflect there are about 3,000 ties to every mile of track, we get some idea of the tremendous effect of the treated tie upon the maintenance of the right-of-way, and all that that implies in the way of expense and labor.

Likewise, the introduction of electric crossing signaling devices has had the effect on the movement of trains as well as employment of labor.

The elimination of grade crossings has displaced crossing watchmen. Then at operating points along the road, automatic water facilities have been introduced, operating on the same theory as our automatic refrigeration. It is controlled by the level of the water in the tank. In the old days, we had the pumper, operating a steam engine, pumping water out of the wells into the tank. The coal chute facilities and cinder pits have also been greatly improved.

In the old days, the coal was elevated on a trestle. Now it is conveyed mechanically to the coal chute. The cinders were formerly taken out of the pit by hand, and now are taken out by hopper conveyors and loaded into the car at the same operation.

The tool introduced in the maintenance-of-way work, or the servicing of the track, that represents the greatest progress might be said to be the ballast cleaning machine, which eliminates cinders and dirt and other substances that get into the ballast and make it mushy.

Every so often, ballast has to be cleaned, and that material removed in order to have a proper foundation under your track.

In the old days, when there was a low joint in a track where the track comes together, the pounding of the drivers of the locomotive on that joint would cause the end of it to wear down, and we would be required to remove that piece of track, cut it off with a hand hack saw, drill several holes in it, and replace it.

Now we have several types of welding machines, and we just dress it up and weld a piece on it, and the joint is as good as it ever was. This has eliminated a huge amount of labor and has meant a saving of a large amount of material.

We have weed-burning machines that clear the right of way. We have ditching machines that dig the ditches alongside the railroad tracks so the water will run off and create proper drainage. We have air-tamping machines that tamp the ballast between the ties. That was done by hand 20 years ago. We now have air-operated drills and mechanical equipment to load and unload ties and rails. That has represented a tremendous increase in efficiency, together with elimination of a large amount of personnel.

Turning now to my own branch of the service, which is the clerical branch, there has been tremendous progress made in that field by the introduction of almost every type of office equipment device: the typewriter, the calculating machine, the key punching machine, the bookkeeping machine, all of which have brought about the unification of the work at a central point.

The machine could not be utilized under the old method. When the machine was introduced it was necessary to centralize the work, and so the work has been removed from many offices along the railroad line and consolidated and centralized in, ordinarily, the headquarters or general office building of the railroad.

The consolidation of railroads has represented a tremendous advance in the elimination of personnel, and made possible the introduction of machinery. We cannot give you any precise figures that could be relied upon as to the cost of that machinery or the displacement of the labor, because there are so many contributing elements and influences; but the displacement has been tremendous. I shall give you some exact figures on the number of employment opportunities that have been eliminated as a result of the great progress that has been made in the industry.

Along with the utilization of all of these now mechanical devices to which I have referred, there has been a tremendous increase in the efficiency of the average worker. Our employment is pretty much stabilized because of the rules and regulations in the union contracts, and as our men grow older in the service, of course, they become more efficient in the performance of their several tasks. With the machine and the man I would say that there has been a tremendous advance in the railroad industry in the way of utilizing the new devices that have developed over that period of 20 years. So that you may have some general information on the industry in addition to what Dr. Parmelee presented yesterday—he put in the record a large number of exhibits and I don't wish to duplicate them because I can agree with most of them and the few that I find I am in conflict with him about I shall take up individually if the committee will permit—there are some matters on which he did not give statistical information that I thought might perhaps be of value to the committee. So if I may be permitted at this time I

would like to introduce Exhibit 2531, showing the outstanding par value of the stocks and bonds of the industry, so that you might have an idea of the general interest of the public, their stake, as one would put it, in this great railroad transportation industry.

Acting Chairman WILLIAMS. It may be admitted.

(The table referred to was marked "Exhibit No. 2531" and is included in the appendix on p. 17367.)

Mr. HARRISON. There are outstanding at par value \$8,148,602,000 of stocks and \$9,934,666,000 of bonds, or a total outstanding capital in the hands of the public of \$18,000,000,000.

Mr. PIKE. This eliminates intercompany ownership?

Mr. HARRISON. Yes; it eliminates intercompany holdings. This is the stock and bonds in the hands of the general public.

Mr. PIKE. And includes receivership roads?

Mr. HARRISON. Yes; it does. The 1938 figure reflects a slight reduction in the bonds. You will notice there is probably some adjustment there as a result of that, but very slight.

I would like to introduce Exhibit No. 2532, Investment in Road and Equipment, Class I Railways and their Lessor Companies.

Acting Chairman WILLIAMS. Let me inquire as to all of these exhibits that you offer. The source of the figures presented by the exhibit is given on the exhibit?

Mr. HARRISON. Yes; on the exhibit.

Acting Chairman WILLIAMS. As to all of them?

Mr. HARRISON. The source is an accepted authority, the Interstate Commerce Commission, in the instance shown on the exhibit.

Acting Chairman WILLIAMS. It may be received.

(The table referred to was marked "Exhibit No. 2532" and is included in the appendix on p. 17368.)

RAILWAY EXPENDITURES FOR NEW LINES AND EXTENSIONS

Mr. HARRISON. The exhibit now before us indicates the expenditures of all class I railways and their lessor companies for new lines and extensions, by years from 1921 to 1938. In the second column is shown the expenditures for additions and betterments by years, 1921 to 1938, totaling \$9,649,385,414. That might be said to represent the gross investment that was made by the railroads through that period of 19 years for technological improvements. There is credited against that approximately \$4,500,000 for property retired, but the fact remains that about \$9,500,000,000 was expended for the purchase of better facilities to carry on transportation, and under the accounting rules of the Commission they are lumped under the general heading of expenditures for additions and betterments.

Mr. O'CONNELL. May I ask a question there? Comparing the two charts, the second one indicates a total net investment of over \$5,000,000,000 during this period, and the other indicates an increase in total capital outstanding of only about a billion dollars over this period. Would that indicate that most of that \$5,000,000,000 was financed out of earnings, depreciation reserves, and that sort of thing rather than new capital?

Mr. HARRISON. That is true. It is the view of railroad labor, with which our railroad management friends don't agree, that prior to 1921 there was a large volume of water in that capital and some of

it has been squeezed out by this process, by putting in and plowing back the earnings.

Mr. PIKE. It might be interesting there, if you have any idea, Mr. Harrison, what the market value of that \$18,000,000,000 is. I don't think it is in the exhibit.

Mr. HARRISON. No.

Mr. PIKE. I wonder what the present estimate is.

Mr. HARRISON. I don't know what today's figure would be, but my recollection is that it is just about one-half of that total—you could buy it on the market for that.

Mr. PIKE. A round amount of \$10,000,000,000, probably.

Mr. HARRISON. Yes.

Acting Chairman WILLIAMS. That would represent in round numbers the value of the bonds outstanding.

Mr. HARRISON. And the stock.

Acting Chairman WILLIAMS. Half would represent just about the value of the bonds.

Mr. HARRISON. I beg your pardon. I didn't understand your question.

Acting Chairman WILLIAMS. The market value today would just about represent the value, I assume, that is, the par value of the bonds outstanding.

Mr. HARRISON. That is right. I didn't understand the question; I am sorry.

I should like to introduce an exhibit showing the number and tractive effort of steam locomotives by years, '21 to '38.

Acting Chairman WILLIAMS. It may be received.

(The table referred to was marked "Exhibit No. 2533" and is included in the appendix on p. 17368.)

Dr. LUBIN. For the purpose of the record will you explain just what is meant by tractive effort?

Mr. HARRISON. That is a very involved matter. I looked it up last night because I didn't know myself.

According to the method used by the I. C. C., the tractive effort of a locomotive is determined by taking the diameter of the cylinder squared, multiply it by the length in inches of the stroke of the piston, multiply it by 85 percent of the boiler pressure per square inch and divide by the number of inches in the diameter of a driving wheel, and that gives you the tractive effort exerted at the rim of the driving wheel.

Acting Chairman WILLIAMS. In plain words does that mean the engine power?

Mr. HARRISON. It means the pulling power of the locomotive; yes.

Acting Chairman WILLIAMS. It simply means the power of the engine.

Mr. HARRISON. That is right, the pulling power of the locomotive.

Mr. O'CONNELL. I note by this exhibit that the number of locomotives during the period decreased from 64,000 to 42,000, and the average tractive effort increased from 36,000-plus to 49,000-plus. Does that increase necessarily represent technological improvement in the locomotive or is it in part explained by a retirement of locomotives with a lower-than-average tractive effort?

Mr. HARRISON. There is a combination of elements in these figures, Senator.

Mr. O'CONNELL. Thank you.

Mr. HARRISON. Many of the smaller types of locomotives have been retired, and of course a number of new and powerful locomotives have been introduced. What the exact figure would show in segregating the two elements I don't know, but there are today 42,000, as you point out, against 64,000 locomotives, with a much larger tractive effort, 13,000 pounds.

Mr. PIKE. Mr. Harrison, Mr. Parmelee yesterday had a few figures on about the same thing only he carried it forward 1 more year, and it shows that the tractive power in 1939 was slightly larger than the total tractive power in 1916.¹ As I remember it, in '16 it was 2,030,614,416, and in 1939 it was 2,153,000,000. There was a slight increase in total tractive power or tractive effort, whichever is the proper term.

Dr. ANDERSON. The total tractive power does not appear in the exhibit.

Mr. PIKE. But you can get it by multiplying the two, and it slightly increased for the period.

Mr. HARRISON. Yes; Dr. Parmelee used 1916. That is a very favorite—

Mr. PIKE (interposing). It would show a slight decrease from '21, which was 2,398,891,315.

Mr. HARRISON. That is true. Since the coming of the depression at the end of '29, you see, there has been an increase from 44,000 average to 49,000, recognizing, of course, the influence of the two elements of obsolescence and improved type of machinery.

Mr. PIKE. A combination of the two.

Mr. HARRISON. Yes.

I should like to introduce "Exhibit No. 2534," which is very much the same as "Exhibit No. 2533," but dividing the types of locomotives as between passenger and freight. It shows relatively the same change as indicated by the previous exhibit.

Acting Chairman WILLIAMS. This may be received, and I may say without repeating, that all these exhibits offered may be received for the record.

(The table referred to was marked "Exhibit No. 2534" and is included in the appendix on p. 17369.)

INCREASED EFFICIENCY OF ENGINES

Mr. HARRISON. The next exhibit discloses the amount of fuel consumed in freight and passenger service, commencing with the year 1921, calculated on 1,000 gross ton-miles freight service, and the passenger-train car-mile.

The table referred to was marked "Exhibit No. 2535" and is included in the appendix on p. 17369.)

Mr. HARRISON. In 1921, the exhibit discloses, it required 162 pounds of coal to move 1,000 gross tons of freight 1 mile—that is, freight and equipment—and it required 17.7 pounds of coal per passenger car-mile. In 1939, in the freight service, it had declined to 112 pounds, or exactly 50 pounds per 1,000 ton-miles, and for every passenger car moving 1 mile it had declined about 3 pounds. I haven't calculated the gross effect of that saving on tonnage of coal and coal miners, but

¹ See "Exhibit No. 2493," appendix, p. 17351.

it is tremendous. It results from better utilization of fuel, better fireboxes, better combustion, better utilization of the equipment and fuel by the firemen and the engineer to a greater degree of efficiency in operation.

The next exhibit indicates the number of passenger and freight cars installed and retired, and it shows pretty much the same story as the locomotive exhibit discloses, retirement of light, small-capacity equipment and the substitution of large, heavier-capacity cars.

(The table referred to was marked "Exhibit No. 2536" and is included in the appendix on p. 17370.)

Mr. HARRISON. The average of these cars in freight service is disclosed by the following exhibit.

(The table referred to is marked "Exhibit No. 2537" and is included in the appendix on p. 17370.)

Mr. HARRISON. In 1921 the average tonnage of the freight car was 42.5, and in 1938 it had increased to 49.4 tons. That has had a tremendous effect, of course, in releasing equipment and personnel and improving the efficiency of operation.

Mr. PIKE. On that I would like to ask you a question which may be way off your beat, but I notice in recent years the freight-car capacity was, say, 100,000 pounds, load limit, 121,000 pounds. I don't know when that came in, but it seems to be fairly recent. What is the practical capacity of that 100,000-pound car? What do they load it to?

Mr. HARRISON. Oh, taking the general type of freight, it is infrequent that we get the capacity of the car.

Mr. PIKE. It is usually the bulk?

Mr. HARRISON. Generally we get about half the car capacity. Now there are figures available; I suppose Dr. Parmelee could tell you the average load.

Dr. J. H. PARMELEE (Bureau of Railway Economics, Association of American Railroads, Washington, D. C.). The average carload last year was 36.5 tons, the average carload of carload traffic, which is about three-fourths of the average capacity of the car, and that is the highest average, by the way, that has ever been attained in the railroad industry.

Mr. HARRISON. Taking all traffic, less than carload as well as carload, what does it run?

Dr. PARMELEE. That we have no figures on. The average load of l. c. l. cars is around five.

Mr. PIKE. Isn't it almost always true except in handling products of mines that the bulk of the freight rather than the weight will limit what a car can carry?

Dr. PARMELEE. Oh, I think so; in bulk movement or in bulk loading you practically load to capacity at all times.

Mr. PIKE. So if you gave the car capacity in cubic feet rather than pounds it would perhaps be a more accurate index for general freight?

Dr. PARMELEE. Really, I don't know what the answer is to that subject.

Mr. PIKE. Well, I shouldn't have brought it up.

Mr. HARRISON. I don't think so, because a railroad car is like any other structure; if you overload it, it will break down. The capacity of the car is generally rated from the diameter of the axle on which the load rests. A 5¼ by 9 by 8 journal is an 80,000-capacity car, and

a 5½ by 10 journal is a 100,000-capacity car. This is a little side line. I used to work in the shops myself, but it has been so long ago.

Dr. ANDERSON. With respect to "Exhibit No. 2537," is there any noticeable acceleration in rate of increase of average capacity from '21 on? Is there anything to indicate that that movement is increasing as technological change increases?

Mr. HARRISON. Yes; the general policy being followed by the railroad is to retire the small-capacity car, because most of those cars are of the old wooden type, you see. The newer-type cars are of larger capacity and of steel construction. I would say there has been a very rapid abandonment of the lightweight wooden, low-capacity car and the substitution of the combination steel-wood and all-steel car of larger capacity. That is one place where we and our railroad management friends disagree. Railroad labor believes that we are headed in the wrong direction, that we ought to put small, lightweight, more frequent units of operation in service to meet this new transportation problem. The railroads for the last 20 years have gone to the slow, large, heavy equipment, and it is just not flexible enough to meet present-day transportation needs, and therefore we are losing in the race of competition. We don't wish to substitute our judgment for theirs. I don't know who is right; but as men who do the work, that is our opinion about it.

Dr. ANDERSON. Well, they are motivated by meeting competition, according to the testimony yesterday. Why wouldn't they see this as preferable?

SPEED OF RAILROAD TRANSPORTATION

Mr. HARRISON. Well, I don't want to be critical, I don't know that I have the answer to it, but if you take it for what it might be worth, we still have today managing and directing the operations of the railroads officials who came in 20 years ago, and they were schooled in this heavy power age and they just can't be convinced that this new idea about it is the solution. As I say, we who do the work believe it is, and on that question it perhaps is of some importance here to say that through the period of the depression when the volume of traffic declined, it was very clear you couldn't operate these heavier types of equipment economically, consequently you held the freight until enough accumulated to make the tonnage that would permit the operation of this heavy, expensive equipment. Therefore we have a tremendous delay in servicing the public, all in order to get the proper tonnage to start the train on its destination.

Mr. PIKE. You can't generalize too thoroughly on that, can you?

Mr. HARRISON. No; you can't generalize too thoroughly on it, but if you will look at Dr. Parmelee's exhibit of yesterday showing the increased speed of trains between terminals, you will see how hopeless we are in that race.

Mr. PIKE. About eleven-something to sixteen-something.

Mr. HARRISON. On the average, 16 miles between terminals. Of course, that doesn't mean from the time we got the shipment until we delivered it. My recollection of that figure is that it is about 5 or 6 miles an hour from the time we get it until the time we turn it over at destination. Now, that is caused by many of these elements, not entirely so.

Mr. PIKE. Of course, in that you have to take products of mines that make up so much of the bulk of the railroads, and usually there isn't any terrific hurry to get it to destination.

Mr. HARRISON. Yes; but the products of mines generally move pretty rapidly. Take the ore trains up in the iron range; an engine will take 135 of those ore cars at the mine, and they are down that hill before you can say "Jack Robinson." It moves in a hurry because it is high grade, very remunerative traffic. Generally there is a boat in that needs a particular type of ore for the mill or needs a particular type of ore to mix with other types of ore that the mill needs, and it moves pretty much on schedule.

I don't want to be misunderstood in trying to substitute my judgment for the operating management of the roads, but that is our view as workers, and this is our day to tell our story, and it goes for what it is worth, I guess.

I should like to submit "Exhibit No. 2538."

(The table referred to was marked "Exhibit No. 2538" and is included in the appendix on p. 17371.)

Mr. HARRISON. The next table gives expenditures for small tools and supplies and machines by Class I railroads from 1910 to 1938.

(The table referred to was marked "Exhibit No. 2539" and is included in the appendix on p. 17371.)

Mr. HARRISON. You will note prior to 1919 the expenditures averaged about \$4,000,000 a year and then jumped up about 2½ times, to around \$11,000,000. During that period, 1920 to 1929, \$110,000,000 was spent for small tools and supplies and \$63,000,000 for roadway machines. That represents the equipment around the shops and on sections, servicing the tracks and the rolling stock.

I want to call your attention to "Exhibit No. 2540."

Dr. ANDERSON. One moment first; with respect to "Exhibit No. 2539," you have presented here just money figures. I presume an adjustment for price changes would accentuate this increase for machinery, would it not?

Mr. HARRISON. Well, I presume if prices declined there would be a larger number of units purchased. On the other hand, if prices increased I presume a lesser number of units would be purchased.

Dr. ANDERSON. Have you made the adjustment for price changes?

Mr. HARRISON. No; this represents actual dollars spent. I don't know anything about what the influence might be if we considered changes in price levels, but the real influence in these figures is the ability of the railroad to buy. Just like the average individual, if you have lots of money it doesn't matter if you spend more. If you are poverty-stricken you pull up a notch and spend less.

Mr. O'CONNELL. I notice, in the exhibit to which Dr. Anderson just referred, the relative decline in the thirties in the purchase of small units and supplies is substantially greater than for roadway machines. Are roadway machines, generally speaking, labor-saving machines?

Mr. HARRISON. Yes; they save a tremendous amount of labor.

Mr. O'CONNELL. That would explain to an extent at least the fact that in that area the decline was not great.

Mr. HARRISON. I think perhaps that is true. The machinery introduced along the right-of-way for maintaining the section has had a tremendous effect in displacing labor.

On that point, I have an exhibit used in the wage-and-hour hearing which gives the effect of mechanizing a typical railroad.

Mr. PIKE. We had that yesterday afternoon and that is in the record.

Senator KING. There seems to be a relation, if I properly interpret "Exhibit No. 2539," between the expenditure for small tools and supplies and for roadway machines, if you run down those two columns; indeed, there seems to be a larger expenditure for roadway machines in 1935 or 1934.

Mr. HARRISON. Yes; that is true, Senator, although the relationship did disappear to a large extent in some of the latter years. Of course, there are a number of elements that influence that. The maintenance engineer submits his recommendations for the purchase of machinery; maybe he can talk a little faster than the mechanical engineer in charge of the shops; maybe he will get the authority and the other fellow won't. There are a hundred and one influences there; maybe one man is a little better salesman than the other and he can sell his machine.

Dr. ANDERSON. It would appear, Mr. Harrison, following Senator King's remark, and Mr. Pelley's statement yesterday, that the problems of the railroad are now problems of meeting severe competition, that since 1931 the relationship between small tools and supplies and road machines has changed as compared with the earlier years to a point where now about the same amount, with one or two exceptions, is spent for road machines as for small tools and supplies.

Mr. HARRISON. That is right.

Dr. ANDERSON. Would that indicate a relatively greater dependence upon road machines, which are labor-displacing, than upon small tools and supplies, which are labor-saving?

Mr. HARRISON. Well, I think perhaps the greatest opportunity for economies does lie in the utilization of maintenance-of-way machinery rather than in the small tools and supplies.

Senator KING. I presume that the cost of maintaining the road in good shape varies from year to year, does it not?

Mr. HARRISON. Well, there are a number of factors there, Senator; the volume of traffic, the financial ability of the particular railroad company, and the type of roadway and the territory. You take the low mountain country and the damp country—there are a lot of influences there.

I have some figures indicating in a general way the variations in that connection, and I shall come to them in a later exhibit.

Senator KING. My observation is that the situation is much like that of a man with an automobile; he uses the machine as long as he possibly can, as long as the automobile renders rather effective service, and then he all at once buys a new machine. So the expenditures for railroad track and improvements will not have a uniform curve.

Mr. HARRISON. No. You take some of the railroads that are in good financial shape, and if you took a look at their right-of-way, they have heavy 130-pound steel, good rock ballast, their bridges and buildings are all painted, and they look in good shape.

On some other railroads that are one jump ahead of the sheriff, if they are about to go bankrupt, their track is very rough, the ballast is bad, the buildings look as if they had been abandoned.

But, generally speaking, they do keep the track in very good shape and in very safe condition.

Mr. PIKE. You will note, though, Mr. Harrison, that once they get safely into the arms of the sheriff, they begin to build up.

Senator KING. They do?

Mr. PIKE. Almost always.

Mr. HARRISON. Well, what happens generally, as we have observed it, is this: when they cease paying the interest on their bonds, during the period of trusteeship or receivership, they spend their money to improve their physical property.

Mr. PIKE. That is exactly what I had in mind.

Mr. HARRISON. If you look at a road that is in receivership or trusteeship, a road that is making money above operating expenses, you will see a railroad in good shape physically. That, of course, increases the equity of the security holder generally. That represented the new stock which in the old days was floated in place of the stock that had been washed out in receivership, but the Commission has changed that.

"Exhibit No. 2540" covers the total number of employees, total number of hours worked, and total compensation for class I carriers.

(The table referred to was marked "Exhibit No. 2540" and is included in the appendix on p. 17372.)

DECLINE IN JOB OPPORTUNITIES

Mr. HARRISON. This table discloses that in 1920 we had 2,220,832 full opportunity jobs, while today, or in 1939, last year, we only had 987,943.

Acting Chairman WILLIAMS. Will you explain what you mean by full opportunity jobs?

Mr. HARRISON. Under the regulations of the Interstate Commerce Commission, in reporting the number of employees to the Commission you are required to report the number of jobs that are considered regular jobs that are in existence at the middle of the month, excluding part-time or seasonal workers.

These are presumed to be regular, steady jobs, eliminating all part-time or seasonal workers. At the middle of the month the number of jobs are counted on every railroad in the country, and the regular jobs are segregated, and that number is reported as full-opportunity jobs at the middle of the month.

Now, we take those reports for the 12 months, add them together, and divide them by 12, and that gives us the average number through the year which is the number used in this exhibit.

Senator KING. It is sort of a weighted average?

Mr. HARRISON. It is a weighted average of full opportunity jobs. It excludes the seasonal and part-time jobs.

Senator KING. The sum total would bring your total—if you included your seasonal and part-time jobs—slightly above the 2,220,832, would it not?

Mr. HARRISON. Yes. In 1939 full-opportunity jobs in the service of class I railroads numbered 987,943, while there were actually employed during that year 1,325,973 different persons. The difference is accounted for by seasonal and part-time workers, replace-

ments for deaths, retirements, resignations, and dismissals, which run about 5 percent a year.

Acting Chairman WILLIAMS. You have an exclusion at the heading of that exhibit. Does that mean that those who are engaged in terminal facilities such as switching, and so forth, are not included?

Mr. HARRISON. No; they are not included because the figures for those companies for the earlier years are not comparable. In some years the Commission included switching and terminal companies in their condensed reports, and in other years included only class I railroads, excluding the switching and terminal companies. Thus in order to have a comparable basis clear back to 1920 it was necessary to exclude the switching and terminal companies.

Now, the switching—I can give you the figures, if you wish it—
Senator KING (interposing). That is, the number of employees in the switching and terminal companies. That number should be added, of course?

Mr. HARRISON. In 1938, Senator, for class I switching and terminal companies—that is, companies having operating revenue of a million dollars, or more—37,457 persons received compensation during the year, of which number 25,025 worked 12 months, or at some time during each of the 12 months, so you might add 25,000 more to the full opportunity figure, and that would include switching and terminal companies of class I railroads.

Acting Chairman WILLIAMS. As a matter of keeping the record straight, do you have it for 1939?

Mr. HARRISON. No; the figures for '39 for switching and terminal companies I do not have available right now, but I can get the figures for you.

Senator KING. They are substantially the same as you gave, I suppose?

Mr. HARRISON. I think it would be within 4 or 5 percent at the outside; for this purpose, I imagine you could take the same figure.

Dr. ANDERSON. Now, Mr. Harrison, reverting for a moment to the full-opportunity definition just given, would you regard that definition of the number of employees engaged in the railroad industry for any one of these years as a suitable base to use in calculating average wages or return for employees?

Mr. HARRISON. No; that would be in our judgment a very misleading basis, a very improper basis. Mr. Parmelee and I have quarreled about that for a long time. I notice in one of Mr. Parmelee's exhibits¹ he uses the same employment figures as I have, which are, as I say, the full-opportunity jobs, and they total about 400,000 less than the number of persons actually employed in the industry at one time or another throughout the year.

Now, he divides the full-opportunity jobs into the total amount of money paid the 1,300,000 persons, every dollar paid in compensation, so you have a distorted average annual wage of \$1,886, as he shows, for the year 1939.

Now, if you will take the total money paid in wages, which he shows as being \$1,863,503,000, and divide it by the 1,325,000 persons who actually got part of it at one time or another throughout the year, you will get a much different figure than \$1,886.

¹ See "Exhibit No. 2517," appendix, p. 17361.

I can give you some very illuminating information on that from the official report of the Railroad Retirement Board for 1939, and I refer to page 152.

In 1938 there were 1,325,973 persons who received compensation from class I railroads.

Dr. ANDERSON. Different persons?

Mr. HARRISON. Different individuals. There were 132,770 who received \$50 or less throughout the year. In the wage group of \$1,500 or more, there were approximately 600,000 persons.

Dr. ANDERSON. What was its range?

Mr. HARRISON. From \$1,500 to \$3,000 would be the range—600,000 persons.

Dr. ANDERSON. What would be the average compensation?

Mr. HARRISON. Somewhere between \$1,300 and \$1,400.

Senator KING. You mean, of that 600,000?

Mr. HARRISON. No; of the 1,300,000. Between \$1,300 and \$1,400.

Dr. ANDERSON. Well, if I understood Dr. Parmelee correctly yesterday, he said that as he recalled, from the same source, the average pay for 12-month men in 1937 was about \$1,650.

Mr. HARRISON. Yes; that is true.

Now, I have the figure for 1938 from the same source—Railroad Retirement Board. There were 803,884 persons who worked some time during each of the 12 months of that year. They represented 60.6 percent of the total persons receiving compensation during the year. The average earnings of this group was \$1,824.

Dr. ANDERSON. Would that average indicate the average earnings of railroad workers generally?

Mr. HARRISON. No; far from it.

Dr. ANDERSON. That is, could we assume that \$1,800 was available to the average railroad worker as the annual earnings?

Mr. HARRISON. Far from it; far from it.

Senator KING. Would not the average earnings of those employees who worked full time reach those figures or perhaps exceed them?

Mr. HARRISON. No, Senator King.

Mr. PIKE. How would this calculation go, Mr. Harrison? I figure that the average earnings for full-time employees (I will explain the basis, if you wish) would run about \$1,550.

Mr. HARRISON. I don't know; I don't think it will run that high.

Mr. PIKE. These figures show 2,520 hours a year, full time. At 40 hours, that is 2,060 hours a year, which is 62.5 percent of the average year shown. Now, take that percentage of the average earning shown gives you about \$1,550.

Mr. HARRISON. That may represent a rough approach to it. I don't think it is that high. We have a tremendously large number of men in the low-wage bracket; as you perhaps recall there were approximately 85,000 getting less than 40 cents an hour, regular workers.

Mr. PIKE. A good many of those are part-time, on maintenance, seasonally, are they not?

Mr. HARRISON. No; I have distributed it here by months. If you wish, I will give it to the committee. Of the total of 1,325,973 persons, 74 percent worked more than 6 months during the year 1938. Perhaps right here I might say this: the average hourly wage, ob-

tained by taking the total number of hours and dividing it into total compensation, is 73.1 cents per hour.

If you will refer to "Exhibit No. 2540,"¹ you will notice that between 1920 and '29, employment declined 12 points, approximately 400,000 jobs.

Since that time there has been a loss of about 700,000 jobs. Taking the year 1933, which represented the depth of the depression, there were about 971,000 jobs. In 1938 employment fell to 929,000 jobs, the lowest level in the history of the industry, or a period of 50 years.

Of course, that was caused by two elements: the general decline in the level of traffic and the technological advances.

Senator KING. When you speak of technological advance, you refer, I suppose, to the competition by water and other means of transportation?

Mr. HARRISON. No, I was referring particularly in that connection to the substitution of machinery, and consolidation within our own industry. Of course we have lost a tremendous percentage of our traffic to other modes of transportation, and that is a technological development in the field of transportation. I think it accounts for about 180,000 of our jobs.

CLASSIFICATION OF EMPLOYEES

Mr. HARRISON. The next exhibit shows a distribution of employment by major divisions as classified by the Commission, showing the decline over a period of years; the 1921 figure, 1,695,000, is taken as the base of this table. In 1939 there were 987,000 jobs.

(The table referred to was marked "Exhibit No. 2541" and is included in the appendix on p. 17373-17374.)

Dr. ANDERSON. I would like to ask a question with respect to "Exhibit No. 2541." Is this distribution into six classes, or five classes with two subgroups, the way in which occupational data are available in the railroad industry?

Mr. HARRISON. That is the way the Commission has instructed the railroads to divide the information on compensation and wages.

Dr. ANDERSON. Now, does this represent a vertical division of skill or compensation?

Mr. HARRISON. No, this shows the employment opportunities at the middle of the month for each of the major groups, and the purpose of the exhibit is to show how the various groups of employees took the impact of the recession in business, and the technological advance.

Dr. ANDERSON. But would there be a rough correspondence between the divisions I to VI, and levels of labor in the industry as indicated by earnings?

Mr. HARRISON. No; there has been a very much smaller displacement of executives, officials, and staff assistants on a percentage basis. That is the most regularized group so far as employment and wages are concerned. They took the least impact.

¹ Appendix, p. 17372.

There is always a place to put the executive to work. When you have to retrench, he generally gets one of the jobs of the classified service, and the classified service takes the impact.

Now, there was a dual effect in maintenance of way and structures. Your ability to keep house, as one would put it, is based on the railroad earnings. In times of financial stringency the maintenance-of-way workers have to take the impact of retrenchment, and the same with maintenance of equipment and stores. When the railroad has to meet bond interest and the amount in the till is rather low, they will shut the shops and lay off the shop men, so they take the impact of the financial difficulty.

On the other hand, if you have business and have to move trains, the engineers, firemen, conductors, and switchmen have to work, because they are moving the traffic. When the traffic is not there, of course they do not work. There is elasticity in the maintenance of equipment and way forces which permits a more violent squeezing, as one would put it, of employment.

Senator KING. The element of safety runs through these lists, does it not, so that it is vital that you shall maintain a high degree of safety?

Mr. HARRISON. Always, Senator King. The railroads try to maintain an absolutely safe operation, even though they have to borrow the money to do it when they cannot afford it.

Senator KING. And the record for safety, it seems to me, from the figures brought to my attention, are most excellent. The accidents to passengers in the operation of railroads have been very few.

Mr. HARRISON. We think we are operating the finest kind of transportation and the safest in the world. That is what we think about it.

Dr. ANDERSON. One more question with respect to that table, Mr. Harrison. Do you have any figures on wages and salaries paid to the various groups here represented? Take, for example, the first group of officials, executives, and staff assistants. There were 15,000 of them in '21, and 11,745 in 1939. Is it possible to know the total salaries paid that group that year as compared with the total wages paid the maintenance men, for example?

Mr. HARRISON. Well, may I file that? I have the information.

Dr. ANDERSON. If it is possible, Mr. Harrison, to file for available years the information on earnings corresponding to these levels, we could then compare the ability of these various groups to bear the impact in various years, as determined by available income.

Mr. HARRISON. All right, sir; I will be glad to give it to you. You want it on the basis shown in "Exhibit No. 2541"?

Dr. ANDERSON. Yes. We will reserve the next exhibit number for that information.

(The document referred to was subsequently submitted, marked "Exhibit No. 2542," and is included in the appendix on pp. 17374-17375.)

Mr. HARRISON. The next exhibit discloses the average hourly earnings over a period from 1920 to 1938, indicating the average rate was 71.1 cents per hour.

(The chart referred to was marked "Exhibit No. 2543," and is included in the appendix on p. 17376.)

DISTRIBUTION OF RAILROAD REVENUE

Mr. HARRISON. The next exhibit shows the operating revenues; that is, the amount of money that the railroads took in for furnishing transportation to the public. The revenue declined from \$6,178,000,000 in 1920 to \$3,995,000,000 in 1939, or 35.3 percent, while the compensation of the workers declined 49.4 percent, indicating a more rapid elimination of labor than the decline in business, based on dollars of revenue, would have required.

(The table referred to was marked "Exhibit No. 2544" and is included in the appendix on p. 17376.)

Mr. HARRISON. That is the result of technological improvements in the industry and the utilization of less labor to earn the dollar of revenue.

The next exhibit shows the distribution of the revenue taken in by the class I railroads from 1920 to 1939. I should call to your attention the fact that in 1920 labor received 55.4 cents out of each dollar taken in, while in 1939 it received only 44.4 cents. Fuel cost 10.9 cents of every dollar in 1920, and that had declined to 6.3 cents in 1938. Net railway operating income, which is the amount left after the expenses of running the railroad are paid, and before interest and dividends are taken out, represented 0.3 percent in 1920, and in 1939 it represented 14.7 percent, indicating the shift in the share of production, to which I called your attention earlier, from labor to capital.

(The table referred to was marked "Exhibit No. 2545" and is included in the appendix on p. 17377.)

Dr. ANDERSON. In most of the testimony thus far you have used a base of 1920. Now, in "Exhibit No. 2545," the sharpest increase you have is from 0.3 percent in 1920 to 11 percent in 1921. Is 1920 a reasonable basis for indices?

Mr. HARRISON. Well, I think it has some complications that you might very well question. We use it because that is the first year of private operation. The railroads were returned to their private owners on March 1, 1920. There was a period of 6 months that followed under Government guarantee. For the purposes of net railroad operating income, perhaps it is not a fair basis.

I would take 1921 for that basis, which might be questioned considered too conservative, because there was a wage cut in effect during that year. They got 10.9 cents out of every dollar in 1921, as compared to 14.7 cents out of every dollar in 1939 in net railway operating income.

That picture is there. It is questionable as to using—

Dr. ANDERSON (interposing). Should we consider the whole table with that same thought in mind, that the change-over from Government guarantees in 1920-21, when the railroads took possession of their properties again, set factors to work which made 1920 and 1921 unsuitable for comparison purposes?

Mr. HARRISON. No; I would not want to make that general admission. There are some elements that in 1920 would be unfair, and other elements where it would be fair. I would not want to make that general admission, not because of what is happening here, but because of the fellow I might have to meet a year from now on that issue. [Laughter.]

"Exhibit No. 2546" shows operating revenue per employee in our service, and hours of compensation, indicating the efficiency of the wage dollar.

(The table referred to is marked "Exhibit No. 2546" and is included in the appendix on p. 17378.)

Mr. HARRISON. Let us take 1921, now, in "Exhibit No. 2546." It shows the efficiency of the wage dollar, and we can take 1921 to avoid the 1920 condition. For every dollar paid the workers in 1921 they produced gross revenue for the railroad company of \$1.99. That is shown in the second last column opposite the year 1921. In 1939 for every dollar paid in wages to the workers they produced revenue for the corporation of \$2.14, an increase of 15 cents; in other words, it became more profitable to employ labor over that period of time, to the extent of 15 cents for every dollar expended for wages. Expressed differently, the output per worker increased tremendously and the number of workers declined. The result of their labor became more profitable to the owners of the industry by 15 percent over the period.

Exhibit No. 2547 discloses freight revenues per revenue ton-mile. That indicates the amount that we collected on the average from the public.

Dr. LUBIN. May I interrupt at that point? Would you state the figures on operating revenue per employee per hour of service for 1920 and 1939. Average hourly earnings were very close in these 2 years, so that in terms of what the worker was getting for the service rendered, I think the comparison between 1920 and 1939 would be fairer than between 1921 and '39, since wages were cut in 1921.

Mr. HARRISON. I think you are right about it.

"Exhibit No. 2546" discloses that in 1920, for every dollar expended for wages the worker produced \$1.68 in revenue for the corporation, or a profit of 68 cents on every dollar he received. In 1939, for every dollar paid the worker, he produced \$2.14 for his employer, a profit of \$1.14.

Senator KING. Is that in the net earnings of the railroad?

Mr. HARRISON. No; the amount taken in, Senator.

Senator KING. But the net earnings of the railroad did not show that disparity?

Mr. HARRISON. The net profit?

Senator KING. Yes.

Mr. HARRISON. No; generally speaking the net profit of the railroads has been in bad shape. However, it has become increasingly profitable to employ the worker; he gets a constantly lesser share of the joint effort of management and capital and the worker as I showed in "Exhibit No. 2545." In 1920 labor got 55.4 cents out of every dollar, while in 1939 it received only 44.4 cents. Capital got 0.3 percent of every dollar in the year 1920, while in '39 it got 14.7 cents, but I agree with you, Senator, in dollars, as a whole, the industry of course has been suffering very badly.

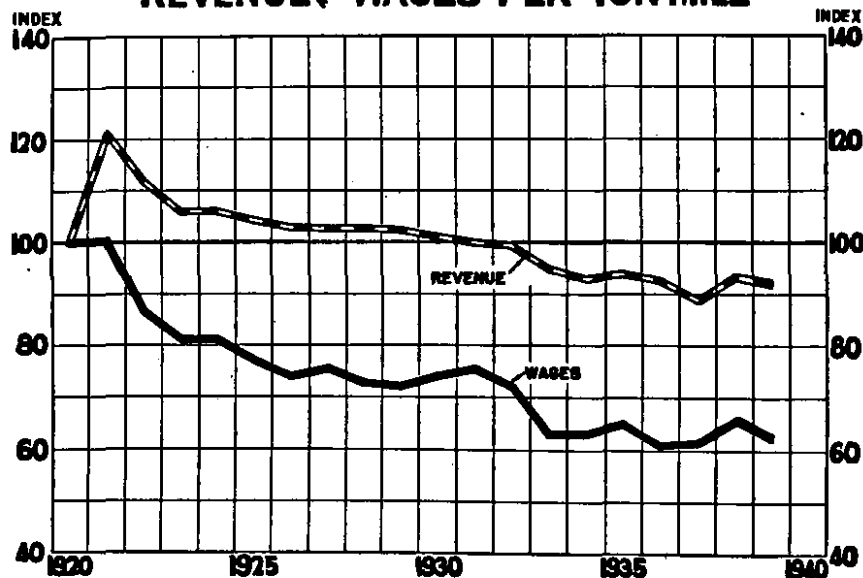
"Exhibit No. 2547" shows freight revenues per ton-mile, representing the amount we collected from the public for the transportation of freight. You will note a decline from 1.052 cents in 1920 to .974 cents in 1939 for moving 1 ton of freight 1 mile, indicating the general improvement in the efficiency of the plant and the ability of the plant to pass on to the public part of the savings.

(The chart referred to was marked "Exhibit No. 2547" and appears below. The statistical data on which this chart is based are included in the appendix on p. 17378.)

EXHIBIT No. 2547

[Submitted by the Brotherhood of Railway Clerks]

REVENUE AND WAGES PER TON-MILE



Mr. HARRISON. The wages to move a ton of freight 1 mile in 1920 were 0.897 cent, while in 1939 that had declined to 0.559 cent, indicating labor's proportion of what was taken in. Out of 0.974 cent for every ton of freight moved 1 mile, labor got 0.559, or a little bit more than half. That is graphically displayed in the accompanying chart.

Senator KING. Of course the improvement of the trackage and so on would diminish the cost of moving the freight.

Mr. HARRISON. There is a joint element there, Senator—personnel, increased efficiency of the average man, better plant, better supervision, consolidations, and elimination of waste, and a number of other elements. Capital had its part, management had its part, and labor had its part.

Dr. ANDERSON. Mr. HARRISON, is there any trend noticeable in this connection that might indicate either acceleration or the reverse?

Mr. HARRISON. No; I think that that is the general avenue we are traveling.

I think the unit price to the public is going down constantly, and the share that labor gets out of the industry is constantly declining. I

don't see any hope for a reversal of that so long as present conditions prevail. But on the other hand, I see a very serious condition for our country, for our people, if we don't find some way to check it, and I take it that is the purpose of this hearing. I want to say something about it before I quit, if the committee will permit.

INCREASE OF LABOR PRODUCTIVITY

Mr. HARRISON. Exhibits Nos. 2548 to 2565 represent a series of exhibits disclosing the productivity of the workers measured by the miles of track operated and the compensation paid. I offer the first 12 of the series for the record.

(The tables and charts referred to were marked "Exhibits Nos. 2548 to 2559" and are included in the appendix on pp. 17379-17387.)

Mr. HARRISON. Briefly, in 1920 an average of 5.4 workers was required for every mile of track operated, while in 1938 only an average of 2.4 workers was required. In 1920, wages per mile of track operated were \$9,756; in 1938 they were only about one-half, or \$4,437. The changes are graphically disclosed on Exhibit No. 2549.

Exhibit No. 2550 shows the change in the revenue freight ton-miles by thousands. I would simply point out that in 1920 there were 410,306,210,000 revenue freight ton-miles as against 333,000,000,000-odd in 1939, a decline of 19 points, while the number of revenue ton-miles handled by each employee went up from 202,000 to 337,000, or an increase of 66 percent. For every dollar of compensation paid in 1920, 111.4 revenue tons were handled 1 mile.

In 1939 that had increased to 138.9 tons for every dollar paid in wages, or an increase of 60 percent in efficiency.

"Exhibits Nos. 2551 to 2558" show pretty much the same general story, and I will not consume the time of the committee to comment unless some member of the committee may wish it.

"Exhibit No. 2560" now comes to the crux of my problem before this committee.

(The table referred to was marked "Exhibit No. 2560" and is included in the appendix on p. 17388.)

Mr. HARRISON. This exhibit discloses the loss in employment opportunities caused by the great increase in the productive efficiency of the plant and personnel. We have coined a measure called a traffic unit, which is described at the bottom of exhibit 2560. In the first column is average receipts per passenger-mile. In 1921 that was 3.086 cents. The average receipts for each freight ton-mile were 1.275 cents. The ratio of passenger revenue to freight revenue was 2:4. Adjusting the passenger miles and increasing the freight miles to get the proper equation, you will find that we have a new balance of traffic units for each of the years shown, in the far right-hand column. In 1921 it was 396,390,000. Bearing in mind the traffic unit as the base of determining the productive efficiency of the plant and the personnel, we go to the next exhibit and we disclose the number of employment opportunities destroyed by this tremendous increase in efficiency.

(The table referred to was marked "Exhibit No. 2561" and is included in the appendix on p. 17388.)

Mr. HARRISON. In 1922 we had lost 218,000 employment opportunities because of increased efficiency. In other words, if we had

remained stationary and handled the same amount of traffic units in 1922 that we handled in 1921 we would have had 218,846 more jobs than we did have, so following that down to the year 1939 as compared with the year 1921, we are short because of technological advance in our industry—and I say that in a broad sense—626,426 jobs. Expressed differently, if the efficiency of the plant and the personnel had remained constant over that period of 19 years we would have 63 percent more employment opportunities today in the railroad industry than we do have. That tells you the story as to what has happened to employment—622,426 jobs have been destroyed in this industry over that period of time.

Mr. PIKE. I don't quite get all of it, Mr. Harrison. This includes as near as I get it both increase in efficiency and decrease in traffic.

Mr. HARRISON. No. This only covers the increase in efficiency. I have taken the actual traffic for each year and I have translated that into traffic units, which is the productive unit, and if the efficiency had remained constant we would have 622,426 more jobs today.

Mr. PIKE. Oh, that second column says the 1921 rate of efficiency rather than the 1921 rate of traffic.

Mr. HARRISON. That is right.

Senator KING. When you speak of efficiency as you have used it, do you refer solely and exclusively to the efficiency of the individual, or the efficiency as it may be translated to and incorporated in better machinery, better trackage, improved facilities? Would you call that part of the efficiency which has produced the figures which you have just given?

Mr. HARRISON. That is true, Senator. We have a more efficient human individual, a more efficient tool, and more efficient supervision. All of the elements combined have produced the destruction of 622,000 jobs.

Senator KING. A person who is technically more efficient manifests better results in the work he does, the track is better, the engine is better, so that the efficiency of the individual is manifested in the increased efficiency of the tools.

Mr. HARRISON. That is right. You see, the individual is working under supervision with the machinery and the tools that management furnishes, and all of those elements, Senator, enter into it.

Senator KING. They are all integrated.

Mr. HARRISON. I want to make it clear that railroad labor is willing to recognize that capital has made it possible to use the new type of tool and has furnished the opportunity for employment directly to that extent. Management has improved supervision, and labor individually has increased its ability, and has utilized these new implements for greater production.

Senator KING. As far as my observation is concerned, I think there has been greater cooperation by and large in the railroad operations from the head down to the humblest man working than in many of the industries.

Mr. HARRISON. Thank you. We feel that we have made a heroic effort, all of us, all elements.

Senator KING. I think the railroad employee deserves the gratitude of the American people for cooperation in making the railroad system serviceable to the public.

(Senator King resumed the chair.)

UNEMPLOYMENT IN VARIOUS LABOR GROUPS

Mr. HARRISON. The following tables, "Exhibits Nos. 2562 to 2568," distribute the impact of that unemployment to the various major occupational groups.

(The tables referred to were marked "Exhibits Nos. 2562 to 2568" and are included in the appendix on p. 17389-17395.)

Mr. HARRISON. "Exhibit No. 2568" has to do with an analysis of that same element of job destruction through increased efficiency in the train and engine service, the men that actually move the trains. You will note over there in the next to last column on the right we are short 73,502 jobs, engineers, firemen, switchmen, brakemen, conductors, all because of the ability of the force to move a greater amount of freight than they did in the year 1921.

The traffic units per locomotive mile in 1921 were 269, which increased to 297 in 1939. The average number of locomotive miles for each employee engaged went up from 4,941 in 1921 to 5,322 in 1939. It would have required an increase of 35 percent in existing personnel to bring us back to the same employment level for engineers, firemen, conductors, trainmen, and switchmen, that existed in 1921.

That concludes my statistical information and I want to make a few observations on the general problem, if I may be permitted.

Acting Chairman KING. Proceed. The committee will be glad to hear you.

Mr. HARRISON. Our industry has, of course, been beset by all the elements of the depression, together with the development of other modes of transportation and discriminatory Federal policy in that direction. Our competitors have been aided directly and indirectly by the Government, and it has been a terrific struggle for men and management. We are trying to correct that. The Government not only has handicapped us and given our opponent an advantage, but has gone into business directly in opposition to us through the parcel post, the waterways and barge lines, and of course private enterprise cannot meet that situation very successfully. The railroad workers have paid the penalty through the loss of their opportunity to live. That, together with the effect of the depression and the financial difficulties of corporations, has made it a very sorry, hopeless picture for railroad labor. As you can see by the statistical information I have put in, we have only about half the full employment opportunities today that we had 20 years ago. I hope that trend can be reversed, but to the extent that unemployment exists it is our general national problem, and the people of this country, if I might interpret their views, are looking to the Members of Congress and to the administration to do something about it. We have not had since 1933, so far as employment is concerned, much improvement. We are spending huge Federal sums, the public debt is \$45,000,000,000, and thinking persons are beginning to worry about that. Just where are we going? If we reflect on what has taken place in other countries throughout the world, we see that the desire for liberty and freedom is not sufficiently strong to resist the human urge to stay alive. In many instances the people have traded that valuable asset and heritage because of the need to keep alive. We can talk all we want to, my good friends, about our democratic political and social institutions, but we have got to solve this problem of unemployment. If we don't,

it is going to wreck us, and with us, democracy. I am not an alarmist and I don't wave a red flag very frequently; I try to be realistic about it. I think there has been a constant shifting of too large a percentage of the results of industry to the people who own industry; not enough has been put into the pockets of the people of the country to sustain our great industrial machine. That has to be halted. Capital can't dry up the sources that create it. Labor was prior to capital, which represents nothing but the surplus of someone's labor of the day before. As Abraham Lincoln said years ago, it has nothing in it of living substance, it is only handy to do some things that we have to do. Unless we can profitably employ labor, the whole structure is going to fall.

Our remedy for the situation is a constant shifting, to a reasonable point, of the proceeds of industry to those who sustain it, with a progressive shortening of the hours—always admitting, of course, that we must pass on to the public a share of the improved efficiency. We in the railroad industry think the time has long since passed when we ought to work as much as 56 hours a week in a good many instances and 48 hours generally for regular employment opportunities. Nationally, under the wages-and-hours law, we have reduced the hours to 42 and ultimately to 40. Our industry is still working 48. We have been trying to get through Congress a 6-hour law, but so far the Senators and Congressmen have indicated that they don't think the time has arrived to enact that kind of legislation. I have been before the committees of Congress repeatedly, urging some solution of this problem. When we realize that we are confronted with consolidations that will undoubtedly diminish employment, it is a pretty hopeless looking picture for the man who has spent his lifetime in the railroad industry. For a large share of these people it means the destruction of their entire investment, because they are in specialized service; they cannot find employment elsewhere, even if there were jobs available. The locomotive engineer can't run a locomotive any place except on a railroad. There are a few around some sawmills and a few of the mines, but if you put them all together they wouldn't mean very much.

I hope that this Congress will make a genuine attack on this problem and reduce the hours in the railroad industry and give these people who have been squeezed out of the industry by these several elements an opportunity to come back in. A genuine attack, I hope, will be made on the whole thing in the way of shortening hours. By the utilization of these new methods and machines, we have outstripped our ability to provide work.

I imagine if there weren't enough bread to go around in this country, we would pass a law taking control of the bread, and distribute it so everybody would have bread. Well, when you talk about people having bread and no jobs, you are talking about giving and taking away, because under our system in order to have bread you must have a job. There isn't any other way to get bread except to go out and steal it, borrow it, or inherit it, but most of us poor devils, who have to work for a living, have only that means of sustaining ourselves and our families, and if you don't furnish us that opportunity we get very little substance out of our whole social philosophy and our structure of government. I am trying to view

the problem realistically. I don't want to be an alarmist, because I think I am more or less one of these individuals who tries to keep his feet on the ground if he knows the facts, and be very conservative about it, but there is a real problem in this country and we have got to find a solution for it. What it is I don't know in total, but some things could be done in the direction I have indicated.

Acting Chairman KING. Do you think the Federal Government should subsidize the railroads, as it is subsidizing waterways and subsidizing truckage, by spending hundreds of millions of dollars annually for roads to facilitate transportation of commodities by trucks?

Mr. HARRISON. No, I don't think we ought to pick the pockets of the public in that fashion. I think the railroads and every other form of transportation ought to operate as private enterprises without subsidy. If the railroads can't do that, let the Government take them over and go in the business of transportation and pay the losses as part of the general social function. No subsidy. That is a process that I am violently opposed to, whether it be for the shipowner, truck operator by utilizing the highway, or the inland water carrier by using the inland waterway. That is just a polite way of picking the pocket of Mr. John Average Citizen, as I view the matter.

Acting Chairman KING. Would there be any impropriety in the Federal Government's attempting to secure revenue from the operation of the trucks—building the highways and waterways and having those who avail themselves of those instrumentalities at the cost of the Government make some contribution?

Mr. HARRISON. I think there ought to be a fair tax levied for the private use of public property. If I went out here and used one of your post office buildings you would certainly expect to collect rent from me, but I can go into the trucking business and utilize your highway and give you nothing for it. You improve the inland stream and I can go into the business of operating barges; you spend the money to maintain the right of way for me. Now that is unfair. The railroads pay part of those taxes, I pay part of them as a railroad worker, and I certainly don't like it and I hope it will be corrected.

Acting Chairman KING. Have you finished your statement?

Mr. HARRISON. Yes, sir.

RATE OF TECHNOLOGICAL CHANGE

Mr. O'CONNELL. May I ask a question? The subject of the hearing is supposed to relate generally to the effect of technological advance, and I wondered whether you had any judgment as to whether the rate of technological change in the railroad industry had been accelerated in the past 20 years, say, as opposed to the first 20 years of the century.

Mr. HARRISON. I wouldn't say that the rate of changing methods has been accelerated, but the effect has been accelerated. They were also introducing new types of machines back in the old days, and new methods, to the extent that they were available. I suppose the rate of change has been somewhat along the same line, but the effect of the change has been more substantial.

Mr. PIKE. It is greater when business is declining.

Mr. HARRISON. The pressure under low profits accentuates technological advance.

Mr. O'CONNELL. As far as the railroad industry is concerned, might not the emergence of competitive facilities, such as the trucks, have had its effect in accelerating the effects of technological change?

Mr. HARRISON. I wish I could say that; I don't think we have met that problem yet.

Mr. O'CONNELL. Haven't met it yet, but to the extent that technological changes have been made it has been in an effort to meet the problem.

Mr. HARRISON. Well, I wouldn't say that either. There have been some changes, but in this whole picture they are nil.

Mr. O'CONNELL. I didn't understand you.

Mr. HARRISON. I say there have been some changes to meet truck competition, but in this whole picture their effect has been nil.

Mr. O'CONNELL. You mean they have not been able to meet the truck?

Mr. HARRISON. No; they just haven't met that problem yet, and we don't think they can meet it with the present plan. You have got to have more flexible, lighter, more frequent service.

Mr. O'CONNELL. But you are arguing for more rapid technological change in the railroad industry.

Mr. HARRISON. That is right, but with it will come increased employment because you will have more units and you will need more men.

Mr. O'CONNELL. So the railroad industry in your view has not been sufficiently alert in making technological changes to meet the conditions.

Mr. HARRISON. That is true. They still hang on to the old equipment. There are two or three reasons for that. First is the different thought among management officers about it, and secondly their financial inability to make the change. Tremendous sums have been invested in this heavy power, heavy equipment, and they can't charge it off because most of it is plastered with a mortgage, unless they substitute or pay the mortgage. Well, they don't have the wherewithal to substitute or pay the mortgage.

Mr. O'CONNELL. Their financial inability to make a change at this time might in itself be a result of failure to keep pace with technological changes over the previous decades.

Mr. HARRISON. I think there is a lot to that, but on the other hand, as I said earlier, a lot of management officers believe they are on the right track with the heavy power. We think they are on the wrong track, that they are just going to wind up on the siding, and the other fellow is going to get our business.

Acting Chairman KING. There isn't much encouragement to invest in railroad stocks and bonds, to make capital investments, in view of the mortality that we witness in the railroads?

Mr. HARRISON. Well, Senator, I am a member of my organization's finance committee, which has large sums of money to invest, and we don't invest one dime in the railroads.

Dr. LUBIN. Mr. Harrison, I would like to ask you a question which has some bearing upon your testimony, and also I think upon the

broader field of economic progress. I was very much interested in a statement you made relative to the new devices and new methods that have been adopted by the railroads that make is unnecessary for them not only to use as much labor but, as I take it, as much capital. If by creosoting a wooden tie you increase the average life from 7 years to 21 years—triple it, in other words—and your investment in that tie of course is nowhere near as much as the original investment, you have automatically created a situation where the railroads need less money to maintain a given level of output, as time goes on. Now is it your impression that the same holds true of other types of equipment? For example, a modern locomotive costing X dollars would give you in terms of its total life many times more ton-miles of service than a locomotive that cost X dollars 25 years ago. Would that be true?

Mr. HARRISON. That is true, yes.

Dr. LUBIN. So that we can expect, once the railroads reach the point of known possible efficiency, that their need to invest more and more money will gradually decline.

Mr. HARRISON. I think that is true if they continue with the present equipment and don't undertake to junk it and replace it, but the investment of either more or less money, Mr. Lubin, doesn't seem to affect our railroad financial operating result, because we have outstanding a huge amount of bonds, and even though we do reduce the amount of actual operating expense we don't retire the debt. If you look over the history of the railroad situation you will see they generally pay a maturing bond issue by issuing a new one, they generally get a little extra money for the till, corporate purposes, as they call it; if you will look at that exhibit I introduced, the bonds outstanding have gone up right along. The problem you are talking about is the matter of operating expenses, so far as the ties are concerned. Ordinary maintenance of the track would be operating expenses, but of course a locomotive would go into capital account as additions and betterments. If I get the theory that you are pursuing with your question, I would say that the technological advances make it unnecessary, of course, to employ as much capital over the long run as before. Now, of course, they are making the investment, and the capital required is much larger than it would be under the old system. A man buys a suit of clothes for \$50 which will last him 3 years, and a man buying a suit of clothes for \$20 has to have two every year. He has to have more capital outlay for the \$50 suit, but in the long run it takes less.

EFFECT OF INCREASED TRAFFIC ON EMPLOYMENT

Dr. ANDERSON. I have just one or two final questions, Mr. Harrison. In your approach here you discuss and arrive at a measure of decreasing job opportunities. As a concluding statement I wonder if you would help us by putting individuals back into this picture and telling us what has occurred to the normal labor force that called themselves railroad men. For example, Mr. Pelley yesterday, in answer to a question of mine, said there was an excess of available labor over labor being employed of about 100,000, and also went on to say that should the traffic of your railroads increase somewhat beyond the 1937 level, new workers would be needed in the railroad industry, that as a matter

of fact in '37 some new workers were added to railroad labor who had never been employed before. His point was that the problem solves itself with an increase in railroad traffic somewhat beyond 1937 levels. You indicated that in '39 1,325,000 different persons were listed as railroad workers. Would you care to hazard a guess as to the size of the railroad labor force not employed, and whether the prospect that Mr. Pelley laid out before us is realistic from your point of view?

Mr. HARRISON. Mathematically he is probably right, but in actual practice, no. That varies by territories. You see, there is a normal attrition in the personnel of a railroad of about 5 percent a year, and since 1920, a period of 20 years, there should have been a 100-percent turn-over in force, but that has not been true. Considering the attrition and the increase in traffic, I think if we go back to the 1937 level we will mathematically absorb the people ordinarily attached to the industry who are called railroad workers, but that won't absorb them throughout the country. Conditions vary on the railroad properties. At some places we are hiring new men of a particular class right now, and we still have men out of work on that particular railroad of a different class of service. Down in Florida we hire men to handle the winter traffic while we are laying them off in the Middle West because traffic has fallen off; on the west coast when we move the food crop we will be hiring men, and laying them off in Florida. In the winter-time we are moving coal, and so on. We have tried to regularize that, by pointing out to the railroads that they ought to recruit workers from different sections who are already attached to the industry instead of taking on new men, and to that extent minimize the effect of these fluctuations. But getting back to your question, I think perhaps Mr. Pelley is right. If we could get back to the '37 level of business we could give a job to every unemployed person who has been attached to our industry. That is made possible by increase in business to the '37 level and by the actual attrition that has occurred among the workers over a period of time.

Dr. ANDERSON. Do you care to make a prophecy as to whether or not it is possible to get back to '37 levels in railroading and to stay at such levels?

Mr. HARRISON. I would just be shooting in the dark. I have guessed so many times, along with a lot of these other economists, about what is going to happen to business that I am almost afraid to make a guess. But I think the railroads will get back to the '37 level of business, if the Government will adopt a fair policy in regard to transportation and give us a fair chance to compete for the available business.

Dr. ANDERSON. Would a return to 1937 levels solve your problem with respect to unemployment in the future?

Mr. HARRISON. No; because I am interested in employment opportunities rather than individuals that are attached to the industry. If our industry doesn't produce its share of employment opportunities, it doesn't make its contribution to the whole scheme of things. We can take back in our industry all the individuals that have at one time or another been associated with us, but when we make an allowance for the attrition and say that that squares up everything and we are satisfied, I say no. We want a volume of employment comparable to the volume of employment we had in 1929, at least 1,600,000

jobs. If the country is going to get back to the level it was then, with everybody employed except about 2,000,000 temporary employees who were shifting and didn't want to work, we have got to get our share back.

Acting Chairman KING. You believe the railroads ought to be dynamic, that you ought to have a dynamic industry instead of a static one.

Mr. HARRISON. That is right, a growing, up-and-at-'em industry providing opportunities for men, management, and money.¹

Acting Chairman KING. We are very much obliged to you, Mr. Harrison.

(The witness, Mr. Harrison, was excused.)

Acting Chairman KING. The committee will recess until 10:30 tomorrow morning.

(Whereupon, at 12:55 p. m. the committee recessed until 10:30 a. m. Wednesday, April 17, 1940.)

¹ See *infra*, pp. 16889-16919, for further testimony on the railroad industry.

INVESTIGATION OF CONCENTRATION OF ECONOMIC POWER

WEDNESDAY, APRIL 17, 1940

UNITED STATES SENATE,
TEMPORARY NATIONAL ECONOMIC COMMITTEE,
Washington, D. C.

The committee met at 10:50 a. m., pursuant to adjournment on Tuesday, April 16, 1940, in the Caucus Room, Senate Office Building, Senator Joseph C. O'Mahoney, Wyoming, presiding.

Present: Senators O'Mahoney (chairman), and King; Representative Williams; Messrs. O'Connell, Pike, Lubin, Kreps, and Brackett.

Present also: William T. Chantland, Federal Trade Commission; S. Abbot Maginnis, Department of Justice; Corrington Gill, Works Progress Administration; Boris Stern, Department of Labor; and Dewey Anderson, economic consultant to the committee.

The CHAIRMAN. The committee will please come to order.

Dr. ANDERSON. Today's hearings and tomorrow's will be devoted to the communications industry and technology in that industry. As has been customary we have both management and labor represented in the hearings, and the first witness today, Mr. William H. Harrison, is the representative of management. He is the vice president of the American Telephone & Telegraph Co., of New York, New York City.

Mr. HARRISON.

The CHAIRMAN. It is customary for us to swear the witnesses.

Do you solemnly swear that the testimony you shall give in this proceeding shall be the truth, the whole truth, and nothing but the truth, so help you God?

Mr. HARRISON. I do.

TESTIMONY OF WILLIAM H. HARRISON, VICE PRESIDENT, AMERICAN TELEPHONE & TELEGRAPH CO., NEW YORK, N. Y.

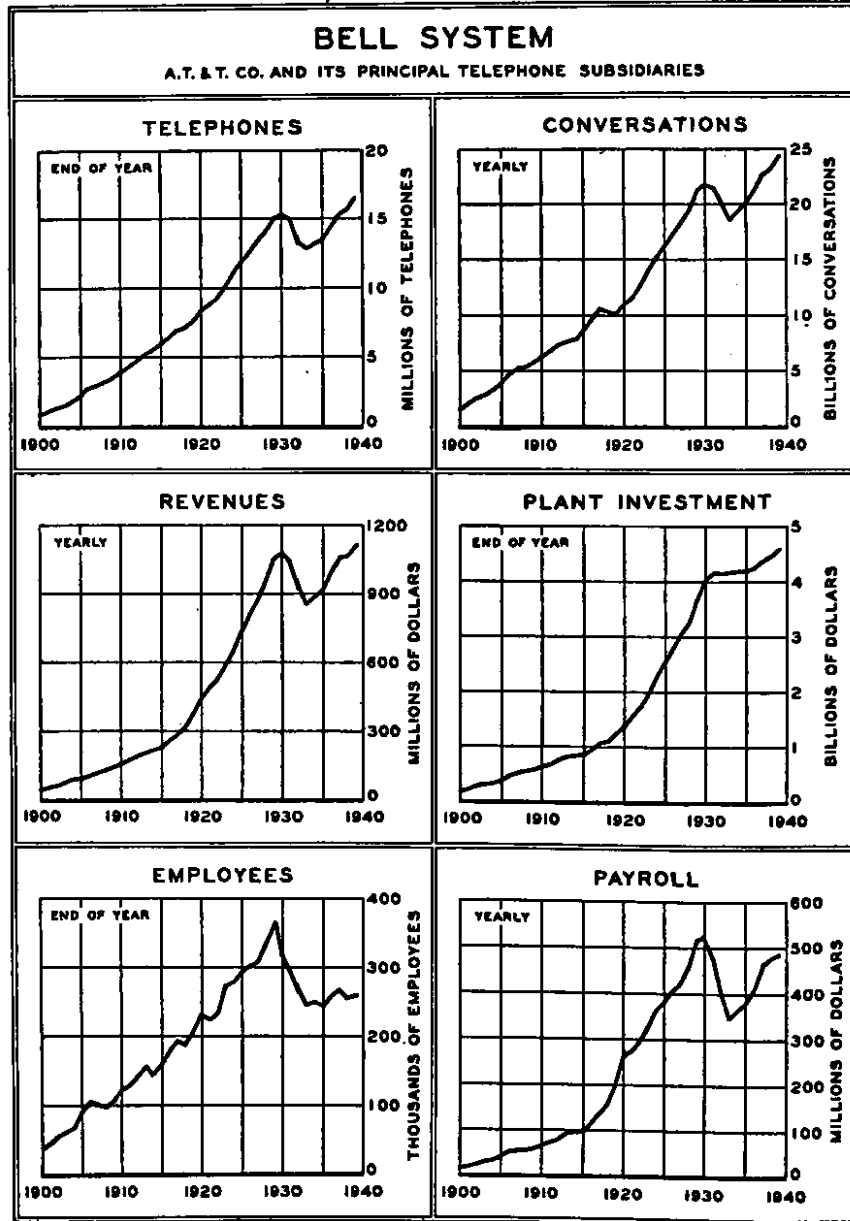
Mr. HARRISON. Mr. Chairman and gentlemen of the committee, my statement deals with the American Telephone & Telegraph Co., and its principal telephone subsidiaries, which comprise upward of 90 percent of the entire Bell System organization. In the country as a whole, including the independent companies, there are now about 21,000,000 telephones, nearly 17,000,000 of which are operated by the Bell companies.

Some of the more significant aspects of the growth of the Bell System business are illustrated in "Exhibit No. 2569," which is the first exhibit attached to that brief statement, and I shall be glad to discuss the details of that in just a moment.

(The chart referred to was marked "Exhibit No. 2569" and appears below.)

EXHIBIT No. 2569

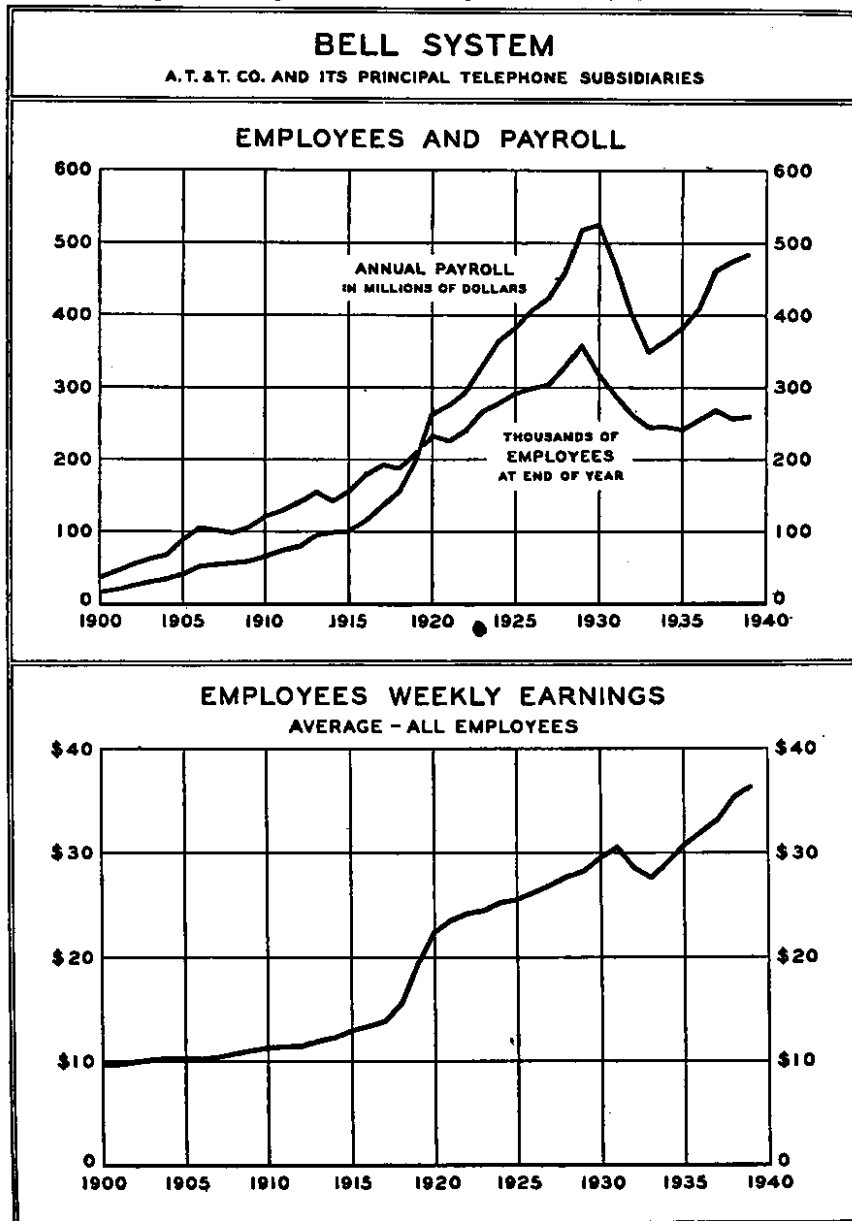
[Submitted by the American Telephone and Telegraph Co.]



The CHAIRMAN. What about that other 10 percent?
 Mr. HARRISON. They represent the Western Electric Co., the Bell Laboratories, Electrical Research Products—not engaged—

EXHIBIT No. 2570

[Submitted by the American Telephone and Telegraph Co.]



The CHAIRMAN (interposing). In communications?
 Mr. HARRISON. In day-to-day telephone work. I am dealing here with the day-to-day operations as contrasted with the manufacturing and the research organizations.

The CHAIRMAN. There is some telephone system outside of the Bell System?

Mr. HARRISON. Yes; there are roughly 6,000 companies, as I remember the figure, and they serve about 4,000,000 telephones. I think they have an investment of somewhere around \$600,000,000 or \$700,000,000.

The CHAIRMAN. Thank you.

Mr. HARRISON. The telephone business is a business based upon scientific discovery and scientific invention.

Without the continuous chain of technological developments which have taken place in the telephone field since the original Bell invention, growth of this magnitude indicated on the charts would not have occurred—telephone service of the present-day scope and character would not have been possible. As I use the term technological development, I mean changes in the art broadly, and not merely those changes affecting the labor content of the individual operations.

Because of the very nature of the business, technology is present in all phases of telephone operations. It is fundamental to the quality and low cost of service. However, I do not plan to discuss its relation to these factors, but I want to come directly to the matter of employment.

The basic facts as to employment are given in "Exhibit No. 2570," which shows the growth in total wages, total employment, and earnings per employee per week from 1900 up to the present. Although not so indicated on the exhibit, it is significant that over the years indicated there, labor has received a practically constant proportion of the revenue dollar.

(The chart referred to was marked "Exhibit No. 2570" and appears on p. 16641.)

Mr. HARRISON. By overcoming, one after another, physical limitations upon the possibilities of telephone expansion, technology has increased the aggregate opportunities for employment. Similarly, it has created new investment opportunities and has expanded the demand for capital goods. By making possible more economical operations, technology has made for higher wages, shorter hours, more skilled jobs, and many other betterments in working conditions in the telephone industry.

The CHAIRMAN. Now, may I refer to your chart on employees and pay roll.¹ That would seem to indicate that the number of employees has steadily increased from 1900 to about 1929 when the peak was reached.

Mr. HARRISON. Yes, sir.

The CHAIRMAN. That thereafter there was a substantial falling off in the number of employees apparently until about 1932, when it sort of leveled off, and in 1935 there was a slight increase and then another little falling off, and it is now leveling off again, but the number of employees has never come back to anything like the peak of 1929.

Mr. HARRISON. Yes, sir.

The CHAIRMAN. And in fact it is now below what it apparently was in 1924. Is that right?

Mr. HARRISON. Well, I don't think it gets back to the 1924 figure but—

¹ "Exhibit No. 2570," supra, p. 16641.

The CHAIRMAN (interposing). Well, I say that because your line crosses the 1925 line—

Mr. HARRISON (interposing). It is right in there somewhere. I plan to discuss, Senator, in a moment or two the reasons for that change.

The CHAIRMAN. You may discuss them; I was just pointing out the chart to see if I understood it.

Mr. HARRISON. That is correct, sir.

The CHAIRMAN. The annual pay roll likewise reached a peak in 1929, fell off precipitously thereafter until 1932, and that pay roll has been going up since, and the rate of increase in the pay roll is much greater than the increase in the number of employees.

Mr. HARRISON. Yes, sir; and the rate of pay to the individual employee has similarly increased each year.

The CHAIRMAN. In other words, the employees are now getting more in their envelopes.

Mr. HARRISON. But there are fewer of them.

The CHAIRMAN. But there are fewer of them.

Mr. HARRISON. Yes, sir.

I would like to say that since the beginning it has been our aim and policy to introduce improved practices and improved apparatus in such a way as to avoid or minimize adverse effects in the nature of economic waste or human hardship. Broadly speaking, employees affected by improvements in apparatus or operating methods have not been laid off, but have been retrained and reassigned. An exception to this is where manual offices are converted to dial operation; here it is impossible to reassign all of the operators displaced, and I plan to discuss this specifically in a moment or two, if I may.

Looking ahead, as we see the situation, there is a large potential market for more and more telephone service and we are exerting our energies to develop this market.

We are counting on continued advances in technology to help in this, and I am confident that employment opportunities, as well as the need for new capital goods for plant additions, will be increased. As a matter of fact, our current gains point specifically to that.

INTRODUCTION OF DIAL SWITCHBOARD

Mr. HARRISON. In the committee's advance statement specific reference is made to the failure of substantial recovery since 1933 to eliminate unemployment, and I want to discuss this from the over-all standpoint of our business. That is the point the Senator spoke of a moment ago. Before doing that, I would like to revert to the dial switchboard, since now and then reference is made to the effect of these switchboards on employment.

As the business expanded it early became evident that the future demand for service would be such that switching systems and operating methods would continue to be more and more complex and it was clear that manual operation, even with such automatic features as could reasonably be introduced, would be less and less suitable for handling the anticipated volumes of traffic, to say nothing of permitting improvements in quality of service.

As an indication of this problem, one has but to consider the situation in one of the large cities where hundreds of thousands of tele-

phones are served from many central offices. Each subscriber in this network—and it must be borne in mind that there are many types of service: business, residence, coin box, measured, flat rate, etc.—must be able to reach promptly every other subscriber and every other class of service. Furthermore, the necessity for reaching the extensive suburban areas as well as the vast number of cities, towns, and rural communities throughout the country requires the handling of enormous volumes of suburban and long-distance messages daily, each of which must be recorded, supervised, and timed.

There are some 90,000,000 calls per day, and one can readily appreciate the growing complexity of the operating work to meet this situation and the difficulty of maintaining an accurate and efficient service through the medium of manual operating methods alone. From such practical realities as these, it was certain that manual switchboards, even with such automatic features as could be provided to assist the operator, could not continue indefinitely to meet adequately the local operating problems of the larger cities.

It inevitably followed that machine switching equipment to complete certain types of connections entirely by mechanical means would ultimately be required. After exhaustive investigations and experiments, an automatic switchboard which met the exacting service conditions was developed and introduced for general use in the early 1920's.

Of course, in cities where the dial switchboard is used, many operators are required. Dial substitutes electromechanical processes for some, but not all, of the manual operations. Operators are needed for many services associated with the dial—among them the handling of charges, information services, and numerous other services of that character. Also a great many operators continue to be required for handling toll and long-distance calls. Then, too, with dial, additional men of greater skill are required for day-to-day operation and maintenance as compared with manual.

There have been lay-offs of operators as individual central offices have been converted from manual to dial. These have been scattered and have not been large in relation to the operating force as a whole. Also, for the most part those released had been engaged for the specific period preceding the conversions. Everything possible, including long-term planning and, generally, separation allowances, is done to minimize the consequences of the change-over.

Conjecture as to the number of operators that would be required today, whether they be more or whether they be less, had the dial switchboard not been introduced, is futile. As I have indicated, present-day scope, quality, and price of telephone service would be impossible under all-manual operation.

Coming now to the broader question, which is employment opportunities since 1933, referring again to "Exhibit No. 2569," I think it will be clear from that that recovery of revenues, of numbers of telephones and numbers of conversations, and of total wages have been about the same. As a matter of fact, recovery of the service to the customers, that is, telephones and conversations, and wages to employees have increased more rapidly than have the revenues of the business. I think that will be evident.

The CHAIRMAN. The pay roll apparently fell off to a greater extent than the revenues did.

Mr. HARRISON. Yes, sir.

The CHAIRMAN. And the gain has been about on a parallel, I would say from the graphs.

Mr. HARRISON. I haven't figured it out precisely. I am rather under the impression that pay rolls increased a little faster. We may be talking in terms of a few percent, but whatever it is it is on the high side rather than the low side.

The CHAIRMAN. The revenues or the pay roll?

Mr. HARRISON. No; the pay roll is on the high side in relation to the revenues; that is, if anything.

Mr. PIKE. It doesn't look it from this chart, Mr. Harrison. Pay roll has not recovered up to the 1930 figure. It looks as if revenues had gone slightly beyond that.

Mr. HARRISON. I am sorry I did not make the point clear. I was thinking in terms of rate of recovery rather than in terms of absolute comparison. I am sorry I did not make that clear.

The CHAIRMAN. Now, there are six charts on this exhibit.

Mr. HARRISON. Yes, sir.

The CHAIRMAN. All of these, with the exception of the chart representing plant investment, shows a decline after 1929. That investment did not drop off, and later began to increase. All of them, including plant investment, and with the exception now only of the chart representing employees, have shown a striking gain after 1932 or 1933. In the charts representing the number of employees, do you find that there has not been the recovery which is evidenced in each of the other factors represented on these charts?

Mr. HARRISON. Yes, sir.

The CHAIRMAN. That is correct?

Mr. HARRISON. That is correct, sir, and I would like to go right to that point.

Dr. ANDERSON. Before doing so, I wonder if we could have the tabular material on which these charts are based?

Mr. HARRISON. I am sorry that I haven't it with me. I have tried to treat this in rather broad terms, but I will be very glad to have the data filed. I was afraid of getting myself messed up in too many detailed figures.

The CHAIRMAN. It can be done.

Mr. HARRISON. It has been done, too.

ANALYSIS OF LABOR FORCE

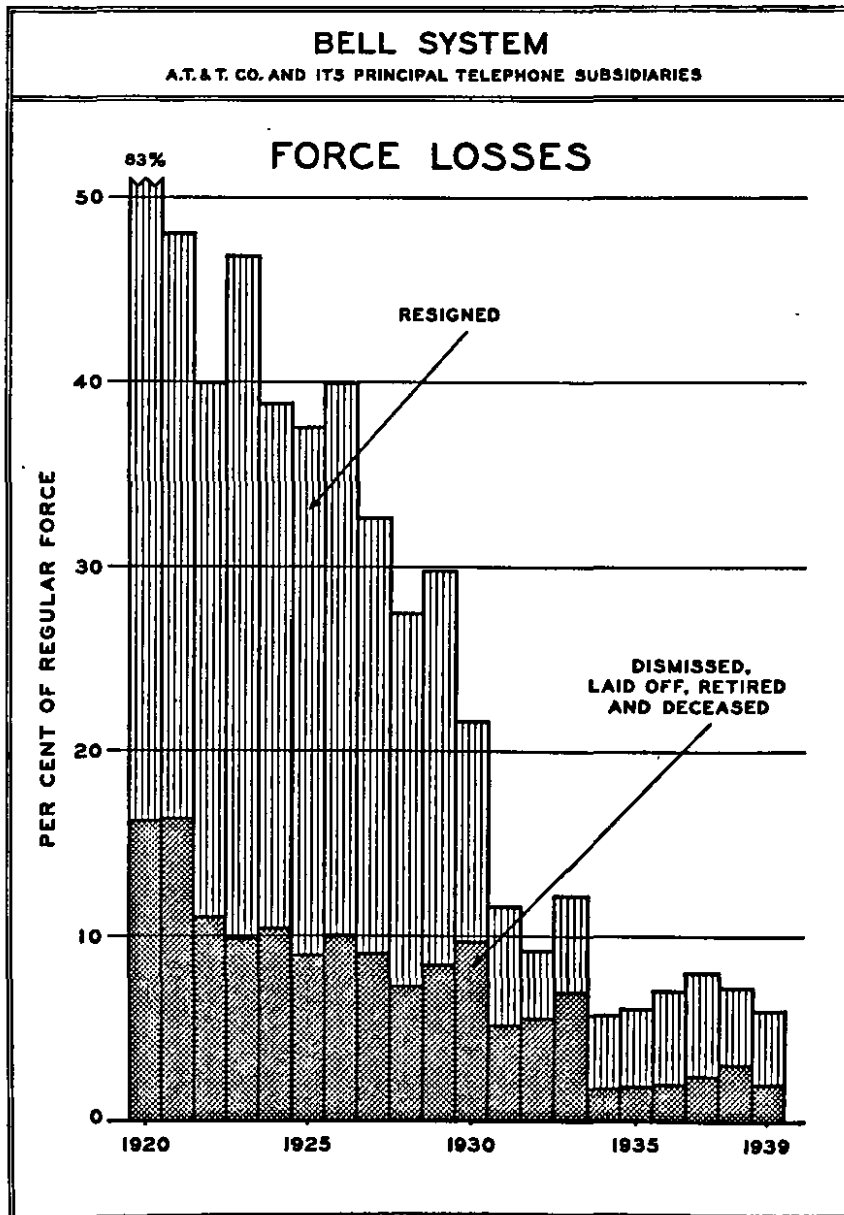
Mr. HARRISON. First, some background is necessary, I think, to comprehend the reason why the rate of pick-up of employees has lagged behind the other items, and I would like to make the observation to begin with that there cannot be any backlog of unfilled orders in the telephone business; the telephone connections between customers must be established promptly, facilities have got to be provided in advance, and personnel has got to be engaged and trained in advance.

Under that obligation of preparedness, and with the heavy demands for service in the 1920 decade, a large construction program had to be carried on to insure adequate physical facilities. In this period, annual gross additions rose from a level of \$200,000,000 at the beginning of the 1920 decade to \$600,000,000 per year at the end of the 1920 decade; in all, some \$3,500,000,000 of construction was com-

pleted as compared with \$1,000,000,000 a decade earlier. The investment in plant rose from \$1,200,000,000 at the beginning of 1920 to \$3,700,000,000 at the end of 1929.

EXHIBIT No. 2571

[Submitted by the American Telephone and Telegraph Co.]



That was the problem of the twenties, getting ready and preparing for that heavy construction program. Then there had to be large numbers of people, particularly new people, engaged and trained.

Dr. ANDERSON. Let me ask a question there. Did this large construction program of the industry in the period of the twenties result in correspondingly large construction crew employment?

Mr. HARRISON. Yes; very specifically, and I have some figures.

Dr. ANDERSON. You will give figures later?

Mr. HARRISON. Yes; I have some figures. I will go on with my prepared statement, if I may, and then discuss it more in detail.

Senator KING. Did you embrace in the word "crew" the manufacturing activities, the number of persons required to construct new appliances, new dials, and what-not?

Dr. ANDERSON. Yes.

Senator KING. So the construction crew includes those engaged in the manufacture of additional mechanical devices?

Dr. ANDERSON. Yes.

Mr. HARRISON. During the 1920's, thousands of new people had to be engaged simply to maintain the existing force. For example, resignations and other normal losses amounted on the average each year to more than 40 percent of the force. The losses are shown in the next exhibit.

(The chart referred to was marked "Exhibit No. 2571" and appears on p. 16646.)

Mr. HARRISON. By the end of 1929 there were 90,000 people—25 percent of the force—with less than 1 year of service, and there were 40,000 people or more during that year who were engaged on construction work, solely for new plant, to provide for the growth that was then coming to us.

Now, the result of all these factors—that is, the large construction program, the training of roughly the 90,000 people with 1 year of experience or less—led to the figure of 364,000 people on the pay roll at the peak of the period. That was clearly an abnormal situation and not an appropriate yardstick with which to appraise subsequent results.

Senator KING. That would be in the year 1920?

Mr. HARRISON. In '29. In 1920 the force turn-over, as I remember it, was 83 percent of the total force; that is, the entire force, males and females.

DISPLACEMENT AFTER 1930

Mr. HARRISON. Now, then, if we can picture the situation as of 1930, when we had just about arrived at the peak of employment, there came a sudden and a sharp drop in demand for new facilities, and there was a slowing up in telephone usage, and to make the force situation more difficult, normal force losses decreased almost overnight, and that is indicated by "Exhibit No. 2571." These changes at once produced a surplus of people, and this situation became progressively more acute.

As the volume of work dropped, adjustments had to be made to bring the forces in line. This was done in an orderly way and with the most careful regard for the welfare of the men and women. Construction during that period was carried on at existing levels, but it soon had to be curtailed as more and more telephones were discontinued and usage was reduced. Intensive sales and other promotional activities were accelerated. Thousands of employees were retained by spreading the available work and other thousands by introducing productive

"made" work. The introduction of new dial offices was reduced to a minimum.

But despite all efforts, work requirements dropped steadily. There was simply not enough work to go around. Had the System released all employees not actually needed, instead of spreading work and providing "made" work, there would have been more than 60,000 fewer employees at the bottom of the depression; this condition prevailed in varying degrees throughout the depression.

I would like to say, too, that throughout all this difficult period of adjustment and of part-timing—and incidentally the entire organization participated in the part-timing—there was the finest kind of cooperation all around.

Representative WILLIAMS. Would you mind explaining what is meant by the term "made" work in this connection?

Mr. HARRISON. That is doing sound, worth-while work that of necessity need not be done at the time, but it is the kind that pretty much we would characterize as advance upkeep work. I don't like to use painting, as there isn't very much of that in the telephone business, but we did things like painting your house a year ahead of time. There are things that an institution might ordinarily defer in bad times; in our case that work was actually brought forward during the bad times, in order to provide work for the people that were on the pay roll.

This readjustment of the force took place gradually, and was spread over a period of years. I think the most significant thing is that the readjustments occurred, not by lay-offs but by not replacing natural losses, that is, resignations, deaths, pensions. As a matter of fact, lay-offs because of lack of work or for other reasons represented a very small percentage of the total force, and were far lower than was the situation during the normal years. That is very apparent in "Exhibit No. 2571."¹ I think the important thing is that the downward adjustment occurred through the medium of not making normal replacements, rather than through the medium of lay-offs.

Incidentally, too, the lay-offs that did occur were regrettable, but they were confined to the short-service people; and for the most part, with the possible exception of some people engaged in construction and engineering work, there were relatively few of the older service employees—and by that I mean service of 5 years and up. We think in terms of an older employee as an employee of 5 years and up, rather than 20 years and up—

Representative WILLIAMS (interposing). In the case of these lay-offs, what, if any, separation allowance was provided?

Mr. HARRISON. Usually—and you will understand when I use the word "usually" rather than be specific, because these operations extended all over the United States—there were separation allowances. They were figured roughly about like this: If by any stretch of the imagination it could be assumed that the individual was entitled to a vacation, even though the year were not up, we started vacation payments. The separation allowance was usually a week's pay for each year of service. If the employee involved had 6 or 7 or 8 years' service, then it became 2 weeks at the sixth or seventh year. In the few

¹ Supra, p. 16646

situations where they had 10 years and up there was specific consideration, which was more generous than the application of a formula.

Representative WILLIAMS. Was there ever any material number of those laid off returned to the service, or was that permanent?

Mr. HARRISON. There were quite a few. I don't have the precise figure on that, but it was the practice as new people were needed in the localities that ex-employees were given the first preference, even though they had been paid separation allowances. As a matter of fact, I know of specific separation cases where they were rehired before theoretically separation payment had run out, but those were incidental.

Senator KING. What proportion of your employees are female?

Mr. HARRISON. At the moment, around 60 percent, and it has been around 60 percent, I think, for the last, oh, 8 or 10 years. It never rose, I believe, much above 63 or 65 percent.

Senator KING. Would they be found in the category of telephone operators?

Mr. HARRISON. A little more than two-thirds, I would say, are telephone operators. The balance are in the accounting and billing departments and commercial departments. Roughly I think at the moment about two-thirds would be in traffic-operating work. Those are round figures. I have the precise figures.

Senator KING. Does it require much of an educational program to qualify them to act as telephone operators?

Mr. HARRISON. Well, sir, the experts disagree somewhat on that, but on the average we think that an employee of 6 months' to a year's service has attained a fair degree of skill in handling the more or less day-to-day run-of-the-mine calls, but they must take on more years of service before they are competent and able to be on their own. I would say that is upward of 3 to 5 years. There is something about the business that one takes on a little breadth of experience more or less each year as you go on, but taking the technical day-to-day operations of handling calls as a routine, I would say 6 months' to a year.

Representative WILLIAMS. I assume you have there somewhere the figures showing the number employed in your construction division and in your operating division?

Mr. HARRISON. Yes, sir.

Representative WILLIAMS. How does that run?

Mr. HARRISON. During the late twenties, when the force was around 340,000 to 350,000, I would say there were 40,000 or 50,000 of those who were involved in the kind of construction related to new business. Now, there is quite a bit of construction that is related to the day-to-day operations of the business—the moving of pole lines, the rearrangements of telephones, changes in that type of thing, but generally a good figure to carry in mind was 40,000 to 50,000.

Representative WILLIAMS. I just wanted a general outline. I believe you have given that, partly, as to what you consider under the construction category in the telephone business.

Mr. HARRISON. I would put it at that figure, sir.

Representative WILLIAMS. I mean, what is the character of the work done?

Mr. HARRISON. It runs, sir, all the way from digging holes to the highest grade of electrical work. It is the labor that is involved in building new plants. There are line crews, the men who install the

telephones, the men who install the cables, the men who install—in a new building we have building terminals and that type of equipment—all of the operations incident to new plant. It is a wide variety of construction work.

Representative WILLIAMS. It doesn't include the construction of the telephone box itself?

Mr. HARRISON. No; we characterize that as manufacturing, and I have not included those figures in my discussion here today.

Representative WILLIAMS. Does it include repair or keeping up of the telephone box?

Mr. HARRISON. Oh, yes; but we don't usually associate that with construction work. The repair, the rearrangements, we talk of in terms of day-to-day operation, just about the same as the telephone operator who puts up and takes down connections.

QUALIFICATIONS FOR EMPLOYMENT IN AMERICAN TELEPHONE & TELEGRAPH COMPANY

The CHAIRMAN. Mr. HARRISON, what qualifications do you look for in a new employee?

Mr. HARRISON. Good character first, the characteristics we hope will make them adaptable to meet the particular conditions of work in which they are to be engaged. Of course, the background qualification of technical training depends in large measure on what particular jobs they are going into. I don't know, sir, that I—

The CHAIRMAN (interposing). Well, let's begin with the male employees. What do you require of an applicant for employment? I suppose you would have some persons who ought to be selected for managerial, executive positions, or engineering positions, in which there would be particular prerequisites demanded. Is that right?

Mr. HARRISON. That is right.

The CHAIRMAN. What kind of prerequisites?

Mr. HARRISON. If the work is primarily of the so-called vocational or craft work, for example, the installation or repairs of the telephone, a high-school graduate who has indicated some aptitude for electrical and mechanical work would be considered. Many of the men are graduates of the vocational high schools. If we are looking for a person who must start in more specialized work, for example in the engineering department, he might be an electrical engineering graduate. Frankly, it gets back pretty much to the individual himself, his character, what someone thinks of his promise rather than his particular background training.

The CHAIRMAN. To what extent do you lay down educational prerequisites?

Mr. HARRISON. I wouldn't think, sir, that there are any hard-and-fast rules. In my own case, perhaps, I am glad there were not; I had to go to work before I was able to finish high school. Had there been any requirements laid down, I am afraid I shouldn't have been able to have gotten a job. To get back to my first premise, it is pretty much the individual himself rather than the specific training the individual has had that is considered.

The CHAIRMAN. Do you discuss the attitude of the company toward the older employees in your statement?

Mr. HARRISON. Not specifically, sir, except to say that at the present time the average length of service is now pretty close to $13\frac{1}{2}$ or 14 years. I think that is made up of men 16 to 17 years in service and women around 13 years in service.

Does that answer the question?

The CHAIRMAN. That is merely describing the actual facts. What is the maximum age? Do you have a maximum age?

Mr. HARRISON. I am sorry I misunderstood the question, sir. Yes; we do have a maximum age. We have a so-called pension and benefit plan, and under that plan the maximum age is 65 years. At the age 65 those who qualify—and the qualifications are very generous and broad—the individual is entitled to a service pension.

The CHAIRMAN. On attaining the age of 65, must an employee retire?

Mr. HARRISON. He must; that is a requirement. There has been no exception to that rule as far as I know.

I should like to go back just a moment and then discuss the situation as of 1933 at the low point when the turn came, and I shall try to explain specifically, then, why employees have not increased in relation to the increase of revenues and of pay rolls.

In the first place, we had excess plant. There were 2,600,000 telephones that were discontinued. Obviously, then, there was no occasion for construction. The construction situation was particularly aggravated because construction had been continued through the depression in order to offset as much as possible the down trend.

Then there was the excess force of over 60,000 that grew out of short-timing and made work. That force had an experience factor of about $10\frac{1}{2}$ years; that is, the average length of service in 1933 was $10\frac{1}{2}$ years. In 1929 it was $5\frac{1}{2}$ years' service. There were those three things, the excess in the force, the excess in the plant, and more experienced force. The first problem was to absorb that force; that is, as the business increased. People had to be restored to full time, and by full time I mean 40 hours a week. Then the organization became progressively more effective because it was getting more experienced each year.

I should like to say that during that period there were no new technological changes introduced that might have tended to aggravate that difficult situation.

The CHAIRMAN. That is a very interesting statement, Mr. Harrison. I wish you would amplify it. You say it with such emphasis that apparently you want to call the attention of the committee—

Mr. HARRISON (interposing). Yes, sir—

The CHAIRMAN. In no indecisive terms to the fact that the company pursued a deliberate policy of not introducing technological improvement at a rate that would excessively displace labor.

Mr. HARRISON. During that period.

The CHAIRMAN. During that period.

Mr. HARRISON. Yes, sir.

The CHAIRMAN. How did you come to that decision and why?

Mr. HARRISON. Well, I think the record indicates in the main the consideration the telephone company has always held with regard to its employees. That is evidenced by the relatively few lay-offs. We recognize that we have an obligation and a responsibility to the people we take on the pay roll.

The CHAIRMAN. In other words, you give a great deal of weight to the human factor.

Mr. HARRISON. We do everything we know of to take care of the human equation in the business because we recognize it as important a fundamental in the business as any other element in it.

The CHAIRMAN. How do you carry that policy out? Can you give us an example of holding back the introduction of technological advance?

Mr. HARRISON. Perhaps one that gets more generally into the picture is the dial switchboard. During those low years—I am quoting now rough figures—my recollection is that the dial shipments were reduced to a figure of between 15 and 20 percent of the shipments made in '29 and '30.

The CHAIRMAN. Yet, unquestionably, had you continued to introduce the dials at the same rate you would have reduced your expenses, would you not?

Mr. HARRISON. Yes; we would.

The CHAIRMAN. And from the profit side, from the financial side of your operation, it would have been an advantage to the company.

Mr. HARRISON. Yes, sir.

The CHAIRMAN. But you preferred not to pursue that policy at the price of excessive displacement.

Mr. HARRISON. That is correct, sir. I would like to say, too, that we are on two horns of the dilemma there. There was the choice of continuing the manufacturing phase of the operation and providing work for the manufacturing people as against the proposition of continuing more operating people, and we elected the path that we thought was the soundest at that time. As we now look back on it we think, considered in the light of conditions of those days, it was the sound thing to have done.

The CHAIRMAN. And you were attempting to balance the human factor against the mechanical factor—

Mr. HARRISON (interposing). Senator, there were human factors on both sides. There were human factors on the construction side; we tried to strike the best balance as we saw it.

The CHAIRMAN. That is what I say, you were trying to strike a balance between the human factor and the mechanical factor so that you could obtain the best out of each.

Mr. HARRISON. That is correct, sir.

The CHAIRMAN. Were you holding back progress by doing this?

Mr. HARRISON. During that period we think not, sir. Had that period continued indefinitely I don't know.

The CHAIRMAN. Another story.

How about other devices beside the dial?

Mr. HARRISON. Again, if I might be permitted to take your time, sir, just with a little background, it so happens that, generally speaking, in the telephone business new technological advances are made in the interest of service rather than in the direct interest of reducing the labor content of specific operations. The introduction of those new instrumentalities to make for improved service usually is related to the need of facilities for growth; that is, it has been so in our business. We have not reached the stagnant stage of growth; we have not reached the point where our plant is leveling out; so we have never yet, broadly speaking, had to meet that par-

ticular problem except in the case of specific dial offices. I might say that, generally speaking, the manual office is not displaced until the time has come when some major move is necessary, when some extensive rearrangement or extensive additions have to be made. That is again a generalization; I shouldn't like to have someone hold me to that and say, "Here is example 1, 2, or 3, which is the opposite."

PROGRESS OF DIALIZATION AFTER 1933

The CHAIRMAN. I can understand, for example, a dial system could not operate successfully in a small community with a few telephone connections. There you would necessarily have to retain the manual board. Is that correct?

Mr. HARRISON. Generally, although even there, sir, in the interest of the service advantage we think the dial holds, there generally has been introduced in small communities the so-called dial switchboard, and, incidentally, they are very well received from the standpoint of the service.

The CHAIRMAN. To what extent, if the dial system were completely used, would that system result in displacing manual operators?

Mr. HARRISON. Well, we now have some 60 percent of our telephones that are dial; roughly, I think the precise figure is 58 or 59. We have with our present experience factor roughly one-hundred-thousand-odd operators. We have never attempted to say theoretically if we had been all dial how many fewer or how many less; my notion is—and again I suggest how difficult it is to forecast what the years ahead hold, and doubly so these days—that if and when we reach the time that we have all dials, we will have more operators, because our services that require operators would have expanded, and, as I look ahead, I will be surprised if the number of operators shows any great downward trend, even as the dial increases.

The CHAIRMAN. The actual number. Would it be correct to say that expanding service demands, and will continue to demand, both more dials and more operators, but that the proportion of operators to the outlets or the connections might be expected gradually to reduce?

Mr. HARRISON. Yes, sir. Thinking the committee might be interested, I attempted to find out just what did happen in the last 5 years in connection with the dial displacements; that is, how many people were involved and what happened to them.

The CHAIRMAN. Very interesting; that tells the story.

Mr. HARRISON. I don't know of any other way to go about this thing.

In the period from December of 1934 to December of 1939, just taking a period, there were about 1,250,000 stations that were converted from manual to dial. In those particular places where they were converted there were 20,000 people.

The CHAIRMAN. Does a station in your terminology mean the outlet, the telephone connection?

Mr. HARRISON. Yes; telephones, just talking in terms of the telephone. There were 20,000 operators at work at that time. After the conversion there were 9,200 operators; in other words, there were roughly 11,000 displaced. Now there were 5,000 of those 11,000 who were reassigned to other work, either in the same locality or at distant

places. There were 6,000 whom we have classified as resigned or laid off. I don't know the break-down between these two, but the bulk of the lay-offs were those people who were engaged specifically for this conversion work. For the most part they were ex-employees. As a matter of fact, there were specifically 2,500 who did not want a further job, and most of them were given separation allowances. That is the case in that particular situation.

Representative WILLIAMS. In that connection, I notice that you distinguish between those who retired and those who resigned.¹ What do you mean? Do we understand by resign what we ordinarily mean by that, just quit?

Mr. HARRISON. Oh, yes. Preparatory to a dial conversion, plans are generally known 2 or 3 years in advance. There is always a normal turn-over, people are leaving, their families move away or they want to take up household duties or they get tired of their work, or a number of reasons. During this introductory 2- or 3-year period, people are hired, many of whom simply want work for a specific length of time, and those people, I put it, are ready to resign at the completion of that particular job. Many of them are ex-employees who either don't have need to or don't desire to work. It is surprising the number of people who even today resign.

Representative WILLIAMS. I wondered whether you used that in the sense we ordinarily understand by the word "resign," whether they just don't want to work and quit, or whether there is some notice given by the company or some reason on the part of the company for their quitting.

Mr. HARRISON. Well, I dislike to suggest that they all fall in the strict class of what you and I think of as resignations. I think there is some part of them—I think it is a small part rather than a large part—who kind of automatically think in terms of resigning, knowing that that particular job is completed. We characterize them as resignations.

Mr. PIKE. Some of those do get married?

Mr. HARRISON. Oh, yes, and take up home duties.

Dr. LUBIN. Mr. Harrison, you said that between '34 and '39 you installed a million stations on dial.

CHANGE IN CHARACTER OF LABOR FORCE

Mr. HARRISON. No, I think we installed more than that. We displaced roughly 1,250,000 manuals. The actual increase in the dial telephones during that period was greater.

Dr. LUBIN. What was the maximum number of operators the company has ever employed at any one time?

Mr. HARRISON. Before I leave that particular case of dial conversion, if I may, Dr. Lubin, I would like to say that in those same places where there were operators displaced there was about a 20 percent increase in the force of the men to take care of the dial office.

Mr. PIKE. Is that a fair proportion, Mr. Harrison, about half as many operators for dial as for manual exchange?

Mr. HARRISON. Yes; I think it is probably on the low side of the half rather than on the high side, although it varies quite a bit, I

¹ "Exhibit No. 2571," supra, p. 16646.

would say 45 percent that are retained is nearer the figure than 50 percent.

Dr. ANDERSON. You said a 20 percent increase in the force of men was required in the average change-over. Let us have the actual numbers of men, then, corresponding to that percentage. Twenty percent might be a large number or a small number.

Mr. HARRISON. The number at the time was 3,700 and after the conversion was 4,700. Now as to the question of maximum operators, we now have in our traffic force roughly 125,000 people. The bulk of those are operators, I would say about 90 percent, and the balance clerks. At the peak there were 180,000. There are now 125,000.

Dr. LUBIN. A decline of over one-third, or of about one-third.

Mr. HARRISON. Of course, the characteristics as to length of service have changed very sharply in that period. During the period when we had 180,000, a great substantial number of them were employees of less than 1 year's service. Now, as I term it, the average is about 11 or 12 years.

Dr. LUBIN. "Exhibit No. 2570" shows that your decline in total employees has been from approximately 350,000 to about 275,000 or 260,000.

Mr. HARRISON. Did you say 360,000?

Dr. LUBIN. 350,000.

Mr. HARRISON. Yes; roughly that.

Dr. LUBIN. To about 260,000?

Mr. HARRISON. Yes.

Dr. LUBIN. A decline of 90,000. In other words, of the decline of 90,000, 55,000 were manual operators.

Mr. HARRISON. I can give you the break-down of that difference, if you wish, sir. Trying to analyze that for ourselves, as to what brought about that change, we made roughly these figures. Growing out of direct reduction in volume of traffic that we handle (these are all forces now, not just the operators) 26,000 or 27,000 fewer have been employed, about 25,000 fewer, due to the fact that the construction has been reduced and there was no need to build plant. We needed roughly 20,000 fewer learners and instructors, kind of growing out of the function of increasing experience of the force. We characterize one item as easier operating conditions, that is we had never operated where we had the margin in plant that we had, and we put down a figure of 6,000 or 7,000 for that. Incidentally, people seemed to take less time off, less casual time off during that period. We found that equated to 4,000 people. And then the balance is made up of fewer clerks and engineers, people who, for instance, did construction activities, and I put down as the things we could directly relate to technological advances during that period less than 20,000 of the total. About half of that is dial and the other half miscellaneous.

Dr. LUBIN. Has your volume gone down markedly since that peak period?

Mr. HARRISON. Oh, no; our volume, sir, has increased.

Dr. LUBIN. I thought you made an allowance for the fact that you needed fewer people because there was smaller volume.

Mr. HARRISON. I was trying to give the reason for the change from the peak to the bottom.

Dr. LUBIN. I am thinking now from your present figure. Your chart runs up to the end of 1939, I take it, and there has been a decline

in employment of about 80,000 people, and if your volume was greater than it was at the peak you certainly can't attribute any of that loss of employment to loss of volume.

Mr. HARRISON. I am sorry, Dr. Lubin, I thought I had covered that; perhaps you weren't here. Briefly, during that depression period we carried more than 60,000 people in excess of the requirements. That 60,000 was made up of part-timing and "made" work, and the first operation was that that group had to be absorbed. That is the principal reason, plus the fact that the experience factor of the force, the efficiency, grows greater as the experience becomes greater, and the added work has been handled with that slack, so to speak, that was in the force, plus the fact that there have been practically no requirements for construction. Roughly, that explains it.

Dr. LUBIN. What does the Bell System claim is the advantage to the consumer or to the user of the services in the dial phone? I raise that question because we had a dial system installed in this very building several years ago and it didn't last very long, the dials stayed but the operators came back.

Mr. HARRISON. I would like to say, Dr. Lubin, not answering the particular question as to what we claim, but rather trying to state the facts, we know of no way to handle the telephone business without the aid of machines. We don't know how we could have given today's service, leaving out price. We don't know how it could be given with manual operation. I have a more complete statement which I would like to offer for the record which attempts to explain the technical background as to why all manual operation would be just impossible. Now really, I don't belong to the school that is willing to make fantastic figures as to what it might have been had we had none of those changes. I am confident that what we have would not have been, leaving out the question of price. Now there may be some disagreement as to the extent. I wouldn't dare say that you can draw a precise line and suggest that beyond you are doing the right thing and this side of it you are doing the wrong thing. If somebody were to say, "You have gone too fast or you have gone too slow," I wouldn't undertake to dispute it. It is of interest, although perhaps not even worthy of bringing to the attention of the committee, that apparently many other countries in the world have found it necessary to go into the dial, and our rate of introduction has been at a more orderly rate.

The CHAIRMAN. Your rate of introduction of what?

Mr. HARRISON. Of the dial. Really, summing up my statement, sir, the number of employees has increased over the past few years, and as the growth continues, and as telephone markets are further developed, we expect this upward trend will continue. We hope and are confident that more and more people will be needed not only to meet the day-to-day need but also to care for construction.

Dr. ANDERSON. Mr. Chairman, this carefully prepared exhibit that Mr. Harrison has asked to be introduced has been provided in a number of copies, and we ask that the committee accept it as an exhibit.

The CHAIRMAN. It may be admitted.

(The document referred to was marked "Exhibit No. 2572" and is included in the appendix on pp. 17396-17406.)

The CHAIRMAN. Of course, it is clear, Mr. Harrison, that the entire telephone system is a triumph of technology. The telephone itself

was a technological invention which created this great new industry. There can be no doubt about that at all. The only question seems to be the degree to which the expansion of this industry can be fitted into the employment of individuals, and it is quite evident from what you have said as I understand your testimony, that the telephone company has recognized that there is a certain amount of displacement, and bearing in mind the importance of the human factor, the telephone company has endeavored to balance the introduction of new devices against the displacement of individual workers.

Mr. HARRISON. Yes, sir.

The CHAIRMAN. And in doing that you have borne in mind not only the specific employment of the workers for the telephone company but also the necessity for maintaining employment among the subsidiaries of the company which manufacture some of your devices and among other manufacturers from whom perhaps you may buy them.

Mr. HARRISON. Yes, sir.

The CHAIRMAN. But the figures and charts which you have introduced here seem to indicate that sometime after the crash, so to speak, in 1929, there came a period when although investment increased and total pay rolls increased and the total number of telephones increased, or the number of stations, and the service itself increased, the increase among the number of employees was no longer apparent. Isn't that correct?

Mr. HARRISON. That is true.

The CHAIRMAN. In other words, there apparently is a point at which the technological advance proceeds at a pace which makes it impossible for employment in terms of individuals to keep up with it. Is that correct?

Mr. HARRISON. Senator, I don't think that is so with respect to our business.

The CHAIRMAN. I am just judging from the material that you have presented.

Mr. HARRISON. I don't believe, sir, that the advance of what we might call technological advances is the factor that is responsible for this precipitous drop.

The CHAIRMAN. I am not attempting to say that any particular factor is responsible. I am merely trying to develop what the fact is.

Mr. HARRISON. Well, the fact is really in our situation that the telephone business can have no held orders, no unfilled business. It has to complete telephone connections as they are ordered. You remember now we had had pretty nearly 50 years of more or less continuous growth, that is in the telephone business. These graphs indicate that, and the growth kept getting faster toward the latter part of the twenties. We had to accelerate the construction program to keep ahead of the needs; we had to accelerate the training program to make available the people 6 months to a year ahead of the time they were actually needed; we had all those goods on the shelf when this drop came. Now, in making the comparison from the recovery, I do think, in looking at the situation broadly, that one has to take into account the situation as of the '29 and '30 period. If you look at that graph,¹ particularly, and look at it in the long-term perspective, it is very clear there that the long-term trend—and the trend has been

¹ See "Exhibit No. 2570," supra, p. 16641.

resumed—is an upward trend and certainly the wages similarly indicate that. I think, Senator, that is best illustrated on the lower graph of this exhibit.

The CHAIRMAN. I think that is quite true, and I don't disagree with that at all. As a matter of fact, I thought I brought that out in some of the first questions—

Mr. HARRISON (interposing). I think you did, sir.

INCREASE OF BUSINESS IN RELATION TO EMPLOYMENT

The CHAIRMAN. That I directed to you. I see that clearly. But this is what I am pointing out. Your revenues are now above the revenues for the peak period in 1929.

Mr. HARRISON. Yes, sir.

The CHAIRMAN. The previous peak period. Your plant investment—that is to say the new capital which you have put to work—is now above the peak of 1929. The number of telephones is above the peak of 1929. The number of conversations is far above the peak of 1929. But only in the case of pay rolls do you find—pay rolls and employees—that you have not yet reached the peak of '29. Your pay roll has increased remarkably, but it has not yet reached 1929. The number of employees has increased very slightly.

Mr. HARRISON. Those facts as you state them are precisely correct, sir; but may I just, at the risk of seeming to be too persistent on this point—

The CHAIRMAN (interposing). You can't be too persistent; let's get the facts out.

Mr. HARRISON. Suggest that this pay roll and these numbers of employees include the day-to-day operation and construction activities.

The CHAIRMAN. Yes.

Mr. HARRISON. Now, day-to-day operations—that is a story by itself. Were construction needs for new business now, thinking in terms of expansion, anywhere near the figures of the '28-'29 period, the figure for employees and pay roll would be quite different from what it is there. They pay roll would be quite a bit up, and the employees, in turn, would be up.

The CHAIRMAN. That is, if you were engaged in the construction?

Mr. HARRISON. Yes; and as you look ahead, we have reason to believe we are going to need more plant.

The CHAIRMAN. That may be. We are dealing now with the facts as they exist.

Mr. HARRISON. That is right.

The CHAIRMAN. And those facts seem to be clear, that in every element of this business, as represented upon the charts which you have produced, the record of the Telephone Co. is far above the peak of 1929 save only in the element of pay roll and number of employees. That is correct, isn't it?

Mr. HARRISON. That is correct. There is no question about it.

The CHAIRMAN. Now, then, you foresee that there may be further expansion.

Mr. HARRISON. Yes, sir.

The CHAIRMAN. There will be necessity for additional construction.

Mr. HARRISON. Yes, sir.

The CHAIRMAN. And when that expansion and that construction takes place, you will necessarily have to employ more people.

Mr. HARRISON. Yes, sir.

The CHAIRMAN. But a moment ago I asked you if it would not be the fact that in relation to the number of outlets, in relation to the number of conversations, in relation to the service that you perform, in other words, the number of employees would be proportionately less than they were in 1929.

Mr. HARRISON. That is correct, sir.

The CHAIRMAN. So that we have reached that point in the development of the telephone system where technological advance and efficiency have improved to such an extent that you get more service and more work out of a fewer number of employees. Is that right?

Mr. HARRISON. Yes, sir; but please again may I go back; a fewer number of employees as contrasted with a very artificial peak. I can't, sir, ignore that, because during that period of '39, sir, there was 25 percent of the force with less than 1 year's service.

The CHAIRMAN. You mean by an artificial peak that you had—

Mr. HARRISON (interposing). I mean that was clearly an abnormal situation.

The CHAIRMAN. Let's see just exactly what you mean by an abnormal situation. Looking at the exhibit with the six different charts, the first chart shows the number of telephones.¹ Now, there was a steady increase in the number of telephones from 1900 right through to 1929.

Mr. HARRISON. Yes, sir.

The CHAIRMAN. By "artificial peak" you mean that to handle those telephones in the decade from 1920 to '29 it was necessary to put on more employees than you had previously?

Mr. HARRISON. To get in training, sir, and for construction, to get ready for the business of 1930 that never came.

The CHAIRMAN. Yes; so you put on a lot of new people, is that right?

Mr. HARRISON. Yes, sir; 90,000 of them with less than 1 year's service.

The CHAIRMAN. Well now, that business has since come on, has it not?

Mr. HARRISON. Yes; that business plus a little more, I think.

The CHAIRMAN. So that during these 10 years, the so-called depression years, you have had that business which you had in 1929 plus a little more.

Mr. HARRISON. That is right.

The CHAIRMAN. There was nothing, then, which has operated to prevent you from exceeding the peak of 1929.

Mr. HARRISON. In employees?

The CHAIRMAN. In business.

Mr. HARRISON. No; as a matter of fact, the contrary—we have a little more.

The CHAIRMAN. So that although your business has equaled the peak and then a little more, to use your phrase, the number of employees has not.

¹ See "Exhibit No. 2569," supra, p. 16640.

Mr. HARRISON. Yes, sir; but that difference cannot be charged to technological—

The CHAIRMAN (interposing). I am not charging it to anything.

Mr. HARRISON. I thought, in order to be most helpful, I could give the background of our business. I don't think, sir, that the difference relates wholly to technological advances. A substantial part of it relates to the greater experience of the force. With a more experienced force, you get greater productivity.

The CHAIRMAN. Oh, yes; surely. But bear in mind, Mr. Harrison, that because of your solicitude for your employees you kept 60,000 on the pay rolls during this very 20 years when you might, had you been cold-blooded about it, have dropped them off your pay rolls and obtained the same results.

Mr. HARRISON. That is right, and then we would have shown an increase.

The CHAIRMAN. So that that only emphasizes the conclusion I am drawing from these charts.

Mr. HARRISON. That is true; yes, sir.

Dr. LUBIN. Mr. Harrison, if I may, I hope you will permit me to forget that '29 artificial peak and let's go back to 1923-24.

Mr. HARRISON. Yes, sir.

Dr. LUBIN. "Exhibit No. 2569" shows that the number of telephones in existence increased by about 60 percent between '23 and '39. The number of conversations doubled.

Mr. HARRISON. Yes, sir.

Dr. LUBIN. The plant investment more than doubled.

Mr. HARRISON. Yes, sir.

Dr. LUBIN. Revenues jumped—almost doubled.

Mr. HARRISON. Yes, sir.

Dr. LUBIN. The number of employees remained exactly the same, so that if we eliminate the artificial peak, and go back to a more regular period, that of '23, the fact still remains that with the same number of people you had in '23, you are turning out almost twice the amount of service.

Mr. HARRISON. Of course that is a reasonable conclusion to come to if you assume that the growth and the expansion of the business would have continued had there been no technological advances during that period.

Dr. LUBIN. Of course, I say that assumption plays no part in the picture. The facts are that with the same labor force you had in '23 you are doing twice the business, you are rendering twice the service.

Mr. HARRISON. Roughly, as a matter of fact, I have the thing figured out here. In 1926 we had 40 stations per employee, and now we have about 60, which checks.

The CHAIRMAN. That is the story.

Dr. LUBIN. I would like to ask for my own information, if I might, Mr. Harrison, what is the limitation to the expansion of the mechanical methods of conducting the industry? Does the limitation lie in the market, or does it lie in the investment requirements? Is it a financial problem or a market problem?

Mr. HARRISON. A limitation, Dr. Lubin, in what respect?

Dr. LUBIN. What determines how fast you do move, as it were? Is it the financial investment that is required or is it the market that determines that?

OPPORTUNITY FOR INVESTMENT

Mr. HARRISON. I don't know. You see, we have no background of stagnation. We consider this an abnormal period because it occurs once in a lifetime and we are back on our way. From the standpoint of getting money, new investment to care for the growth and to care for the technological improvements, we have been going along, as I see it, at a fairly uniform rate. What would happen when we stopped, whether or not we would go out to get money simply to displace existing plant, I don't know. Trying to answer your question directly, I don't know what is the dividing line.

Dr. LUBIN. After all, this is expensive stuff. It runs into billions of dollars, and I take it you people have to make a decision. Is it worth while going out trying to raise additional hundreds of millions now, or shall we wait until the market makes it necessary in the sense that we can't furnish service unless we do it?

Mr. HARRISON. Thinking in terms of the operating man who has to do with the rendering of the day-to-day service, and who is not responsible in the question involved in raising new capital, I don't recall any single instance that capital expenditures thought proper by the operating people were deferred because of investment questions. I am not suggesting that that day may not come but the operating group is, and has been, free to make recommendations to the sound and over-all interest of, first, the service, making the service better; second, things that will make ready the plant, facilities and personnel for tomorrow's service; and third, the things that have to do with the interest and the welfare of the human equation in the business. Those are things in which the operating man has as yet had no limitation of finances. I don't know when that day may come, so I can't answer your question.

Representative WILLIAMS. As I understand, you have had no trouble about your plant investment policy, securing the funds with which to improve your plant.

Mr. HARRISON. That is true.

Representative WILLIAMS. Has it been new capital or has it been internal financing?

Mr. HARRISON. Broadly, I would say that it has been new capital. I don't know the precise make-up, but I would say that for the most part it is new capital.

Representative WILLIAMS. You know, there has been some talk about its being very difficult for some companies to obtain capital for plant investment, plant improvement. That hasn't been your experience?

Mr. HARRISON. No; it has not, sir. As I tried to explain to Dr. Lubin, I am unable to answer the question he has properly projected, because I haven't reached that place in the business.

Representative WILLIAMS. And it has been largely new capital, rather than the capital that has been accumulated through depreciation and obsolescence?

Mr. HARRISON. Yes, sir.

Dr. LUBIN. What does that portend in terms of something I hope won't ever happen again, namely, another serious depression? It is quite evident from these figures that after you have kept this labor force at a peak for a period of time there was a gradual decline in

employment and you didn't replace these people. The result was that your costs of operation fell, in the sense that you didn't have these people on your pay roll. Now, as you displace more and more people, put in more and more machines with borrowed money, which means that you have fixed obligations, does that mean that it becomes more and more difficult for the consumer to get service at a lower price because a greater proportion of your costs become fixed?

Mr. HARRISON. Yes; I think that is a broad characterization. I would like, though, to make this one qualification. The labor content of the revenue dollar has changed very little even during the depression years. I think it is very important, that through these years, roughly now, the content, the price that has been paid to labor for day-to-day operations, neglecting construction, now is about 40 percent of the revenue dollar. I think it got down to 39 percent, maybe, 1 year, and got up to 42 or 43. I think right now it is 41. So that I think, looking at it from the standpoint of numbers of employees, looking at it from the standpoint of pay rolls in relation to the revenue dollar, the earnings of individual employees, which is so well illustrated here, it is clear that labor has benefited broadly through the advances of the business.

The CHAIRMAN. That is, the particular persons who were fortunate enough to stay on the pay roll.

Mr. HARRISON. Trying to characterize labor in the broad sense.

Dr. LUBIN. Has there been any change in the hours worked by these people?

Mr. HARRISON. The hours seem to be getting progressively shorter.

Dr. LUBIN. Has there been any shortening of hours in recent years?

Mr. HARRISON. Right now, generally it is about 40 hours. No one works over 40 hours, I think, except perhaps a handful of people who might work in some of the districts where it is still permitted to work 42 hours.

Dr. LUBIN. Bearing upon your last remark to the chairman, wouldn't this shift in average weekly earnings upward in recent years be accounted for in some measure by the fact that as you displace operators the people you retain are in the higher category? In other words, the higher-priced people are kept. The lower-priced people are taken off the pay roll, so that automatically, with no change in wage rates, you might have got an automatic increase in the average weekly earnings of those people who were left.

Mr. HARRISON. Yes, sir; but I think the influence of that on the rise is very small, and I should like to go back and say that over the past several years, now, the proportion of male and female has remained practically constant. Each group becomes more skillful as we get more mechanical devices. The operators who remain have to be more skillful because they are on toll work. They are on the assistant services in connection with the machine switching board, and their skill, and naturally their rate of pay, progressively goes up, and similarly that of the plant craftsmen goes up. Thinking in terms of the supervisory administrative people, the day-to-day administrative people, the foremen, the groups two or three steps above the foremen—they have remained practically constant in number. In relation to the pay roll, they and the administrative forces are sliding down just a little, whereas the vocational forces are go-

ing up. If I were again trying to make some broad characterizations, I would say that through this period the vocational forces have advanced far more rapidly than have either the supervisory or administrative forces. With the exception, sir—

CONSTRUCTION IN RELATION TO GENERAL OPERATION

Dr. ANDERSON (interposing). Mr. Harrison, I wish to mention this artificial peak in '29 again from a different angle because I know it is basic to the discussion that will follow. You gave two reasons for that unusual rise in 1929, amounting finally to some 364,000 employees in the A. T. & T. First, the construction during the twenties moved at an accelerated pace, and therefore made for an artificiality in the number of workers employed in 1929; second, you were accumulating employees in training, ready to take on more business each successive year. You were training them. They were therefore not productive in the sense your regular employees were, but they were being paid while learning.

Now, Dr. Lubin's Department published an article in the Monthly Labor Review for February 1932, in which a breakdown appears, dividing workers into five classes—operators, central office installation and maintenance men, line and construction and installation maintenance, cable and conduit construction maintenance men, and others—and the comparison was made for the period you had reference to, namely 1921–39. I find by running out a computation here on the percentage composition of the 2 years, that there is no alteration. In other words, in construction, proportionately the same number of workers were engaged in 1930 as in 1921, that even when you run up percentages of increase, they are not substantially greatly out of line, and it would indicate that construction work was not unduly stressed in comparison to all other kinds of operations during that time. Would you comment on that?

Mr. HARRISON. Well, I must say that I have difficulty getting away from the facts. The facts were that during 1928 and 1929 our construction program was \$600,000,000 each year. Right now our construction program is \$350,000,000 or \$360,000,000. Back in 1921 or 1922, whatever that period is that you have in mind, I daresay our construction program was quite a bit less than it is today. I may have those figures. So quite apart from the relationships, the facts are quite clear there that in 1 year when you have a construction program of that magnitude, it has some bearing on the force.

Dr. ANDERSON. But thinking of this period of time not only as regards construction increase but operation increase as well, there didn't seem to be a distortion in the direction of construction increase as compared with general operation.

Mr. HARRISON. Might I cite just at that point that in 1920 and 1921 the construction program was less than \$200,000,000. In 1920 it was somewhat under, and in 1921 just a shade over, and I would say that an average of the 2 years was \$200,000,000, and in 1929 and 1930 it was \$600,000,000.

DIVISION OF REVENUES IN A. T. & T.

Dr. ANDERSON. The next point I wanted to ask about was with reference to the point you made of the portion of the revenue dollar that goes to labor. I should like to approach it from a little bit different angle, and refer to some data that I offered you this morning, some that Dr. Kreps has assembled. The sources are given at the base of the table. While I wasn't going to introduce this as an exhibit, Mr. Chairman, I think it bears on the discussion and should go in the record, and I should like to submit it at this time.

The CHAIRMAN. This is submitted as an exhibit prepared by Dr. Kreps and the exhibit shows on its face the sources from which the various figures have been obtained?

Dr. ANDERSON. That is right.

The CHAIRMAN. Without objection it may be admitted as an exhibit.

(The chart referred to was marked "Exhibit No. 2573" and appears on p. 16665. The statistical data on which this chart is based appear in the appendix on p. 17407.)

Dr. ANDERSON. I just want to call attention of the witness to several of the columns. They are worked out on indexes with a basis of 1923-25 as 100. Pay roll, you will note, moved to 148 in 1930. Dividends and interest paid moved, however, considerably above that, to 179.

Mr. HARRISON. From what period?

Dr. ANDERSON. The period 1923-25 equals 100.

Mr. HARRISON. Might I just say in that connection that the investment per telephone at that time was about \$170, and the investment per telephone today is about \$275, and when thinking in terms of dividends—

Dr. ANDERSON (interposing). What would that imply, if you would run that difference out?

Mr. HARRISON. The implication is that of course you must have more of what we call net earnings in order to support an investment of \$275 a station as against an investment of \$175, we will say.

Dr. ANDERSON. If you will take the last three columns, you will see both weighted and unweighted productions, and explanations are given. You will note that production increased substantially. As a matter of fact, production shows, in comparison in 1938 with pay rolls, in the weighted averages, slightly less. Employment, however, shows a very decided drop, bearing out in part but accentuating the thing you indicated in your series of charts.

During the period under review, it is your contention that labor benefited proportionately with other claimants on the revenue dollar produced?

Mr. HARRISON. Those are the facts, not my contentions, sir.

Dr. ANDERSON. That labor did benefit proportionately with the other claimants?

Mr. HARRISON. Yes, sir.

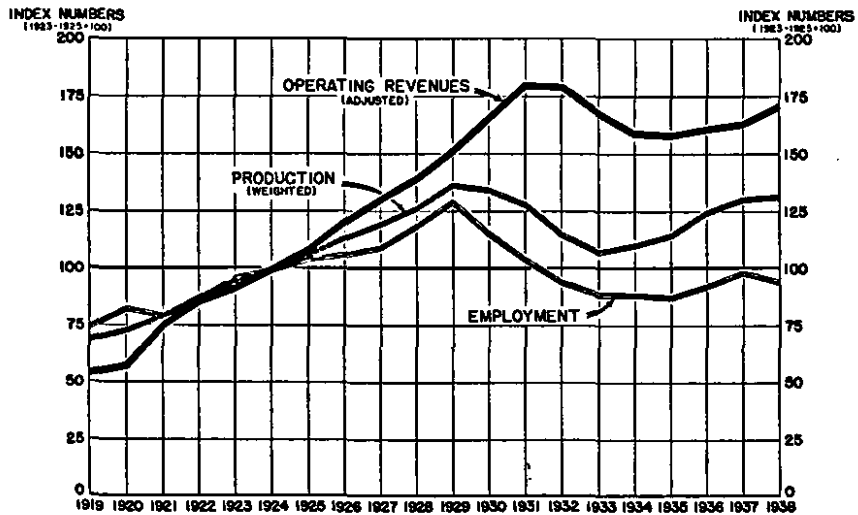
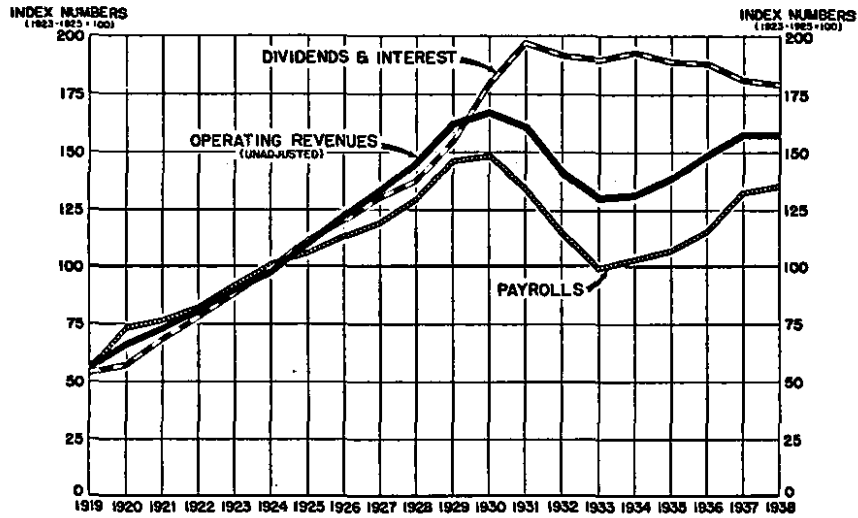
Dr. ANDERSON. That dividends and interest did not hold up unusually in comparison to pay rolls paid?

Mr. HARRISON. No, I would rather put it that the earnings available for the investor had taken a downward trend.

Dr. ANDERSON. Investors' earnings in comparison with pay rolls have gone down?

EXHIBIT No. 2573

PRODUCTION EMPLOYMENT AND INCOME
DISTRIBUTED
BELL SYSTEM
1919-1938



SOURCES: EMPLOYMENT and PAYROLLS from American Telephone and Telegraph Company, COMPTROLLER'S ANNUAL REPORT, (Western Electric Company not included)
 DIVIDENDS and UNADJUSTED OPERATING REVENUES from Federal Communications Commission, REPORT ON AMERICAN TELEPHONE AND TELEGRAPH COMPANY, CORPORATE AND FINANCIAL HISTORY.
 INTEREST from ANNUAL REPORT OF THE AMERICAN TELEPHONE AND TELEGRAPH COMPANY.
 ADJUSTED OPERATING REVENUES by dividing Unadjusted Index by SNYDER'S INDEX OF THE GENERAL PRICE LEVEL.
 WEIGHTED PRODUCTION from National Bureau of Economic Research, Bulletin No. 59.

Mr. HARRISON. No; investors' earnings in comparison with revenues—the relationship of investors' earnings to revenues.

Dr. ANDERSON. That, of course, wouldn't take into account anything that might have been paid out by way of investors' dividends from reserves?

Mr. HARRISON. That is taken into account in all of the earnings.

I think that it might be of interest, Mr. Chairman, to say, now that Dr. Anderson has raised that point, I happen to have here the facts that indicate the earnings in percent of total revenues just keep sliding off a little.

The CHAIRMAN. What is your program now?

Dr. ANDERSON. This afternoon we have Miss Rose Sullivan of the American Federation of Labor, speaking on the same subject from the standpoint of labor involved.

The CHAIRMAN. Do any members of the committee desire to ask a question?

Mr. PIKE. I have one simple question, sir, if you don't mind. I would like to know if you see anything coming on in the technology of the telephone business that might have any widespread effect comparable to the dial phone. Is there anything in the shop that you see? That was a big thing.

Mr. HARRISON. Over a period of years, as you try to look ahead to the day-to-day operations and as you visualize the increasing complexity of the handling of the short-haul toll calls in and around metropolitan areas, for example now there are pretty close to 3,000,000 of those calls a day handled manually, they have to be timed and recorded.

Mr. PIKE. I don't mean more dial installations, but do you see any new invention or device that is on the way that might have a comparable effect on the whole telephone business that the dial did?

Mr. HARRISON. Broadly, no.

Mr. PIKE. The things that may be expected to come along insofar as you can see, then, are the various small devices and changes and improvements, but no great broad basic change.

Mr. HARRISON. All of which progressively will add to the productivity, if you wish, of labor.

Mr. PIKE. You are used to that in all businesses, of trying to do better and better each year, but every now and then comes a big one like this, or like the continuous strip mill in the steel industry, which has quite an upsetting effect. I just wondered if you saw another one coming along.

Mr. HARRISON. We do not; no, sir.

The CHAIRMAN. What is this opportunity for new construction to which you referred? How extensive is that?

Mr. HARRISON. Well, last year we added what we called net additions; that is, really the net increment of added plant to something over \$100,000,000. This year I would expect that it would be more than that. We have used up reasonably well what we call excess margins.

The CHAIRMAN. Excess margins of what?

Mr. HARRISON. Of plant.

The CHAIRMAN. Of plant?

Mr. HARRISON. Yes; and as the business expands we will be back into our more or less normal construction programs.

The CHAIRMAN. In what fields do you see the opportunity for expansion?

POSSIBILITIES OF EXPANSION

Mr. HARRISON. Scattered throughout all the operations, I mean all parts of construction.

The CHAIRMAN. Of course, it all depends, in the last analysis, upon the installation of new stations.

Mr. HARRISON. That is it; it gets back to increased usage either by telephones or calls.

The CHAIRMAN. What opportunity is there for increased usage?

Mr. HARRISON. We think there is good opportunity; that is, our current gains, for example.

The CHAIRMAN. All right; what are your current gains? How do they compare with former years?

Mr. HARRISON. Well, last year, and leaving out a few years that we were recapturing our lost telephones, just leaving those out, last year, as I remember the figures, was our second or third best year from the standpoint of gain in telephones.

The CHAIRMAN. In other words, you have recaptured all of the telephones that you lost in the depression and you have established the second or third best year in the history of the telephone company.

Mr. HARRISON. In gains.

The CHAIRMAN. And that was last year, in terms of gains.

Mr. HARRISON. Now, this year at the start of the year it is just as encouraging as it was last year. What the balance of the year holds is only a forecast.

The CHAIRMAN. In other words, more people are constantly using telephones than ever before. Is that correct?

Mr. HARRISON. That is true; yes, sir.

The CHAIRMAN. To what extent can that continue?

Mr. HARRISON. We in the business, in trying to analyze our markets ahead, are confident, assuming always that business generally is in reasonably good shape, that our gains will continue and we hope at about the current rates. Of course, predictions as to the future are pretty precarious, but we hope, and we have reason to believe, that because of our current gains. I would like to say that we have, contrasted with our peak, about 1,400,000 more telephones.

The CHAIRMAN. You have—

Mr. HARRISON. Now 1,400,000 more telephones than we had at our peak.

The CHAIRMAN. In 1929.

Mr. HARRISON. I think it was the spring of '30.

The CHAIRMAN. That is a very good increase, isn't it?

Mr. HARRISON. Very much so, and our usage is increasing and our prices are going down a little.

The CHAIRMAN. I think the telephone business is distinguished from almost any other kind of business except perhaps the postal service, in the fact that it completes a contact between the institution which offers the service and individual citizens and residents of the country. That is your business.

Mr. HARRISON. Yes, sir.

The CHAIRMAN. You make more contacts with the individual than any other business. It is a straight, direct-to-you business that you are engaged in.

Mr. HARRISON. Ninety million of them a day.

The CHAIRMAN. Just exactly like the postal services. Now it is a striking thing to me that the record which you have testified to here is similar to that of the Post Office Department. You are now describing more telephones in use than ever in history, greater business, greater revenues, and all of that. The postal service testifies to the same thing. Last year in the Post Office Department the revenues exceeded any in the history of the postal department, and the record to date in 1940 points out a still further increase. But while you have this tremendous advance in the telephone system and in the postal system, we still are confronted with unemployment. So that leads me to say that perhaps the telephone company is showing the way to all industry in taking care of the human factor. You have evidently, by the testimony which you have given here this morning, shown that your company has followed a very enlightened policy toward preserving and maintaining employment.

It occurred to me as I was going over your written testimony that it might not be inappropriate if I were to give a little emphasis to two or three points which seem to me to be particularly significant. For example, you said, "I would like to say that since the beginning it has been our aim and policy to introduce improved practices and improved apparatus in such a way as to avoid or minimize adverse effects in the nature of economic waste or human hardship."¹

Later you said, "There have been lay-offs of operators as individual central offices have been converted from manual to dial. These have been scattered," and I am leaving out some. "Everything possible, including long-term planning and generally separation allowances, is done to minimize the consequences of the change-over."²

And also "The introduction of new dial offices was reduced to a minimum.

"But despite all efforts, work requirements dropped steadily. There was simply not enough work to go around. Had the system released all employees not actually needed, instead of spreading work and providing 'made' work, there would have been more than 60,000 fewer employees at the bottom of the depression. This condition prevailed in varying degree throughout the depression."³

In other words, summarizing what you have said, the telephone company has followed the policy of gradual or delayed introduction of technological improvement, of making work, and of long-term planning in order to provide for the absorption in the company of those workers who were being displaced because of the conditions.

Mr. HARRISON. We have done our best, sir.

The CHAIRMAN. Don't you think that that might be a pretty good policy for all industry to follow? Perhaps you don't want to give that advice.

Dr. LUBIN. One question, Mr. Harrison, before we adjourn. What is the relationship between new housing construction and increase in your business? Do you have a definite formula which you use in forecasting?

Mr. HARRISON. No, Dr. Lubin; we don't; but it is very clear that during the depression families had to double up and naturally that

¹ See p. 16643.
² See p. 16644.
³ See p. 16648.

brought about some reduction in the number of telephones, and as people go into their own homes the market for telephones opens up and specifically I think there would be a direct relationship.

Dr. LUBIN. So if we could find some way of still further stimulating housing construction you would feel the effects directly by still greater increases?

Mr. HARRISON. Yes, sir; I am sure we would.

The CHAIRMAN. May I thank you, Mr. Harrison, for your presentation? It was most interesting, and we particularly appreciate the frankness as well as the clearness with which you have discussed these problems.

(The witness, Mr. Harrison, was excused.)

The CHAIRMAN. The committee will stand in recess until 2:30.

(Whereupon, at 12:35 p. m., the committee recessed until 2:30 p. m. of the same day.)

AFTERNOON SESSION

The committee hearing was resumed at 2:40 p. m., the chairman, Senator O'Mahoney, presiding.

The CHAIRMAN. The committee will come to order.

Dr. ANDERSON. Mr. Chairman, the first witness for the afternoon is Miss Rose Sullivan, organizer for the American Federation of Labor, and a person who has had a very long, somewhat exciting career in the field of the organization of telephone operators, extremely well informed, and is ready to present testimony at this time.

The CHAIRMAN. Miss Sullivan, do you solemnly swear that the testimony you are about to give in this proceeding shall be the truth, the whole truth, and nothing but the truth, so help you God?

Miss SULLIVAN. I do.

TESTIMONY OF MISS ROSE SULLIVAN, AMERICAN FEDERATION OF LABOR, NEW YORK CITY

The CHAIRMAN. Will you give your name?

Miss SULLIVAN. My name is Rose S. Sullivan.

The CHAIRMAN. What are you engaged in?

Miss SULLIVAN. I am general organizer for the American Federation of Labor.

The CHAIRMAN. How long have you held that position?

Miss SULLIVAN. I worked in the labor movement as an organizer for about 20 years, A. F. of L., I. B. E. W., telephone operators.

The CHAIRMAN. Telephone operators and what other?

Miss SULLIVAN. International Brotherhood of Electrical Workers, Needle Trades, in fact pretty nearly every type of industry.

The CHAIRMAN. Before you were an organizer what did you do?

Miss SULLIVAN. I worked for the telephone company.

The CHAIRMAN. In what capacity?

Miss SULLIVAN. As a telephone operator.

The CHAIRMAN. How long were you engaged in that?

Miss SULLIVAN. About 5 years.

The CHAIRMAN. You began when you were young.

You may proceed.

Miss SULLIVAN. I want to preface this by saying that I claim no direct technical experience. This is prepared from the point of view

of the telephone operator and from the union angle concerned with the effects of technological unemployment on telephone operators.

Since early in the 1920's, the operating companies of the Bell System have been making rapid change-overs from manual to machine-switching operation for the handling of telephone calls.

The job opportunity loss has been very great as a result. The statistics supporting this statement are so readily available to this committee I shall not take the time to recite them. They appear in special studies made by the United States Bureau of Labor Statistics (1932) and the Women's Bureau (Dial Cut-Over in a New England City). Although the city is not named, it is the city of Worcester, Mass.

ANALYSIS OF EFFECT OF DISPLACEMENT

Miss SULLIVAN. Unfortunately, this study does not give a true picture of the situation, as the Bureau apparently did not go behind the company's statements, and did not interview representatives of unions or did not run down the validity of the so-called voluntary resignations or the financial fate of the transferred operators.

This Worcester study of the Women's Bureau represents exactly what the company would like to have the public believe happens when a big cut-over from manual to dial takes place. All the employees hired for about 3 years before a cut-over are hired on a "temporary" basis, and so are automatically out when no longer needed. They are supposed to take this very gracefully, and as far as the company is concerned it is just as though they had never been employed at all. As a matter of fact, their employment relationship to the telephone company is exactly identical with every other employee's in their class. They were hired when and because they were needed and are fired when no longer needed. If mechanization had not proceeded, they would continue to be needed and would still have jobs.

They are complete and total victims of technology. Yet, by some strange alchemy of delusion, the telephone company has managed to translate this simple expedient for grinding its own axe into an "enlightened policy" toward technological unemployment and has fooled many persons, including high Government officials, into writing encomiums about it.

Permanent employees who are no longer needed after mechanization also have the most obliging habits of disposing of themselves so that the company may enjoy an enlightened reputation. They all suddenly find husbands or other jobs or win sweepstakes. Anyway, they all "resign," according to the company, at the most appropriate moment, not a day too soon, while they are still needed for the operation of the manual boards, and not a day too late when after the cut-over their presence on the pay roll would be an expense and an embarrassment.

Then there is the group to whom the company gracefully refers as "transferred to other cities." That is not quite as pleasant as it sounds. Worcester is a city running about \$24 a week top salary for operators. A transferred operator would not be getting the top, naturally. Say she is getting \$21 a week, living at home, making her contribution count in the family economy. She is offered a trans-

fer to, say, Bennington, Vt., a city with about an \$18 top. Her service rating under the scale would entitle her to about \$15 a week, a loss of \$9. Maybe she takes it, and maybe she doesn't, but in any case, she shows up in the telephone company as a smiling statistic—"transferred," if she takes it, "resigned" if she doesn't. And don't overlook the fact that if she goes to Bennington, it simply bars a Bennington girl from a job. The overflow from dial offices chokes off employment in the remaining manual offices.

The American Telephone & Telegraph Co., the Bell System, is the largest single employer of women in the United States. In the pre-dial days it took into the system at least 25,000 and possibly closer to 50,000 girls every year. These girls came fresh from school. The company did its own training. This avenue of employment for girls, one of the largest, the requirements simple, good average education, good health, faculties normal, with absolutely no preemployment required, has been completely closed off by dial development.

No young people are being hired for telephone work, and haven't been for over a dozen years, and this is emphatically not a depression phenomenon. It is due to mechanization.

The situation grows worse daily. The operators at present holding jobs in the telephone company used to say, "Well, it will last my time." Now they are beginning to wonder. As more and more manual offices are dial converted the question keeps recurring, "Where are they going to put them?" Only a small proportion are now trained for dial when an office is changed over—eloquent testimony that they are not going to be needed, and not having been instructed in dial, they must resign themselves to being bounced around from one manual office to another as each in turn succumbs to mechanization.

There was a time, even under dial operation, when an operator could feel that she had a breathing spell of job security when she got into a dial office. Understand that mechanization is practically complete. No ordinary calls require any operator service or intervention. Practically the only requirement for operator services in a dial office is (1) to run the cordless B board on which terminal calls from manual offices come in, and (2) ticket calls—that is, calls outside the contiguous or free area. These calls all had to be put up by the operator. You couldn't dial them. The operator had to make the connection and make out the ticket. But not any more. We now have zone dialing and the customer now can dial practically anywhere within his metropolitan area. We used to figure the old rates of displacement as about 1 operator to 6; that is, in the dial we could leave 1 operator where 6 operators had been needed in manual or straight local operating. Now with the zone dialing it is impossible to see how there will be any jobs left at all in dial offices.

The cordless B board, on which calls from manual offices come in to dial offices, is obviously a transition and temporary device which becomes gradually obsolete as more and more exchanges become dial, and need no human factor at all for trunking and switching. The cordless B board is of course semimechanized as compared with the manual B board, and it has a 50 percent increased load performance; but at least for as long as it lasts it affords some small chance for employment in multitrunking dial offices. This is only in metropolitan areas which have some dial and some manual exchanges. A single

exchange area or a multiarea with all units dial, does not need the cordless B board.

A word on the cordless B board. An item of expense in the dial conversion is the call indicator board. This board registers calls from a dial to a manual office. For example, when an office is cut over to dial, the existing B or terminating boards from that office to all manual offices becomes useless, they must be ripped out and a call indicator board installed. These call indicator boards in turn become obsolete when the exchange in which they are located becomes a dial office. In an area of, say 50 exchanges, 1 exchange is made dial and 49 call indicator boards must be put in to allow the manual completion of calls from a dial office into a manual office. There is no alternative. The customer dialing cannot complete the call, the existing manual board won't do so because it is based on manual transmission of a call from one exchange to another by an operator, and no operator is involved in the dial office, so a device must be found which will let the operator in the manual office know what numbers the dial station is calling. That, of course, is a great additional expense because these are all installed and all ripped out again as useless after dial conversion.

DISPLACEMENT IN THE BOSTON AREA

Miss SULLIVAN. The Boston metropolitan area now employs between 3,500 and 4,000 operators. When I worked for the Bell Co. operating in that city 20 years ago, 6,600 operators were employed, but that does not tell the whole story of job loss. There has been an enormous gain in telephone stations and in messages during that period. It is one of the heaviest regions in the country for density of telephone development and use.

Based on the number of stations and messages handled by an operator in, say, 1925, at least 12,000 operators would now be required to man this system. This is a job opportunity loss of 8,000 in that one city. This makes allowances for other factors which increase operator value aside from dial operation, such as machine and selective ringing, straightforward trunking, nonrepetition of customer's order, and so forth. Making an allowance for all of that progress, we still have a figure of 8,000 job losses.

The CHAIRMAN. You make a distinction between an opportunity lost and a job lost by displacement?

Miss SULLIVAN. Surely.

Dr. ANDERSON. But you indicate, do you not, in this illustration from one city, that both have occurred in that city?

Miss SULLIVAN. Both job loss and opportunity for job loss; yes, indeed.

Dr. ANDERSON. Would you generalize concerning the whole system on that one example?

Miss SULLIVAN. Well, I should say that it runs perhaps about the same throughout the country. I am more familiar with the New England area, because I know everybody there, and we have had organization there, and have had a better chance to keep track of figures. I should say it was pretty much the same in every large metropolitan area. Where business is great, the density of telephone service is great. Of course, in a town like Butte, Mont., where there

aren't as many telephones, and usage and density aren't as great in telephone service, there might be a difference.

However, I think the question of displacement by dial even in the small town might be illustrated by the city of Terre Haute, Ind. Terre Haute, Ind., was an independent company, and had no toll service. The toll service was done by Bell. When they were manual, they had 180 operators; after the conversion to dial they had 12. That is an example of the greatest reduction that I know of.

The CHAIRMAN. Do you object to the introduction of the dial system?

Miss SULLIVAN. Well, my point is that we will not object to the introduction of any mechanical adjunct that is a social service. Naturally, especially in times of depression with so many unemployed, we feel that introduction of machinery should be at least delayed so as not to place an added burden on these people, but we do feel that if we can see some social value to the public, there may be some reason for accepting this great displacement by the machine.

The CHAIRMAN. The statement, of course, is made that the introduction of the dial has been at least somewhat delayed.

Miss SULLIVAN. The point I hope to make here is that the dial has no social value to the public.

The CHAIRMAN. Well, that, of course, is another matter. Have you any opinion or any knowledge as to whether or not there has been some delay on the part of the company in introducing the dial system?

Miss SULLIVAN. Well, I have something on that a little bit further on here that I want to bring out, and I also want to bring out something in connection with that in answer to a statement made this morning by Mr. Harrison, if I may, that "some 60 percent of our telephones * * * are dial; roughly, I think the precise figure is 58 or 59."

I understand the annual report of the A. T. & T. states that out of about 17,000,000 telephones in the United States, 9,000,000 are dial converted, so that would be even greater. That would probably be nearer 65 percent. The city of Newton is being cut over this summer. Three exchanges now employ 250 girls; 60 of these girls are to be trained for dial, according to reports. The remaining 190 will be crowded into manual offices. Somerset-Prospect exchanges, serving the city of Somerville, employing 150 girls, will shortly be cut over. The city of Quincy is the only sizable manually operated office south of Boston in the suburban area. This city will be cut over in the summer of 1941, and over 100 girls now have jobs there. Jamaica exchange, cut over a short time ago, about 80 girls. They needed 12 after the cut-over. South Boston, cut over a few years ago, gave jobs to almost 100 girls before dial. It became simply a few positions on another exchange switchboard. Charleston, 80 or 800 girls met the same fate a little earlier. Within the next year or so, no less than 600 jobs will go, to carry in substitution not more than 100 to 125. All of the city proper is dial-operated, except Quincy, slated to go in 1941, as is all of the south suburban area except a fringe of small exchanges on the border of the metropolitan area. North of Boston within the metropolitan area there are a few manually operated exchanges left, although the city of Cambridge has been dial for several years and Somerville goes out soon.

Outside Boston, all the larger cities are dial operated. Worcester, which gave the telephone company so much pleasant fame for its enlightened policy, used to have almost 300 girls, and now has 100. Cities handling their own toll and long distance, as Worcester does, do not suffer the same job loss, as long-distance work is still handled manually. Worcester handles its own long-distance work. However, the company is taking care of that. Short-haul toll calls are being transferred to local offices and doubtless extensions of the zone dialing principle will soon enable the customer to dial his own long-distance calls.

PBX work is the only job outlet for telephone operators outside the company service. On a board manually operated, if it were at all busy, it was necessary for the PBX operator to have been trained in the telephone company. Such training is less important now. Furthermore, a strong campaign is being made to further mechanize the PBX by installing an internal dial system in large business institutions, hospitals, and so forth.

DIAL SERVICE V. MANUAL SERVICE

Miss SULLIVAN. It is very expensive to install and gives infinitely less satisfactory service than an operator gives, but that doesn't seem to matter. They are going in just the same. The telephone company has competition on this (PAX) but the company is out hard after business. This eliminates about one operator in three on the private branch exchange in this kind of service. It is a nuisance and an abomination, and the customers usually hate it after it gets in, but they have put out so much money on it, they have to stick to their bargain.

An operator still handles out and in calls manually, but internal calls are dialed on another instrument. Imagine in a hospital trying to locate a doctor without the human aid and interest of the operator. Hospitals which have installed the PAX or the telephone company system have to put in a public address system to supplement it, and then it isn't a two-way telephone communication system at all.

The telephone company is therefore abolishing jobs for operators within the service, and at the same time is busy outside, trying to eliminate PBX jobs which company-trained girls might have a chance to get.

Telephone service at its best is personal service. This is true of the PBX as well as of the central office service. To attempt to mechanize PBX service is to render it an inferior service. Yet the telephone company is doing exactly that, just so that it may load up gullible customers with expensive equipment, with the bait that "in time" operator-wage saving will pay for it. Some "businessmen" superintendents of hospitals have been falling for this, but if you want to find out how it is working, don't interview the superintendents—interview the doctors and nurses.

I have shown here in a small way, by casual illustrations, what the machine-switching method has done to operator jobs. The full story is, of course, available in F. C. C. reports since 1934 and I. C. C. reports before that; in special studies by the Labor Department, in the Census of Telephone and Telegraphs of the Bureau of the Census, in the Report on Technological Changes of the National Resources

Commission, and in the extended investigation by F. C. C. into the American Telephone & Telegraph Co.

I suppose I can add my own estimate, and say 150,000 women's jobs have been lost during the last 15 years to the dial. At a \$24 weekly wage, that is about \$10,000,000 pay roll a year, removed as a potential purchasing power and following the downward spiral affecting the silk-stocking trade, the groceries trade, and all the spots where 150,000 girls would spend their wages if they had jobs.

The most appalling picture of all, however, to my mind, is that this job-source is being closed off for all time—not because of the depression—the depression hardly caused a ripple in the telephone business. They only had about a year of really poor business with net station losses. The unemployment casualties which were truly depression-born would have been minor and temporary.

1931 was the biggest telephone year up to then; 1932 was bad and part of 1933, but by 1937 they had reached a new high, largest number of telephones in history, greatest number of messages, best long-distance business, highest profits. Thus the richest, biggest, most powerful corporation in the world is deliberately liquidating its job responsibility to 25,000 American girls every year.

And this brings us to the dial telephone itself. Has it been worth this sacrifice? Has society gained more than it has lost? The dial telephone furnishes a poorer, slower, less accurate, far more expensive service to the public than the manually operated telephone.

It is practically useless in an emergency. It makes more mistakes than the operator does, and she, being possessed or human intelligence, immediately sees her mistake and corrects it.

The service of the telephone operator in every type of emergency, disaster, and catastrophe needs no tribute from me here. It is written on every newspaper page in the history of the last 60 years. That precious element of human quick-wittedness, human devotion, human bravery will go from the telephone system with the last operator, and you will have substituted for it a chill thing of steel, without nerves, emotions, responses, or intelligence. On a manual telephone you have but to lift the receiver, knock it off if necessary, groan if you cannot speak, and on the instant the operator, with all that magnificent mechanism at her fingertips, will act with the speed of lightning to bring aid to safety to you.

The dial? Are you able to dial the operator? If so, you can get her to be sure, but then can you talk to her and tell her exactly where you are? On the manual she can locate you, whether you can tell her where you are or not. On the dial she can't. If you should hang up or have the telephone removed from you and cradled, her chance to help you is gone completely. She doesn't know where you are. You are just an accidental signal on the sender monitor or the unused cord board. If the line had been held open, she might have been able to find out where you were by notifying the wire chief, who might have been able to trace the call. But that chance is lost, and that is hardly emergency service.

I have known operators to implore victims of an accident or assault to remain on the line, to hold the connection open so that, assuming their inability to describe where they were, she could set in motion the cumbersome process of tracing the call through the plant department. But persons distracted by fright or injury or desperation can-

not reason and act coherently. They can't or don't tell the operator where they are, they can't or don't hold the line open, and she is helpless to aid them.

Not so were emergencies handled in the old manual days. A receiver off brought the operator in on the line instantly. She had a sixth sense for human trouble and need. Not a word need be said, a faint groan perhaps, or labored breathing or the shuffle of a body struggling to rise. She knew where it was. There was her familiar little lamp cap with panel and jack plainly marked.

Even if the receiver went back on again, if no coherent word were spoken, she knew she was needed and where and she went into action. The police arrived in 5 minutes and apprehended the assailant. The firemen arrived in 3 minutes and saved the children. A little dog got his picture in the paper in Boston the other day. His master lives in one of the few manual areas left. He knocked the receiver off the hook, the operator went in on the line and heard his ominous barks, preceded by low, prolonged growls.

Realizing that it might just be the postman who inspired the growls, she nevertheless took no chances and dispatched both the police and fire departments to the house. It was a fire; two children were asleep upstairs. The newspaper made the comment: "A good thing it wasn't a dial telephone." This is very unusual, for the newspapers are usually beguiled by company propaganda that the dial is progress.

To substantiate the argument that the dial telephone has robbed the service of one of its most romantic and valiant characteristics, there need only be an examination of the Vail medal awards of the recent years of preponderant dial operation. One year there were no awards at all. No episode worthy of the Vail medal tradition could be found in the entire system.

The Journal of the International Brotherhood of Electrical Workers, the labor organization of jurisdiction in the telephone field, commented on this happening, editorially under the caption "Telephone service at its best is personal service." The Bell System has not since failed to make a Vail award each year, but the awards have increasingly gone for deeds outside the service. A lineman makes a rescue from drowning for instance, a commendable and humane thing, but the act of a passerby rather than that of a telephone man, and only incidentally associated with the telephone service. Needless to say, the Vail medal was designed to memorialize deeds growing out of the operation of the telephone service itself.

Some of the most glorious of these experiences were those of operators in small and remote communities. Under the dial system, the policy is to mechanize these small offices completely, then lock them up and leave them and the community to the strange devices of machinery, with no human eye, ear, voice, or brain on duty for safeguard against any enemy of life or property.

Those are remote-control exchanges, connected to the outside world only through the exchange to which the smaller office is tributary, and that office where flesh-and-blood operators are on duty may be 20, 30, or more miles away.

The telephone-company advertising is very interesting to examine. They never show a dial telephone in their advertising. They stress women, children, and babies in their advertising and, being master

psychologists, know better than to intrude the dial on that picture. A woman with a baby and two or three small children depending on her protection would get very little aid through a dial telephone, if a danger threatened them. The company also, quite unblushingly advertises an operator seated at a switchboard, operating a fully manual board, although they are busy scrapping these boards and these operators as quickly as they can.

At the Telephone Code hearing, under the N. R. A., a telephone-company official was asked when and why and under what circumstances the company determined on dial installation. He replied, after some evasion, that it was usually at the request of the subscribers. I doubt this very much. In fact, I know it isn't true. Despite the terrific build-up which dial has received, customer resistance to it is strong. Every operator knows this.

The calling rate goes down under dial in the beginning; the ratio of abandoned calls goes up. You can't use a dial telephone except in a lighted room. If you wear glasses, you have to find them and put them on. Many old persons, especially if living alone, find the telephone a comfort in keeping in touch with relatives and friends. The dial telephone destroys this, being too complicated.

Dial codes vary from city to city. It is no longer sufficient to know merely the number. You must know and remember the prefixes, sometimes two letters and one digit and sometimes three letters, sometimes letters and one digit, and so on to accomplish the complicated labor of making the time impulse work.

In addition to remembering all the prefixes, you must remember, if the number itself is less than four digits, to dial the number of zeros necessary to make the mechanism work. This is all too much for the aged, the infirm, the partially literate, the foreign, the poor-visioned, leaving this group, to whom the telephone is of special importance, practically shut out from its services.

A phase of the dial question which has received very little public attention is the quality of service it gives. In the *Chicago rate case* it was put forth and supported by good engineering opinion that the dial is incapable of handling an equal number of calls per hour as the manual board. All operators know that the dial is highly susceptible to error. The dial "false busy" is a byword in telephone offices. The importance of timing is such that dialing slowly or more rapidly than normal will result in a wrong number. Dial cut-offs are a nightmare to PBX operators. If your dial falls into a wrong groove, as it not infrequently does, you not only get a wrong number, you can't get a correct number. If you dial 20 times, you still get the wrong number. You can get your call through only by leaving the dial to its own resources and getting an operator to put the call through for you.

I have no qualifications whatever in any technical sense, and my knowledge of telephony is confined to that possessed by an experienced and competent operator. But I have studied and observed the dial in many manifestations, and I believe there are many things which require more authentic explanation than has ever been given by the telephone company.

For example, the New England flood of 1934 affected equally two Massachusetts cities, Lowell and Lawrence. The only obvious difference between the two cities is that Lowell is farther up the river,

and might, therefore, if anything, be more affected by the flood than Lawrence. Lowell had a manual telephone office at that time, Lawrence had a dial.

In Lawrence, the telephone system collapsed completely, and the Army had to set up field telephone service to carry on emergency and relief work. Lowell's manual telephone service stood up to the test in a comparatively high measure of efficiency. The Boston operators could at least get Lowell all through the emergency, but they could not get calls in or out of Lawrence.

The obvious explanation is that the mechanized system, since it could not handle all the load put on it, sagged, buckled, and failed altogether, while the manual system with the factor of human intelligence in control, handled all that was physically possible, which was a substantial portion of the total.

This same phenomenon, which I maintain is characteristic of the dial, occurred when Cambridge, Mass., was cut over. That was the largest single cut-over to that date in the New England area. After the cut-over, there was no service in the city for 2 or 3 days. It just cracked under a load too big to handle. The Boston papers were full of the story. The company said the collapse was caused by curiosity calls, and as usual everybody accepted that.

Now, that could have been true, and if so, proves my point that when loaded with an abnormal demand, whether inspired by fear of death in rushing flood water or curiosity about a new toy, the dial can handle no business at all. On a manual board the operator cannot, of course, handle any more than she is able to, but, as we all know, the capacity of human strength, endurance, and accomplishment, when need requires, is practically limitless.

At any event, in such emergency, the operators can handle loads to the physical possibilities of their switchboards and can apply the indispensable element of discrimination and intelligence. That is, they can give preference to the authorities, hospitals, doctors, and the most affected sections. In short, the situation is within human and rational control. The machine, you see, doesn't know one call from another and can't handle them all. So, in characteristic robot fashion, can handle none and passes out of the picture as a communications medium, usually when most needed.

The cost of the dial reaches, of course, practically astronomical figures. In the *Chicago* and the *Massachusetts rate cases*, this was clearly demonstrated. The New England company sought higher rates in the late twenties, because the cost of the dial installations had disorganized its rate of return. I shall introduce exhibits on these points.

Dr. ANDERSON. Do you want the exhibits introduced here?

Miss SULLIVAN. Yes.

Dr. ANDERSON. These exhibits are extensive documents, and rather than have them printed in the record, we will file them as exhibits.

The CHAIRMAN. You might indicate what you are filing, so that the record will show where they may be obtained.

Dr. ANDERSON. "Exhibit No. 2574" a file exhibit, "The Dial Telephone and Unemployment," from the Monthly Labor Review, February 1932, Bureau of Labor Statistics.

"Exhibit No. 2575", file exhibit, from the Journal of Electrical Workers and Operators, June 1934, "Full Text of Epochal Telephone Decision."

"Exhibit No. 2576", file exhibit, the same journal, March 1935, "Costly Dials Make Subscribers Work."

"Exhibit No. 2577", file exhibit, the same journal, April 1936, "Gifford's Chickens Come Home to Roost."

The same journal for December 1939, "More Glimpses Into Private Life of A. T. & T.", "Exhibit No. 2578."

(The documents referred to were marked "Exhibits Nos. 2574 to 2578" and are on file with the committee.)

Miss SULLIVAN. I have just one more page.

Nobody likes the dial; nobody wants it. It gives inferior service at a very greatly higher price. It is an inconvenient abomination. It is useless in a personal emergency. It cracks up completely in a community emergency. It is nothing that a telephone ought to be and everything that it shouldn't be. It is inanimate, unresponsive, stupid, when telephone service ought to be vital, animated, and intelligent. It does none of the things which machinery is supposed to do in industry. It does not reduce human labor; it merely transfers labor from the operator, who gets wages, to the subscriber who doesn't. It does not cheapen the product, it costs more. It is not more efficient, it is far less useful than the manually operated service. It destroys jobs and closes off an entire employment field, with no compensations to society.

It has been pushed onto the public regardless of merit. When first installed, it could not test consecutive lines. If you had 10 telephone trunk lines and the first line was busy, the party calling you got the busy signal, although 9, 8, 7, or 6 lines might be free. When first installed, it could not measure overtime so that the cost of telephone service could not be equitably distributed among users. These defects have now been corrected.

While the dial was being pushed like mad in Boston, important Massachusetts cities still using the manual were left way behind the times on developments which had long been part of the advancement of the telephone art, such as selective and divided machine-ringing and straightforward trunking. Old ring-down circuits and even old drop systems were still in use in some places, years behind the telephone art, while in other places fine modern common battery boards with straightforward trunking, tandem circuits, automatic ringing, boards capable of many years of useful life, in no way approaching obsolescence and worth millions of dollars, were scrapped for dial, while the other exchanges with the outmoded equipment of the eighties and nineties were left without modernization.

J. J. Carty, A. T. & T.'s great engineer, always opposed the dial telephone and it was not until late in his life when his judgment was overruled, that the Bell System went in for rapid dial conversion.

The dial telephone history has never been adequately studied. No State regulatory body has done anything. The information which has been adduced in State cases has come from litigants and intervenors against rate increases or for rate decreases. The Federal Communications Commission in its investigation of the A. T. & T. apparently did not consider the service angle of dial unless it did so in some staff report with which I am not familiar, although it did consider the cost angle.

The dial telephone is the perfect example of a wasteful, expensive, inefficient, clumsy, antisocial device, being substituted for satisfactory

competent, human labor which received wages for work now performed at exactly the same expenditure of human effort without the compensation of wages.

The CHAIRMAN. If it costs more, Miss Sullivan, to install the dial system, what is the explanation of its adoption?

LABOR DISPLACEMENT AS A PURPOSE OF DIALIZATION

Miss SULLIVAN. Well, that is the question I expected to be asked, and I think the answer is this: The personnel problem in the American Telephone & Telegraph Co. was becoming a very vital one. There was unionization in New England. It was small, but very competent and very militant. The keeping up of the company union is an expensive project for any corporation, and the telephone company undoubtedly saw that this personnel problem would one day be a factor in regulating working conditions, hours, and wages, and therefore went hog-wild on this dial installation, which unquestionably is expensive but which they felt in the long pull—no one knowing how long the pull may be—would reduce their personnel. It has already, by their own charts, reduced the wages of their personnel. It will reduce them by an incalculable amount in the days to come and has also reduced their personnel problem, which is a very real factor in a corporation with a decided antiunion policy.

The CHAIRMAN. Will you pardon me? I have just had a call on a manual board.

(Dr. Lubin now presiding.)

Acting Chairman LUBIN. The testimony given here this morning points to the question I asked, namely, why the dial was installed. This was not of course answered the way you presented it, but the statement was made. I am wondering whether you have any information on the subject, whether it would have been physically impossible to meet the growing demands for telephone service without mechanization. Do you know anything about that aspect of the problem?

Miss SULLIVAN. I would disagree with that completely. A manual switchboard can be installed having up to 10,000 lines, and there is no limitation on the duplication of manual switchboard units. I would say that was definitely not so.

Acting Chairman LUBIN. Do you know whether it takes longer to complete a call on a dial as compared to the manual?

Miss SULLIVAN. All things being equal, I think it probably might be a little faster. I think there would be an advantage in the personal service.

Acting Chairman LUBIN. I know one of the manufacturers of the manual switchboards claims they can prove that it takes less time.

Miss SULLIVAN. Our position is that it takes less time, but I haven't the number of seconds.

I should like to put something in the record in answer to a statement made this morning by Mr. Harrison, of the telephone company, about keeping on 60,000 employees during this long depression. I think that figure of 60,000 is probably true, but I do think mention should have been made that the operators themselves bore part of the burden of that 60,000; that in New England, for instance, work was staggered and many operators—in fact almost all—lost 1 day's

pay a week in order to give additional work to those 60,000 employees. So the cost was not wholly borne by the telephone company, but was borne by the operators themselves—the cost of carrying those 60,000 people.

And I don't believe the telephone company dared to suddenly throw 60,000 people on the streets and say, "This is a result of the dial." It would have been bad for a corporation which spends so many millions and buys up so many pages of magazines with pictures of nice old ladies—I understand there is a nice old lady on the back of the Saturday Evening Post, but no dial telephone beside her. So I would like to leave the thought in the minds of the committee when they think of the 60,000, that the telephone operators themselves also carried part of the financial burden of the 60,000, and in my opinion, I do not believe the company dared to throw that great number of people on the market as an open indication of dial displacement. They would prefer to do that more gradually.

Acting Chairman LUBIN. It might interest you to know that the experience in the United States Senate was to the effect that when the dial phones were installed the Senators and employees said they refused to take over the duties of operators, and the result is that although the phones are dial phones, they are manually operated.

Miss SULLIVAN. I think all of you on the committee who dial your numbers are doing the telephone operator's work without wages and without a corresponding lowering of your telephone bill.

Dr. ANDERSON. Viewing the industry as you know it today, could the telephone system of the United States be handled efficiently on a manual operation basis?

Miss SULLIVAN. I absolutely believe that it could be.

Dr. ANDERSON. What is your estimate of the number of operators who would be required in excess of those now employed, were it so handled?

Miss SULLIVAN. At the present time?

Dr. ANDERSON. Yes.

Miss SULLIVAN. I would rather let you make your averages from the figures I absolutely know, and those are the New England figures, which show a loss of 8,000 jobs for the Boston area alone.

Dr. ANDERSON. You indicated a moment ago that labor also bore part of that great burden during the period of the depression.

Miss SULLIVAN. I was speaking there of the New England district, where I know it was done, and I am pretty sure it was the policy throughout the country. In fact it was done here in Washington, too.

Dr. ANDERSON. Do you know whether, during the period of curtailed earnings of the company, the dividend receivers also bore any of the cost there involved?

Miss SULLIVAN. The Bell Telephone stock stayed at 9 percent during all of the depression years, and—

Dr. ANDERSON (interposing). That was regardless of earnings?

EARNINGS OF EMPLOYEES

Miss SULLIVAN. The A. T. & T. stock dividend was \$9, and has been all through the depression, regardless of earnings. Before we had a depression in the telephone company at all, in the year 1930

and '31, when the company was doing well, all increases in the telephone industry were stopped. A moratorium was declared on increases, and this was in the very best year of the company, 1930-31, and all increments, all raises, were frozen, and no further increases were given for a period of 3 or 4 years.

(Senator O'Mahoney assumed the chair.)

Dr. ANDERSON. This morning, Mr. Harrison submitted "Exhibit No. 2570" which showed the average weekly earnings of all employees. I take it you have seen that exhibit?

Miss SULLIVAN. Oh, yes; that was a point that I heard Mr. Harrison make this morning. I think he said that the wage scale, if anything, was a little higher than it had been some years ago. I would like to point out that naturally when no new people have been hired over a period of 15 years, you reach your top salaried people, and in the event of the cut-over all those who are hired and let go as not needed would be the low-wage persons, and of course those who have had 10, 15, or 20 years' service would be the higher-paid people, and comparing that scale, it would look as though the wage scale were a little higher.

Dr. ANDERSON. There is one other comment I should like to ask for on this matter of employees' weekly earnings. You will note he has a single line on the chart indicating the average for all employees. You have devoted most of your paper to the effect of dial upon operators. If you put in a line here indicating operators' earnings, do you have any data that would indicate to the committee what operators have earned in weekly earnings during the period under review?

Miss SULLIVAN. I have many wage scales in my office and I should be very glad to submit them to you for your report.

Dr. ANDERSON. This would indicate that the average weekly earnings for telephone employees—and I take it this being all employees, it includes Mr. Gifford's salary as well as the lowest-paid operator in the system—all averaged, amounted to something like \$37 a week. In the district you know best, what are the average earnings of operators?

Miss SULLIVAN. The telephone scale for telephone operators is \$26 at the end of 15 years in the big cities. In cities like Chicago and New York it goes up to \$28, occasionally to \$30. There are graduated scales. They have class A, B, and C, and down to an \$18 or \$21 top. There is no scale in vogue for every telephone operator. It begins with the metropolitan areas and goes down to the smaller areas, and there are six or seven or eight schedules.

Dr. ANDERSON. What would be the lowest schedule?

Miss SULLIVAN. The lowest might be around \$16 or less—that is, comparable to whatever the minimum is in a very, very small town or village, a small exchange, but top would be, in New York City, \$30.

Colonel CHANTLAND. Is that beginners?

Miss SULLIVAN. No; that is after 15 years. There has been no beginning rate, because the company has closed the schools for the last 15 years. There have probably been no telephone operators hired, excepting when a cut-over comes, and they hire an enormous amount of temporary people, and give them around \$14 or \$16 beginning rate.

Colonel CHANTLAND. Even in the large cities?

Miss SULLIVAN. Yes; as a beginning rate.

Mr. PIKE. Those are a good deal higher than they used to be. I used to work for a telephone company at \$15 a month as an operator.

Miss SULLIVAN. I was a member of the first telephone operators' union in New England, and we do take credit, in the International Brotherhood of Electrical Workers and the Telephone Operators' Union, for all of the good wages and good working conditions now enjoyed throughout the telephone system. We fought for these conditions and struggled and bargained for them, and the telephone company then automatically put them into effect throughout the system. So beyond any question, we can demonstrate the fact that what is considered by the company today a fairly good policy in hours and wages is the result of the telephone operators' union. In fact, we had to threaten strike in New England at the time of the N. R. A. to get 46 hours' pay, or to get 48 hours' pay for a 46-hour week, then 44 and 42, and finally a 40-hour week with the 48 hours' pay, but that was no generous gift from a concern that didn't know quite where to put its undivided surplus lest the Government take it. It was something we had to frighten out of them in order to get it.

The telephone company buys all its equipment, from a pencil to a switchboard, from the Western Electric Co., which is a subsidiary of the American Telephone & Telegraph Co., and it is therefore buying from itself and selling to itself, and if it makes a nice little profit that can go over to Western Electric Co. as a melon. That is a very nice way of doing business. You have no competitors in your equipment, and the price is whatever you wish to make it.

Colonel CHANTLAND. Miss Sullivan, you make this statement, that it doesn't reduce human labor, it merely makes the subscriber do the work, who doesn't get wages.

Does your memory run back to the time when the Bell Telephone Co. itself used the argument against the independents who had dial telephones?

Miss SULLIVAN. I believe it does.

Colonel CHANTLAND. It was one of the hardest arguments the independents had to go against.

Miss SULLIVAN. At that time the Bell Telephone Co. didn't have the patents, and the dial was all wrong. Now they have the patents, and the dial is all right.

Colonel CHANTLAND. In other words, the Bell Telephone Co. at that time said it was a nuisance and "you don't want those telephones with that nuisance on them."

UNIONIZATION IN THE A. T. T.

Dr. ANDERSON. You spoke a moment ago of the effect of unionization and the collective bargaining upon the wage rate of telephone operators, taking credit for the increase as a result of unionization. What is the practice in the A. T. & T. with respect to unionization and collective bargaining?

Miss SULLIVAN. The telephone company at great expense has set up a company union. They were one of the first industries in the company-union field. They have this organization superimposed upon the operators, and now with the imminence of dial and the threat of loss of jobs, it is pretty hard to get people out from under the domination of the company and the company union.

Dr. ANDERSON. So the company union operates within the A. T. & T. as the dominant bargaining group?

Miss SULLIVAN. I have never known of them to bargain. If they do any bargaining, it is news to me.

Dr. ANDERSON. In other words, the effect a union of that kind might have upon technological advances in the industry would not correspond to the effect your union as an outside bargaining agency has?

Miss SULLIVAN. Congress has decided that a company union is not a legitimate union and is therefore out-moded and made illegal, so we hold there is no union in the Bell Telephone System, and I feel the threat of a real union that would have some say as to hours, wages, and working conditions is one of the deciding factors in the promotion of the dial.

Dr. ANDERSON. Is your attitude with respect to the dials being un-social and all the other things you characterized it as being, your personal view or that of your union and its representatives?

Miss SULLIVAN. That is the view held by all telephone operators whom I know, and I know many thousands of them. It is also the view held by people who have made a study of the dial itself, and have not been beguiled by the telephone company's advertising.

Dr. ANDERSON. Have you ever opposed any other technological change the Bell Telephone System has installed?

Miss SULLIVAN. No; we were in favor of their straightforward trunking and certain earlier things such as tandem switching and machine-ringing, and so forth, which improved the service.

Dr. KRERS. I should like to ask the witness a question which is probably somewhat academic, but it is alleged that machines are introduced because of high wages, and whenever wages are raised you increase the pace of mechanization. On that point I should like to ask you two questions out of your experience. In the first place, did machine technology coming into the telephone industry, particularly the dial telephone, displace low-paid or high-paid workers? And in the second place, if there were differences in pay of the operators displaced, did it tend to displace workers who got higher pay as opposed to those who probably, in outlying districts or in other districts of the country, got lower pay? In other words, was there a tendency for the dial system not to be put in, say, in the South or West, where wages were lower, and to be put in specifically where wages were higher?

Miss SULLIVAN. The expansion of the dial was greater in the North, and wages in the North—telephone wages—are generally higher. So I think that it might be that the drive came in the North, where wages were higher, and it is my convinced opinion that the telephone company has rushed the dial at great expense and inconvenience to the public because they foresaw a problem where organization in the field of the telephone industry would mean a higher wage for their employees.

Dr. KRERS. Among the employees of the telephone company itself in an ordinary telephone exchange was it the relatively high-paid employees that were supplanted or the low paid?

Miss SULLIVAN. We had established a policy, with 10 years of unionism in New England, that has been pretty generally followed by the company, and that is that in lay-offs or transfers, length of service

shall count in holding your job. The newer employees, those with the shorter length of service, and therefore with the lowest pay, will be the first to go. That is a union principle.

Mr. PIKE. Of course, the displacement wouldn't hit the supervisors and chief operators as much as people who had been doing regular work on the board, would it?

Miss SULLIVAN. When it eliminates an operator it eliminates a supervisor and a chief operator. Take, for example, the small exchange that has become completely automatic. When that is closed and turned over to the devices of the machine, there will be no plant chief, wire man, telephone operator, information operator, supervisor, or chief operators.

Mr. PIKE. That wouldn't be true in the larger city.

Miss SULLIVAN. It will eliminate the higher-paid people, if you are thinking of supervisors, chief operators, and people of that sort, in proportion to the number of operators eliminated. If there is 1 supervisor to 10 operators and you eliminate 100 operators, you eliminate 10 supervisors and 1 chief operator.

Dr. KREPS. Could you have delayed the installation of the dial system by lowering the wages of the operators?

Miss SULLIVAN. I do not believe that it was the high wages, because the wages are comparatively not high. I believe it was the personnel problem that the company foresaw in the future, especially with the National Labor Relations Act. They realized they could not forever hold their people in a company-dominated union, and when they would get into a real labor union, they would have to face the problem of better wages and better conditions. I think that was the situation they wanted to sidestep, and not any high wages they now have.

Dr. ANDERSON. You now have a situation in which well over one-half of the industry has been mechanized with dials—some 60 percent, as I remember your remarks.

Miss SULLIVAN. Yes.

EMPLOYEE ATTITUDE TOWARD THE DIAL

Dr. ANDERSON. Obviously, it is impossible to turn the clock back. Is it your opinion that the union will continue to resist further installations of the dial on the grounds you have stated in this paper?

Miss SULLIVAN. We see no reason, since there is no social value to the public, to the employees themselves, for this tremendous job loss that exists and that will continue to exist as dialization is extended.

Dr. ANDERSON. And you therefore urge a return to the manual operation of the telephone service?

Miss SULLIVAN. We urge at least the cessation of the dial installation.

The CHAIRMAN. You mean the—

Miss SULLIVAN (interposing). The cut-over; and I still feel that the public was better served by the operator.

The CHAIRMAN. You were speaking a little while ago about the temporary employees of the company, the operators. Can you amplify that a little bit?

Miss SULLIVAN. About 3 months before the cut-over takes place, it is necessary to have an additional force of operators, and the telephone

company will point out this fact to the subscribers and say, "Why, we not only don't let our people go, we hire more."

The CHAIRMAN. Why is that necessary?

Miss SULLIVAN. There are many factors. The operators must be taken from the board for periods of time and taught the dial operation, and therefore it will be necessary, on the manual, to have others take their places. So for a period of 6 weeks, we will say, the number of operators who are to be retained in dial must be taken from the board and trained in dial operation, and someone must handle the boards while they are not there.

Then the general excitement and change due to any cut-over would require additional operators, but that is for a very short period, and the company, of course, because they write "temporary" beside their names when they give them jobs, does not enter them in the statistics at all.

The CHAIRMAN. We have been told that those who are displaced by the dial system are, for the most part, temporary employees of that character. What is your view about that?

Miss SULLIVAN. That would not be so, if we will assume that an exchange has 100 people and that after the cut-over they are going to need 20, or less.

The CHAIRMAN. Is that a proper proportion?

Miss SULLIVAN. That is about the proportion. Sometimes it is 6 operators displaced to 1 girl on the dial. It might run down to 14 percent, but we will assume the most advantageous, one-fifth, 20 people to remain out of 100.

The CHAIRMAN. Would you say that on the average the installation of the dial system reduces employment?

Miss SULLIVAN. It takes four-fifths, at least.

The CHAIRMAN. Of the operators?

Miss SULLIVAN. The operating force—I am including information operators, supervisors, chief operators.

The CHAIRMAN. I understand.

Miss SULLIVAN. Shortly before the cut-over, in this 6 weeks to 3 months period, an additional 10 percent is taken on. That would be 10 operators are hired, making the force 110 to carry them over this training period, so that when the girls are laid off, finally, after conversion, 90 go. That is 80 of the old girls, plus the 10.

The CHAIRMAN. That must include many more than these temporary employees.

Miss SULLIVAN. Eighty percent of the force, plus the 10 percent taken in during the conversion.

The CHAIRMAN. We heard testimony to the effect that the company has adopted as a policy the delay of installation of dials, has adopted a policy of making work and long-range planning in order to absorb those who are displaced by the introduction of devices like the dial. Have you anything to say about that?

Miss SULLIVAN. The company is being as careful as possible not to get an unpleasant odor abroad among the people by sudden, spectacular displacement of telephone operators.

The CHAIRMAN. I take it that there is some effort to do this upon the part of the company, but your feeling is that it doesn't go far enough.

Miss SULLIVAN. That is true.

The CHAIRMAN. In other words, that the policy isn't sufficiently enlightened, that it may be partially enlightened.

MISS SULLIVAN. Where there is a great deal of toll service, the displacement of telephone operators is not so great. A two-thirds displacement instead of three-fourths, four-fifths, or five-sixths.

On the machine in the telegraph industry, may I introduce the president of the Commercial Telegraphers' Union, who is a testing and regulating plant man here in Washington, D. C., for Western Union, I should like to have him give some testimony about the machines in Western Union.

The CHAIRMAN. That is part of our story.

Colonel CHANTLAND. Did you read or hear Mr. Harrison's testimony?

MISS SULLIVAN. I heard the last 10 or 15 minutes of Mr. Harrison's talk.

Colonel CHANTLAND. He spoke of a separation wage based on a vacation plus, I believe, a week per year of service for the first 6 or 7 years, and 2 weeks for each year of service above that, as a separation wage that they paid these displaced people. Is that substantially correct?

MISS SULLIVAN. Well, I think the separation wage is for some of the older employees, those, for instance, who have 15 or 20 years of service. I have not heard of it as far as telephone operators are concerned, for what the company terms the temporary 10 percent group, nor is it, in my opinion, a general practice for the younger group.

Colonel CHANTLAND. He didn't claim it for the temporary, but anybody that was on the regular roll—whatever vacation they were entitled to, plus 1 week more for every year of service up to 6 or 7, and 2 weeks' pay for every year of service above 6 or 7; that that was paid as a general practice, I believe he led us to believe.

MISS SULLIVAN. I do not believe that that is a general practice. I am not aware of it.

Dr. LUBIN. Do you know whether that is the practice in the Boston area?

MISS SULLIVAN. In the Boston area the union is strong, and we have been able to keep our people moving around the manual offices so that no one has been separated from the job.

Dr. LUBIN. What is the attitude of the union in those instances where a new exchange is erected? Would the union feel that new exchanges should be manually equipped?

MISS SULLIVAN. In the face of 9,000,000 dial telephones out of a possible 16,000,000 or 17,000,000, and the company's policy—it seems to me that it wouldn't be very important what we thought. The public is going to get the dial whether they like it or not.

Dr. LUBIN. You did say that what the union really wants is that they should stop making conversions.

MISS SULLIVAN. We believe that if they started tomorrow on their new equipment to reestablish manual operation, it would be better for the public and for employment.

The CHAIRMAN. Have you discussed that with the company?

MISS SULLIVAN. No, I haven't, personally. But I believe that where our representatives are bargaining collectively, the company is well engaged in.

Dr. ANDERSON. This morning we were given testimony to the effect that last year's operations were the highest in the history of the telephone company, that there is every prospect, with the movement of business forward to higher levels, that the telephone company will also reach higher levels of production and operation; and incidental to that higher achievement will come substantial increase in employment; that the prospect is, therefore, one in which, while technological advance will be noted, it will be not detrimental, and will increase the number of workers engaged in the telephone industry. Would you care to make any observation on that point?

Miss SULLIVAN. I should say that until we are 100-percent mechanized, at the rate of existing expansion and telephone use, there will be some additional operators taken on, but even then I would question whether the company would be able to take care of all of the remaining operators who will be displaced and who are now operating manual boards. I doubt if it will take care of this group.

Dr. ANDERSON. Do you see any prospect, then, of the telephone industry's becoming, as it once was, a place of new entrance to the labor market, to the extent, as you indicated, of some 25,000 girls a year during the twenties, who will find employment in the immediate future?

Miss SULLIVAN. I see no possibility of that. I think that opportunity has gone forever, and that at the present rate of progress of the dial, it will reach the stage in a few years where the service will be thoroughly and completely mechanized, that there will be a minimum of employees, not only operators but plant and installation.

The CHAIRMAN. Are there any other questions to be addressed to Miss Sullivan? We are very much indebted to you, Miss Sullivan, for a very clear presentation.

Miss SULLIVAN. I should like to present Mr. John W. Reynolds, of the Washington, D. C., Commercial Telegraphers' Union.

(The witness, Miss Sullivan, was excused.)

The CHAIRMAN. Do you solemnly swear that the testimony you shall give in this proceeding shall be the truth, the whole truth, and nothing but the truth, so help you God?

Mr. REYNOLDS. I do.

TESTIMONY OF JOHN W. REYNOLDS, COMMERCIAL TELEGRAPHERS' UNION, WASHINGTON, D. C.

Mr. REYNOLDS. I only have one copy of this. You may have it after I read it.

The CHAIRMAN. Let's get you identified.

Mr. REYNOLDS. John W. Reynolds, Commercial Telegraphers' Union.

The CHAIRMAN. What is your position with the Western Union?

Mr. REYNOLDS. I am the assistant automatic chief of the Western Union Telegraph Co.

The CHAIRMAN. And your position with the union?

Mr. REYNOLDS. I am president of the local in Washington.

The CHAIRMAN. Thank you.

Dr. ANDERSON. And the local is an A. F. of L. local?

Mr. REYNOLDS. Yes, sir.

Since the time Samuel Morse sent his historic message of "What hath God wrought?" until the present time, Western Union has been the dominating figure in the written word communications. At first it was made up of numerous small telegraph companies which finally banded together and formed what has been for the last 50 years known as the Western Union Telegraph Co.

TECHNOLOGICAL CHANGE IN TELEGRAPHY

Up to 1912, about 95 percent of all telegraph sending and receiving was done by Morse, operating in the term of "pounding brass." With the exception of crude machines which fed out a tape when the distant Morse operator was sending and made ink lines on the tape in the form of the Morse code which was later deciphered by a Morse operator and written down, automatic telegraphy was little known in this country. It had been experimented with in the laboratories of Europe and developed to a semipractical stage.

In the years of 1912 and 1913 automatic telegraphy began to show itself in the Western Union in the form of Barclay machines and perforated tapes which sent and received the written word, laboriously to be sure, but nevertheless it was automatic, and the operation did not require the skill of the old-time Morse men.

At the beginning of the World War in 1914, the Multiplex appeared, and is the basis of all automatic telegraphy that is used today. By means of distributors, relays, and the duplex theory, multiple sendings and receivings could be produced on a single wire simultaneously. With the increased volume of business due to the war, a faster means of transmission and reception was imperative to the telegraph company, and the Multiplex was the answer. Little by little the Morse operator was pushed aside by experienced typists who could learn the routine and system used by the telegraph company and extra lists of Morse operators began to appear.

When the United States became involved in the war, the volume of telegraphic file was enormous, and even the Morse operators found employment in their chosen field. Employment in the communications field remained at its height until the post-war period, when improvements in the automatic system again began to show on the horizon. To give the devil his due, the Western Union willingly trained all Morse operators who were willing and able to learn the new system, but naturally there were some old dogs who could not learn the new tricks, and they were shunted to the extra list to make whatever time they could when excess help was needed in their line of work.

In 1924 the telegraph business was still in a state, but more and more the automatics were eating up the Morse facilities and in that year the teletype or Simplex reared its head and by 1926 Western Union had concentrator units of this new machine. This pushed the Morse telegraphist farther in the background and Morse telegraph jobs became a problem. The teletype or Simplex was used on branch office lines and short-way lines in concentrators which had fixed positions for each line wire, and later a plan was devised whereby the individual office was placed on a turret comparable to a telephone switchboard. Any operator in the concentrator unit could plug in any office whose light happened to flash on the board as a call. This concentrator unit had lights and signals which would point out to the

supervisor the location of any idle operator, the operator next to take a call, the number of unanswered calls, the number of busy operators and the exact location in the unit of all idle operators. All during this progress in the automatic field, the Morse telegraphers were dwindling, until 1929 when about 90 percent of the Morse telegraphers were working outside of the telegraph companies. They had, of necessity, to find jobs in the brokerage offices, newspaper offices, baseball parks, and bucket shops. There was little need of Morse telegraphers in the biggest corporation in the telegraph field. Those who could learn the new system, either the Multiplex or the Simplex, were retained, and some are still able to earn a living as combination automatic and Morse operators. There are at the present time, according to reports, 20,000 telegraph employees unemployed, working part-time, or employed in other work in almost every city in the country.

During the depression and up until the present time Western Union has been experimenting with various technological devices, most of which are not a benefit to the service or the public but a direct effort to eliminate manual labor in the telegraph field. The service itself has suffered, until Western Union is losing revenue because of some of its supposed improvements. Western Union has what is known as the Multiplex-Simplex repeater, a device which comprises a portable table on wheels which can be connected with adapters on any trunk circuit, and give direct service to any branch having a teletype machine. At first glance this would seem to be expediting business, but when it is found that Western Union encourages false routing of business to eliminate using the natural relay for business, then it is a detriment to good service. Suppose, for example, that the Western Union branch in this building has 10 messages for Chicago. The Multiplex-Simplex repeater is placed on the Chicago trunk wire in the main offices, and those 10 messages are transmitted to Chicago. That is good service; but in the meantime the clerk at the counter has taken over about 30 more messages. Those 30 messages are sent to Chicago, regardless of where they are going, and in that unnatural routing, it is eliminating jobs in the main office at Washington.

Dr. LUBIN. May I interrupt there? What do you mean? If this telegram is addressed to New York, would it go to Chicago and back to New York?

Mr. REYNOLDS. Absolutely. They have direct service to Chicago, and the operator is working on that line. I have an example showing that business for Jacksonville, Fla., has been sent to Chicago, then back to Atlanta, which has a direct line to Jacksonville, so that in the round-robin of service you have lost time, an element important in good telegraph service, just to use the relay.

The delay entailed in such operations is the cause for losses of file by Western Union. These adapters have been placed on most trunk circuits in the Washington office, so that it can be seen that most of the branch office file could be routed away from the Washington main office, thereby creating a false impression as to the density of the business in the Washington area.

In 1937 a reperforator was installed in Richmond, Va., and, despite the reports of the company to the contrary, 70 percent of the entire personnel lost their jobs. It was claimed that they were transferred

to other jobs at other points in the system, but 70 percent of the entire personnel either lost their jobs entirely or were transferred out of the city to be put on the unemployment list of other towns or part time in another city in Western Union. There have been reports that most of the personnel of the Richmond office was taken care of, but of the five who were supposed to be transferred to Washington to take care of their loss of jobs, we found only one who was finally reported to Washington, and he was a service clerk and was put on the bottom of the list subject to part time or to be fired at the first time there was a drop in business in Washington.

The reperforator consists of banks of relays, transmitters, and automatic equipment designed to eliminate jobs. Instead of the message being printed on a tape and gummed by an operator as before, it is received in the form of a perforated tape with the printed message above the perforated tape, and is switched to its destination at the switching center and placed in a transmitter by the receiving or switching operator. One operator in a switching center can take care of the same number of wires that four operators formerly worked, thereby eliminating three operators. The switching center operator must now also be a route clerk. She must note the destination of each message she receives and what wire to plug it into, thereby eliminating the route clerk's job. This procedure eliminates jobs even down to the timekeepers. Where it formerly took two timekeepers to keep the time in the Richmond office, there is now only one because of the unemployment caused by the installation of the reperforating system. It would seem that with this wholesale eliminating of jobs, the company could afford to pay the remaining employees fabulous salaries. They have reduced their pay roll way down, and those who are left should, if you come down to a common-sense principle, get more money if they are handling more business, but the pay roll for the Richmond office hasn't increased.

The CHAIRMAN. You say the company is getting more business?

Mr. REYNOLDS. No. I have some figures on the business.

The CHAIRMAN. I understood you to say that just then. Did you mean that?

Mr. REYNOLDS. No.

The CHAIRMAN. I misunderstood.

Mr. REYNOLDS. No; I said that the employees with the same amount of business with less help should get more money for the work performed.

The CHAIRMAN. You are speaking of the amount of work done by the employee?

Mr. REYNOLDS. That is it. In other words, formerly an operator handled 75 messages on one side or the other of the wire; now she handles 375. Surely the operator should get part of the revenue from these 375 messages.

Dr. ANDERSON. When do you fix the time of change? When did she handle 75?

Mr. REYNOLDS. Before the perforator, which went into Richmond in 1937.

Dr. ANDERSON. So it is a very recent change?

Mr. REYNOLDS. Yes. The money spent on such mechanical devices was earned by those who were eventually let out, so it would

seem that the hard work performed by the Richmond personnel, for instance, would finally lead to the loss of their jobs.

The next installation of this robot which eliminates jobs is Atlanta, Ga. Western Union workers in that town are becoming panicky because of the results in Richmond. Atlanta is the biggest Western Union office in the South, and is the division headquarters for the company. Is there any wonder why these people are becoming hysterical and wondering when the axe is going to fall and cut off 75 percent of their personnel?

Next came the dial system. This is also very recent. It was originally intended to be fast and direct service between railroad terminals to distant main offices, thereby eliminating relays which are bad on short-haul business. For instance, if you go to the Union Station and file a message to a person at Baltimore saying you are going to arrive in Baltimore 45 minutes later, if that message was sent through the regular channels, going through the Washington main office, to the Baltimore main office, to the addressee in Baltimore, it would take considerable time, and with the fast train service you get now you would reach there before the message. This dial was primarily set up so that you could dial Baltimore and send a message without any relays, but Western Union also has taken advantage of this to defeat the employment problem by routing over the dial business which has to be relayed after it has been sent to the railroad terminal.

For example, Union Station, Washington, has a message for Philadelphia, and the operator at the Union Station dials Philadelphia and gets them; she sends the Philadelphia message and has several more on hand, not for Philadelphia, but she sends them anyway because her chart or instructions tell her that if she is in connection with Philadelphia, also to send Pittsburgh, Cleveland, and Detroit business. This eliminates the main office procedure in Washington, which has direct trunk lines to all three of those cities.

The company is now experimenting with a facsimile machine whereby you write out your message, put it in a slot, pay the fee, and it comes out in the handwritten copy at the other end. The actual service now is worse than it has ever been because of the deficiency of help. If less than adequate force is maintained, the Western Union will continue to lose business because of its so-called technological improvements which are a detriment to the public service and the employees as a whole.

Mr. CHANTLAND. Why is this Washington operator told to put these Pittsburgh and Detroit messages at the tail end of a Philadelphia message to Philadelphia? I don't understand that.

Mr. REYNOLDS. It eliminates a relay through Washington, and in that way if the Washington force is kept at a minimum, making it impossible to cover those channels without outside help.

Dr. LUBIN. Does it mean, on the other hand, at the same time that you have to have more people in Philadelphia to relay that on to Detroit?

Mr. REYNOLDS. It is possible, yes; but the natural relay for that business is Washington, D. C., and if the company has a force at Washington, D. C., to take care of that, why send it to Philadelphia? Eventually if you send enough business, you are going to eliminate your Washington operator.

Mr. CHANTLAND. Do you gain any time by that? If you had the force at Washington wouldn't it be quicker to send it out of the Washington office?

Mr. REYNOLDS. My contention is yes, sir; but it is a saving in money and salaries to the telegraph company.

Mr. CHANTLAND. The telegraph company is supposed to mean speed, isn't it?

Mr. REYNOLDS. Absolutely.

Mr. CHANTLAND. Which is the speedier if they ran it right?

Mr. REYNOLDS. Naturally the routing to Washington and sending it on a direct trunk line. The facilities are here to meet those conditions. Why shouldn't they be used?

(Dr. Lubin took the Chair.)

Acting Chairman LUBIN. Are there any questions the committee members wish to ask?

LABOR DISPLACEMENT IN THE TELEGRAPH INDUSTRY

Mr. REYNOLDS. The chairman asked for these data, which I have here:

The Fifth Annual Report of the Federal Communications Commission gives a partial picture of the unemployment in the telegraphic communications industry, which indicates that the loss of employment and employment opportunity in this field has been terrific during the so-called depression period, 1930 through 1938. Briefly, the picture presented is this: At the close of June 1930 there were 92,658 employees in the industry, while in June 1938 there were only 63,411 employees, which is a job loss of 29,247.

It cannot be argued that this actual loss of jobs is attributable to loss of business by the companies, for the same report shows that during this same period the number of revenue messages transmitted has shown a decided increase from 188,776,653 in 1930 to 196,551,582 in 1938.

Acting Chairman LUBIN. Are there questions of the witness?

(The witness, Mr. Reynolds, was excused.)

Dr. ANDERSON. This morning we introduced a chart which I ascribed to Dr. Kreps' authorship, and it has such bearing on the problem we have been discussing today and will still be discussing tomorrow we have asked Dr. Kreps to explain it to the committee.

Dr. KREPS. This is "Exhibit No. 2573".¹ It might well be called the pattern of idle funds and unemployment due to distortion of the stream of purchasing power. The chart is in two portions.

Acting Chairman LUBIN. Dr. Kreps, will you refer to the exhibit number?

Dr. ANDERSON. 2573.

Dr. KREPS. The top portion of three lines represents dollar figures. The heavy line shows the operating revenues collected from the public, collected, of course, in this case from millions of households in small monthly amounts. The bottom line indicates what happened to the stream of funds put back in the form of mass disbursements to labor, namely, pay rolls. Notice that the trend is continuous throughout the period. During the entire period from 1919 to 1938 receipts from

¹ Supra, p. 16665.

the public have tended to outdistance what was disbursed back in the form of mass purchasing power to labor. Both, incidentally, are expressed in terms of indexes. In the accompanying table¹ I give the actual figures upon which these indexes are based and the sources of the data.

Notice also that disbursements to stockholders in the form of dividends and interest, shown by the broken line at the top, reached a peak in 1930 and have remained high throughout. There was a question asked earlier today why technological improvements are introduced if they don't mean appreciable reduction in cost. The answer in part is that businessmen are always on the lookout for a place to earn high returns on surplus funds. Technological improvements even when they fail to reduce costs are highly desirable if they provide a profitable outlet for funds. They take this dollar that comes in and get more of it into the hands of the owners. Machines are put on the pay rolls instead of labor, for about the same reason a manager often puts his son or other relative on the pay roll.

CONCENTRATION OF OWNERSHIP IN AMERICAN TELEPHONE & TELEGRAPH CO.

Dr. KREPS. The net picture, then, is one of increasing disbursements in the hands of those who receive dividends and interest. If those were mass disbursements, no particular distortion to the flow in the income stream would be caused, but when it is remembered that even in this company, which excels in the distribution of stockholdings and public favor which it enjoys, less than 5 percent of the stockholders own more than one-half of the company, it is quite clear that the top line does not represent mass purchasing power.

Mr. PIKE. Is that true? I thought they said that no stockholder owned as much as 1 percent.

Dr. KREPS. That is correct. To own 1 percent of a corporation which has an asset value of \$2,500,000,000 is tantamount to saying nobody has as much as \$25,000,000 invested in this one stock.

Mr. PIKE. Senator O'Mahoney just before he left gave some of the figures here that just came out. As I remember, there are about 18,000,000 shares of stock—what I mean to say is that you gave me the impression when you said 5 percent—

Dr. KREPS (interposing). Of the stockholders own more than 50 percent of the total stock.

Mr. PIKE. Yes; that is right. My misunderstanding.

Dr. KREPS. The exact figures are contained in a report of the Federal Communications Commission. Five percent is about 34,000 to 35,000 stockholders, I believe.

Mr. PIKE. I shouldn't have spoken at all.

Dr. KREPS. The picture is one of steadily accumulating idle funds at the same time that you have an instrument at work constantly subtracting funds in small monthly amounts from millions of householders, funds which are not distributed back to as large a number or in such small amounts as collected. That distortion of the stream of purchasing power, of the income stream, is one of the most fundamental facts deserving the consideration of this committee.

Acting Chairman LUBIN. Isn't it true, however, that since 1932 the tendency has been reversing, that is, the index numbers representing

¹ Appendix, p. 17407.

revenues going down and the index of pay rolls going up? In other words, you are getting them close together, closer than they formerly were at the bottom of the depression?

Dr. KREPS. There has been some change, not so much since 1932, but since 1937. As you remember, there have been some rate reductions.

Acting Chairman LUBIN. But in 1933 your index of pay rolls was 100 and now it is 130, and in 1933 your index for interest and dividends was about 190 and now it is about 176, so they are coming closer together again, aren't they?

Dr. KREPS. They are beginning to, that is right, although the spread is still substantial.

Mr. PIKE. Well, they stayed pretty well together until the end of '29.

Dr. KREPS. That is due in part to the fact that '23 to '25 has been used as a base. The tendency to diverge existed throughout the period but was accelerated after '29.

Mr. PIKE. The divergence is there, but the trend is fairly well the same, and wouldn't you think that those last 2 years of interest and dividends going up in even a sharper trend represented what Mr. Harrison spoke of this morning as being the momentum in planning for business that never did show up? They did increase their plant, as I remember it; they raised a lot of money in '29 for plant and put it in the plant, and with the unchanged dividend rate the dividend and interest would go up. Wouldn't you think, to a great extent, that represented expectation that operating revenues would go up and they just didn't? As he also said this morning, they pretty well used up their surplus plant, and the using up of that surplus plant, it seemed to me, to some extent is shown by what Dr. Lubin just spoke of, the operating revenue and the pay rolls, both going up again. It isn't at all sure that they will meet, but I think there may be a great deal of that in that 2-year lag. They used to plan pretty far ahead. They planned wrong in this case.

Dr. KREPS. The bottom portion of the chart shows not dollar figures but what might be called real values. The heavy line depicts what the community had to surrender in the way of goods and services in order to get the dollars it used to pay telephone bills. Technically, it is the index of operating revenues adjusted for the value of the dollar in all its uses, including the payment of pay rolls. It is the index of the general price level devised by Dr. Carl Snyder of the Federal Reserve Bank of New York. The middle line shows service rendered. This is what the community got in the way of telephone service; it gave up what is represented in the heavy line, showing that the exchange value of telephone service went steadily upward. It commanded a larger share of community goods and services than it did before. More had to be surrendered. The community had to work harder for the same unit of service. All the technological change that took place did not enable the community to command telephone service with less effort. None of the great increase in technological efficiency of the company was transmitted to the public in terms of lower prices to a sufficient extent to make telephone services cheaper relative to other things.

Acting Chairman LUBIN. Just what do you include in production?

Dr. KREPS. There are two measures. In the table both the weighted and unweighted figures are given. One is the weighted average of exchange and toll messages of the Bell System as com-

puted by the National Bureau of Economic Research and published in its Bulletin No. 59. The other is based on average daily conversations as reported in the Federal Communications Commission special investigation.

Acting Chairman LUBIN. I don't see how you conclude that we had to give up more goods and services. All you are saying is that the revenues went up faster than the service created.

Dr. KREPS. Adjusted revenues went up faster than the service created.

Mr. PIKE. It would be really adjusted cost to the consumer.

Dr. KREPS. That is right. This represents what the consumer had to surrender in the way of real effort.

Mr. PIKE. Purchasing power.

Dr. KREPS. Purchasing power; how hard he had to work. It is similar to the familiar example of the farmer who has a mortgage to pay. Wheat at \$1 a bushel and a \$1,000 mortgage means he has to raise a thousand bushels of wheat. If wheat goes down to 50 cents a bushel he has to raise 2,000 bushels of wheat. That is exactly the idea underlying this comparison. You have in the middle line a physical measurement of the service which the telephone system rendered the community. The top line gives a physical measurement of the sacrifice which the community had to go through in order to command the funds necessary to pay the bill. At the bottom is represented the employment created, the amount of work, the amount of outlet for the energies of the community which was afforded by the telephone system. Notice that employment, as has been testified by Miss Sullivan, went down steadily.

Acting Chairman LUBIN. Is that actual number of persons employed or man-hours?

Dr. KREPS. That is actual number of persons employed.

Dr. ANDERSON. Thereby it would be a crude measure only. If you had man-hours you would get even a sharper picture, would you not?

Dr. KREPS. Yes; that is correct.

Mr. PIKE. Those are figures Mr. Harrison gave this morning.

Dr. KREPS. These data, incidentally, are all taken from the reports of the company.

The significance of this chart is that it pictures in a nutshell the fact of technological advances not passed on to the public.

Mr. PIKE. It is reaped by the shareholders.

Dr. KREPS. The benefit of technology is clearly one that the shareholders reaped.

Mr. PIKE. I think the bondholders would tell you they didn't get much.

Acting Chairman LUBIN. Are there other questions?

Do you have any other witnesses?

Dr. ANDERSON. Not this afternoon.

Acting Chairman LUBIN. The committee will stand in recess until 10:30 tomorrow morning.

(Whereupon, at 4:20 p. m., the committee recessed until 10:30 a. m., Thursday, April 18, 1940.)

INVESTIGATION OF CONCENTRATION OF ECONOMIC POWER

THURSDAY, APRIL 18, 1940

UNITED STATES SENATE,
TEMPORARY NATIONAL ECONOMIC COMMITTEE,
Washington, D. C.

The committee met at 10:50 a. m., pursuant to adjournment on Wednesday, April 17, 1940, in the Caucus Room, Senate Office Building, Representative Clyde Williams, Missouri, presiding.

Present: Representative Williams (acting chairman), Senator O'Mahoney (chairman); Messrs. Pike, Lubin, Hinrichs, O'Connell, and Brackett.

Present also: Boris Stern, Department of Labor; William T. Chantland, Federal Trade Commission; S. Abbot Maginnis, Department of Justice; and Dewey Anderson, economic consultant to the committee.

Acting Chairman WILLIAMS. The committee will please be in order.

Dr. ANDERSON. Mr. Chairman and members of the committee, we propose with this morning's witness to finish the testimony on the communications industry, and this afternoon we have a witness who will speak more generally on the problems of technology as they are affected by electric power. The witness this morning is Mr. Paul E. Griffith, president of the National Federation of Telephone Workers, Chicago, Ill.

Acting Chairman WILLIAMS. Do you solemnly swear that the testimony you are about to give in this matter now pending shall be the truth, the whole truth, and nothing but the truth, so help you God?

Mr. GRIFFITH. Yes, sir.

TESTIMONY OF PAUL E. GRIFFITH, PRESIDENT, NATIONAL FEDERATION OF TELEPHONE WORKERS, CHICAGO, ILL.

Acting Chairman WILLIAMS. State your name.

Mr. GRIFFITH. My name is Paul E. Griffith.

Acting Chairman WILLIAMS. Your residence?

Mr. GRIFFITH. I live in a suburb of Chicago, Ill.

Acting Chairman WILLIAMS. What is your business and background, Mr. Griffith?

Mr. GRIFFITH. I began with the Bell System in 1922, and since then have been employed in various departments of the Bell System; the Western Electric inspection department; Western Electric engineering department, the group that is now the Bell Telephone Laboratories; Western Electric factory at Hawthorne in Chicago, as a dial switch man for the Illinois Bell Telephone Co., and an engineer for the Illinois Bell Telephone Co.

Acting Chairman WILLIAMS. What is your present position?

Mr. GRIFFITH. I am an engineer for the Illinois Bell Telephone Co. and president of the National Federation of Telephone Workers.

Acting Chairman WILLIAMS. What is this federation?

Mr. GRIFFITH. The federation is an organization of telephone unions in the telephone industry throughout the country, including the operating, manufacturing, and research departments of the industry. You will note I said "industry," not just the Bell System.

Acting Chairman WILLIAMS. I notice you did not include construction. Is that included, also?

Mr. GRIFFITH. That is included also; yes, sir. You use the term "construction" in a little different sense, of course, than we do. The federation includes all phases of the telephone work in the industry.

Acting Chairman WILLIAMS. You represent your federation, composed of workers in every branch?

Mr. GRIFFITH. That is correct.

Acting Chairman WILLIAMS. Of the telephone industry?

Mr. GRIFFITH. That is correct, including, as I said, manufacturing and research.

Acting Chairman WILLIAMS. What is the number of the membership in that federation?

Mr. GRIFFITH. We have 110,000 dues-paying members at the present moment.

Acting Chairman WILLIAMS. And you have been selected as the president of that organization?

Mr. GRIFFITH. That is correct.

Acting Chairman WILLIAMS. You may proceed.

Mr. GRIFFITH. I would like to congratulate you gentlemen on your fortitude in listening to all of this maze of testimony and figures that you have in past days. I think it is remarkable, and speaks well for your sincerity.

As spokesman for the National Federation of Telephone Workers, I wish to express to the members of this committee our appreciation for this opportunity to present our views on the impact of technology on employment in the telephone industry.

Our general view is that we are not opposed to technological advance to the extent that it contributes to the improved and increased use of telephone service. In the approval of technological changes, however, the National Federation of Telephone Workers is of the firm conviction that the telephone worker and the telephone subscriber should share equitably in the economic benefits of such changes, and the job security of the worker should be a vital and important factor of every step.

Technological advance in the past has created unemployment of a considerable magnitude in the telephone industry. It is anticipated that the extension of improved methods and equipment already in use, and to be introduced in the future, will progressively reduce the number of labor units required to build and man the telephone plants.

Such curtailment of employment opportunities by this economy in labor necessarily results in social hardships to the telephone worker, his family, and community. We are reminded here of Edwin Markham's words, "Why build we these cities great, when the builder we forget?"

We submit for the consideration of the committee a number of facts and opinions pertaining to this problem in the telephone industry. We appreciate that they are in some respects incomplete and of provisional character. The very nature of the problems arising out of the failure of employment to keep pace with technological advances upon labor is such as to make quantitative analysis and evaluation difficult in the absence of intensive research far beyond our present resources. We believe, however, that this fact should not be permitted to interfere with an accurate survey of this problem as it applies to the telephone industry. We therefore, pledge our cooperation as a labor organization to this committee in this work. We appreciate, as we know the committee does, the need of fairly considering all factors and all of the various interests involved.

While some of the points we appear to rely upon are opinions instead of facts, we urge their serious consideration, first, because they represent the opinions of thousands of intelligent and educated telephone workers, with a background of experience which embraces the years during which the telephone industry developed from a minor to a major position in the United States; and second, because we are certain that subsequent study will, in virtually every case, bear out these opinions.

The subject should be viewed with a keen interest, as most telephone companies are of themselves utilities supplying interstate and local telephone service to the public in practically every community of the United States. We recognize that the telephone companies comprising this industry are subject to various local, State, and National regulatory bodies, whose specific purpose is to establish and prescribe fair and comparable rate regulations. These commissions, however, do not concern themselves with good or bad policies on labor economics.

I will repeat the sentence, These commissions do not concern themselves with good or bad policies on labor economics.

In outlining the fact, and our views, on the impact of technological advances on employment in the telephone industry, we have confined ourselves to what we believe to be reliable statistics on the operation of certain telephone carriers of the United States, assembled from time to time by separate bureaus or commissions of Government. We believe these exhibits will show the merit of our opinions on this subject.

REDUCTION OF EMPLOYMENT

Mr. GRIFFITH. There has unquestionably been a decline in the total number of employees in the telephone industry with relation to the total number of stations and investment, as shown in the three exhibits.

Incidentally we have a total of eight exhibits we should like to introduce as a part of this record.

Acting Chairman WILLIAMS. The first three exhibits may be received.

(The tables referred to were marked "Exhibits Nos. 2579 to 2581" and are included in the appendix on pp. 17408-17410.)

Acting Chairman WILLIAMS. Do they all indicate the source of the data given?

Mr. GRIFFITH. They do. It will be seen from these tables that the number of telephone carriers have decreased from 140 in 1926 to 73 in 1938. This has been the result of corporate merger or consolidations.

Acting Chairman WILLIAMS. What do you mean by carriers? I don't happen to know what the number of carriers means. What is that?

Mr. GRIFFITH. A telephone company is a telephone carrier. They are designated so in the statistics. A class A carrier is a company with an annual income of \$100,000 or more.

Acting Chairman WILLIAMS. That simply means a telephone company then.

Mr. GRIFFITH. That is right.

They decreased from 140 in 1926 to 73 in 1938. The depreciation reserve for the industry has been continuously bettered, as its ratio to investment in telephone plant has steadily advanced from 20.23 percent in 1926 to 27.52 percent in 1938. This is a 7.29 increase in 1938 over 1926. Under capitalization the tabulated columns reveal a decrease in debt ratio to total capitalization, from 27.67 percent in 1926 to 19.4 percent in 1938.

Mr. PIKE. There is a point there, Mr. Griffith, I would like to ask you about. That funded debt right through, I take it, is almost all owned by the public. Is that not generally true? There is very little funded debt owned across between companies?

Mr. GRIFFITH. It is my opinion that you are correct.

Mr. PIKE. Whereas in the capital stock a great deal of it includes capital stock of the operating companies, which is owned by American Tel. As near as I can make out from the totals, there must be substantial duplication.

Mr. GRIFFITH. The American Telephone & Telegraph figures are included in these figures. These are figures for the entire industry.

Mr. PIKE. Yes; but they don't represent merely the capital stock that is held by the public, but they represent, let us say, a subsidiary company having \$10,000,000 of stock issued all owned by the American Telephone, that is in as \$10,000,000, and then the \$10,000,000 that the American Telephone Co. had to issue to buy that stock is also issued. When you get up to \$4,000,000,000 you get to a total which is something twice the total of the American Telephone stock outstanding, so I think there must be a whole lot of duplication here, inter-company ownership.

Mr. GRIFFITH. It may be so, I couldn't say.

Mr. PIKE. Maybe Dr. Anderson could answer that.

Mr. MAGINNIS. May I ask the witness where he obtains his figures that are used in this?

Mr. GRIFFITH. We show on the footnotes that we secured them from the Fifth Annual Report of the Federal Communications Commission, for the fiscal year ending June 30, 1939.

Acting Chairman WILLIAMS. Proceed.

Mr. GRIFFITH. While the total surplus has decreased considerably from the high figure of 1931, it still remains a substantial figure, well above that shown for 1926. Your attention is directed to the

fact that declared dividends have always been constant even during the depression years.

The ratio of operating expense to operating revenues has been very consistent, the extreme variation being from a low of 66.95 percent in 1928 to a high of 71.44 percent in 1933. Net income has been good although somewhat variable. A consistent annual gain is shown in the totals for wire mileage.

It will be seen that the total number of telephones in service increased steadily until 1930, when a sharp decline is noted. This decline in total telephones in service continued until the depression low point was reached in 1933. The 1930 peak of telephones in service was approximately regained by 1937, and definitely surpassed in 1938.

These tables further indicate that the volume of business, shown as the average number of calls originating per month, quite closely followed the total number of telephones in use. There was a steady increase until 1930 and a decline until 1933 as before. By contrast, however, it should be noted that the 1930 peak in business volume was surpassed in 1937 and a new all-time high established in 1938.

We would like to note here the following comparison taken from "Exhibits Nos. 2579, 2580, and 2581."

	Year	Total tele- phones	Number of employees at close of year
Normal year.....	1926	14,371,922	322,536
Depression low year.....	1933	14,293,251	267,139
Difference.....		-78,671	-55,397
Normal year.....	1929	16,973,590	387,023
Service recovery over past high point.....	1938	17,431,353	285,650
Difference.....		+457,763	-101,473

From the foregoing it is evident that the number of telephone employees at the close of each year shows an economy in labor entirely out of relation to the telephones in service and the volume of business handled by the industry previous to 1929.

Mr. HINRICHS. You refer to 1929 as a normal year and for many lines of business 1929 was regarded as an exceptionally high year. Would your tables indicate that as far as the telephone business is concerned it moves rather evenly from 1 year to the next so that 1929 was not a year of exceptional activity?

Mr. GRIFFITH. During 1929, 1929 was not considered exceptional. It was only considered exceptional when later events showed it to have been a peak.

Mr. HINRICHS. The growth, in other words, from year to year had been more or less consistent through that period.

Mr. GRIFFITH. That is right.

The telephone industry as a whole in 1938 operated more telephones and supplied more service than it did in 1929, with 101,473 less employees. This does not include employment dislocations in telephone

manufacturing plants or research laboratories within the industry. This is referred to elsewhere.

(Senator O'Mahoney assumed the Chair.)

Representative WILLIAMS. Did you hear Mr. Harrison's testimony?

Mr. GRIFFITH. Yes, sir.

Representative WILLIAMS. Do you agree with him as to the reason for that decline in employment during that period?

Mr. GRIFFITH. I heard Mr. Harrison's testimony and his explanations that the decline was on account of advance planning, and the securing and training of employees in advance in anticipation of business which did not come, and I am in accord with him in that.

Representative WILLIAMS. Also, didn't he make the point, as I understood it, that 1929 was an abnormal year in the construction field, after that there was a letting down, necessarily, of the construction business for the reason that the demand didn't exist, and in other words, as I understood him, they were rather overbuilt and they were in those 10 years following taking up the unutilized facilities of plant.

Mr. GRIFFITH. They didn't foresee that in 1929. I was employed in 1929 by that company and it was considered a normal year until the events that followed showed it to have been a peak year.

Mr. PIKE. That was a fairly characteristic mistake of business, wasn't it?

Mr. GRIFFITH. That is correct.

Mr. PIKE. It wasn't only the telephone company.

Mr. GRIFFITH. That is correct, they were very enthusiastic and planned for the future, evidently feeling that the business for 1930 to 1939 was going to continue right on the way it had during that 10-year period.

Representative WILLIAMS. I got the impression from his testimony, although I may be wrong about it, that that was largely due to an overbuilt condition, and the falling off in employment during that time simply was lack of demand for increased construction improvement, and that it was not due materially to technological improvements in the telephone business.

Mr. GRIFFITH. The point I was trying to bring out is that it wouldn't have been an abnormal time and construction wouldn't have been too high if it hadn't been for the depression; if they could have foreseen the depression I have no doubt that they wouldn't have built up the plant as they did.

Representative WILLIAMS. I am not talking about their failure to get business, but whether or not that was the fact.

Mr. GRIFFITH. They did have too much plant after the depression struck them, that is a fact, decidedly too much.

Representative WILLIAMS. And then do you agree that the falling off of employment following that period was due to that fact, we will say failure to foresee the depression that was coming?

Mr. GRIFFITH. To a large extent that is correct. The people in the construction department of the telephone companies were a problem, to get them located in other departments to prevent a general lay-off.

Representative WILLIAMS. Well, have you any figures to show while we are on that particular question—then I won't ask anything

more—to what extent the real improvements, technological improvements, have displaced labor?

Mr. GRIFFITH. The chief displacement of labor on which you have available figures, of course, would be the traffic department—operators. I have some figures on operators. Those figures are available, but many of the other displacements in addition to operators are more or less an opinion.

Representative WILLIAMS. Well, have you those figures? If you have, later on I will call for them.

Mr. GRIFFITH. I don't have the figures on construction people, although there were vast numbers of them. We were trying to reassign them in other departments to keep them from being laid off. The principal reason why we adopted the spread-the-work plan was to reassign the construction workers, more than any other one group, because during the 1920's they were a large department, as you doubtless realize.

Take the city of Chicago, for example. In '29, my recollection is they had approximately 1,400 nonsupervisory construction employees. That is my own recollection; I have no supporting data. At the present time, it is my opinion that they have between 400 and 500 in that same department.

Dr. ANDERSON. In the Monthly Labor Review study, to which I referred yesterday, operators as such in your traffic department in 1930 were 54.2 percent of the total labor force employed. Construction workers in central office installations were 5 percent—5.3 to be exact—and line construction workers were 10 percent—or 10.3, to be exact. Cable and conduit construction men were only 3 percent.

According to this tabulation, in 1930 a preponderance of workers were engaged in the traffic department as operators, not in construction.

Mr. GRIFFITH. That is correct.

Dr. ANDERSON. So that the construction workers to be affected are the minor portion of the total employment.

Mr. GRIFFITH. That is correct. When we say "construction," we might not mean exactly the same thing that your committee means by "construction." Construction people generally have to do with the underground facilities or aerial wire, cables, and such as that. That is what we mean by construction.

Another comparison and correlation can be shown by using the telephones-per-employee figure. This may be obtained by dividing the total number of employees for any given year into the total telephones in service. By using such figures secured from Exhibit No. 2581 we obtain the following examples.

Year :	Telephones per employee
1926.....	44.5
1929.....	43.8
1938.....	61.0

The figure 44.5 telephones per employee in 1926 to the 43.8 in 1929 is fairly related, and represents normal growth in those predepression years, when the peak of employment of 387,023 was reached in 1929. The same relation, however, does not hold true for 43.8 in 1929 when compared with 61.0 telephones per employee in 1938.

We would like to show for this same period the increase in tele-

phone plant investment and the number of telephones per employee for the corresponding period.

Year	Telephones per employee	Investment telephone plant
1926.....	44.5	\$2,978,932,711
1929.....	43.8	3,862,241,317
Minus efficiency.....	.7	1,888,308,606

¹ Increase.

NOTE.—This is only a 3-year period before depression.

Year	Telephones per employee	Investment telephone plant
1929.....	43.8	\$3,862,241,317
1938.....	61.0	4,783,082,079
Plus efficiency.....	17.2	1,920,840,762

¹ Increase.

NOTE.—This is a 9-year period including the depression.

It will be noted from these figures that the plant-expansion program was curtailed somewhat for the period after 1929, which would cause some increase in the number of telephones per employee. On the basis of these figures for the 3-year period before 1929, however, it is evident that this accounts for only a very slight part of the marked increase shown for the period following 1929. It is obvious, therefore, that there must be some other reason for the reduced work requirements. We believe that an adequate explanation will be found in the improved methods and equipment employed by the telephone industry. We will introduce further tables to substantiate our contentions.

One general explanation, of course, is that the period of service of the average employee increased considerably during the depression years, when expansion was greatly curtailed, resulting in increased employee efficiency and experience. It is difficult to accurately evaluate the effect of this change, but it has been cited, along with other reasons, and certainly finds support with the telephone employee body.

In a report to the stockholders of the Bell System in 1939, Mr. Walter S. Gifford, president of the American Telephone & Telegraph Co., in outlining factors responsible for employment differences in the 1920's as compared to the 1930's, stated:

A much more experienced and efficient personnel which this difference in the relative proportion of learners [at the end of the boom period in 1929 the number of learners was 90,000 while at the end of 1939 it is only 18,000—1939 annual report of the A. T. & T. Co.] reflects, together with the continuing improvement in methods and apparatus and substantially reduced construction activity, are the major causes of the differences in employment in 1939 in comparison with 1929.

Mr. Gifford's statement would appear to substantiate our analysis of this situation.

Separating the telephone station, financial, and employment situation statistics of the Bell System from the entire industry figures is very revealing. In this connection we direct your attention to the following quotation from *A. T. & T.*, a book by Mr. N. R. Danielian, published in 1939:

By December 1937, the volume of traffic and the number of telephones in service surpassed the peak figure of 1930. Bell-owned telephone stations in service had reached 15,645,000, exceeding the corresponding figure for 1930 by 62,000 stations. The average number of daily telephone conversations in 1937 was over 69,000,000, as compared with little more than 65,000,000 in 1930. The gross revenues of the System reached \$1,069,000,000. The net income of *A. T. & T.* was at an all-time peak of \$179,834,815, and total dividend payments of \$168,180,906 were the largest in the telephone company's history. But employment did not pick up commensurately. At December 31, 1937, the number of Bell Telephone Co. employees was 272,172, not including Western Electric and Bell Laboratories, which had 47,171 employees at that time. At these levels, there were nearly 92,000 fewer telephone company employees, and about 42,000 fewer people employed by Western Electric and the laboratories together, than in December 1929. In fact, at the very time that telephone traffic was scaling the peak of 1930, employment was back only to 1917 levels.

In brief retrospect, what does "the tragedy of a depression" reveal? Mr. Gifford's organization curtailed the number of workers by 60,000 people in 1930, just at the time Bell System business, in all its phases, was at the peak. After that, through 1933, the various indices of telephone service declined and employment in the Bell Telephone System was reduced by 120,000, or one-third of the total at work four years earlier. Western Electric reduced its force by 66,000 people, or over 80 percent. After 1933, business picked up, so that by the end of 1935, telephone service was only about 10 percent below 1929, but employment was reduced still further, to the lowest levels of the depression period. Since then, telephone business has reached and surpassed the high levels of 1930, but employment in the Bell Telephone Companies still remained, at the end of 1937 25 percent less than in 1929, and Western Electric's labor force was still half of what it was in that year. These conditions cannot be explained by reference to the business slump.

Your attention is directed to this quotation, which brings out the fact that up to the present time considerable dislocation of employment still exists in the plants of the Western Electric Co., which manufactures telephone equipment and is a subsidiary of the Bell System. We are submitting an exhibit which shows the direct labor hours worked in these plants.

(The table referred to was marked "Exhibit No. 2582" and is included in the appendix on p. 17410.)

Mr. HENRICHS. You want that exhibit to be headed "Relative Activity of Western Electric Co.'s Plants," do you not?

Mr. GRIFFITH. Yes.

At this point we introduce "Exhibits Nos. 2583, 2584, 2585, and 2586." These tables were taken from a survey made by the National Research Project of the Works Progress Administration.

(The tables referred to were marked "Exhibits Nos. 2583 to 2586" and are included in the appendix on pp. 17411-17412.)

Mr. GRIFFITH. You will note in "Exhibit No. 2583" that the indexes of output per employee and output per employee-man-hour both increase during the 6-year period from 1932 to 1937.

(Mr. O'Connell assumed the chair.)

Mr. GRIFFITH. "Exhibit No. 2584" shows the progress of dialization of telephone equipment in the Bell System. In 1920 practically all telephones owned by this system were manual, whereas by 1935 almost half of them had been converted to the dial method of operation, and

according to testimony at these hearings it is now around 60 percent, instead of the figures shown for 1935.

We believe that "Exhibits Nos. 2585 and 2586" explain more clearly than we can the consistently increased productivity of the telephone employee. It will be noted, however, that this increase was greater in the case of the operators than for all employees in general.

No attempt will be made here to catalog the many broad and detailed developments in methods and equipment used in the telephone industry, many of which tangible and intangible improvements have been so outstanding that they are generally known. We can state without possibility of contradiction that more and better telephone service is being furnished generally to an ever-increasing number of users, at a lower cost and with the employment of fewer workers per unit of equipment and service.

Determination of the exact character and extent of the technological advances in the industry and their effects on employment past, present, and future will require the cooperation of the telephone industry. A survey of this nature would appear to justify the time and effort required. An additional reason for such a survey is that valuable data might be secured regarding the increased productivity per worker, including the manufacturing branch of the Bell System.

EFFECT OF RATE REDUCTIONS ON VOLUME OF BUSINESS

Dr. ANDERSON. Going back for a moment, you say that this "service is being furnished generally to an ever-increasing number of users, at a lower cost and with the employment of fewer workers per unit of equipment and service."

Do you have any specific figures on changes in rates charged and costs to users of telephones?

Mr. GRIFFITH. I don't have any figures, Doctor, but it is common knowledge among all telephone workers, and also a worry, I might add, that the ever-increasing demand for lower rates might in time affect the welfare of the workers. That is one of the major problems that they keep watching.

Dr. ANDERSON. The demand for lower rates has been met by actually lowering rates the country over?

Mr. GRIFFITH. They have, particularly in the long-distance field, but there have been also other rate reductions that affect certain subscribers, such as suburban areas adjoining large metropolitan centers, and so forth.

Dr. ANDERSON. In view of the data you submitted elsewhere and discussed previously with respect to the net earnings of the telephone corporation, do you care to hazard a judgment as to whether or not rates now charged are as low as they could reasonably be?

Mr. GRIFFITH. Well, you are touching on a delicate point there, Doctor. That would depend on the amount of business that the companies could secure. If the amount of business they could secure would justify a decrease it would be satisfactory; but how would you know, if you instituted a Nation-wide rate cut of drastic proportions, that they would come out with a profit, at least for a long time in the future?

Dr. ANDERSON. I assumed that there was some discussion, current discussion, about lowering prices and thereby increasing volume and increasing employment. Do you have any judgment on that?

Mr. GRIFFITH. It is our impression, of course, that the cheaper you make a product and the better the product is, the more business you would thereby secure.

Dr. ANDERSON. But large profits of telephone companies do not indicate to you that prices of telephone service could reasonably be lowered to increase that business?

Mr. GRIFFITH. The public in general, in my opinion, is not clamoring for any great reduction. That is usually the political bodies.

Mr. HINRICHS. Mr. Griffith, in connection with the question of studies of employment and output, is it your feeling that studies of that sort should be continuously made by some agency of the Federal Government?

Mr. GRIFFITH. I would think that the manufacturing ends of the industry should be included in any studies made by the agencies of the Government. I think you will find that even more interesting and revealing than the statistics you have secured on the operating companies.

Mr. HINRICHS. Well, would you limit studies of the relationship between output and employment to the manufacturing end? In general our interest in the Bureau of Labor Statistics is in all workers and not necessarily confined to manufacturing workers.

Mr. GRIFFITH. All workers, of course, but it is just my impression that you have more statistics available on the other branches of industry than you have on manufacturing. There have been more studies made in the past—at least there have been more called to our attention.

Mr. HINRICHS. Those studies, if they are going to be significant to you, need to be kept up to date. It is not just a question of a study one time and then putting it away on shelves to gather dust, is it?

Mr. GRIFFITH. That is correct.

Mr. HINRICHS. These changes are going on, sometimes large and sometimes small, but changes are going on every year.

Mr. GRIFFITH. That is correct.

Mr. HINRICHS. And therefore studies of that sort, if they are going to be really significant in serving the purposes of management and labor in discussions of technological change, need to be continuously made.

Mr. GRIFFITH. But as a labor union we represent the people in the factories as well as the industry. Looking at this thing sanely, the cheaper the telephone companies can buy their material from the Western Electric Co., naturally the cheaper they can install it and the less increase will there be in their investment. On the other hand, a large part of every dollar they spend with every factory goes to wages, so as a labor union we are keeping that phase under close attention.

(Senator O'Mahoney assumed the chair.)

Mr. GRIFFITH. The Western Electric section of the telephone industry is competitive, regardless of what you might have heard to the contrary. I worked out there for a number of years, and I know it is highly competitive with other companies in the electrical field. Studies and comparisons are made at all times, and of course if

there is too much for cheapening their product, that would reflect itself in the opportunities for our people who are now employed, or have been employed in the manufacturing end of this industry. Too many people forget one phase of any situation while they are concentrating on another.

Mr. O'CONNELL. What do you mean by saying that the Western Electric is competitive? Do you mean it is competitive in securing the business of the A. T. & T.?

Mr. GRIFFITH. There are many other companies manufacturing telephone equipment in addition to the Western Electric Co., and the prices that the Western Electric charge must compare with the prices charged by other companies. I myself took part in securing data which were finally used in a rate case to prove that the products manufactured by Western Electric could not be manufactured any more cheaply by any other manufacturing concern, in similar quality and of similarly close limits and methods of manufacture.

Mr. O'CONNELL. I don't think I made my question entirely clear. Does Western Electric supply the A. T. & T. system with these telephones?

Mr. GRIFFITH. They supply much of it. The Automatic Electric Co. of Chicago also furnishes much of it, particularly the dial equipment that is used in the smaller areas. That is secured from the Automatic Electric Co. of Chicago, and not manufactured by the Western Electric Co.

Mr. O'CONNELL. Do they manufacture that type of equipment?

Mr. GRIFFITH. During the times when the Automatic Electric Co. was unable to provide enough, the Western Electric Co. also went into the manufacture of this equipment. They set up a department in Hawthorne, in Chicago, for that purpose. That department has now been done away with.

Dr. ANDERSON. What was the reason for doing away with the department if they were successful as a subsidiary of the corporation in supplying it with that equipment at one period of time? Why did they cease doing it later?

Mr. GRIFFITH. That brings up a point where many people are not exactly in accord with the policies followed by the Bell System. They use the Automatic Electric Co. as their main source of supply, and only use the Western Electric Co. for the excess over and beyond what the Automatic Electric Co. can furnish. When the demand slacked off they discontinued manufacturing their own products.

Dr. ANDERSON. I should like to ask why, if most of the electrical equipment used by the Bell System is manufactured by its own subsidiary, and I presume at a profit, as you have indicated the profit structure of the subsidiary, they discontinued such profitable business within their own subsidiary and farmed it out, paying the profit to a competing firm?

Mr. GRIFFITH. It has been my impression all the years I have been with the firm that they want these other companies to remain in business.

Dr. ANDERSON. I understood this was a business structure for profit. What is the basis of the want? Why do they want it to remain in business?

Mr. GRIFFITH. It is our impression, and just my own personal opinion in the matter, that they do not wish to be regarded as strictly monopolistic in all phases of their work.

Dr. ANDERSON. You mean, wish to be regarded as monopolistic in the public eye?

Mr. GRIFFITH. That is correct. They buy material from many, many suppliers.

Dr. ANDERSON. And in order to satisfy that wish, is it considered profitable in this business structure to pay profits out of company funds to other competing firms?

Mr. GRIFFITH. I couldn't tell you, of course, as to the financial arrangements they have with the Automatic Electric Co. It may be that they are under contract so that they have to give them a certain amount of business. That is strictly a hazarded guess, you might say. I don't know. With their own company, the Western Electric Co., they may break contracts at will.

Mr. PIKE. The patent group involving the dial telephones certainly involved the Automatic Electric Co., which, if my memory is correct, controlled some of those patents.

Mr. GRIFFITH. I believe you are correct, and it would seem, offhand, that it would be natural to assume that they did have negotiations and enter into some sort of agreement which they probably had to live up to all through the depression.

Mr. PIKE. Normally it was a result of contractual relationship with the selling company that it would get the first crack at the selling of those things.

Mr. GRIFFITH. I don't know; I am not a member of the management of the corporation, and I do not know what they have done in management contracts with other corporations. I just know, as an observer and representative of all our people, what happens, and that particular angle is not regarded with high favor by our members. We would prefer that the Western Electric Co. get the business and then that the excess go to outside companies, but that is just the reverse of what they did.

We are not aware of any comprehensive studies being conducted at the present time, although it is our opinion that research departments of several universities have at various times investigated working conditions in the Bell System. The results of one such study made at the Hawthorne plant of the Western Electric Co., have been published by the Harvard University Press, under the title "Management and the Worker"; F. J. Roethlisberger and W. J. Dickson are co-authors.

EFFECT OF MECHANIZATION

Another study that has come to our attention showing results of the change from manual to dial operation in the telephone industry was conducted by the Women's Bureau of the United States Department of Labor, Bulletin 110, printed in 1933, covering a period in 1930 and 1931.

This study indicates that the industry attempts to cushion these dial conversions by giving only temporary or occasional work to operators before these cut-overs. However, on page 6 of the above study, the

following disposition of the 534 operators on the pay roll just before the cut-over was as follows:

	Regular employees	Temporary and occasional
Total before cut-over.....	312	222
Retained.....	253	7
Transferred.....	37	94
Resigned.....	18	9
Laid off.....	4	113

This study was conducted in a manufacturing community with a population of nearly 200,000.

Mr. HINRICHS. What is the distinction between regular and the temporary workers as you used the terms here?

Mr. GRIFFITH. A temporary employee in the traffic department is one who is specifically hired for a certain period. They tell her when they employ her that her period of employment is to a certain date—June 6, 1942, or some particular date, after which it is uncertain. So when she takes that job she understands thoroughly that it is a temporary job. However, if they do have need, and they usually do, of at least a few of those temporary girls, they take the best of them—naturally they would—and assign them permanently, after which they are subject to the rules and regulations of a permanent employee and not a temporary employee.

Mr. HINRICHS. For how long a period are temporary appointments made?

Mr. GRIFFITH. Up to 2 years or so.

Mr. O'CONNELL. According to these figures, about 40 percent of the total working force before the cut-over were classified as temporary and occasional.

Mr. GRIFFITH. When they decide when a certain area is to be converted—of course the factors involved in their decision are the changes in the neighborhood, degree of obsolescence of equipment, and all that sort of thing—beginning then all the girls that they hire are hired on this temporary basis.

Dr. ANDERSON. Well, speaking to that point, you undoubtedly heard the testimony given by Miss Rose Sullivan yesterday afternoon—

Mr. GRIFFITH (interposing). Yes.

Dr. ANDERSON. And to refresh your memory with respect to the particular study you are now reviewing, I will read you a portion of it:

All the employees for about 3 years before the cut-over were hired on a temporary basis, and so were automatically out when no longer needed.

Does your knowledge of this particular study come to the same conclusion as the table you have inserted in the record, that temporary employees were hired for about 3 years prior to the cut-over?

Mr. GRIFFITH. Well, perhaps it would be 3 years in some cases. I said 2 years; 2 or 3 years. They are hired, however, with that understanding that they are temporary employees. There is no doubt about that whatsoever.

Mr. HINRICHS. Now, is that practice of hiring temporary employees used after the station has been converted? Is it usual today in a dial station to hire workers on a temporary basis?

Mr. GRIFFITH. Oh, no; a temporary basis is concluded when the area is converted, when the conversion is complete, on a certain specific date. We know that as long as 18 months or 2 years in advance. I worked on dial conversion projects myself. The exact day and hour of the conversion is known 18 months or 2 years in advance.

Mr. HINRICHS. So that the temporary hiring is, as far as you know, used only in connection with the conversion of stations?

Mr. GRIFFITH. That is correct, and I am quite positive that they have not deviated from that. If they had, it would have been called to my attention by our operator union employees.

Dr. ANDERSON. So as to have it very clear in the record, it is not a general policy of the A. T. & T. Co., to hire new employees on a temporary basis?

Mr. GRIFFITH. Only when there is a conversion in the picture. That is the only time.

Dr. ANDERSON. Otherwise all new employees are hired as regular employees.

Mr. GRIFFITH. That is right, subject to the regulations going with regular employment. I might add that this method is meeting with favor among our operators. They prefer that the steady older employee who desires to remain in that employment as long as she is of working age, do so; they prefer that any changes in employment be among these newer people who have been hired on a temporary basis. Many of these people hired on a temporary basis are former employees who have gotten married and for one reason or another want a job, the husband is out of work, or ill, and they desire temporary or part-time work; often they wouldn't accept steady employment. What they want in many cases is temporary work only.

Mr. HINRICHS. But it isn't your contention that the system of hiring temporaries is undesirable; you are merely introducing the picture in order to show the change in total employment; isn't that right?

Mr. GRIFFITH. That is right; I am just trying to tell you what is done and what our people think about it.

Mr. HINRICHS. From the point of view of the individual or individuals, some of whom in any event are going to be laid off, it is better to have an advance notice of that fact than to go in ignorance of it until the last minute.

Mr. GRIFFITH. That is right. Our telephone people are not experts in economics and all that sort of thing; they think it is fine they can secure part-time employment, and those regularly employed think it is equally fine that if there is due to be a decrease in the force it should be handled in that way. We don't say that it is the right over-all economic picture. We are not talking about that. Our people don't know anything about economics except as it affects themselves.

POLICIES OF UNIONS IN A. T. & T.

Dr. ANDERSON. With respect to the negotiations that you and your unions carry on, do you make a distinction between regular and temporary employees?

Mr. GRIFFITH. Regular and occasional employees?

Dr. ANDERSON. Temporary and occasional.

Mr. GRIFFITH. Absolutely.

Dr. ANDERSON. In other words, you carry two types of employees in your record.

Mr. GRIFFITH. Yes, sir.

Dr. ANDERSON. Are other distinctions made in union practices with respect to these two groups? In negotiating, what do you do? Do you lump them all together as a single group or carry them as distinct groups?

Mr. GRIFFITH. In negotiating for wage increases they are treated as regular employees. For example, if they have 2 years' service with the company, they receive progression schedules that go with that employment. They would get perhaps 3 increases during that period, the same as if they were scheduled to become regular employees.

Dr. ANDERSON. As regular employees in your negotiations, do they then begin to regard their temporary status as something that no longer holds, and do they make demands upon the union to see to it that they are carried on the employment rolls?

Mr. GRIFFITH. Those who are hired for a definite period have no comeback if they are not retained, and we have received no general complaints. If they are retained, however, we insist that they be treated as regular employees.

Dr. ANDERSON. You mean they are given a terminal date for employment when they are hired?

Mr. GRIFFITH. Oh, yes, yes.

Dr. ANDERSON. When they are hired an indication is made that within 3 years they will be severed, for instance, from employment?

Mr. GRIFFITH. At least in some cases the employer mentions a certain date, the day of the month.

Dr. ANDERSON. In all cases?

Mr. GRIFFITH. I can't say what they do all over the United States, of course, but I don't believe there has been very much deviation from that, at least in serious proportions, or it probably would have been called to our attention.

Mr. PIKE. When they are transferred from temporary status to permanent status, you see that they get their seniority back?

Mr. GRIFFITH. They get it. That has all been taken care of a long time ago, and it is carried right on through automatically.

Mr. PIKE. This isn't like a company I watched work for a while that gave a 50-year medal to an employee, and found he was still carried on the rolls as a temporary mill clerk?

Mr. GRIFFITH. Things like that do occur even in the best-regulated families. I recall that we had a janitress in Chicago—at that time I represented those people also—and this lady became sick for the first time in her 15 years of employment with the company. When she failed to receive her check for sick benefits we looked into it and found she was carried as a temporary employee.

Mr. PIKE. That was just an oversight.

Mr. GRIFFITH. That is right; and their faces were rather red. It was taken care of very speedily, as soon as we called it to their attention.

Mr. MAGINNIS. Mr. Griffith, is your union an A. F. of L. or a C. I. O. union?

Mr. GRIFFITH. It is neither. I might add that we insist on independent status and we are patterning our organizations after the well-known railroad brotherhoods, attempting to function as they have functioned so well.

Mr. MAGINNIS. How long has your union been in existence?

Mr. GRIFFITH. Our national federation, as a federation, has been in existence since June 1939. Of course, many of the component parts of it have been in existence for longer periods.

Dr. ANDERSON. Mr. Griffith, on that point, you may want to comment on the rumor or statement which many of us have heard to the effect that your federation amounts to a federation of company unions of the Bell System.

Mr. GRIFFITH. I have heard that a few times, you might imagine, myself, and I know exactly the feelings of your committee in that regard. Some of our organizations were company unions. They have been entirely reorganized and the other organizations done away with completely. Our present organizations live up to all provisions of the regulations, cross every "t" and dot every "i."

I will challenge any other labor organization to show halfway as clean a record as ours since 1935. To understand the labor situation in the telephone industry, you have to know something about the industry, you have to know something about the people in the industry. Other organizations have done wonderful work in their lines of work. They have no understanding of the people in the telephone industry or other utilities where there is a service element attached to it, that spirit of service. It might be amazing to this committee to know that in the old days before service was at the present high standard, if there was a storm during the night the telephone man would get up and go to work and get there at 3 or 4 o'clock in the morning. Nobody called him, nobody asked him to do that; he didn't get any extra pay for it. After the practice of overtime payment was instituted, the company had difficulty getting some of the men to accept. They figured it was just part of the job to do the work. It is an astonishing thing; you people should have an understanding of that. If any of you have ever been a salesman you know that you cannot use the same selling methods to all people. If you go to sell a life-insurance policy to a teamster you don't use the same tactics that you do to sell to a college professor. The same way with our people, that is why our federation is successful. We know our people. Other organizations have been unsuccessful insofar as the telephone industry is concerned. It is my opinion that our organization will continue to increase in prestige and effectiveness, as we have already done to a certain extent. In the future it will increase and we will be able to work side by side with these other labor organizations for the common good of all people at work. That is our aim. Some unions already work with us in that light in some locations in some parts of the country, and others do not. It hurts our pride a little bit, of course, to have people refer to us as company unions all the time, and to hear witnesses in these hearings state that our industry is not organized, but take it from me, it is. We have got the members; they haven't.

I hate to chide the committee in any way, it is presumptuous, of course, but it is noteworthy that nobody asked the other witness how many members they had in the industry.

Mr. PIKE. How many have they?

Mr. GRIFFITH. If you can get them to tell you, you will be very good. It is my guess that it is something less than 3,000.

Mr. PIKE. You have 115,000?

Mr. GRIFFITH. We have 110,000.

Mr. O'CONNELL. How many people are there in the industry?

Mr. GRIFFITH. Organized into independent unions at the present time, we estimate there are 225,000. We have another 100,000 yet to go.

Mr. O'CONNELL. Do you mean all workers in the industry?

Mr. GRIFFITH. That is right; nonsupervisory. That is another distinction we draw that other labor organizations do not; we want only the people that work, not the supervisors, foremen, general foremen, chief operators, and what not that the other organizations want. We believe that a labor organization cannot function properly if the members of the management are a part of that organization. We insist, therefore, that they not be members of any one of our member organizations.

Mr. O'CONNELL. Does your union operate under what is known generally as the industrial basis?

Mr. GRIFFITH. Industrial. We represent everybody in all departments, all branches of the industry, and our member organizations likewise.

EMPLOYEE POLICIES IN THE BELL SYSTEM

Mr. GRIFFITH. Practically no unskilled labor is utilized by the telephone industry. Many of the phases of telephone work are highly specialized, with no comparable work being performed elsewhere in industry. It is common knowledge among telephone people that unemployed telephone workers, particularly male employees, usually find it necessary to begin anew in a different and often semiskilled line of work at a sharply reduced income.

The A. T. & T. and associated companies have made some use of the separation allowance to reduce the adverse effect of lay-off on the displaced employee. It is not believed that any standard practice has been agreed upon in this regard. In general, however, the worker dismissed due to lack of work is given his regular vacation allowance plus 1 week's wages for each year of service up to 10 years, and 2 weeks' wages for each year of service in excess of 10 years.

In the operating companies the separation allowance is, at times, offered to operators on a voluntary basis as an incentive to resignation. In contrast to this, however, the Western Electric manufacturing and installation branches have in the past used the separation allowance as a means of keeping a supply of skilled workers available in case an increase in business justified their reemployment.

In Mr. Gifford's 1939 report to the stockholders, he states that the Western Electric Co. has made an initial appropriation of \$1,045,000 for an employment stabilization reserve, which the company hopes will become a real help in dealing with its employment conditions, which are fundamentally less stable than those of telephone operating companies. The method of utilizing this fund is not known.

This review of the effect of technological advance on employment in the telephone industry would be incomplete if we failed to mention the feeling on the part of the great majority of the rank and file of the telephone workers, especially of the Bell System employees, a majority of whom we represent, that they are not receiving an equitable share of the profits from the business. We direct your attention to the loss of many thousands of telephone jobs during the last depression without reduction of the \$9 dividend paid to the stockholder by the A. T. & T. Co.

As an immediate and temporary expedient in order to spread employment, we advocate the adoption of a shorter workday and work-week without reduction in wages paid for the telephone industry.

Employment conditions in the Bell System, which include vacations with pay up to 3 weeks for 15 years of service, a sickness benefit and pension plan, generally safe and pleasant working conditions, vocational general training programs, pay-roll deduction to provide for payment of life insurance, hospitalization premiums, and purchase of U. S. savings bonds, are highly regarded by the workers.

The average telephone worker, while affiliating, or retaining his independent right to affiliate, with a union of his own choosing, nevertheless exhibits a well-known and profound interest in rendering service of the highest type to the public at all times.

For many years in practically every section of the Nation, telephone workers have been welding themselves by democratic process into independent labor organizations of ever-increasing strength and effectiveness. This movement was greatly accelerated by the passage of the National Labor Relations Act by Congress on June 19, 1934, and the subsequent amendment of this law on July 5, 1935, to bar assistance of any kind by an employer to a labor organization of his employees. It is estimated that today there is a total of 225,000 members of independent labor unions in the Bell System alone.

As the organized telephone worker began to appraise his situation he became aware of the existence of problems—national problems—which transcended State lines and eluded any attempt at solution by his individual organization. In addition, there developed an appreciation and desire for the inspiration and guidance that is to be gained from a close contact with the many thousands of other telephone people throughout the country.

On June 5, 1939, the National Federation of Telephone Workers, with a membership of approximately 110,000 of Bell System workers, was organized at New York City.

Virtually all of the National Federation of Telephone Workers affiliates have collective bargaining contracts with the operating companies by whom their members are employed. The membership of the National Federation is not confined to Bell System workers. A copy of the official proceedings of the constitutional convention and fourth national assembly of National Federation of Telephone Workers held in New York City, June 5-9, 1939, has been turned over to the counsel of your committee. From this may be obtained a general knowledge of the aims and objectives of the organization and its constitutional structure.

The National Federation of Telephone Workers is the only labor organization, national in scope, which represents any appreciable

number of Bell System workers, and is either authorized or qualified to speak for them.

Incidentally, Mr. Chairman, every telephone man in your great State is a member of our organization.

The CHAIRMAN. We have got a lot of fine telephone men out there.

Mr. GRIFFITH. That is right. Do you think the cowboys you know out there could be coerced in any way by the management or anybody else?

The CHAIRMAN. I doubt it.

Mr. GRIFFITH. The Senator says he doubts it. We would like to have you, along with Senator King and Senator Thomas, attend part of our meeting at Salt Lake City in June if it is convenient to you, Senator.

The CHAIRMAN. Well, I appreciate the invitation. We may not be out there by then.

Mr. GRIFFITH. We believe we have furnished you with the main outlines of the problems associated with technological advances and employment in the principal section of the telephone industry. It is our hope that in so doing we have been of service to the committee.

That concludes my regular report, and I have a few remarks that, if it is agreeable with the committee, I would like to add.

Mr. CHANTLAND. May I ask a question before you go to your general remarks? You say there are 225,000 members of independent labor unions in the Bell System, and that your federation represents 110,000.

Mr. GRIFFITH. That is correct.

Mr. CHANTLAND. And it is the only one of size. What is the situation as to the other 115,000?

Mr. GRIFFITH. The others belong to independent organizations now, similar in their organization to those that comprise our National.

Mr. CHANTLAND. You mean they are what might be called locals?

Mr. GRIFFITH. That is right, organizations in their own territory. Incidentally, we have only been officially organized since last June, and from that period to now we feel we have done quite well to get 110,000. We think we will have that other 115,000 shortly.

Mr. CHANTLAND. Are any of the 115,000 outside your Federation, besides the ones that Miss Sullivan represented, so far as you know affiliated with the two older, larger labor organizations?

Mr. GRIFFITH. They are.

Mr. CHANTLAND. How many in number?

Mr. GRIFFITH. Those A. F. of L. contracts are of long, long standing, nothing recent. In the city of Chicago we have 400 installers who install equipment in Cook County. That contract has been in effect since 1910—400 American Federation of Labor installers. They are employees of the Illinois Bell Telephone Co., the same as anyone else, and subject to all benefits, but they carry cards in the American Federation of Labor.

Mr. CHANTLAND. Can you give a judgment of the total number of people out of this 115,000 that are so affiliated?

Mr. GRIFFITH. Four hundred in the city of Chicago and the plant workers in the State of Montana. I am sorry I can't tell you how many plant workers there are in the State of Montana, but that is a rather sparsely populated State and there wouldn't be so very many.

That also is a condition of long, long standing. Our people work with these people in complete harmony.

Mr. CHANTLAND. You left out the number Miss Sullivan had.

Mr. GRIFFITH. You are right. In addition to the 400 installers in Chicago and the plant men in the State of Montana, the American Federation will have some members in some exchanges in the New England territory. There are two organizations in that territory—the Telephone Operators' Federation and this American Federation of Labor affiliate that Miss Sullivan represents.

Mr. CHANTLAND. From what you say, then, would it be correct to say that less than 5,000 all told are thus affiliated?

Mr. GRIFFITH. It is my impression that 5,000 would be quite a safe figure on the high side.

Mr. CHANTLAND. Thank you.

Mr. O'CONNELL. You say 225,000 workers. Do you mean that is the total of the workers in the industry, or the number of workers in the industry who are affiliated with some labor organization?

Mr. GRIFFITH. That is correct, affiliated with some labor organization.

Mr. O'CONNELL. How many workers are there in the industry, organized or unorganized?

Mr. GRIFFITH. There must be pretty close to 300,000 in the Bell System who are not supervisors, 275,000 or 280,000 anyway. It is very difficult, of course, to pick out just exactly how many.

Mr. O'CONNELL. When you speak of the industry you mean a broader classification than the A. T. & T. system?

Mr. GRIFFITH. That is correct, because there are numerous independent companies, some of which are of quite large size.

Mr. O'CONNELL. There are no more than 300,000 workers in the total industry?

Mr. GRIFFITH. Counting the independent workers, it would run decidedly more than 300,000.

Mr. PIKE. There are about 4,000,000 non-Bell telephone stations?

Mr. GRIFFITH. That is correct. Almost 17,000,000 are operated by the telephone company, and the balance, up to almost 21,000,000 are operated by the independent systems.

Mr. O'CONNELL. What I was trying to get at was the extent to which the industry is organized one way or another.

Mr. GRIFFITH. The figures are very fragmentary with regard to the independent employees because there is such a vast number of companies and some of them are more or less on a part-time basis. Some of the central-office exchanges of the small independent concerns might be in the bedroom of a man's residence. His wife might be the operator, and this man might be a farmer, for example, who would do the repair work on Sunday afternoon or in the evenings. It is very difficult to secure figures on all that, and, needless to say, when there is a two-man telephone company like that they do not belong to any labor organization of any character whatsoever. They own the company, or most of them do.

There are, of course, a number of larger independent companies with thousands of employees and lots of companies of varying size in between, and it is my impression that the A. F. of L. has had some of the operators in some of those companies. I heard of one such

company where they had 20 operators that belonged to the A. F. of L. Those figures are fragmentary and concise, exact figures put out by the statistics department of the A. F. of L. have never been called to my attention.

SEPARATION PAY

Dr. ANDERSON. Mr. Griffith, may I refer again to the separation allowance which you discussed, because it has been a point of controversy in these hearings with Mr. Harrison's statement of the morning and a contradictory statement in the afternoon by Miss Sullivan. You have taken a somewhat in-between position when you say the A. T. & T. associated companies have made some use of the separation allowance. When effecting or negotiating a contract with the A. T. & T. is that one of the specific points in your contract?

Mr. GRIFFITH. No, sir; we have never been able to pin them down to any guaranty as to separation allowance.

Dr. ANDERSON. Do you have a copy of the kind of contract that you attempt to get with the A. T. & T. with you?

Mr. GRIFFITH. I do not. I didn't bring any contracts.

Dr. ANDERSON. Would it be possible to supply the committee with negotiation contracts? Are they public documents?

Mr. GRIFFITH. I could probably secure them for you. I don't have them here. I can have them sent to our Washington representative and he in turn would give them to you.

Dr. ANDERSON. When you said they have made some use of the separation allowance, you have no specific figures as to the proportion of workers covered by a separation allowance?

Mr. GRIFFITH. That is correct. In general I think they use it even in the case of very small lay-offs or perhaps a discharge for cause. I have even heard of their giving a separation allowance of a few weeks' pay, plus a vacation, if they are eligible for any vacation in the service that they have. I have heard no complaint in that regard. They are liberal in their interpretation as to the vacation allowances to which a discharged person is entitled.

Dr. ANDERSON. You also discussed briefly the Western Electric Co. employment stabilization reserve fund of a million dollars. Is that only in the Western Electric Co.?

Mr. GRIFFITH. That is correct; only in the Western Electric Co. That is where the worst shock of the depression was felt by the employees of the Bell System. It was a very, very disheartening spectacle to walk through the great Hawthorne manufacturing plant of late years and recall how it was when I was employed there myself.

Dr. ANDERSON. You go on to say that the method of utilizing this fund is not known.

Mr. GRIFFITH. That is correct.

Dr. ANDERSON. Have you sought to find out the specific method that the company uses in applying the fund?

Mr. GRIFFITH. No; we have not. We did not know of its existence until we saw it in the bulletins issued by the system.

Dr. ANDERSON. You had no part in the negotiation of such a fund?

Mr. GRIFFITH. None whatsoever. Of course, there has been a lot of discussion in regard to the general phases of this unemployment condition throughout, and it is just a recognition on the part of the

company that they are taking some steps to quiet this feeling of unrest.

Dr. ANDERSON. But there is no such fund to cover A. T. & T. operators?

Mr. GRIFFITH. That is correct. Any separation allowance that is given by the operating company, so far as I know, they merely take out of their own funds. How they account for it in the bookkeeping end I couldn't say.

Mr. HENRICHs. Pardon me; Mr. Anderson used two phrases—one the terms that you had tried to secure or wished to secure in contracts and the other the copies of contracts now in existence. Are those two synonymous, or would you wish to distinguish between the contracts that you are going to submit and the terms that you would like to see?

Mr. GRIFFITH. The features that we hope to secure in some of our contracts we do not now have. After all, the contracts that we do have, the agreements that we do have, are something that some other organizations were unable to get in many, many more years than we have had months.

Mr. HENRICHs. Is it your feeling, Mr. Griffith, that this problem of technological displacement is one which should primarily be handled by negotiations between a union representing the workers and the employers in the industry, or is it a field in which legislation is needed?

Mr. GRIFFITH. Our people are very independent in their thinking, and they would not ask for aid from the legislative bodies unless they felt that bargaining was breaking down. It may be the answer in the ultimate. As I say, our people are not economic experts. They don't look at these things the way you people do, of course. They are looking at how these things and these changes affect them. I might add they do not take the view that of course this committee would, that each industry has a certain duty to keep a certain number of people employed. Our people by and large do not go for that view. We take the viewpoint—when I say "we" I mean all our people—that as the stagecoach departed and as the pony express departed, and a lot of things like that, our industry will likewise change, and we as employees can't keep it from doing that. However, as representatives of these people we feel that they should be given important consideration in bringing these changes into effect. That is our view. We are not fighting the change, if such a change is beneficial to the public. Our company maintains that they have three factors to consider: the public, the owner, the employee. We would just change that around a little bit: The public, the employee and the owner.

That is the view of our people in regard to the consideration that is given. It has been brought out many times here in previous testimony, and the companies have put it out in their publicity. Mr. Harrison himself here repeated also that a higher degree of skill now is needed on the part of the telephone workers—that the need for skill is ever increasing. Well, if you tell our people that, they naturally are going to believe it, and want wages and salary commensurate with that increase in skill. That is what we are going to have.

Dr. ANDERSON. Mr. Griffith, as the federation representative, do you seek at some future date to negotiate on a national basis with a single entity called the A. T. & T.?

Mr. GRIFFITH. We expect in the future to deal with the American Telephone & Telegraph Co. and also the heads of independent companies on two bases, we might say: first, we see no reason why we couldn't act as an appeal agent to them or to a subsidiary company head in the event one of our member organizations feels that they are not getting anywhere with their local people. That would be the first basis that we would seek to contact the A. T. & T. Co. on, and the second would be on general problems, on which the master minding comes from the American Telephone & Telegraph Co. in the first place. In fact if we wanted to negotiate for changes in the pension or benefit plans, as all the companies have the same plans, the representatives of all the subsidiary companies would have to agree to any change. Those changes, and a lot of other changes, are coordinated, I will say that, at least, coordinated at 195 Broadway, the headquarters of the American Telephone & Telegraph Co. Obviously, we would save a lot of time if we dealt there in the first place, and that is what we plan to do.

The CHAIRMAN. That is what you plan to do?

Mr. GRIFFITH. Yes, sir.

The CHAIRMAN. I suppose the fact that the telephone company has one central office for the entire country is one of the reasons why you deem it necessary to have one central office for all of the workers in your union?

Mr. GRIFFITH. That is correct, Senator. We think that the A. T. & T. Co. seems to have been a fairly successful corporation, and if it is profitable to them and of benefit to the public to coordinate their affairs in one central location, by a similar line of reasoning we should also do the same thing.

The CHAIRMAN. In other words, the telephone business is evidently a national business?

Mr. GRIFFITH. That is correct.

The CHAIRMAN. Operated from a national headquarters?

Mr. GRIFFITH. That is, the major portion of it is.

The CHAIRMAN. The final authority rests in the national headquarters, doesn't it?

Mr. GRIFFITH. They own the business, and naturally they have the final authority, no matter how they soft-pedal it.

The CHAIRMAN. There are regions all through the United States and subsidiary companies, are there not?

Mr. GRIFFITH. Yes, sir.

The CHAIRMAN. Those regions and subsidiary companies are established without regard to the geographical boundaries of States, are they not?

Mr. GRIFFITH. Many of the companies do follow State boundaries. The Illinois Bell Telephone Co. follows the boundaries.

The CHAIRMAN. Many of them do; they don't all.

Mr. GRIFFITH. They often follow natural boundaries, such as a river. In your neighborhood, the boundary between the Pacific Co. and Mountain States Co. follows the Snake River up there in Idaho.

The CHAIRMAN. That is a mighty fine river to travel on, too. I will put in a plug for the summer attractiveness.

Mr. GRIFFITH. That is great country out there, Senator; I agree with you.

The CHAIRMAN. And then, of course, there is the North Platte River in Wyoming, of which it is said that it is a mile wide and an inch deep, and flows uphill.

Mr. GRIFFITH. Sometimes it is different, though. In 1921 I saw it a little different than that.

The CHAIRMAN. Seriously speaking, these regions of operation are not identified with the States?

Mr. GRIFFITH. They are not.

The CHAIRMAN. As a rule. And I suppose that in your operation you pay very little attention to State lines?

Mr. GRIFFITH. That is correct. We follow whatever method appears to be the most efficient and the best. We may change them from time to time.

The CHAIRMAN. So here you have a big national business upon the one hand, and a big national union upon the other?

Mr. GRIFFITH. That is correct.

Mr. MAGINNIS. May I ask, Mr. Griffith, your impression of Dr. Anderson's question along the line as to whether your federation doesn't look forward, perhaps in the not very distant future, to the time when the A. T. & T. will have taken in all of the independents?

Mr. GRIFFITH. Well, it doesn't look to me as though they are going to take in all the independents.

Mr. MAGINNIS. You don't think that is inevitable?

Mr. GRIFFITH. I gather that the Federal Communications Commission—it is also my impression from statements issued by President Roosevelt that he would be more or less in favor of that, but here is the hitch to that. I can tell you as an engineer. It would cost an awful lot of money because much of the equipment that the independent companies have is not Bell standard by any manner of means, and it would certainly be a huge undertaking to bring all the telephone service of the United States up to Bell standards.

Dr. ANDERSON. But, Mr. Griffith, referring to your table on the number of carriers,¹ there has been a constant trend of mergers, as you indicated in your testimony, so that in 1928 we had 140 different companies operating, and in 1938, only 73.

Mr. GRIFFITH. That is correct. It is my impression, however—it might be interesting to check into it further—that the General Telephone Corporation and others are themselves getting larger. It is my recollection that there are 6 major telephone systems in this country, out of the six-thousand-odd companies, in addition to the Bell Telephone Co.; a total of 7 that are of any size at all.

UNION ATTITUDE TOWARD MECHANIZATION

Dr. ANDERSON. You didn't mention specifically whether your union would oppose the cut-over from manual to dial telephones, as Miss Sullivan indicated yesterday that her organization did.

Mr. GRIFFITH. I could comment on that, doctor, from two viewpoints: first, the unions; and second, my own private opinion as an engineer, and a man who has worked in dial equipment the major part of my term of employment. Regardless of our other views, I will

¹ See "Exhibit No. 2579," appendix, p. 17408.

agree with Miss Sullivan to the extent that the dial system is inevitable. Independent companies installed dial equipment a long time before the Bell System did.

Some of the types of dial equipment that they used were a rather queer looking piece of apparatus, obviously entirely unsuited to any except very small neighborhoods, and it seems, therefore, that the Bell System didn't choose to begin dial until they had some equipment that would be usable and proper anywhere. I saw one installation of dial equipment in a small town in Indiana one time where every single solitary number that could be reached was on the dial. The only way they could get more telephones would be to have a bigger dial, and you had to use a needle to do your dialing. That equipment was installed and in use 35 or 40 years ago.

It seems to me it would have been foolish for the Bell System to go to dial on such a proposition as that. Our people, as I said before, are resigned to the inevitable so far as dial is concerned, and they are concerned that the change shall be on a very gradual basis in order that employment may not be disturbed and that the change-over will not have any detrimental effect on them as a whole. After all, there are a lot of people retiring every year, and people die every year.

The CHAIRMAN. There isn't any dispute about the central fact in all this testimony; namely, that by reason of the technological advance, the telephone company can and does give greater and better service with fewer employees.

Mr. GRIFFITH. That is absolutely correct.

The CHAIRMAN. It is also true that you and Miss Sullivan, speaking for the unions, declare that you do not wish to be understood as opposing technological advances, though Miss Sullivan believes that the dial system does not have values of sufficient degree to justify its full use. Now, what suggestion, what positive suggestion, do you make as a solution of this situation, as a curative agent of the fact which nobody denies, that employment is falling off?

Mr. GRIFFITH. Well, we have a couple of suggestions, one of which I included in my observations here that I had permission to read.

The CHAIRMAN. I just wanted you to summarize it. Just mention it briefly and any others that you may have.

Mr. GRIFFITH. This matter of separation allowance and other things of similar character would figure in our opinions in that regard. I think that any labor organization would be foolish, indeed, to fight anything that was a benefit to the large mass of people, and you might say a blessing to humanity.

The CHAIRMAN. But a separation allowance, obviously, provides only temporary relief and gives the displaced worker a certain period, according to the length of time to which it is made to apply, to look for another job.

Mr. GRIFFITH. That is correct.

The CHAIRMAN. But the story that is told to us is that this phenomenon appears in every industry, at least in those industries which are operating on a large scale. We had Mr. Hook here speaking for one part of the steel industry, and he acknowledged that there is such a thing as technological displacement. We have had spokesmen for the railroads here—Mr. Parmelee, head of the Bureau of Railway Economics, gave us at length descriptions of machines which take the place of men, and the production on the railroads, just like

the production on the telephone system, has been increased with fewer employees.

And so one could go from one industry to another, particularly to those industries which are affected by technological advance, and while it must be acknowledged that new industries are constantly being created by invention, nevertheless the unemployment problem remains because the workers who are displaced in the most instances are those who have been trained in the particular line, like your telephone operator, like the rolling-mill worker, like the track layer on the railroads who, when they reach a given age of 40 or 45, are unable to adapt themselves to any other employment.

Now those are the persons, from the human point of view, that society and industry must take care of. They are not taken care of except temporarily by your displacement allowance. Do you have any other suggestions?

Mr. GRIFFITH. The answer, in my opinion, Senator, is we have to have more business. Although the telephone companies are aggressively promoting sales, I don't think that they have anywhere near reached the point of increasing the sales that are possible. I think that would be their contribution to the matter, to try to get more business. There are many people who don't have telephones. Many people who do have them don't have enough. The business could be increased enormously. I see no saturation point in years and years.

The CHAIRMAN. But new business cannot be secured, can it, unless the masses of the people are able to pay for it?

Mr. GRIFFITH. That is correct.

The CHAIRMAN. Mr. Ford, of the Ford Motor Co., testified to us with respect to the growth of the motorcar industry. He was an ideal witness because he represented the company which was the pioneer in the field of mass production, and he showed that the market for the Ford car was opened when the Ford price was reduced to such a level that it became possible for persons who had been unable to buy high-priced cars to buy the cars that the Ford Co. was making. So it becomes necessary, does it not, to open up a new market by increasing the capacity of the people to buy?

Mr. GRIFFITH. That is correct; but here's where the rub comes, Senator, in the case of a utility. Once the price is set it is very difficult to increase it. Therefore it might be most interesting—

The CHAIRMAN (interposing). You mean to decrease—

Mr. GRIFFITH. An experiment might be made, say in a certain community, of making a drastic cut in their rates just to see what would happen, providing, of course, that it was strictly understood that it was merely an experiment. It might be advisable to reduce rates to see if they could make more money, as much money as they did before, and at the same time have more equipment in use and more people employed. That would be following the tactics of the Ford Motor Co. As I understand it, they have more people employed than they did before, even though they use these technological methods.

The CHAIRMAN. Perhaps if it is a good thing for business to reduce price in order to promote distribution, it might also be a good thing for Government to reduce taxes as a stimulus to business in reducing prices.

Mr. GRIFFITH. I expect that would be received with considerable favor by most telephone utilities. They make much of their tax bill in their annual reports, figuring out how much they are per employee, and it reaches an enormous figure per employee that they pay out in taxes for various governments.

The CHAIRMAN. If a reduction of taxes could be accomplished by some effective method of preventing the acknowledged abuses in business which have resulted in the past in holding up prices, and in concentrating control, perhaps everybody, including the Government, would benefit from that method.

Mr. GRIFFITH. You might have something there, Senator.

The CHAIRMAN. I think I have.

Mr. GRIFFITH. I have a few observations that won't take very long.

As I mentioned before, my training has been from the engineering standpoint, and therefore we have to throw figures around a little bit, and it is interesting to make contrasts of figures occasionally. Let's see what happens. You heard testimony yesterday as to the effect of the enlightened policy of the Bell System in retaining certain people in employment. They employed 387,023 people in 1929 and 285,550 in 1938—a decrease of 26 percent. People who are interested in playing around with figures might apply that same figure of 26 percent to the total employment in 1929, which was 36,000,000. You will find that if you do that you will get a considerably larger figure than the total unemployed that you now have.

I thought that was rather interesting.

SUGGESTIONS FOR CUSHIONING DISPLACEMENT

Mr. GRIFFITH. The National Labor Relations Act and the Fair Labor Standards Act contain specific guaranties designed to protect certain rights of labor. Through normal collective-bargaining procedures with industry some progress on this problem can inevitably be made. Nevertheless, industry, especially such as the telephone industry, which is affected with a "public interest," should assume a degree of public and social responsibility so that its employees should not have to pay for the introduction of technological methods and devices by the outright loss of their jobs.

A study of the telephone industry will reveal that it is a self-contained industry. Workers displaced by technological improvements do not have the opportunity at present, but they should be absorbed in the regular labor turn-over.

(Mr. O'Connell assumed the chair.)

Planning on the part of telephone management in advance of introducing technological improvements should include notice to displaced workers far enough ahead to permit this worker to attempt employment rehabilitation. The employer should go so far as to assume a social responsibility of vocational guidance and training.

We know that these observations are not necessarily new or offer a solution, but we know they are at least an advance over present conditions in our industry.

The railway brotherhoods have had agreements with certain railway carriers which, incidentally, are public utilities. These agreements provide for compensation to employees whenever they lose their jobs through consolidations or mergers of two or more carriers.

In brief, such displaced railway workers receive the equivalent of their last monthly pay for the period indicated, which was: 1 to 2 years, 6 months' pay; 2 and less than 3, 12 months'; 3 and less than 5, 18 months'; 5 and less than 10, 36 months'; 10 and less than 15, 48 months'; and 15 years and over, they receive 60 months' pay, or 5 years.

Mr. PIKE. Where is this, Mr. Griffith?

Mr. GRIFFITH. In certain railway brotherhoods—agreements with some of the railroad carriers.

Provided such displaced employees did secure reemployment elsewhere at less than the above equivalent before the time expired, then he received the difference from the railroad carrier.

In a United States Supreme Court decision, No. 343, October term, 1939, the *United States and the Interstate Commerce Commission, appellants, v. Frank O. Lowden, James E. Gorman, and Joseph B. Fleming, as trustees of the Chicago, Rock Island & Pacific Railway Co., and so forth*, decided December 4, 1939, there is a further point of interest which could also be made a partial solution to the technological displacement problem.

The question in this case concerned a railroad reorganization in which the trustees applied to the Interstate Commerce Commission for authority to lease another railroad and properties thereof to themselves (the trustees). The Commission found the rates, routes, and so forth, would result in no change to the public. They also found that the accounting office of the leased railroad could be eliminated, which would result in annual savings of \$100,000, which was to be effected through the ultimate dismissal of 49 accounting employees and the transfer of 20 others to the lessees' main offices. The Commission also found that the welfare of the employees affected by the elimination of the accounting office is one of the matters of "public interest" which the Commission must consider in the proceedings under section 5 (4) (B) of the I. C. C. Act as amended:

It accordingly authorized the lease upon the conditions which it found to be just and reasonable: that for a period not exceeding five years each retained employee should be compensated for any reduction in salary so long as he is unable, in the exercise of his seniority rights under existing rules and practices to obtain a position with compensation equal to his compensation at the date of the lease; that dismissed employees unable to obtain equivalent employment be paid partial compensation for the loss of their employment in specified amounts and for specified periods depending on the length of their service, and that the transferred employees be paid their traveling and moving expenses including losses incurred through being forced to sell their homes. The maximum cost of compliance with the conditions, it was found, would be \$290,000 spread over a period of five years, during which the savings effected by the lease would be not less than \$500,000. The Commission found that the proposed lease, with the specified conditions, "will be in harmony with and in furtherance of our plan for the consolidation of railroad properties and will promote the public interest."

A district court enjoined the Commission from enforcing its order, whereupon the case was appealed to the Supreme Court, which reversed the lower court and sustained the Commission, and said in part:

The fact that a bill has recently been introduced in Congress and approved by both its Houses, requiring as a matter of national railway transportation policy the protection of employees such as the Commission has given here, does not militate against this conclusion. Doubts which the Commission at one time entertained but later resolved in favor of its authority to impose the condi-

tions, were followed by the recommendation of the Committee of Six that fair and equitable arrangements for the protection of employees be "required." It was this recommendation which was embodied in the new legislation (S. Rept. No. 433, 76th Cong., 1st sess., p. 29). We think the only effect of this action was to give legislative emphasis to a policy and a practice already recognized by section 5 (4) (b) by making the practice mandatory instead of discretionary, as it had been under the earlier act.

This decision establishes a precedent and shows by judicial determination what congressional intent appears to mean in protecting displaced railroad workers under such conditions.

Possibly, if collective bargaining cannot secure fairer results, then corrective legislation may be the answer. We solicit your studies and action upon this great problem. We would actively participate in any movement to cooperate with industry to find an honest solution.

That concludes my remarks.

(Senator O'Mahoney, the chairman, now presiding.)

The CHAIRMAN. Thank you very much.

Do you have any concluding questions?

INTRODUCTION OF LETTERS RELATING TO INSURANCE HEARINGS

Mr. PIKE. Possibly, Mr. Chairman, I had better put in this material the first thing this afternoon, on a matter of the insurance.

The CHAIRMAN. If you care to put them in now it will be perfectly all right.

Mr. PIKE. If you remember, the committee authorized you to appoint a committee to examine certain letters which had been received from insurance agents, following which you appointed Mr. O'Connell, from the Treasury, and myself from Commerce, to look over these letters, of which there were about 2,000.

The CHAIRMAN. These 2,000 letters had been received by the S. E. C. in response to their inquiry, and then the committee delegated to this subcommittee, consisting of the two of you, the task of making a selection from that group, and you now have completed that selection.

Mr. PIKE. Yes, sir.

We went over the 2,000 letters and have selected—I might say the selection was done to a great extent independently. We didn't get together until after the selection was done, Mr. O'Connell and myself, and we selected 17 which we consider typical, and which we wish to present for the record, together with a copy of the Commission's circular letter to which these were replies. They have been selected without consulting representatives of the S. E. C., since it was our understanding that you wished it to be done entirely independently.

These letters are of very high average quality and show a good deal of thought on the part of the agent. There is also considerable uniformity among the replies in answering the questions which the Commission put. Most of them felt that agents should be better trained and more carefully selected. Most of them felt that part-time agents should be eliminated and that changes in method of compensation would be desirable, although there was disagreement. Most of them though they ought to get more. Most of the agents who expressed an opinion thought that there were many opportunities left for further sales, but there was some lack of balance between the number of agents selling and the size of the market.

It was frequently expressed that this lack of balance might be adjusted through the elimination of the unfit and unqualified agent. Most of these letters were certainly not from disgruntled older agents or agents who have some personal ax to grind. In general, they are constructive, reasoned replies from men who have unquestionably had some success in their field and who are proud of their position in the life-insurance business.

Now here is a point which I would like to have consideration for. Many of these agents requested that their replies be kept confidential, and on that basis there has been some editing of the letters in order that the name of the sender cannot be determined from the context. There has been, however, no chance in the substance. In looking these over I find that, in my opinion, further editing of names and places is desirable, and I would request that before they be made public, certain other eliminations of places and names be made.

The CHAIRMAN. You mean merely to strike out any indication that might identify the authors of the letters, since they have requested that their names not be made public.

Mr. PIKE. Yes, sir; so that there should be no possibility of the identification of the writer or the company for whom he works or where he is located.

The CHAIRMAN. The letters will be received for the record with that understanding.

(The documents referred to were marked "Exhibits Nos. 2587 to 2604" and are included in the appendix to Hearings, part 28, pp. 15634-15641.)

The CHAIRMAN. The committee will stand in recess until 2:30 this afternoon.

(Whereupon, at 12:50 p. m., a recess was taken until 2:30 p. m. of the same day.)

AFTERNOON SESSION

The hearing resumed at 2:40, at the expiration of the recess. Senator O'Mahoney, the chairman, presiding.

The CHAIRMAN. The committee will please come to order.

Dr. ANDERSON. Mr. Chairman, this afternoon's witness, winding up the testimony with respect to the electrical field, will be Mr. James B. Carey, general president of the United Electrical, Radio, and Machine Workers of America, and national secretary of the Congress of Industrial Organizations.

The CHAIRMAN. Do you solemnly swear that the testimony you shall give in this proceeding shall be the truth, the whole truth, and nothing but the truth, so help you God?

Mr. CAREY. I do.

TESTIMONY OF JAMES B. CAREY, GENERAL PRESIDENT OF THE UNITED ELECTRICAL, RADIO, AND MACHINE WORKERS OF AMERICA, AND NATIONAL SECRETARY OF THE CONGRESS OF INDUSTRIAL ORGANIZATIONS, WASHINGTON, D. C.

Mr. CAREY. I ask the committee's permission to enter in the record a statistical brief which I mention and discuss during my testimony.

The CHAIRMAN. That will be presented as an exhibit?

Dr. ANDERSON. It will be exhibit No. 2605.

The CHAIRMAN. Without objection, it is so ordered.

(The document referred to was marked "Exhibit No. 2605" and is included in the appendix on pp. 17412-17424.)

The CHAIRMAN. These figures all apply to your industry, the electrical and machine manufacturing industry?

Mr. CAREY. That is right.

The CHAIRMAN. And what is the source of the figures which you are presenting here as conclusions?

Mr. CAREY. The sources of the figures are all outlined in the statistical brief. This is just a summary of what is shown in that brief. We go into greater detail there, easily secured from the brief itself.

The CHAIRMAN. What is your full name?

Mr. CAREY. James B. Carey.

The CHAIRMAN. And what position do you occupy?

Mr. CAREY. The position of general president of the United Electrical, Radio, and Machine Workers of America.

The CHAIRMAN. How long have you held that position?

Mr. CAREY. I have held that position since the inception of the organization in 1936.

The CHAIRMAN. What is your own personal business?

Mr. CAREY. My own personal business, my trade, is in the radio manufacturing field.

The CHAIRMAN. How long have you been so engaged?

Mr. CAREY. I worked for 6 years at the Philco Co. in Philadelphia.

The CHAIRMAN. What was your training for that business?

Mr. CAREY. I attended Drexel Institute studying electrical engineering, and also attended the Wharton School of Finance in Pennsylvania.

The CHAIRMAN. Did you receive a degree from any of these institutions?

Mr. CAREY. No. I attended night school.

The CHAIRMAN. When did you complete your educational training?

Mr. CAREY. I completed the educational training while I was working in the plant, and engaged in labor-union activities about 1935.

The CHAIRMAN. How long have you been engaged in this trade?

Mr. CAREY. In the trade 6 years.

The CHAIRMAN. Six years all told?

Mr. CAREY. More than 6 years; 6 years for one company. I worked in radio previous to that for a short time.

Dr. ANDERSON. Mr. Carey, by way of an introduction, would you tell us just what your industry comprises? When you speak of these over-all figures, to what particular branches of the electrical industry do you refer?

Mr. CAREY. I suppose the best and simplest way is to name the companies and the products they manufacture. Our organization covers such companies as General Electric, Westinghouse, Allis-Chalmers, R. C. A., Philco, and all the other electrical manufacturing companies. They manufacture such products as generators, motors, some business-machine equipment. In the machine field it is the manufacture, of course, of consumer products such as refrigerators and radios, and all other electrical equipment of that type.

Dr. ANDERSON. I raised the question, Mr. Carey, to bring out the nature of the industries with which your organization deals.

Mr. CAREY. I am submitting to the committee a rather detailed statistical brief covering the important facts of technological change as it occurs in the electrical and machine manufacturing industry, an industry in which approximately two-thirds of all employees are working under the union contracts and collective-bargaining status of the United Electrical, Radio, and Machine Workers of America.

Because it is difficult to grasp complicated statistical pictures when presented verbally, and because the students who will make the best use of this material necessarily prefer to work from the documents themselves, I shall not attempt to handle this wealth of factual material at this time. Instead, I want to attempt to simplify the problem, to show the gist of the situation as I see it.

Let me first sum up, however, the factual points made in the statistical brief I am filing. We show the following things about our industry—and I will simply run over them rapidly so that you can get the general outline of the picture, which the brief will fill in in much greater detail.

EFFECT OF TECHNOLOGY IN THE ELECTRICAL INDUSTRY

Mr. CAREY. We show :

That technological improvement in our industry has been much more rapid than in industry generally.

That our industry has a special bearing on the question of technology, in that our industry is actually supplying an increasing amount of the very machinery by which *other* industries make their technological advances.

That the actual nature of this special type of machinery which aids technological advance in other industries is changing, so that *control* instruments make up an increasing percentage of the product, in contrast to mere recording instruments, which do not function as controls.

That because our industry is highly concentrated, both as to the geographical location of plants and as to ownership of principal plants, any technological improvement spreads throughout our industry very rapidly.

That in our industry, operations which formerly required a relatively large number of skilled workers are being broken down into smaller operations which achieve the same or better production results, but which require fewer skilled workers.

That as a result of the above, the ratio of skilled workers to all workers in our industry is rapidly falling.

That in our industry the increase in productivity per man-hour worked has been very great—so much so that we are confronted by the following facts:

1. Hours worked per week today are about 25 percent under 1929.
2. Employment is about 16 percent under 1929.
3. Productivity per man-hour in the heavy goods section of our industry is 32 percent above 1929, and 29 percent above so recent a year as 1937.
4. In radio, productivity is more than 100 percent higher than in 1929.
5. Defining productivity per man-hour in 1929 as 100 percent, we find that by 1939 it has risen to 137 percent.

6. The labor cost for each \$100 of value produced in 1939 was about 14 percent less than in 1937. In the radio section of the industry, the drop in labor cost since 1937 has been about 23 percent.

These are a few of the outstanding facts with which we are faced in the electrical and machine manufacturing industry, and which are generally characteristic (in different percentages, to be sure) of all industry.

All our studies, the studies of other workers in the field, and most important of all, the day-to-day practical experience of hundreds of thousands of employees and ex-employees in our industry, contribute to the emphasizing of this central fact:

That the benefits of the extraordinary technological improvement that has taken place in this country are unfairly divided, as among the men and women who do the work, the men and women who buy the goods, and the men and women who own the industry.

So great has been the technological change in our industry that it has been possible for the companies to agree in many cases to *increased* wages for *fewer* employees, to reduce the sales price of the product, and still have enough left over for substantial increases in profits.

In other words, the savings resulting from improvement in method and in machines are *so large* that a small fragment of the savings can be (and sometimes is) given in the form of slight increases in pay to those employees who *survive* technological displacement and another small fragment can be (and sometimes is) given to those consumers who *survive* the disaster of technological displacement; and after both these fragments have been dealt out, there is still enough left for maintained and, today, increased rates of profit.

The increases in wages, when there *are* increases—and this is by no means characteristic of all industry—do not begin to make up for the total decreases in wage money paid out.

Now, in the years preceding 1929, it could not be said that industry was doing an adequate job in matching product with purchasing power. Even in 1929, industry was turning out so much less in purchasing power than in product, that our economic machine clogged up and has remained clogged up ever since then. That was the case in 1929 and previous years, when product was substantially in excess of purchasing power.

So we can imagine how much more acute the crisis in the field of technological change has become today, when it is possible to turn out *still more* product while turning out *still less*, much less, purchasing power.

Let me refer again to our statistical study, to emphasize these points in another way.

Our industry can today produce the same amount of electrical machinery as was produced in 1929, with about *24 percent* fewer workers.

The radio division of our industry can today produce the same amount of radios as in 1929, with *only half* the number of employees.

And in the interval between 1929 and 1939, thanks largely to the activity of organized labor, hours of work per week were reduced in the industry. Indeed, if employees were today working the same number of hours they worked in 1929, then the crisis would be still more acute—for under such circumstances two-thirds of the number

of employees needed in 1929 could now produce the same amount of produce as was produced in that year.

When the situation is approached from another point of view, the same basic facts are italicized. When we relate our facts to the value of the product, we see that the labor cost for each \$100 value produced has declined, for the entire industry, about 15 percent from 1929 to 1939.

In our industry, and industry generally, it is today possible to turn out still more product while turning out still less in purchasing power.

This is the very issue, of course, on which the two main schools of economic thought are divided today.

What we call, and can call quite calmly, the "reactionary" school, says: "In order to match purchasing power and production, let us cut purchasing power still further and cut the amount of product accordingly." The other school, my school and, I believe, the obviously correct school, says: "In order to match purchasing power with product, let us increase the amount of product still further and increase the amount of purchasing power accordingly."

These two schools go by all sorts of names. A very descriptive phrase for the reactionary school is the "economy of *scarcity*" phrase; it emphasizes the fact that partisans of this school believe that the way to balance the total economic and productive budget is by slashing at the product in order to keep it within reasonable range of the purchasing power.

But the two schools of thought have sharply different effects on our Nation.

A school which bases itself on the need to pull product *down* to purchasing-power levels, rather than lifting purchasing power levels *up* to the amount of product we can produce, yields what a philosopher might call "incidental" results of a disastrous nature.

I will not call these side results "incidental" because they are the results that have put this Nation in a predicament where some 12,000,000 living human beings are out of work, and where at least half of those who do work get along on substandard scales of living conditions.

What it comes to is that by some perversity of thought and thinking, we have reached the point where the brilliant results of the finest managerial and scientific minds in the Nation are being used for the *rapid impoverishment* of the people.

That this impoverishment is a fact, no one of whatever school can deny. It is all around us, and there are not, I suppose, more than 300,000 persons in the United States who do not have direct, personal knowledge of this shocking impoverishment.

Let us not be deceived by the false notion that "machines are doing the work that men used to do." That is close to the truth, but not quite close enough, for machines without men cannot do any work.

So vast has been the output of method, procedure, and mechanics in this field, and so astounding are the results that it is easy to lose sight of the fact that machines are but *instruments* for the *multiplication* of manpower.

This point is obvious, when we consider the simpler machines. A hammer, for example, does not do any work. A hammer merely multiplies the effectiveness of the human being who uses it. A wheel-

barrow does not carry any bricks; it enables a living human being to carry more bricks than he could do otherwise; a wheelbarrow thus does not do the work, but multiplies the work-power of the man who uses it.

This situation is easy, as I say, to grasp in the cases of the hammer, the wheelbarrow, and perhaps in the cases of the simpler modern machines. So let us not lose sight of the fact that the same situation applies even in the most advanced instances. A giant machine, performing, as they say, "automatically" very complicated operations is not doing the work itself, but is enormously increasing the output of workers.

The brainpower that once had to stand at a machine and control it is now embodied, in some operations, in a punched card or roll which controls the operations. Gear ratios and cams, set once and for all by a human brain, vastly extend the power of such a human being. Thus, in the most advanced cases of technological change, as in the more primitive ones, we are confronted not by machines which do the work themselves, but by instruments which enormously *multiply* the work of living men and women.

I have just stressed the role of control, through human brainpower, in advanced technological operations, and I did so, first, because in our industry (as our brief will indicate) there has taken place a great rise in the importance of *control* instruments, and secondly, because it is far too common to forget the fact that *all* human labor is valuable because of its brainpower.

In keeping with traditional concepts, we are, of course, fully familiar with what is meant by "skilled" as against "semiskilled" and "unskilled" labor. But this must not blind us to the fact that the humblest unskilled worker is hired primarily for his *brain*, not his brawn. The ditch digger, ordinarily considered a strictly manual laborer, needs plenty of muscle to dig his ditches, but it is his *brain*, which tells him *how* to dig ditches, which makes his work valuable, and it will be noted that the very simplest task of so-called "brute labor" requires a human brain for its performance.

The very simplest task requires a technique, however simple both the task and the technique may be, and both task and technique are beyond the range of even the strongest creatures if they have not human brains.

Very complicated operations require highly coordinated brain power, highly developed planning, highly developed thinking. The new tendency in technological change is to do this thinking, this planning, once—and then to embody it in routines, punched cards and rolls, ratios and gears and cams. Once this has taken place, it is then possible for "semi-skilled" workers to carry out operations which, otherwise, would require skilled workers.

So, as these control and planning operations gain in prevalence, the lines between these classes of labor grow vaguer and vaguer, and the practical effect is to reduce all labor to a common level; the skilled workers are pushed down toward jobs which require of them less than their full capacity, and the entirely unskilled workers starting out in industry are forced to learn, and learn quickly, tasks of a semi-skilled nature. The old criteria of skill disintegrate; they cease to have the practical meaning they once had—and along with the disintegration of criteria of skill goes, as we all know, a disintegration of the wage structure.

We know that the old inequality of product and mass purchasing power produced with disastrous regularity cycles of depressions. Periodically, the accumulation of product in relation to purchasing power would grow too great, and this accumulation would discharge itself over a period called a depression.

So vast has been the technological change since 1929, that the cycles have enormously speeded up. Nowadays, we cannot get out of one depression before another starts up; one comes on the heels of another so fast that, as far as the ordinary people of this country know, there has been one continuous and steadily worsening depression since 1929 itself, regardless of what ups and downs may have been the experience of those closer to the top of the structure.

When the question of a remedy comes up, as it is coming up in these committee sessions and throughout the Nation with increasing emphasis, we have, it seems to me, no more than a few directions in which to look.

REMEDIES FOR UNEMPLOYMENT

Mr. CAREY. First, the leaders of industry can themselves, if they will, take the necessary steps to equalize the inequalities. The first answer, then, is private industry.

Second, labor can and perhaps must, through its normal processes of collective bargaining, press and achieve its demands for equalization.

Third, if labor by reason of obstacles placed in its path cannot, and if industry will not, then the Government must step in.

And the fourth answer, one that labor rejects with all the power at its command, is the far too prevalent answer that there is no answer.

Excluding this fourth answer, the "no" answer of the cynical or defeatist, labor would have good reason to expect that all three of the other answers might yield good results. Private industry can do something, labor can do something, and Government can do something. That, of course, is exactly the reason why we of organized labor have never let up in our demand that a genuinely representative conference be called on the subject, where leaders of government, labor, farmers, professional groups, industry, finance, all, can get down to the practical problem.

"What can industry do?"

If the leaders of industry were voluntarily to agree that whenever productivity is increased through technological change, the benefits would be passed on to labor in the form of increased wages, decreased hours, and increased number of jobs, and passed on to the public in the form of decreased prices, or if industry would even go part way in this direction, then a beginning would have been made.

"What can government do?"

Government can first do what it is not doing today, and that is to attack the problem directly. It is all but incredible that when the country is faced by this paramount problem, the problem which overshadows and embraces every other national problem, the Government should still remain silent and motionless in regard to the solution of the problem.

Government can take steps to see to it that when industrial leaders do take steps in the right direction, they are encouraged and re-

warded; and that the employers who decline to take such steps are not encouraged or rewarded. Government can keep the channels of collective bargaining clear for labor. Government can and must bridge the gap between what must be done and the percentage that private industry is able or willing to do.

We of organized labor can and are doing what we see as the jobs for us—and I do not believe it can be said that any substantial group has more actively taken the lead than labor.

In our own industry we are introducing as rapidly as possible the contract provision on certain phases of technological change. In an increasing number of our contracts, as in our General Motors electrical division contract, the question of speed-up is declared by contract to be a subject of collective bargaining.

Speed-up is, to be sure, only one primitive kind of technological change and is never a decisive matter when dealing with the full impact of technology. We anticipate the need for making all matters of technological change subject to collective bargaining.

We are pressing for a reduction in the work week, without any reduction in weekly pay.

Our own studies show that if as many employees were working in our industry as in 1929, but were working on a 35-hour week, then total production would be approximately the same as in 1929.

Just as important, all of organized labor is repeatedly calling the attention of working people to the problem itself. "Technology" is no longer a strange word for working men and women, for they have seen this thing called technology force more and more of their number out of jobs.

The normal, proper operation of technological change is to increase the amount of product without increasing prices or decreasing purchasing power.

Instead, technology is today operating to reduce the number of jobs, to result in wage payments which, despite certain individual areas of increase, slowly decrease in total amount. Technology cuts the prices to the consumer of certain classes of consumer goods, but along with that it destroys the purchasing power to a still greater extent. What good is a 10-percent price cut if whole areas of purchasing power are wiped out? A 10-percent or a 20-percent or even a 50-percent reduction in price means nothing to the family that has lost its income. The 12,000,000 jobless cannot buy the goods at either the full price or the cut price. An average family which gets along, as do nearly half the families in the United States, on \$16 per week or less is not effected by great price cuts in autos, refrigerators, radios, or other products in fields where technological change operates.

The new approach to the problem, the approach which involves the substantial increase of purchasing power, does not involve, as many believe, the abolition of profits.

To be sure, it may call for lower rates of profit, but the profit system is by no means destroyed; indeed, it is preserved far more securely than by this contemporary process of more and more profits for fewer and fewer people.

Our interest is not in how much goes to profit but in how little goes to the people. Today the penalties inflicted on the unemployed and on the substandard-wage groups amount to economic death. If

a worker gets caught in the expanding desert of unemployment, his income disappears.

You will find that the overwhelming majority of our American people will not object to large and even very large incomes on the part of owners and managers as long as the income of the average American family is high enough to support a decent American standard of living.

We do not care, and the people do not care, if there be a certain group which pays itself \$25,000 or \$25,000,000 per person in salaries and dividends and profits. What we do care about is the improvement of conditions of those who get from zero to \$2,500 and \$5,000 per year, especially the group below \$2,000 annual income.

We say, and we know, that the Nation can produce enough to give all American families an American income, and that doing this does not preclude the payment of much higher incomes to employers and owners.

A reasonable income for all does not preclude but in fact guarantees, higher incomes for owners and managers.

I say "guarantees," because no one can look at the picture today without realizing, as many of the well-to-do do realize, that there is nothing stable or guaranteed in eternity about higher incomes now. Today the high incomes rest on a base that is dissolving before our very eyes—dissolving into misery, unemployment, substandard wages, poverty. Jobs for all, reasonable incomes for all, can stabilize this base, can make it solid and permanent and healthy. That is what we ask industry and government to do.

Mr. MAGINNIS. Mr. Carey, I didn't want to interrupt, but I was rather interested in one paragraph on page 5. You say:

What we call and can call quite calmly the reactionary school, says, "In order to match purchasing power and production, let us cut purchasing power still further and cut the amount of product accordingly." The other school, my school, and I believe the obviously correct school, says, "In order to match purchasing power with product, let us increase the amount of product still further and increase the amount of purchasing power accordingly."

You don't mean that is just your view? What school of thought has the first view?

Mr. CAREY. The first view is held by the people who state we are overproducing in this country. There are a great many who believe that, that we are now producing more than we can use. I don't say that this thought is original with me about the other school which believes we should raise the standard of living of the people and give them an opportunity to use all we produce today, and more, by increasing the amount of money that they have at their disposal to purchase those products. One school of thought, the reactionary, or scarcity, school of thought, believes in reducing the amount of production to meet our present consuming power. The other school says, increase the amount of production and increase the amount of purchasing power in order to match that.

Mr. MAGINNIS. Do you believe that any large industry that is attempting to make a success of its business deliberately attempts to cut the purchasing power still further, and cut the amount of the product accordingly?

Mr. CAREY. They do that for their own immediate advantage. I do believe that there are a great number of industries, even far more

companies, that are a drain on our whole economy, because they produce a great deal in product and little in purchasing power.

Mr. MAGINNIS. That is more or less of a general theoretical thought. You don't know of any industry that deliberately does that, do you?

Mr. CAREY. Some of them look at it not in the sense that they are part of the over-all production plant, but from the standpoint of their own immediate profit. In my own industry I know of companies that I could name that actually are a drain on not only our industry but our whole economy because they pay so little wages that the people can't afford to buy the products they make, as well as any other products of the same standard. The whole radio-parts industry is a drain on our economy because of the low wages that they pay.

Mr. MAGINNIS. What you mean is that the effect of their operation is that, not that their intention is that? The effect of their operations is to cut the purchasing power still further, but you don't mean to say that that is their plan and their school of thought?

Mr. CAREY. It is just the way it works out. The school of thought is a group of people who believe in limiting the amount of production.

(Mr. Pike assumed the chair.)

Dr. LUBIN. Isn't it true, Mr. Carey, that there are many industries in this country, who, when the price level falls, immediately curtail their production and thereby cut down employment, thereby cut down pay rolls and purchasing power, but theoretically, at least, if they had continued to produce, they at least might have limited the extent to which employment would have fallen in the economy as a whole?

Mr. CAREY. Yes, sir; we have some companies in the radio industry that went out of business because the profit per unit was not sufficient for them. They just closed their plants and said, "When the time comes when our profit per unit is sufficient we will go back into the manufacture of radios," and they are not small companies by any means.

Dr. ANDERSON. Do you mean they would forego even small profits rather than to break the price structure?

Mr. CAREY. Yes, sir.

Dr. LUBIN. You might even get the reverse situation, where you operate only a certain level of capacity and keep prices up, whereas if you lowered your prices it might be possible that you would increase your level of capacity and increase employment and purchasing power too.

Mr. CAREY. Except in an industry where there is a saturation point rapidly being reached. As I say, in radio you arrive at the point where you feel that the market is not enlarging, in fact the market is contracting. In the radio field today all we can do is replace the old radios that are being worn out, and the only other market is for people to have two radios in their homes instead of one. In other words, there are not enough new markets.

Dr. LUBIN. But you might stimulate replacement by lowering the prices.

Mr. CAREY. Up to the point where the people have at least some money to buy some radios. I would say there is not a large market for radios today because all the people who can afford to buy a radio have a radio.

Dr. ANDERSON. And is it your judgment, Mr. Carey, that, generally speaking, in the industries with which you have contact, the policy of maintaining the price is pursued regardless of its effect?

Mr. CAREY. No, sir; I don't believe that is general.

Acting Chairman PIKE. There has been a great drop in the general retail price of radios in the last 8 or 10 years.

Mr. CAREY. A tremendous drop, and much better radios; there are more work units per radio.

LEVELING OF SKILLS

Dr. ANDERSON. I would like to move over to a discussion of a problem that interests all of us, one upon which you touched in your paper. You mention a problem that has been of great concern to the students of this matter of technology and its effect upon workers, saying—

As these control and planning operations gain in prevalence, the lines between these classes of labor grow vaguer and vaguer, and the practical effect is to reduce all labor to common level.

Do you believe, as a result of your experience, that a general and progressive degrading of labor is occurring?

Mr. CAREY. Yes, sir; it is; there is not as great need for skill today in what we term the "skilled trades" as in the past. For instance, machine operators today who were formerly classed as machinists are today classed as semiskilled rather than skilled workers because they operate one type of automatic machine.

Acting Chairman PIKE. Following that point a little further, Mr. Carey, these machines as installed do require a certain type of skill in repair and adjustment; that is, most of these things are set up so tight for hair-line measurements or better that they do require something of a pool in almost every factory of a few very highly skilled mechanics.

Mr. CAREY. Yes, sir; but once they are set it doesn't require a man as skilled as the one who made the setting to stay with that machine.

Acting Chairman PIKE. That is true; he comes around only once a week, or when the operator complains or when the spoils are getting too big, but there is always that pool of very highly skilled mechanics in a highly mechanized factory, not very large.

Mr. CAREY. Yes, sir; and becoming smaller and smaller.

Dr. LUBIN. Mr. Carey, I was very much interested in your brief, particularly that part of it which deals with the low cost of each unit of productive capacity. You mentioned television as a case in point. Is it your experience in the industry that that process is going on? In other words, put it this way: whereas, formerly it cost you \$10,000 to buy a machine that produced a thousand units, now for \$100,000 you can get a machine that will produce, say, 1,500 units. Is that trend going on actively in the electrical industry?

Mr. CAREY. Yes, sir; and the rate of acceleration is not hesitating; it is increasing.

Dr. LUBIN. That means we are in position today to increase the productive capacity of the Nation without investing more money as compared to what we used to have to invest.

Mr. CAREY. Oh, yes, sir. In that particular reference I believe I mentioned that it wasn't by putting in new machines, it was just by adding to the machines already in and increasing capacity. We are far from reaching capacity in our industry and I doubt if other

industries will reach it. Without increasing the capital investment we could increase our capacity.

Dr. LUBIN. So as far as all this argument that one hears that we will have to have more and more and more investment if this country is to grow and the standard of living is to increase, the facts in your industry are to the effect that with relatively small increases in investment you get a much larger and increasingly larger volume of production.

Mr. CAREY. Correct.

Dr. ANDERSON. In connection with the degrading of workers, which seems to be of such great concern, you say in your brief, "Exhibit No. 2506":

This tendency has reached alarming proportions, for the ratio of skilled workers to the total labor force is continually dropping.

Were you referring there to the labor force engaged in electrical industries?

Mr. CAREY. In the electrical industry. I am referring primarily to the people who were formerly classed as skilled labor and are now classed as unskilled, or partly skilled.

Dr. ANDERSON. That led to your table on the importance of this problem in your industries, in which you show that skilled workers are 21 percent of the industry, semiskilled workers 52 percent, and unskilled workers 27 percent. The bulge apparently is in the semi-skilled level. That is what they are degraded to?

Mr. CAREY. From skilled; yes, sir. For instance, a person in radio manufacturing in 1926 had to have a pretty complete knowledge of radio. He would make a radio. Today they don't require men of that type. They require men who know how to use a hand wrench and put on one nut or a few wires. Sometimes they don't even know what work they are doing. In some cases in our industry we have workers who have never seen a complete job that they work on. Today it doesn't require a great deal of skill to make a radio.

Dr. ANDERSON. Might it not mean also that you got a degrading of highly skilled craftsmen at the top and an upgrading of unskilled levels from the bottom into the semiskilled level?

Mr. CAREY. We know the number of skilled people required in a plant, and as we bargain collectively on job classification, the tendency on the part of the company is to reduce the classification so that they can give lower rates of pay. The effort on the part of the company is to put in new methods of procedure in order to reduce the labor cost, and in order to reduce the labor cost they change their classification. They don't give a person a wage cut, they just say that that classification is no longer necessary, no longer in existence.

Dr. ANDERSON. In negotiating you have split up the industry into a series of levels, each having its own job classification and its pay returns. Has the number of those classifications increased or decreased with advancing technology?

Mr. CAREY. The number of classifications has increased but not because of technology, in the sense of new methods of machinery; it is new systems on the part of the company that have become increasingly complicated. At one time they had three classifications, craftsman, helper, and apprentice; now they have broken it up into

27 different classifications. Every company uses a different method, and they use different names and different criteria to determine a classification.

Dr. ANDERSON. And you feel that that split-up into more and more classifications does not mean an increase in skill, but rather degrading to a common level that could be called simply semiskilled.

Mr. CAREY. That is correct; yes, sir.

Acting Chairman PIKE. On that matter I would like to get it clear in my head what you call semiskilled. I wonder if you would agree with me that a man may be highly skilled in a particular narrow application as you said a moment ago, a fellow who adjusts a particular part rather than the man who makes the whole radio, he may be very much skilled in that particular operation, he must be to be on the job, but he would still be a semiskilled workman. Does he have no breadth of adaptability, no training in, let us say, making the whole radio, the difference between the cobbler making the whole shoe and 200 people on the line, each doing one particular piece of work? He is nonadaptable to a great extent?

Mr. CAREY. They could be very adaptable, but there is no use for the adaptability.

Acting Chairman PIKE. No; but the training leads him to be very narrow in a groove. Let's say there were another factor of a somewhat different kind; let's say I am a skilled workman, and I adjust a particular operation, and they say, "We don't have that operation here, so, as far as you are concerned, you are not a skilled workman." Is that somewhere in the range of what you mean by semiskilled or is it just a shadow line or rather a no-man's land between entirely unskilled people and a thoroughly skilled master mechanic who nobody doubts is a master workman? I am trying to get through my own head the definition of a semiskilled person.

Mr. CAREY. The best definition would be that a skilled operation is one that requires an apprenticeship of, say, 3 or 4 years. A semiskilled operation may require certain ability on the part of the operator but not long training in learning the job.

Acting Chairman PIKE. No broad base.

Mr. CAREY. Correct; it may take him some time to become skilled at that particular operation, but to learn the job itself is practically simple; say, 6 weeks of training would make him an operator capable of holding up his end on a production line. We hear a great deal about scarcity of skilled labor. We have thousands of skilled mechanics in the metal-trades field who are now working on production lines. In fact, our answer to the people who say there is a scarcity of skilled labor is to say, "Name the city and we will supply you any number of people who are skilled in that field."

Dr. LUBIN. How long would you say it would take an entirely green person who has never been in any of the plants to reach his maximum earning capacity on the job that he happens to go into, taking the jobs by and large? In the automobile industry it is said that within 2 or 3 months a man reaches his maximum earning capacity on that particular job. How long would you say for the tool and electrical industry?

Mr. CAREY. Two or three months is long; I would say 6 weeks, with few exceptions.

Dr. ANDERSON. Mr. Carey, what is the characteristic of a modern industry? You spoke a moment ago about a skilled craftsman's building a radio. What is the transformation that takes place in the industry which brings about this enormous degrading of labor?

Mr. CAREY. Of course, there is the production line. At one time, a comparatively few years ago, because the radio industry is very young, people would make a radio on a bench. That radio would be completely wired by one person—the parts would be placed on the chassis and he would wire it; in many cases do part of the testing. Then it would be passed along to another person who would finish the testing and, of course, pack it. Now, a radio starts out as a piece of metal as a base and they have a transformer put on it and it is placed on a long conveyor. Most of the conveyors today in large companies have about 150 employees on each side of the conveyor, and each person does one operation. About three-fourths of the way down the production line it says, "Turn the right side up," and they put the tubes in it and put it in the cabinet that comes along on another conveyor at the end of that production conveyor, and it goes out and is put in a box and on the train; it doesn't even stop.

Dr. ANDERSON. In other words, the characteristic of an industry changing from skilled labor to semiskilled is the belt line or the conveyor line? And then you mentioned a moment ago the increasing use precision instruments were having in the electrical industry and in other industries supplied by the electrical industry. Do you take it that such devices are in themselves an indication of advancing technology?

Mr. CAREY. Yes, sir; in our industry we manufacture equipment that is used to make a technological advance in other industries, so our industry provides an opportunity to determine whether the pace of technology will increase. We manufacture labor-saving devices for the automobile industry, the steel industry, and all others, and there our production of that particular line of goods is increasing.

Acting Chairman PIKE. Of course, your whole industry is based on the very latest technology. It is a technological industry from start to finish.

Mr. CAREY. It is a very advanced industry. We manufacture advanced equipment for other industries.

Acting Chairman PIKE. It was created by technology, and now other things are happening to it by technology?

Mr. CAREY. Our industry is highly centralized. That is, when there is a new way of doing things it rapidly spreads because of high concentration.

EFFECT OF PATENT RIGHTS ON TECHNOLOGICAL CHANGE

Dr. LUBIN. How far do you feel the patent situation affects the growth of technology in your industry?

Mr. CAREY. I frankly don't think it affects it a great deal.

Dr. LUBIN. You don't think it stands in the way of it moving faster?

Mr. CAREY. I don't believe anything stands in the way of its moving faster, except that no employer that I have met yet in our industry is willing to make anything he doesn't think he can sell.

Mr. O'CONNELL. What about passing the benefits of technology on to the consumers and others in the groups you mention as being interested? Might not the patent control or any other device which would constitute a monopoly control tend to slow up the passing on of the benefits?

Mr. CAREY. It could either slow up or increase it.

Mr. O'CONNELL. Increase it?

Mr. CAREY. It could.

Mr. O'CONNELL. How do you think it actually operates in practice? I take it you don't think they are being passed along rapidly enough, or else you wouldn't have made the point.

Mr. CAREY. At some points in our industry there is what could be termed "an actual increase of rate" of passing it on to the people.

Mr. O'CONNELL. How would that be?

Mr. CAREY. For instance, they may try to pass on the results of a very efficient manufacturing process if they have collective bargaining to operate certain checks in certain fields, and we keep pressing for reduction of number of hours and increase in pay at the same time, the industry can move ahead and meet the requirements and at the same time do a good job, say, for the consumer. Where they have monopoly, or at least some form of it, they can plan their production; they can do a far better job than they could otherwise. You don't have to worry much about styles; they can plan their styles and the needs of the consumer and determine what their market will be. That is the effect, I believe, only in certain branches of our industry. In certain other branches, where there is less information available, say in television and things like that, it is doubtful what could be done. A lot of people are saying television is going to be the solution of all our problems, that a new industry is arising which is going to meet our needs. I believe 50,000 employees can manufacture all the television our people can use, so I don't think that is the solution.

Mr. MAGINNIS. Mr. Carey, don't you think it would be more desirable for the consuming public, as well as for labor, if certain patent rights owned by large corporations were permitted use by licenses so as to have competition in manufacture to cover more ground in production?

Mr. CAREY. I believe so; yes, sir.

Acting Chairman PIKE. There is one thing on my chest I would like to get your opinion on. On the matter of reduction of hours, do you regard further reduction of hours as mostly a straight device to spread employment, from 40, 42, or 44, or whatever standard hours are at the moment, that that further reduction is desirable on the point of view of more leisure for the workman or less fatigue? I would like your guess as to where the point comes when the lessening of fatigue has lost its importance and where lessening of hours comes to be a straight work-spreading campaign. Thinking back to the 12-hour day, 7-day week, which isn't so far behind in some industries, and certainly the 60-hour week which is quite recent, and then coming down to 54, 48, and so forth, somewhere there is a point in there where from a good many points of view there is no further advantage to the person. I am speaking of a man who used to work 70 and sometimes 80 hours a week at day labor, where further leisure isn't of great social importance. I would like to get your feeling on that.

Mr. CAREY. Well, in my brief I say that in our industry a 35-hour week should be the workweek. I don't come at that by saying that is what the human body will stand. I don't think that is the way we can go about it because I contend that people are hired not because of their brawn but because of their brains.

Acting Chairman PIKE. So the fatigue element isn't in it as much as it used to be, certainly?

Mr. CAREY. Not in industry generally; in certain industries of course, but that is an exception. I say we have to determine the number of hours worked by what our whole economic set-up will stand. There is such a thing as working too many hours—and we are doing it at the expense of a proper balance and a proper wage structure.

Acting Chairman PIKE. So it is really work spreading you are thinking of rather than the fatigue or leisure factor?

Mr. CAREY. Not only work spreading, but providing an opportunity to help maintain purchasing power.

Acting Chairman PIKE. I meant with all its implications to what spreading work does.

Mr. CAREY. Where you have 12,000,000 people unemployed in the Nation, and a large number in the electrical manufacturing industry, that concerns the industry, because the plant manager is thinking in terms of having 10,000 people outside his plant willing to work for 10 cents an hour less than the person on the job.

Acting Chairman PIKE. That is the point you handled. I wanted to know whether the element of producing fatigue which used to be pretty important when you were working from 7 to 6 hadn't pretty well gone out of most industries, when you had an 8-hour day 5 days a week.

Mr. O'CONNELL. On this matter of reduction of hours it could be argued, I take it, that one might carry the period of reducing hours of employment to such an extent that it would almost be a part of the doctrine of scarcity to which you referred in your article?

Mr. CAREY. If the time came where you had too much purchasing power and not enough products, you might find it necessary to increase the hours. I don't look for it.

Dr. ANDERSON. Mr. Carey, we have frequently referred in these hearings to the effect of technology on older workers. You have pointed out that technological change in your industry has meant the use of semiskilled workers doing comparatively light work—that we call upon brains, not brawn. I presume that older workers could work there about as efficiently as younger workers. Can you tell us what is happening with respect to older workers as technology advances in the electrical industries?

Mr. CAREY. Speed is an important factor, so they would rather have younger workers. We are able to check that somewhat through collective bargaining; on the other hand we can't check it sufficiently as long as there is a vast pool of unused labor before us.

I think as we reduce the number of hours, we can and do reduce the amount of skill required, and we can reduce or improve the opportunity for aged workers. We have in our industry the feeling that 40 years is pretty old, but actually it shouldn't be. I think a person 60 could very easily perform the operations in our industry, at a pace where they more than pay their way.

Dr. ANDERSON. Whose is this feeling that 40 years is old in the electrical industry?

Mr. CAREY. Well, it is a new industry, and many people feel there is a wonderful opportunity in the new industries, that that is the future of America, so we have an influx of young people. The companies of course attempt to retain what they think is the best, and let out the people they feel might be a burden to them in the near future.

We do have pension plans and things like that which will help to keep the situation from becoming worse than it is.

Dr. ANDERSON. Earlier in these hearings Mr. Hook called attention to a study made by the National Association of Manufacturers on workers above 40. Does your organization find any such problem as that of retaining workers of more than 40 years of age?

Mr. CAREY. Yes; we have a great problem in that. Of course I don't know the details of the study made by the National Association of Manufacturers. But I think they could do a lot more than give dinners for people who worked in those companies for 25 or 50 years. It is just what I would term propaganda to justify their position. The same story is the great need for skilled labor. It is just a lot of nonsense. They fail to meet their social obligations, and they are trying to say they meet them very well and they like old people because they are nice to have around. Well, it comes down to doing an operation, and that is what determines whether or not they are going to keep them.

Dr. ANDERSON. Now when you bargain with a particular company how does the age factor enter into the negotiations?

Mr. CAREY. We put the emphasis on length of service. A company will naturally put the emphasis on the ability to produce. We say that the person with the longest service contributed more to the building up of that particular company, and, therefore, has more equity in his job. With the companies today we don't have a great deal of difficulty in collective bargaining. Less than 7 percent of our people have been engaged in labor disputes. Fortunately we deal with companies that are willing to deal in collective bargaining without a great deal of trouble, and we can usually find some just way of handling the problems.

Now it is true that we have some companies which spend thousands of dollars per year to find new ways of handling everything but their labor relations policy. In other words, they want 1945 methods of production and George Washington methods of dealing with the labor union.

UNION AGREEMENTS AS TO LABOR DISPLACEMENT

Dr. LUBIN. Do any of your agreements make any provision for displacement of labor due to changes in methods of production?

Mr. CAREY. Yes, sir; we have some understanding with some of the companies that are written out very carefully. It is hard to find a hard and fast rule but we say in several of our agreements that with a new method of manufacture or new way of producing it, or anything else that involves labor-saving devices, the cost of the engineering operation should be removed from the estimated saving over a period of time, and that saving should be distributed either

in reduced prices or increased wages; or rather the same wages and reduced hours for the employees.

Dr. LUBIN. But the employee was displaced. Is there any provision made for him?

Mr. CAREY. Only on a seniority basis. That is, we attempt to find another job for that employee either within a department or within the plant. Of course, the larger the company, the easier it is to find a job for him, but that eventually displaces someone else, unless a new operation produces a new market.

Dr. LUBIN. The thing that interests me about your testimony is the fact that, after all, you felt that your industry creates technological unemployment in the sense that you make the machine and powder-driven mechanisms that make it possible for other industries to do the work with less labor. Now the general feeling that the average man has, is the more machines that you have, the more displacement and unemployment you have—but you create more employment in making these machines that get rid of labor in other industries.

Mr. CAREY. Once they are made of course the job is over.

Dr. LUBIN. I get from your testimony that in your industry, even though you continue to produce more and more types of machinery, technological displacement due to new devices occurs there, too.

Mr. CAREY. In fact, to a greater extent there than in other industries because it is an industry that was born and lives on technological improvement, and because of its set-up they are able to spread new methods much faster than in other less concentrated industries.

Dr. LUBIN. Do you think the age of the industry has anything to do with the rate of technological displacement? In other words, being new, it wasn't so long ago that the methods were relatively simple—perhaps simple isn't the word I want to use—less well integrated it was a new thing; you just did the best you could, and as time goes on you know more and more about it; you subdivide into more and more parts; you put it on a conveyer and consequently you can take advantage of all modern methods of production. Industries that were older had already reached the stage where they were fairly efficient before this drive on technological improvement started, since, say, 1939.

Mr. CAREY. Well, that is, of course, the reason. There are also other things that come into these new industries. For instance, I think every new industry is without exception a seasonal industry, without any real need for it. Take radios. At one time radios didn't play very well during the summer because of atmospheric conditions, and they sold a lot of radios during the winter, making them in the summer. Today you can use a radio all year round, and still we have those peak periods of production more or less as a carry-over without any really good reason for it. Those things are expensive to the industry itself. In other words, if you could eliminate those bumps in production you could do a better job for labor and consumer as well as industry, because the fixed cost of that plant has to be taken out of 3 or 4 months' production instead of 12.

Dr. ANDERSON. Mr. Carey, what is your opinion as to the rate of maturing in a new industry as a result of technological advance? We have an accumulated technology which speeds the maturing process now, I believe. For instance, from the invention of the automobile

to its commercial production a number of years intervened. The same is true of the airplane. Almost in your own working lifetime, however, has come the inception and development of the radio. Do you have any comment to make on that accumulation of technology?

Mr. CAREY. Well, I attempted to point out that a lot of people regard new industries on the horizon, like television, as the hope of the Nation. But all the experience we have gathered together in other industries will certainly apply to any new industry that comes in. We take a raw material, whether metal or wood, and we develop new ways of handling that now, in plastics and everything else. Well, if an industry still unheard of comes in it will be a very short time before that industry operates efficiently. We won't have what we had in radio, for instance. Radio took from 1927 until 1932 to get into mass production in such a way you could turn it out to be sold in a chain store. Any other new industry that comes into existence won't take 4 years to get on mass production. They will develop it so as to put it in mass production to start off with.

Acting Chairman PIKE. The technique is already available to put it on mass production?

Mr. CAREY. Correct. Radio started out on a bench; television comes in and goes right on the conveyor, right out of the laboratory.

Acting Chairman PIKE. There is another thing I would like to ask. We found in looking over the steel business that in certain cases there had been whole communities that had been displaced, practically put on the bread line by the movement of a part of the industry away from the community—New Castle, Pa., I think was the outstanding instance. I don't think you have had anything that serious, but I would like to know if you can remember in your end of the industry if whole factories were closed up and moved away, moved their operations away, and what they have done in general.

Mr. CAREY. We haven't any cases like that. Our industry decentralized sometime ago. Although it is concentrated east of the Mississippi and north of the Mason-Dixon Line, it is still an industry that is growing. They rapidly displace products, but they take in others in their place. For instance, as one consumer product went out something else would come in, and it is going in that way.

Acting Chairman PIKE. You haven't had in your industry anything similar to what would happen if the General Electric Co. left Pittsfield or Lynn, Mass.? You haven't had any of that wholesale packing up and leaving the whole town broke?

Mr. CAREY. We haven't had anything like that.

Dr. ANDERSON. Mr. Carey, you have noted the effect upon older workers of the advance technology. What about this vast army of young people who have never had permanent connections with industry? Are they being seriously affected by technology?

Mr. CAREY. Very much so; because those people are coming out of school with the idea that they have been trained to go into industry and make good, using their high-school education. Yet in 6 weeks the company can take a person without high-school training and train him for most of the jobs in mass production. Our industry is pretty young. We do not have many people who have been in our industry 25 or 30 years. We have some, of course, that have been in our industry for 25 or 50 years, but there are very few of them, so the people in our industry are not old. There is very little

hope in our industry at the present time to absorb a great number of young people. That problem can only be solved when more people can buy more goods, in my opinion.

Dr. ANDERSON. Your industry is an expanding industry. Is it continuing year by year to employ more workers?

Mr. CAREY. At the present time it is not. We find that there were more people employed in our industry, say, in 1929 than are employed at the present time. Yet we find that some of the large companies are making the same or more profit, and yet operating below capacity. That is something that we fear in the over-all picture. Our industry is producing more than we produced several years ago, and with less people.

Acting Chairman PIKE. Do you have any examples of those companies? I was trying to think of some that would show more than 1929 earnings and I confess I can't do it.

Mr. CAREY. I think I point some out in the brief, I am not certain; if not, I certainly could supply some.

Acting Chairman PIKE. If they are in the brief that will answer my question.

Mr. CAREY. I have a list of all the companies that we have under contract in our industry. Frankly, we are very proud of our record. I would like to give them to the members of the committee. We have between 225,000 and 250,000 under contract in our industry. Of every \$5 worth of electrical equipment made, \$4 worth of it is made under agreement with our union, so we have our industry pretty well organized. I have all the names of all the companies and some of the recent conditions in wages, where they are improved, and places where hours were reduced without reduction in wages.

Acting Chairman PIKE. Might one of those be suitable to put in the record?

Dr. ANDERSON. I should think it would be a good exhibit.

Acting Chairman PIKE. It may be received for file.

(The document referred to was marked "Exhibit No. 2606" and is on file with the committee.)

PROSPECTS FOR ABSORPTION OF UNEMPLOYED

Dr. ANDERSON. Mr. Carey, do you believe that the electrical industry will be able to absorb its proportionate share of the new labor that reaches the market?

Mr. CAREY. No, sir; they can't absorb the labor now available in that industry.

Dr. ANDERSON. You see no immediate prospect that conditions will change?

Mr. CAREY. No, sir; I don't; not at the present hours worked per week.

Dr. LUBIN. Do you know what the situation was at the peak of 1939, November and December, in terms of employment in your industry as compared to, say, 1929?

Mr. CAREY. I would say there were about 350,000 in 1939 as against 400,000 in 1929. I think I cover that in the brief.

Dr. LUBIN. Do you know how that picture was in 1937?

Mr. CAREY. No; but we recognize 1937 as an important year. We took the years 1929, 1931, 1937, and 1939, because we recognized that that was an unusual situation.

Dr. LUBIN. In 1937 you had more employment than you had in 1939?

Mr. CAREY. Yes, sir. The drop from 1937 to 1939 was not as acute as it was in other industries, or in industry generally. In other words, we won't feel the effects of the next depression in our industry as much as industry generally will feel it.

Acting Chairman PIKE. Is that all?

Dr. ANDERSON. Yes. I think Mr. Carey had a witness whom he wanted to bring in.

Mr. CAREY. I wanted to introduce Mr. Driesen, representative of the American Communications Association (C. I. O. union), who would like to present a brief on some questions pertaining to the communications industry.

Acting Chairman PIKE. A statement to read?

Mr. DRIESEN. Yes, sir.

Acting Chairman PIKE. Very well.

Do you solemnly swear that the testimony you shall give in this proceeding shall be the truth, the whole truth, and nothing but the truth, so help you God?

Mr. DRIESEN. I do.

Acting Chairman PIKE. Will you ask the witness the qualifying questions?

TESTIMONY OF DANIEL DRIESEN, LEGISLATIVE REPRESENTATIVE, AMERICAN COMMUNICATIONS ASSOCIATION (CONGRESS OF INDUSTRIAL ORGANIZATIONS)

Dr. ANDERSON. What is your name?

Mr. DRIESEN. Daniel Driesen.

Dr. ANDERSON. Mr. Driesen, what is your official position?

Mr. DRIESEN. I am legislative representative of the American Communications Association.

Dr. ANDERSON. And what is the American Communications Association?

Mr. DRIESEN. That is the C. I. O. union with jurisdiction over the communications industry.

Dr. ANDERSON. How many members does it have?

Mr. DRIESEN. At the present time it has 21,000 members. These are divided into four main departments: telegraph division, point-to-point radio, broadcast, and marine.

Dr. ANDERSON. Are there any other unions operating in the same field covering the same type of workers?

Mr. DRIESEN. There are several A. F. of L. unions. There is the International Brotherhood of Electrical Workers and the Commercial Telegraphers Union; but there is no other C. I. O. union.

Dr. ANDERSON. You haven't entered the telephone field itself?

Mr. DRIESEN. No; we have not.

During the past decade, mechanization has taken a terrific toll of the jobs of communications workers. I am here particularly concerned with the effects on telegraph workers of changes in the methods of operating the domestic and international telegraph companies, and

the steps our organization has taken to protect communications workers from attempts to install new methods of operation at their expense.

The number of workers employed in the telegraph industry has declined by 31,600 during the past decade. This is almost half the total number presently employed by the radio and wire telegraph companies.

Replacement of the Morse key with the automatic multiplex telegraph and the keyboard printer, which permits the transmission of messages by operators using a keyboard similar to that of the typewriter, has resulted in eliminating thousands of highly skilled Morse operators from the industry. Elimination of the Morse operator is one of the best-known examples of so-called technological displacement.

MECHANIZATION OF TELEGRAPH INDUSTRY

Mr. DRIESEN. At the present time the telegraph industry is again in the process of almost complete remechanization. This process is described by Mr. White, the president of Western Union Telegraph Co., in a speech delivered in New York on February 16, 1939, as follows:

This program falls into four main categories:

The first is extensive development of what now are known as carrier or superimposed circuits, by means of which a pair or a relatively small number of wires or cable conductors may be made to carry a large number of separate channels of communication.

The second is extension of automatic switching between circuits connecting various cities and between central offices and customers, so that direct communication will be effected quickly and without necessity of copying, relaying, or retransmission as practiced generally today.

The third is a wider application of the varioplex, which made possible the creation of a service known as telemeter. The varioplex automatically divides the total "word capacity" of a multichannel single line among a number of subscribers. Each pair of subscribers employs one of the subchannels and is in direct communication simultaneously. Total circuit capacity is at all times equally divided among those who are actually using it at any time; in this way, the idle channel time of each customer is automatically placed at the disposal of other subscribers. Advantage is self-evident.

The fourth is widespread application of the much-discussed system of automatic facsimile telegraphy, permitting transmission and delivery of exact duplicates of the original "copy," be it picture, printed matter, or whatever else.

Facsimile telegraphy in various none too practical forms has been known for many years, but until the invention of R. J. Wise of a dry recording facsimile paper which records direct electrical action without subsequent processing, facsimile had remained impractical. The new carbon-bearing fibrous conducting paper is as sensitive to electricity as photographic paper is sensitive to light. As a result, facsimile has become one of the real contributions to advancement in telegraph history.

So great has been the progress already made in the application of this new method, it would not be surprising if it did not some day in a not too distant future supersede present-day telegraph printers, just as they in their turn superseded the simple instrument of Morse.

With a facsimile as now developed we at last have the automatic telegraph. Thanks to the new paper, telegrams may be loaded and fed automatically into the machines, and when received, dropped onto belt conveyors and delivered to distribution centers. Facsimile telegrams can be relayed as many as three times from the original facsimile copies. Facsimile telegraphy will make the telegraph service increasingly available to the public. Equipment is housed in small, attractive cabinets, into which telegrams may be inserted as easily as letters are dropped into mail boxes.

Looking into the future, we easily can visualize what these basic developments portend. Carrier circuits and the varioplex will enable the telegraph

industry to utilize its present wire plant without addition and serve the telegraph needs of the Nation for many years to come. Automatic switching will provide a tool greatly accelerating business and industry. Facsimile not only will completely eliminate errors in transmission, but, like automatic switching, will provide added speed and convenience to telegraph service. Introduction of facsimile telegraph provides abundant opportunity for exercise of one's imagination. It is conceivable its use even may change our present news distribution system or even the method and manner of printing newspapers themselves.

Inherent in the program of Mr. White for automatic telegraph is a program of wholesale lay-offs for communications employees. He draws an analogy between the introduction of facsimile, which will supersede printers, and the introduction of printers, which superseded Morse.

Rapid progress in mechanization in the radio and cable fields is also under way. Radio Corporation of America Communications has been developing ultrahigh-frequency circuits operated by printer or facsimile. Thus the R. C. A. Communications office in Philadelphia is connected with the New York main office by radio circuit over which messages were transmitted by printer operators at wages as low as \$12 per week until the union obtained its first agreement and raised the minimum wage to \$23 per week. Since the printer was first brought on the scene, R. C. A. C. has not employed any new radio operators. The great majority of R. C. A. C. offices are now printerized and gradually the radio operators formerly employed at these offices are being replaced by printer operators at \$13 a week less than that paid to radio operators.

Facsimile operation is also being installed by both R. C. A. C. and Press Wireless Co.

It is apparent that the communications companies are undertaking a widespread program of mechanization without consideration for the workers involved, and that wherever union organization is not present to prevent it, this mechanization results in unemployment, reduction in wages, increase in speed-up, and worsening of working conditions.

A few days ago Mr. Philip Murray, chairman of the Steel Workers Organizing Committee, outlined in masterly fashion the effects of technological advances on employment and job security in the steel industry. He further laid down a practical program for alleviating the effects of uncontrolled mechanization on the workers in the steel industry.

UNION AGREEMENTS ON TECHNOLOGICAL CHANGE

Mr. DRIESEN. Our organization has been working along the same lines, and the history of our attempts to obtain protection for communications workers from uncontrolled mechanization can be seen in various clauses of our contracts with communications companies.

In our contracts with Mackay Radio, Postal Telegraph, and French Cables, we have insured employees of these companies an opportunity to acquire the skill and training necessary for any new type of operation which might be installed during the life of the contract. The relevant clause in these contracts reads:

If, during the life of this agreement, the company changes its methods of transmitting and receiving messages, or changes its operations in any other respect which will require additional knowledge or skill on the part of the employees, no additional employees shall be hired by the company until the

employees already working shall be notified of such changes and allowed a reasonable training period to acquire the necessary knowledge or skill for retaining his employment. There shall be no change in salary during the training period of any such employee and no reduction in pay upon being reclassified in a new position.

In our contracts with R. C. A. C. the company is required to give the union 6 months' notice in advance of proposed mechanization changes. This section of the contract reads:

The union and the directly affected employees shall be notified at least six months in advance of proposed mechanization changes and such employees shall be allowed an opportunity during said period of at least six months, on their own time, or on the Company's time at the Company's discretion, to acquire such additional knowledge or skill as may be necessary for retaining employment in different classifications. During said six months no new employees shall be added to the regular staff at the office or station affected in the classification or classifications for which the directly affected employees are allowed such opportunity for training.

In the most recent contract signed by our organization with Mackay Radio & Telegraph Co., we have achieved a real guarantee of job security for employees during a period of mechanization. The clause entitled "Mechanization and Technological Changes" of the Mackay agreement reads:

No employee of the Company shall be dismissed by the Company during the life of this agreement because of mechanization or technological changes.

This agreement was signed March 20, 1940, and should be compared with the agreement signed by our organization for the previous year on January 25, 1939. In this agreement we were not able to secure a guarantee against lay-offs, but merely obtained a clause requiring severance pay. This clause read:

In the event any employee covered by this agreement is discharged or dismissed from employment because of technological improvement, he shall be given severance pay according to the following schedule:

1. Employees with five or less years' service shall be given one week's pay for each completed year of service.
2. Employees with more than five years' service shall be given two weeks' pay for each completed year of service.

An even more important consideration for the protection of employees from the threat of mass lay-offs due to mechanization is the provision for improvement of working conditions, guarantee of a full work week, and shorter hours, provided in the contracts of the American Communications Association (C. I. O.) with communications companies.

Thus Mr. Reynolds, a Western Union employee, who testified yesterday before this committee concerning the effects of mechanization in the telegraph industry indicated that in the Western Union Telegraph Co. employees in almost every city in the country are on part time; many of these employees have more than 10 years' seniority.

It is our estimate that about 40 percent of those working for Western Union are on part time. It should be noted that in contrast to this situation in Western Union, which at the present time is unorganized, the A. C. A. has eliminated part timing in companies it has organized and with whom it has contracts.

(Senator O'Mahoney resumed the chair.)

The CHAIRMAN. How have you done that?

Mr. DRIESEN. First by a guaranteed workweek for all employees covered by the contract.

The CHAIRMAN. What effect has that had on the number of persons employed?

Mr. DRIESEN. It happens that there has not been a decline in number, because our contracts also provide for improvement of working conditions and cessation of speed-up, and that has taken up the slack. As a matter of practical experience, no employees have been let off as a result of these contracts.

The CHAIRMAN. What was the cause of the part-timing? Have you covered that?

Mr. DRIESEN. Yes; I did indicate above that a great part of it was due to mechanization, and I indicated that in companies where we had contracts protecting the employees, as far as working conditions went, there was no part-timing.

The CHAIRMAN. Well, if it is due to part-timing, the abolition of speed-up wouldn't affect mechanization, would it?

Mr. DRIESEN. It is my contention that there are several contributing factors which could alleviate the effects of mechanization. One is shorter hours, another is cessation of speed-up, another is bettering the working conditions generally. I point to the fact that in our contracts where we have achieved these things we have eliminated part-timing.

The CHAIRMAN. And what is the workweek under these contracts?

Mr. DRIESEN. It varies. In Postal Telegraph it is a 44-hour week for day workers, 42 for early night, and 41 for late night.

The CHAIRMAN. What was it prior to the signing of the contract?

Mr. DRIESEN. Prior to the signing of the contract it was 48 hours, and that was before the wage-hour law. In the Western Union, which is a parallel case—

The CHAIRMAN (interposing). Well, it could have been 48 hours only for full-time employees. What for these part-time workers?

Mr. DRIESEN. They worked on what are called 4-hour tricks, or 5-hour tricks, or 6, 7, and 8 hours a day. Many of these employees worked only 4 hours a day, assigned some particular time. It is graduated.

The CHAIRMAN. Is that 24 or 28 hours of the week?

Mr. DRIESEN. That would be 24 hours of the week, but a certain percentage would work 4 hours, a certain percentage 5, 6, 7, 8.

The CHAIRMAN. Do we understand that these workers who before the contract was made were getting only 28 hours of the week or 24— which was it?

Mr. DRIESEN. Some were getting 24, some 28; it varies.

The CHAIRMAN. Those who were getting 24 hours of the week are now getting 44?

Mr. DRIESEN. That is right, sir.

The CHAIRMAN. There has been no diminution of the number?

Mr. DRIESEN. That is right, sir.

It follows also that the provisions of the Fair Labor Standards Act, which reduced hours of work in a large section of the communications industry, also tended to mitigate the effects of mechanization on communications employees, since our organization was able to prevent this reduction in hours from being accompanied by a reduction in wages.

In our attempts to protect communications workers from the effects of uncontrolled mechanization, we have been hampered, rather than

aided, by the Government regulatory agency involved, the Federal Communications Commission.

The Federal Communications Commission has made no studies of this question, although it is a major consideration for the workers in the industry, nor has the Commission, in its report to the Interstate Commerce Committee on proposed merger of the telegraph companies, even considered the viewpoint of labor on this question.

It is not even possible to present here in any precise manner the effects of mechanization on the wages of workers in the industry, nor is it possible to ascertain the extent of part-timing and other questions affecting the workers, because the Federal Communications Commission only requires telegraph companies to report rates of compensation rather than actual wages paid, despite the fact that so large a percentage of the workers employed in the industry are now on part time.

CONSOLIDATION AND LABOR DISPLACEMENT

Mr. DRIESEN. The Federal Communications Commission in its report of December 23, 1939, to a subcommittee of the Interstate Commerce Committee investigating the telegraph industry, stated:

Any substantial increase in telegraph traffic consequent on changes and rearrangements of the telegraph tariffs presents no problem from a technical standpoint. Means and methods for handling increased volumes of traffic are common knowledge and it requires only the existence of that traffic and available funds to effect the necessary plant changes. Substitute methods of telegraph transmission, for example, facsimile transmission in place of teletypewriter, printer, or Morse transmission are being investigated. The telegraph carriers, particularly the Western Union, have done substantial work looking to reduction of the cost of telegraph service by major changes in operating practices. Whether these methods are extensively utilized in the future will depend upon the relative magnitude of the cost elements not common to the two methods of transmission.

A consolidated telegraph carrier enterprise should be of sufficient financial strength to permit these operating improvements being adopted rapidly in order that the telegraph service market may be stimulated and expanded by rate reductions consequent on the economies inherent in these new improvements.

The Federal Communications Commission here states that one of the purposes of consolidation would be to enable the companies to remechanize their plants. Consolidation itself, unless the companies are required to specifically guarantee the protection of workers from lay-offs, will result in the loss of thousands of jobs.

The Federal Communications Commission report indicates that the telegraph companies, by consolidation at the expense of workers' jobs, will be financially able to introduce technological changes which will enable them to lay off further workers and reap additional profits.

Yet the program of the companies and the proposals of the Federal Communications Commission provide no specific guaranty of improvement of service to the public and protection of labor.

The international executive board of our union, in considering the present status of the industry, issued the following statement on the questions of merger and mechanization:

At the present time the communications companies are in a critical financial position because of a long and uninterrupted history of financial mismanagement and systematic mulcting of the public and the workers in the industry. The companies are currently seeking a solution to their problem by two

means, mechanization and merger, both of which, under their plans, would result in loss of employment for thousands of workers.

On the question of merger, certain facts must be kept clearly in mind:

1. Merger is a solution being offered by the companies to extricate themselves from a dilemma which they have created;

2. All available evidence indicates that a monopoly, either through merger or liquidation, in the communications industry is inevitable;

3. The public—as well as the workers in the industry—has an interest in the conditions under which any merger may take place.

In the light of these facts, the American Communications Association, C. I. O., takes the following position on the question of any merger plan offered by the companies:

1. It must be in the public interest.
2. It must contain the following guarantees for labor:
 - (a) No lay-offs
 - (b) Shorter work week
 - (c) Guarantee of collective bargaining
 - (d) Elimination of speed-up and part-timing
 - (e) Increased wages.

The position of the A. C. A., CIO, may be summed up as follows: While we have concluded that a monopoly through merger or liquidation is an economic inevitability, the terms of any merger are subject to legislative, economic and trade-union influences. We oppose any merger which would result in wholesale lay-offs and other injuries to the workers, and equally obviously we would support any merger which would give all the guarantees outlined above. The A. C. A. will conduct a national campaign to enlist the support of the public, the Government, and all trade unions for the successful consummation of its program.

On the question of mechanization, the companies are constantly developing new machinery for the purpose of laying off highly skilled workers and replacing them with semiskilled or unskilled workers at much lower wages, in order to increase profits. The introduction of new machines can contribute to the general social welfare if the owners of the communications industry can be restrained from using them solely for the purpose of increasing profits for themselves.

Since mechanization is a method for increasing efficiency of operation, reducing costs, and increasing profits, we insist that the workers in our industry shall share in the benefits possible under mechanization, in the form of shorter hours, higher wages, and job security.

The CHAIRMAN. What would be the effect of a merger under such a plan on the efficiency of operation?

Mr. DRIESEN. We believe at the present time that the communications companies are not giving adequate service to the public, either in terms of coverage or in terms of speed. We think that a merger, if it were effected in the interests of labor and the public, would guarantee the public efficient service, would also guarantee to labor good working conditions, and would mean the retention of the jobs of all those presently employed in the industry.

The CHAIRMAN. Is there any relation between the speed-up of which you spoke a little while ago and the speed of transmission of messages?

Mr. DRIESEN. No; I don't think so, except that it affects the accuracy of transmission. A person working under the speed-up will not be able to transmit messages with the accuracy of one working under decent working conditions.

The CHAIRMAN. I was wondering if there was any conflict between your statement that you have tried to eliminate speed-up and the statement that you now make that a merger would result in more rapid transmission.

Mr. DRIESEN. I don't think there is any conflict.

The CHAIRMAN. I thought you might want to clear it up in the event that understanding might be gathered from what you said.

Mr. DRIESEN. I think that the efficiency of operation should be increased, but that the pressure on the individual operator should be decreased.

The CHAIRMAN. What reasons are given for merger?

Mr. DRIESEN. The reasons are a result of the whole economic position of the telegraph industry. During the past few years the industry has been subject to competition by air mail, telephone, and also the telegraph service run by the telephone company. The telephone company does about 40 percent of the telegraph business of the United States over their private-wire service, and also the air mail night letter has practically cut the night letter file of the telegraph companies to pieces.

The CHAIRMAN. From whom has the suggestion for merger come in the first place?

Mr. DRIESEN. Well, in 1935 the Federal Communications Commission recommended to Congress a merger. This recommendation was made at the request of one section of the industry, International Telephone & Telegraph. Since that time all sections of the industry have indicated the desirability of a merger.

The CHAIRMAN. What has been the attitude of the companies involved?

Mr. DRIESEN. The attitude of the companies has been that they favor a merger if it does not restrict them in their allocation of the plant and employment of workers in the processes of the merger.

The CHAIRMAN. Then the companies themselves have not been responsible for the original suggestion.

Mr. DRIESEN. I believe they were. I think the International Telegraph & Telephone Co. first sponsored the suggestion, and as a result of that the F. C. C. in 1934 held hearings, and in 1935 made its recommendation to Congress.

The CHAIRMAN. What are the competitive factors, air mail—

Mr. DRIESEN (interposing). Telephone, private wire service operated by the telephone company, and also there is competition of the radio telegraph companies with the telegraph, like R. C. A. C. and Mackay, and of course, the competition among the telegraph companies.

The CHAIRMAN. In other words, technological advance is increasing competition with this older industry.

Mr. DRIESEN. Yes; and decreasing the participation of the telegraph companies in the total communications business.

Mr. PIKE. In looking over this last page, it would seem to me that the international executive board was a little broad in its statement there. We take it, of course, that that is the opinion of the board, but it referred to their solution being offered to the companies "to extricate themselves from a dilemma which they have created." It is not really a very fair statement. They may have had a part in creating it but you yourself brought out a point I wanted to bring out, that competition from other rapidly improving forms of transmission, of intelligence and communications, has had a great deal to do with this mess that they are in, not wanting to take all the blame off the companies' shoulders.

Mr. DRIESEN. That is true; but I also neglected to point out that part of this dilemma is due to the financial history in the communications industry; for example, the I. T. & T. system and the holding companies, which constitute the telegraph and radio companies, is one of the most intricate holding-company set-ups in the world, I suppose.

Mr. PIKE. Do you suppose the Postal would last 20 minutes longer going into bankruptcy if the I. T. & T. didn't own it?

Mr. DRIESEN. Probably not; but I don't think the Postal would last 10 minutes if they didn't think they would get a merger.

Mr. PIKE. Or they wouldn't if I. T. & T. didn't own and support them.

Dr. ANDERSON. One particular part of your testimony is unusual in this series of hearings. In the history of industrial labor relations, is this the first time that actual contracts have been signed which include that matter of technological displacement?

Mr. DRIESEN. Well, I can't answer that question outside the communications industry. I believe in the communications industry it is.

Dr. ANDERSON. Do you know of any other industry where we have had specific clauses and contracts of this sort?

Mr. DRIESEN. I am not aware of any; I just don't know.

Dr. ANDERSON. Do such contracts in themselves weaken the competitive position of companies which have made liberal agreements, as compared with the others?

Mr. DRIESEN. Well, no; because they are not drastic enough. The last which we obtained from Mackay Radio, providing that no employee during the life of the contract shall be dismissed by the company because of mechanization, is an iron-bound protection for the workers during the life of the contract. The other provisions merely give, I think, an air of decency to the company's throwing a person out of work as a result of change in transmission by giving him a few months' notice, or a few weeks' severance pay. I don't think that they constitute a substantial burden on a large communications carrier, so much so as to lower its competitive position.

Dr. ANDERSON. I understand that severance pay and certain other conditions have been found in contracts of labor unions previously negotiated, but this one in the Mackay contract is a very inclusive obligation, is it not, on the part of the company?

Mr. DRIESEN. Yes, sir. I think the answer to that is found in the economic situation and technical situation in the industry itself as compared with, let us say, the steel industry, as pointed out in Mr. Murray's testimony. That is, the possibilities of improved service, of expansion in the communications industry, are still very great, and in a very decided way the union is doing a great service, insofar as it can by working for more employees in the industry, better service to the public, because that does two things. It increases the efficiency of service, it insures a wider service to the public, and it protects the employees from mechanization, and I think in the end improves the industry. Suppose we take that in reverse. Let's take the actual history of mechanization and lay-offs in a company like the Western Union, where, in order to meet a falling dividend rate the company lays off 10,000 or 15,000 people, let's say, over a period of years. This results in a decline in efficiency of service and a diversion of

business to other forms of communications, such as radio, telegraph, or telephone, which in turn forces the telegraph companies to increase the pace of mechanization, to lay off more people, and so on in a vicious circle. If you can reverse the circle and give better service to the public and increase your facilities, it will put the telegraph companies in a better competitive situation, in a stronger position to bid for business and to survive.

The CHAIRMAN. Are there any further questions?

You have covered all the suggestions that you care to make?

Mr. DRIESEN. Yes, I have, sir.

Dr. LUBIN. I would like to say for the record that the United Textile Workers Organizing Committee and the Amalgamated Clothing Workers have clauses in some of their contracts relative to displacement due to technological changes, although they are not identical.

Dr. ANDERSON. Are they as complete as this last one of the Mackay?

Dr. LUBIN. They are not as complete as this.

Dr. ANDERSON. To my knowledge, this is the most comprehensive single statement that has ever been written into a labor contract on the subject of technology and displacement.

The CHAIRMAN. Was the so-called Washington agreement, which was negotiated by the railroad brotherhoods with the railroads, a first step in this general direction?

Mr. DRIESEN. The Washington agreement provided for a system of severance pay rather than job protection, but it, of course, did provide—

The CHAIRMAN (interposing). That was the first step, was it not?

Mr. DRIESEN. That was in 1936; yes. That was prior to ours.

The CHAIRMAN. Was there anything before that?

Mr. DRIESEN. Not that I know of.

Dr. LUBIN. Has the question ever arisen in the interpretation of your contract as to just what mechanization technological changes mean? Have you ever got to the point where you had to argue this thing out and find out whether this was a technological change?

Mr. DRIESEN. Yes; but we have never had any disagreement with the companies. For example, a change in the method of transmission which required a knowledge of code, say, either Morse or Continental, to a printer-operator who was required to be an expert typist but did not have to know code, would be considered a change in the type of transmission. What we have tried to do is hit the major things, and the companies have never argued with us on this question.

Dr. LUBIN. You have never got to the point where there was a disagreement between you as to what a technological mechanical change is?

Mr. DRIESEN. No, we haven't; but I think there are many places in the communications industry where such a situation might arise. For example, there is a question, in the increased capacity of equipment, increase in the channels of wireless, eliminating maintenance employees and plant employees as to whether or not the change is technological.

The CHAIRMAN. We are very much indebted to you, Mr. Driesen.

Do you care to call anybody else this afternoon?

Dr. ANDERSON. No; but I should like to refer to the testimony of Mr. George Harrison. He has sent in very promptly the table to be

substituted for "Exhibit No. 2541." I should like to submit it instead of the table received yesterday. There are copies here.

The CHAIRMAN. It may be so admitted.

Dr. ANDERSON. Tomorrow morning we are unusually favored by the presence of Mr. Thomas J. Watson, the president of the International Business Machines Corporation, New York City, to open the testimony on the effect of technology on white-collar workers as a result of business-machine changes.

The CHAIRMAN. The committee will stand in recess until 10:30 tomorrow morning.

(Whereupon, at 4:45 p. m., the committee recessed until 10:30 a. m. on Friday, April 19, 1940.)

INVESTIGATION OF CONCENTRATION OF ECONOMIC POWER

FRIDAY, APRIL 19, 1940

UNITED STATES SENATE,
TEMPORARY NATIONAL ECONOMIC COMMITTEE,
Washington, D. C.

The committee met at 10:45 a. m., pursuant to adjournment on Thursday, April 18, 1940, in the Caucus Room, Senate Office Building, Representative Clyde Williams, Missouri, presiding.

Present: Representative Williams (acting chairman); Senator O'Mahoney (chairman); Messrs. Lubin, O'Connell, Pike, and Brackett.

Present also: William T. Chantland, Federal Trade Commission; S. Abbot Maginnis, Department of Justice; and Dewey Anderson, economic consultant to the committee.

Acting Chairman WILLIAMS. The committee will be in order, please.

Dr. ANDERSON. Mr. Chairman and members of the committee, today we open hearings on the subject of technology in the fields of white-collar employment, the clerical fields of business particularly, and this morning we have with us Mr. F. W. Nichol, vice president and general manager of the International Business Machines Corporation, and the president of that corporation, Mr. Thomas J. Watson. In talking over the nature of the presentation this morning we have come to the conclusion that it would be best to proceed as follows: That Mr. Nichol, who has prepared a statement for the corporation discussing this whole problem, will read that statement, and we hope with as few interruptions as possible, because it is a continuous statement in which things discussed follow one after the other. Following the presentation of the paper and the question period, Mr. Watson will be available to the committee for interrogation on the problems of the paper, or more particularly the general problems which have been the concern of this hearing on technology and concentration of economic power and unemployment.

If it is your pleasure, Mr. Chairman, we will proceed with Mr. Nichol at this time.

The CHAIRMAN. Will you gentlemen both be sworn? That is our custom.

Do you solemnly swear, each of you, that the testimony you are about to give in the matter now pending will be the truth, the whole truth, and nothing but the truth, so help you God?

Mr. WATSON. I do.

Mr. NICHOL. I do.

(Senator O'Mahoney assumed the chair.)

TESTIMONY OF THOMAS J. WATSON, PRESIDENT, AND F. W. NICHOL, VICE PRESIDENT, INTERNATIONAL BUSINESS MACHINES CORPORATION, NEW YORK, N. Y.

Mr. ANDERSON. Proceed

Mr. NICHOL. Shall I begin?

The CHAIRMAN. You may proceed.

TECHNOLOGY AND ECONOMIC RECOVERY¹

Mr. NICHOL. The United States has 6 percent of the population of the world. We started without any industries, and we have built up to a point where we manufacture 47 percent of all the goods manufactured in the world based on the present rate of exchange, and under our American system we consume about 90 percent of what we produce. That is a great tribute to our people, to their ingenuity, and to the machines which they have produced. By the use of improved machines, we have been able to shorten working hours, and at the same time increase wages and reduce the price of manufactured goods, resulting in the highest standards of living in the world.

From 1850 to 1930, the number of industrial workers increased about twice as fast as population, and the wages paid increased nearly 6 times as fast as the increase in the number of workers.

We frequently hear that we are living in a "machine age," but I feel we are living in the greatest man-age the world has ever known. Machines are simply tools that men have devised to enable them to do a better job.

In England, in the early 1700's, planks were made by men's ripping logs with a long hand saw. It was very hard work and made men old at 40, giving them what was called "carpenter's heart." Most of them were dead at 50. One day an ingenious Englishman decided to hitch a water-wheel to a saw, and that became the first engine.

The introduction of the spinning jenny and looms in England in 1764 actually started a great increase in employment in the textile industry, though it was thought at first that nearly everyone would be thrown out of employment in the whole industry.

In 1859 there were 191,000 wage earners in textile mills in the United States—6,200 of each million of the total population. In 1937, there were 1,125,000 wage earners in textile mills—8,700 of each million of the total population.

From 1859 to 1937 the proportion of the total population working in textile mills had increased 40 percent and the annual wage had increased 313 percent.

In 1890, when the typesetting machine was beginning to come into use, we had 30,000 compositors in printing plants in the United States, or 476 of each million of the total population. In 1930, the number engaged in this occupation was 184,000 or, 1,500 of each million of the total population. In 1890, compositors worked 54 hours a week at the rate of 49 cents an hour. Now they work a 40-hour week and receive \$1.30 an hour. Since the introduction of the typesetting machine, the proportion of the total population having jobs at typesetting has increased 215 percent, and the hourly wage has increased 165 percent. Thus printing has become cheaper, and weekly news-

¹ Prepared statement of Thomas J. Watson.

papers have been turned into daily newspapers, increasing the number of employees.

In 1870, before the typewriter, only 2,100 out of every million of population were engaged in office work. Then came the typewriter, followed by machines for adding, computing, accounting, record keeping, writing, and other business procedures. Today, there are 33,000 people per million of population engaged in office work.

In 1890, before the accounting machine, there were 159,000 bookkeepers and accountants. In 1930, there were 931,000. During this period, population increased 96 percent, but accounting people increased 486 percent.

When a new machine is installed, we must not overlook the fact that from producing the raw materials to manufacturing the machine, a great amount of labor is necessary before the machine is ready to be installed. Through the use of the machine, products can be manufactured more economically, and the market is broadened to serve more people, which in turn creates more employment.

We cannot reduce the cost of goods to the consumer without using the latest type of improved machinery.

I should like to quote here from a short article, "Things We Didn't Have Only Ten Years Ago," which appeared recently in Reader's Digest:

Here are some of the things we take for granted today that we didn't have, or hadn't begun to use, as short a time ago as 1929:

Streamline trains. Television. Transoceanic passenger air service. Synthetic rubber. Fluorescent lighting. Colored home movies. New plywoods, stronger than steel. Half a dozen new plastics and resins. Polarized glass. Glass building blocks. Fibre glass for insulation and textiles. Synthetic hosiery replacing silk. Synthetic vitamins and hormones. Sulfanilamide and sulfapyridine, drugs that kill the deadly streptococcus germs.

Don't ever believe the country's future lies behind it. Inventive genius and business enterprise never stand still.

Under the American system, all industries are interdependent. The American system is largely predicated upon mass production, which, in turn, is based on machine methods.

Under the American system, the people enjoy more of the comforts and conveniences of life than in any other country in the world.

INTERNATIONAL BUSINESS MACHINE'S SHARE OF THE BUSINESS MACHINES INDUSTRY

Mr. NICHOL. According to reports of the Census of Manufactures for 1937, the total business machines production in the United States amounted to \$246,362,914. International Business Machines Corporation's share of the value of business machines produced was 7.3 percent.

In the typewriter branch of the industry, I. B. M. has about 1/2 of 1 percent of the total output of machines.

By far the greater part of the bookkeeping and accounting work in the United States is still done by the method of hand entries. We made a careful estimate from available Government records of the cost of the accounting work in the United States, and found that the amount was about \$3,788,000,000 annually. The money spent for the use of our accounting machines amounts to only 2/3 of 1 percent of the total accounting cost of the country.

Our company does the accounting and statistical work of business organizations and institutions whose accounting and statistical problems are such that the electric accounting and bookkeeping machines give satisfactory service. The idea that these machines do a great part of the total accounting work of the country is erroneous.

Those offices using our machines do a great amount of work on other machines, in addition to which there is in these same offices a vast amount of clerical work not done by machines at all. The documents from which cards are punched must be prepared and arranged for the punch operator, and the results obtained by the machines must be arranged and interpreted by accountants, auditors, and others.

It has been the policy of our company during the past 26 years to carry on an expanding research and development program. Research and engineering is the only branch of our business which is not budgeted.

Our engineering staff consists of 300 scientists, engineers, and inventors.

During the past 26 years our company has placed emphasis on education. What we consider one of the most important buildings in our business is our schoolhouse at our main plant at Endicott, N. Y.

The program at this school comprises courses for I. B. M. executives, salesmen, customer servicemen, systems servicemen, and systems servicewomen, office and factory employees, and apprentices.

We also provide administrative training courses for customers' employees.

In addition to training customer department heads at Endicott, we conduct schools in various cities of the country in which customers' employees are trained in the operation of our machines. These schools offer an opportunity for persons out of employment to become operators of our equipment, thus qualifying them for useful and remunerative employment. No charge is made for this training.

Our educational program also covers our people in all of our offices, where regular educational conferences are held. Educational material for these meetings in the form of textbooks on machines and their applications and on selling technique, leaflets describing particular applications, and other aids are being constantly provided by the Educational Department for the benefit of our people and customers.

In addition to the regular faculty and staff instructors, our schools are taught and given lectures by executives, specialists in various industries, outstanding salesmen, and noted educators and business executives from outside our own business.

We operate on the basis that there is no saturation point in education, and our educational program is extended over our whole organization throughout the world.

WAGES PAID AND HOURS WORKED

Mr. NICHOL. The company's wage-and-hour scale has always been liberal. On April 24, 1933, the company established a minimum-wage scale which was higher than that later fixed under the N. R. A.

In January 1935, as an incentive for quality rather than quantity production, piecework was abolished and a minimum rate of 55 cents per hour established for all qualified workers, which rate has since

been raised to 65 cents an hour, without differentiating between male and female labor.

The 48-hour week was standard up to January 1, 1933, when it was reduced to 43 hours and later in the year to 40 hours.

The following is the record in detail of the I. B. M. plant at Endicott, N. Y., where the greater part of I. B. M. manufacturing is done.

Dr. ANDERSON. This is Exhibit 2607.

(Representative Williams assumed the chair.)

Acting Chairman WILLIAMS. It may be received.

(The table referred to was marked "Exhibit No. 2607" and is included in the appendix on p. 17424.)

Mr. NICHOL. I shall read only the years 1926 and 1939. In the year 1926 the average number of hourly workers was 806, the average annual earnings were \$1,420.99, and the average hourly rate was 58.6 cents, the average hours worked per week 46.6, standard hours per work-week 48. In 1939, the last figure, the average number of hourly workers was 3,148, the average annual earnings were \$1,850.68, the average hourly rate was 89.5 cents, the average hours worked per week 39.8, and the standard hours per work week were 40.

It will be seen, therefore, that during this period the number of wage earners increased 291 percent, and the average annual wage showed an increase of 30 percent.

At the end of 1926 we had 255 customer servicemen. They are the men who maintain our equipment in the field throughout the country, who were paid \$140 a month on the average. At the end of 1939 we had 1,098 service men who received \$179 a month on the average. In the 13-year period the number of these employees has increased 350 percent and the average salary is 25 percent higher.

Beginning in 1937, vacations with pay were granted to all factory workers, on the basis of 2 weeks of vacation for those who had worked continuously for 1 year or more, and 1 week to those who had worked from 6 months to 1 year.

In addition, hourly employees are paid full time for 6 national holidays—New Year's Day, Memorial Day, July 4th, Labor Day, Thanksgiving, and Christmas.

These vacation and holiday advantages had been extended to salaried employees prior to 1937, and all employees now have like vacation and holiday privileges.

Since 1924 the company has carried group insurance on its employees, without contribution from employees toward premium payments. This insurance coverage has been broadened several times.

The present schedule of group insurance covering all employees, the entire premium for which is paid by the company, stands as follows: \$1,000 to all employees with 1 year of service, \$2,000 to all employees with 2 years of service, \$5,000 to all employees with 3 years of service, \$7,500 to all employees with 5 years of service; \$10,000 to all employees with 10 years of service.

The total amount of this insurance now in effect is \$42,159,000.

Our factory employees have long had an organization for the payment of sick benefits. The company contributes to this relief association so as to more than double the benefits available from member contributions. The present sick-benefit schedule provides for payment by the company of the full amount involved for the first 3 days, and thereafter the expense is shared equally with the relief association.

Recreational facilities for our factory employees have been provided in a large country club with 680 acres of land. Thousands of meals are served each month at cost in the club dining rooms, which are open daily. Libraries with reading rooms, and party rooms, card rooms, billiard, ping pong, and shuffleboard rooms are available. Organized groups meet regularly for private dinners, educational discussion, and social contact. An orchestra, band, glee club, and chorus give regular concerts and broadcast from the main auditorium of the club house.

There are 16 bowling alleys in the main club house, which accommodate 380 teams, and on which were rolled last year 184,730 games.

A rod and gun club has its own clubhouse and provides a modern skeet field, trap, rifle, and pistol ranges. Classes, under competent instructors, are conducted to teach the proper handling of firearms.

In connection with the clubhouse is a 27-hole golf course, swimming pool, rifle and pistol ranges, 6 doubles tennis courts, 2 softball diamonds, 1 baseball diamond, archery ranges, and quoit and horseshoe courts.

The management of all of these recreational facilities is vested in the IBM Club, an organization of employees.

ACCOUNTING MACHINES AND EMPLOYMENT

Mr. NICHOL. Based upon observation and experience, we believe that the use of our accounting machines tends to increase rather than to decrease employment, due to the fact that our machines are designed to obtain more information from original records rather than to make the original records by the use of less labor. Once the entries have been transferred to punched cards, they can be rearranged any number of ways to develop useful information from the basic data.

I shall here cite an example of a situation which confronts many manufacturers in the management of their business. This example is illustrative of one of the many functions which our machines perform in business, and shows that their favorable effect on employment is not confined to the office, but extends throughout the factory.

I have in mind a specific company which had no adequate cost of production system, nor control of sales, labor, materials, overhead, and inventories.

A contract was made with us purely on the basis of giving them the necessary facts to do a better job of management in their manufacturing plant.

Prior to the installation of our system, because of a poor production system, they were frequently confronted with the fact that they were suddenly out of one or more vital parts of the equipment they manufacture. This resulted in the removal of unfinished units from the production or assembly line and setting them aside until the necessary missing parts were produced. This, in turn resulted in laying off certain assemblers sometimes for a week or more or finding something else for them to do in the plant, and it also resulted in increased costs and delays in production which seriously affected the business.

Our machines corrected this condition.

Another result of the installation was the elimination of the manufacture of parts which could not be sold in the immediate future, and the placing of responsibility for spoiled parts. Thus a bad situation

which the management knew existed but which up to that time they could not locate was corrected.

With our system, coordination of sales and production was achieved through the comparison of production reports and sales reports. This installation also resulted in the addition of a few extra men in the plant to trace production orders, and apply corrective measures where errors were revealed.

Our machines are used all over the world, including countries in which the wage scales are so low that labor-saving as against the cost of our machines could not possibly be the cause of preference for our machines. Our company is doing business in 79 countries, and the manufacture of machines in our American plants for foreign consumption creates employment in our own country.

To determine the effect of the use of business machines upon employment, consideration must be given, first, to the reasons which prompt their use by industry and Government.

Our records show that the reasons for the installation of our machines are: management control, flexibility, speed, economy, and accuracy, in the order named.

Business machines may be adopted not solely because of any one advantage but because of a combination of two or more of them.

During the past few decades the need for facts and figures regarding operations has increased greatly due to the increasing complexities and speed of modern business. As competition increased, and mass production became general, and as distribution and service became increasingly important, business executives came more and more to recognize the value of additional information regarding every phase of their operations. They also recognized that this information, if secured, must be timely and accurate. Therefore, the executive's problem in meeting these changing conditions was not one of curtailing information in order to economize, but rather of finding a medium that, at a reasonable cost, would provide the information needed.

Regardless of the desirability or the necessity for these additional facts, management still had to weigh the cost of their production against their value. While it is true that much of the additional information now being compiled by modern business might have been prepared without business machines, the probabilities are that it would not have been prepared if only the slow, cumbersome, and costly hand methods had been available.

Management's problem, therefore, to maintain revenue, profits, and employment, to say nothing of increasing them, resolved itself into the need for a more careful analysis of every operation of their business. Such an analysis was only possible through developing more facts and figures than had ever been developed before. Coupled with the admitted need for additional information was the necessity for developing it promptly and accurately, as well as providing a method which had sufficient flexibility to permit its change at a moment's notice. Therefore, in the marketing of business machines, and particularly the products of our company, we find that the principal reason for their use is that they can provide management with vital information—accurate and timely—at a cost that can be justified.

Experience has shown that the failure of an enterprise generally does not result from a single great loss but rather from the cumula-

tive effect of minor losses which frequently are brought about by a lack of prompt and accurate information on which to make intelligent decisions. The ease with which accounting and auditing routines detect losses depends upon the quality and extent of detailed information that is introduced into the records and summarized into intelligible operating reports.

By management control action taken in time is more likely to have a favorable influence on the earnings of a company, on the maintenance of continued and increasing acceptance of a product or service, and on the employment and earnings of personnel.

Management in recent years has recognized the tremendous wealth of figure facts reposing in its basic accounting records.

Management then is directly confronted with the problem of evaluating the worth of each report contrasted to the cost of its preparation.

Because of the inherent ability of modern business machines to completely analyze at a reasonable cost the figure facts in the basic accounting records, management adopted these devices so that all information of value to the enterprise would be made available.

As an example of the need for a flexible method in modern business, let us consider the amount of information available from a simple pay roll time ticket. Essential reports derived from it include those for pay-roll compilation, income tax, and other reports required by audit practice and governmental agencies.

In it are also contained the data required for the compilation of other valuable internal operating statements. Among the latter are such statements as direct and indirect labor costs, planning on production schedules, machine-operating costs, and the like.

It is this flexibility of electric accounting machines to analyze in various ways information contained in one original document that has been a determining factor in the use of the machines by many companies.

In these days operating information regarding a business is valuable only if available in time to be used effectively. Information which is furnished too long after the occurrence of events delays the institution of corrective measures. Modern business is adopting methods which will reveal facts as soon as possible after transactions occur.

It must be remembered, also, that not one, but many reports which must be compiled from one set of original records are required to satisfy the needs of many individuals in positions of responsibility and authority. Promptness in supplying reports to responsible individuals is one of the most important elements in the achievement of sound business operation.

In many instances the element of time is the predominant factor in the adoption of the use of electric accounting machines. The importance of current information regarding accounts payable and receivable, sales, inventory, expenses, and costs is recognized by efficient management. Modern business machinery presents the best method available for the prompt compilation of vital information necessary to the conduct of sound business.

In the operation of any business or government constant effort must be made to bring about economy and efficiency in all operations.

The installation of business machines, in some instances, results in the temporary displacement of labor, just as does the introduc-

tion of many other machines and mechanical devices developed by the inventive genius of man.

On the other hand, business machines as well as others have been the benefactor of labor by the creation, either directly or indirectly, of many additional places for both skilled and unskilled labor.

In manufacturing, economy is also expressed in terms of lower unit costs of production—always, of course, with no sacrifice of quality of product or of safety of employees.

In determining the value of reports prepared by the accounting department, management contrasts their value with the unit costs of preparation.

Executives recognize that under mechanized routines an increased number of reports may be compiled at a nominal increase in total cost, but at a lower unit cost for each report.

Economies achieved by the use of machines in the preparation of such reports afford to management an opportunity for the compilation of these vital figure facts which otherwise would remain undisclosed.

The need for accuracy in the maintenance of records for the preparation of financial reports such as the balance sheet and profit-and-loss statements has long been recognized.

The expansion of the use of figure facts for management control makes it imperative that reports upon which policies are established should be accurately prepared.

Accuracy in the rendering and payment of bills and in the preparation of pay rolls is vital to a company's relations with its customers, vendors, and employees.

The checking and correspondence necessary to expose and adjust accounting errors, with attendant annoyance to customers and employees, places a premium upon accounting accuracy.

Scientific studies and practical experience have demonstrated that mechanized accounting procedures achieve a degree of accuracy not to be expected in manual procedures.

The modern demand for accuracy of both internal and external accounting documents is frequently a major reason for the adoption of business machines.

An analyses of our records covering the new contracts entered into by us in New York, Brooklyn, and Newark in 1939 reveals that our machines were installed for a number of reasons by many of the companies, but the principal reasons were, 49 percent because of managerial control, 15 percent because of flexibility, 14 percent because of speed, 12 percent because of economy, and 10 percent because of accuracy.

Following are five cases selected from sales made last year in the area mentioned, each of which illustrates 1 of the 5 reasons why businesses install our machines; namely, management control, flexibility, speed, economy, and accuracy.

ADVANTAGES OF BUSINESS MACHINE

Mr. NICHOL. Our machines were installed at company A, which is engaged solely in the manufacture of metal fasteners, for the major applications of merchandising control, production statistics, pay roll, and labor distribution records.

The matter of effecting economy in office clerical personnel had nothing to do with the adoption of our machines. They were adopted after a study revealed that they would provide essential control data.

To accomplish merchandising control, sales were analyzed by industry, customer, sales, and product. For production control, daily and periodic production reports were rendered, facilitating plant supervision.

The effect of the finished stock inventory application has been outstanding. It has provided accuracy, permitted of the centralization of stock records, provided an accurate monthly stock position report—which would be exceedingly difficult to prepare by other methods—making it possible for the management to see at a glance the production, shipments, and inventory of each of the company's products. It provided an important element in the production and planning department's activities. As one result, the management's attention was directed to the advisability of converting dead stock into cash and removing slow-moving items from the line.

As a result of our installation, four extra people were directly employed in the accounting department. Because of better management made possible by accurate and timely figure facts, the business of this company was materially improved. At the time of installation, May 8, 1939, there were approximately 5 people in the office and 300 employees in the plant. Since the installation, operations have expanded, and there are now approximately 80 people in the office and 400 people in the factory working two shifts, which means 800 people.

In August of 1939 the comptroller's office of municipality B contracted for the use of electric accounting machines for the purpose of maintaining the fund ledgers and contract ledgers of the municipality and for providing supporting records of an accounting and statistical nature. The fund ledgers and contract ledgers are maintained to record expenditures against the individual funds set up to take care of items prescribed by the municipal budget. The record not only shows the appropriations already made against each fund or contract within the fund but also shows the amount of the unexpended balance at all times. Prior to the introduction of our system to perform this work most of the operation had been done on a manual basis, although the contract-ledger portion of the job was being handled on bookkeeping machines.

An investigation of all types of equipment and methods was undertaken early in 1938, under the direction of a responsible official, because of the dissatisfaction on the part of the officials of the municipality with the operation and results of the methods and procedures then in use. The ultimate objective in changing procedures was to achieve the greatest possible flexibility and accuracy so that detailed analyses of revenues and expenditures could be obtained and thus enable the comptroller's office to render an improved service to the municipality by exercising a closer control over those items. It was not possible to forecast all of the analyses which might be required due to the numerous changing problems of a modern municipal government. Consequently, a flexible method which could provide numerous types of analyses was of paramount importance.

Actual practice has demonstrated the wisdom of the decision to everyone concerned. Numerous calls have been made for special analyses and reports and all have been satisfactorily handled.

As a result of the installation of our electric accounting machines, all objectives have been attained and nine additional positions have been created.

Our accounting machines were installed at agency C. This agency was formed in a city under the joint supervision of Federal and State governments, to establish new milk-pool prices monthly at the earliest possible moment. There are 10 classifications of milk now allowed for which new prices must be set. A set price for the milk delivered to the distributor by the producer is established. The distributor then contributes to, or receives benefits from, the pool, depending upon the ultimate use that is made of the milk he receives from the farmer. The establishment of the new milk-pool price is determined by a formula which takes into consideration such elements as utilization, butterfat, and transportation. The agency produces reports on production for the preceding month by the 14th of the following month. Producers and handlers must have all the reports into the agency by the 10th of the following month; hence, only 4 days are available for the compilation of the figures.

Under the manual plan reports were produced by the dead-line date, but no immediate statistical information was available. With the introduction of electric accounting machines, the reports are produced 1 to 2 days earlier than was previously possible, enabling producers and distributors to plan the ensuing month's operations at an earlier date. The new plan makes available valuable statistical information which was not heretofore possible, soon after the pool prices for the new month are determined.

It is essential that new pool prices be available as soon as possible, and speed in handling the figures submitted by the producers and distributors is absolutely essential. The use of electric accounting machines has made it possible for the earlier establishment of milk-pool prices, together with statistical information on a sufficiently timely basis to aid the agency in its proper operation.

The installation of electric accounting machines did not displace clerical help in this agency, nor did it result in the employment of additional people.

Approximately 6 months ago distributor D in the metropolitan New York area installed machines to facilitate the handling of essential accounting and report work, and to effect certain economies necessary to meet competition.

As a result of this installation, more timely and accurate reports are being made for the merchandising department, the traffic department, the buying department, and the Government.

Through the development of further managerial reports this company has virtually eliminated a costly "out of stock" condition, and, at the same time, has appreciably reduced its inventory investment. Due to the machine accuracy of billing, they have established a vastly improved retail inventory control over merchandise in their stores.

The preparation of an improved order-filling medium by the machines, and the inventory control previously mentioned, have resulted in maximum warehouse efficiency, and provided faster and more dependable delivery to stores.

As a result of this installation, the executives of this concern are now enabled to maintain constant control, speed up operations, realize quicker turn-overs, and improve their services for the ultimate benefit of the consumer.

The effect on employment in this case has been the elimination of 11 people.

Company E is a manufacturer. Its volume of business increased rapidly. It became apparent that more accurate and complete information concerning manufacturing costs was necessary. A complete survey of the requirements of the E company was made by our representatives, a proposal submitted, and the contract was signed in September 1939, because it was felt that electric accounting machines were the answer to their need for accurate and detailed records. The application of machines was for their pay roll and associated records, cost accounting, stock and production control.

Under the former method, reconciliation of shop pay roll and distribution of labor had been difficult, since the annual methods they employed did not lend themselves to a volume operation. Our machines and the system we installed facilitated this procedure and provided accuracy.

In connection with stock control, part numbers sometimes run into 10 characters with attendant possibility of error in transcription under the former method. Under the present method this hazard is eliminated with resulting accuracy of recording stock movements.

It was found also that more accurate forecasts of requirements in connection with booked orders by part numbers and scheduled delivery dates were obtained.

The accuracy, speed, and flexibility of our system, in this company's expanding situation, has placed the management in position to make its decisions based on reliable information.

This installation has resulted in the employment of seven additional people in the accounting department.

DIRECT AND INDIRECT I. B. M. EMPLOYMENT

Mr. NICHOL. On December 31, 1914, the International Business Machines Corporation had less than 300 employees in the United States. On December 31, 1939, the number of employees was 7,610, an increase of more than 2,400 percent in 25 years. Incidentally, throughout the world we now employ 11,478 people.

In addition to the 7,610 persons employed directly by our company in the United States, other concerns employ 1,041 persons who work exclusively and continuously on the requirements of our company, making a total of 8,651.

In addition, because of the sale and the continued use of our machines, many other concerns manufacturing accessories and supplies are the direct beneficiaries of our sales work. Such products include wiring, motor generators, noise-reduction equipment, cabinets, files, stationery, and so forth. We estimate there is \$2,000,000 worth of business done by other companies in furnishing the paper used in connection with our machines, exclusive of the operating cards. This furnishes employment for a large number of people.

And our company, in turn, gives employment to the producers of raw materials and parts which it buys, to the producers of the machines

and tools used in our factories, and to transportation companies and others which render service to our company. In 1939 we paid \$7,346,000 for materials and \$1,487,000 to railroads and other transportation agencies for services.

Before we start the manufacture of any part of our machines, we create employment. It goes back to the mines where the ores are produced; to the smelters, refineries, and copper mills; to the transportation companies—rail, water, and motortruck. We have created employment in these various places. We create employment in our designing, in our engineering, manufacturing, shipping, and recording work. All this work is created before any machine is placed that would tend to increase or decrease employment. We not only create employment before the machine is made but we also create employment after the machine is placed by enabling the manufacturer to do a better job and sell more goods.

It is in this way that our country has been able to bring our per capita consumption up to a point where it is seven times as great as the rest of the world. In countries which do not use machines you will find the per capita consumption, the wages, and the condition and intelligence of the people are the lowest.

A study was made from our own records of every individual sale of electric accounting machines in the year 1939 in our New York, Brooklyn, and Newark offices with a view to ascertaining the effect of these orders on employment both effected and contemplated, and it was found that in 80 percent of the installations involved, no gain or loss in employment resulted because of adopting our machines and systems.

In the remaining 20 percent of installations, 70 percent increased employment and 30 percent decreased it. This study shows that 153 employees have been released and 56 more may be released, or a total of 209 actual and anticipated releases. Against this, there have been 289 persons employed, and 8 more are expected to be employed, bringing the total increase to 297, or a net gain in employment of 88 persons.

There were 74 employees transferred to other work, and 112 more may be transferred, making a total of 186 transfers within these businesses.

The increase in our employment in the same sales territories in which these sales were made, during 1939, was 41 persons. The sales in this same area provided work for about 600 of our factory employees, not to mention the indirect employment to a substantial number of people incident to our business.

This study clearly shows that the expansion of accounting and record making which accompanies installation of these machines, and the employment in making and selling and servicing them, results in a substantial gain in total employment.

Our company maintains schools for machine operators and placement bureaus to find employment for those whom it trains. During the year 1939, we enrolled in our training classes 3,645 employees of customers so that they might transfer from former occupations to operate our machines. During 1939, our company enrolled 2,854 other persons, trained them in machine operation, and placed 1,170 in permanent jobs, and, in addition, 2,783 placements were made in temporary jobs.

Considering the business machines industry as a whole, it is my well considered opinion that the growing use of efficient office machines has increased rather than decreased employment.

This interpretation of available data is based on our own experience both with office machines and other machines. In our factories, advantage has been taken of every practical technological development. We buy the latest, most efficient tools with which to produce. But labor saving and reduced employment are not the same thing. While maintaining our plant in this modern manner, over the years the record shows that we added people to our pay roll.

In 1880, before there was any office equipment industry, there were 25,467 copyists at work. Much of the work of the copyist was in duplicating legal papers. At about that time the typewriter began to be used commercially. The typist can write much faster, do a better job and can produce a large number of duplicate copies. One typist could easily do the work of several copyists. But in 1930 there were 811,190 typists at work. That is, in 1880, before this machine was in commercial use, there was one job of copy-writing by hand for each 2,000 population. In 1920, 50 years later, there were 13 machine-writing jobs for each 2,000 population.

The same story can be told of other branches of office work. At the 1890 census, the office equipment industry reported the production of about \$4,000,000 worth of office machines for domestic use. Of each 1,000 population, 372 were reported as being employed, of whom 7 had clerical jobs.

At the 1930 census, production of about \$114,000,000 worth of office machines for domestic use was reported. Of each 1,000 population, 398 were reported as having jobs, of whom 33 had clerical jobs. That is, in 40 years, the total number reported as having jobs per 1,000 of population gained 7 percent, but clerical employment gained 370 percent.

I will go further and say that, in industry as a whole in the United States, improvements as the result of science and invention have resulted in increasing the wages and reducing the hours of labor, and that they have not caused unemployment in general, although there are undoubtedly specific instances in which they have done so.

In 1860, the average annual wage of factory hourly workers was \$288. Data of hours worked are incomplete, but the best figures I can get indicate that the average was about 64 hours a week. Due to the use of improved machinery and better cooperation between business, labor, and Government, the average annual factory wage in 1937 had risen to \$1,180, and the work week was down to 38½ hours. In other words, science and invention and better cooperation between business, labor, and Government must be credited with having reduced the hours of labor by more than 40 percent and with having increased the wage by 300 percent.

Changes in employment are constantly occurring. At times, one efficient person will displace two or more inefficient people. Unemployment may be accounted for by several reasons not involving the machine. One reason is that our economic system is out of balance due to changes in world markets. Our agriculture has been developed to meet world needs for certain crops which we produce to advantage, and under present conditions we have large surpluses. Some arrangement must be made whereby we can find markets for these surplus products.

Change is the one certainty that we have. We cannot remain as we are. We must either go ahead or go backward. Machines are but

the tools which civilized man uses and whenever we find any place in the world without machines we find a place in which few would care to live. We either must improve and develop those tools or we must begin to throw them away and go back to the \$288 annual wage for a 64-hour workweek and then to whatever conditions prevailed before 1860.

As for me, I prefer progress. What we need is more science, invention, and machines, because with more of these we shall replace the inadequate equipment of the past and present with the better, safer, and progress-promoting equipment of the future.

Thank you.

Acting Chairman WILLIAMS. Have you any further statement to make, Mr. Watson?

Mr. WATSON. No, sir.

Acting Chairman WILLIAMS. Dr. Anderson, do you want to ask some questions?

Dr. ANDERSON. I want to ask some questions with respect to this paper, Mr. Nichol, so that the record will be perfectly clear. You state: "At the 1930 Census production of about \$114,000,000 worth of office machines for domestic use was reported," and then: "Of each 1,000 population, 398 were reported as having jobs, of whom 33 had clerical jobs. That is, in 40 years, the total number reported as having jobs per 1,000 of population gained 7 percent, but clerical employment gained 370 percent."¹

May I ask for the source of the data?

Mr. NICHOL. I will have to find that in my statement.

Dr. ANDERSON. I think I know the source. I just wanted to see whether you aren't in agreement that these are figures taken from the census, the decennial censuses of the United States.

Mr. NICHOL. They are; yes, sir.

Dr. ANDERSON. Then I would ask this following question. I think this is an error that is very frequently made in the use of the census of occupations, which records the total population listed as available for work, either employed or unemployed. It does not necessarily mean people actually employed. Then the statement that in 40 years there was a 7-percent gain in the number of employed per 1,000 of population, clerical employment gained 370 percent, would have to be seriously qualified, would it not?

Mr. NICHOL. We were guided by the figures in the census of manufacturers. We accepted those as being correct.

Dr. ANDERSON. The census of manufacturers didn't give the data for 1930. The 1930 data were taken from the census of population in which the division on census of occupations is recorded. The point I am making is that the frequent translation of census of occupations data into census of employment data is an incorrect use of material.

Mr. NICHOL. I have never been aware of that.

I have taken it naturally for granted that those figures were correct as stated.

Dr. ANDERSON. As a matter of fact, the census itself is so definitely aware of it that in this particular census it no longer will have the captions that have usually appeared, "Gainfully employed," and captions of that sort which have been so misleading. It will now have

¹ See p. 16772.

strict census of occupations in order to overcome that difficulty. But I take it that the same sort of reasoning was used in your statement when you made comparisons between the situations in England at various periods of time. The English figures are also occupational figures, occupational census figures rather than actual employment census figures.

Mr. NICHOL. Yes.

Mr. PIKE. Is that a very substantial error?

Dr. ANDERSON. No one knows the size of the error. Let me show you the size of the error if you took it at a period of time such as this. I have a document here which is a United States Department of Labor Wage and Hours Division document, Report of Proposal to Exempt Clerical Employees from the Hours Provision of the Fair Labor Standards Act of March 1, 1940. To show you the wide margin of error that could take place—I don't say it did, but the fact of the matter is that we don't know what the size of the error is—in November 1937, the Census of Unemployment found 943,000 clerical employees and kindred workers totally unemployed or on work relief in the United States. If the census had been taken in 1937 the 943,000 would have been included in this group of presumed employed workers.

Mr. PIKE. It doesn't necessarily infer that the error increases or decreases by censuses, so that if the percentage of error had been the same—

Dr. ANDERSON (interposing). Of course, you know that these censuses coming once every 10 years we would have to have a very detailed analysis of what was occurring with respect to actual employment in each occupational category and subgroup in order to know that the unemployment factor was canceled out in successive censuses.

Mr. PIKE. I was looking at an exhibit that Dr. Kreps brought in in the first day's statement.¹ The figures aren't strikingly comparable but they are something of the same nature.

Dr. ANDERSON. I drew attention at the time, as you remember, to this very point. The caption reads "Occupational Distribution of Gainful Workers," gainful workers being a concept meaning all those who offer themselves or are considered to be available for labor. It does not treat of employment. In other words, it is a caption descriptive of the labor force rather than of employment conditions.

Mr. PIKE. So that any conclusion you would draw from such figures wouldn't be aggregate. In the case, however, where you get an increase of 200 or 300 or 400 percent, you would say there was a substantial increase in there somewhere.

Dr. ANDERSON. In employment as well as in the number of people available, that is likely true.

Mr. PIKE. If the error wouldn't be large enough to throw the trend out. All the people unemployed wouldn't have said in 1890 that they wanted to work in a machine shop and in 1930 they wanted to work at a desk.

Dr. ANDERSON. That is right; and it is true, as Mr. Nichol has indicated, with this correction that I have attempted to bring in, that the focus of attention upon clerical service in the United States has been out of all proportion to the focus of attention upon any other broad group of gainful workers.

¹ See "Exhibit No. 2437," *infra* p. 17281.

EFFECT OF MECHANIZATION UPON EARNINGS

Dr. ANDERSON. I wanted to ask a further question of considerable importance, Mr. Nichol, with respect to the effect of business machines and mechanization in the clerical field on clerical wages and earnings. Do you have any data that would indicate what has been the result?

Mr. NICHOL. No; but my general impression would be that people who are trained to operate our machines are promoted and receive more remuneration than they did in the previous occupation. Is that the point you wanted?

Dr. ANDERSON. Yes. The United States Civil Service Personnel Classification Board made a study in 1929 on this point. They were trying to establish certain classifications of employees and they made a very sizeable comparison, in large and small cities, of routine stenographer-clerks and dictating-machine operators. Then they ran out the percentage of workers with annual earnings of less than \$1,550 and found that 69 percent of the routine stenographer-clerks were in that category, as compared with 81 percent of the dictating-machine operators. They found that 79 percent of the bookkeeping-machine operators were in the low-wage category, as compared with 48 percent of the routine bookkeepers. Would you care to comment on those figures as an indication of the results of mechanization?

(The table referred to was marked "Exhibit No. 2608" and is included in the appendix on p. 17425.)

Mr. NICHOL. Where did these figures come from?

Dr. ANDERSON. These are from the United States Civil Service Personnel Classification Board study, 1929.

Mr. NICHOL. I am not equipped to answer that specifically. As I said before, from my general knowledge it has been my impression that the people who operate our machines are transferred from other occupations and receive more money after their training and become qualified and competent.

Dr. ANDERSON. So that your conclusion is that mechanization in the clerical division actually does not have a detrimental effect upon wages?

Mr. NICHOL. Yes, sir.

Dr. LUBIN. Is this a classification of Government employees?

Dr. ANDERSON. No. This was a classification made by the civil service of outside workers in the large and small cities.

Mr. O'CONNELL. Dr. Anderson, if I understood those figures correctly, they come to a somewhat different conclusion from the one that Mr. Nichol believes to be the situation.

Dr. ANDERSON. That is right. I wanted to bring the contrast in to get the judgment of Mr. Nichol, who has had such broad experience in the field. His conclusion is quite opposed to this one.

Mr. NICHOL. So far as that is concerned, the application to our particular business could be very readily ascertained, and I will do so for my own satisfaction.

Dr. LUBIN. Will you send us for the record such figures as you do find?

Mr. NICHOL. Yes; I will be glad to.

Dr. ANDERSON. Mr. Nichol, I know the seriousness with which you went about preparing this paper. I wonder if you would care to

make a comment on the availability of material in this broad field of clerical occupations and the effect of technology in the field. Was it difficult to find data?

Mr. NICHOL. Yes.

Dr. ANDERSON. In other words, you find statistical information on this problem is very rare?

Mr. NICHOL. It requires a great deal of digging in a great many sources, and it isn't always up to date, either.

Dr. ANDERSON. Would you be interested in seeing Government bodies make available more complete data?

Mr. NICHOL. I think it would help the present situation, not only in our own field but business as a whole.

Mr. MAGINNIS. Mr. Nichol, in your sales of machines in other parts of the world, are those machines manufactured in this country or do you have subsidiary companies in certain foreign countries?

Mr. NICHOL. Some of them are manufactured here, and we have plants in Germany, France, and Italy.

Mr. MAGINNIS. Then, most of your machines that are sold in Europe are sold from those plants you have in Europe?

Mr. NICHOL. Partially. Those plants are not fully complemented in every case. We ship parts of machines and they are assembled there in some cases. In one plant they are wholly made. Before tariff barriers we made all of the machines here and shipped them abroad.

Mr. MAGINNIS. Do you manufacture typewriters?

Mr. NICHOL. Yes; in a small way.

Mr. MAGINNIS. You don't sell them?

Mr. NICHOL. We have just gone into the business.

Dr. LUBIN. What kind of typewriters do you manufacture?

Mr. NICHOL. Electric typewriters, electromatic typewriters.

Dr. LUBIN. Can you tell us what it will do?

Mr. NICHOL. Well, its points of advantage are the number of carbon copies which it can make as compared with the manual machine.

Dr. LUBIN. How many more?

Mr. NICHOL. It will make 20 where the average machine cannot do better than 6 or 8. Then there is the uniformity of touch, resulting in uniform copy. Every letter is alike and it turns out a beautiful job. The operator does not have to move her fingers off the keyboard for a return of the carriage, turning up of the platen, and all that sort of thing, and tabulations. It relieves the operator of fatigue and it increases production.

Dr. LUBIN. How much will it increase production as compared to the standard machine? Have you figured that out?

Mr. NICHOL. That is disputed in a great many ways. We have had estimates from 6 to 25 percent.

Dr. LUBIN. In other words, you can expect the productivity of the workers, on the average, to increase at least 10 percent by the use of this machine?

Mr. NICHOL. Yes; although my personal opinion is more than that.

Mr. MAGINNIS. Does it have interchangeable type?

Mr. NICHOL. No, no.

Mr. MAGINNIS. Does it have automatic justification?

Mr. NICHOL. No; it does not. I might say that it is used in special purposes for stencil cutting. It does a splendid job on stencil cutting and duplicating work.

Dr. LUBIN. Does that mean that we can expect, with a given rate of output for a given firm, to be able to get along with 10 percent fewer stenographers?

Mr. NICHOL. Not necessarily. I think it might mean that more letters might be written.

Dr. LUBIN. But assuming the same volume of output, I mean.

Mr. NICHOL. Yes, sir.

Dr. LUBIN. It means that we can look forward to displacement of more typists?

Mr. NICHOL. If we ever sell enough of them.

Mr. PIKE. I suppose the price is pretty high, isn't it, Mr. Nichol?

Mr. NICHOL. The price is \$225 as compared with \$115; that is before discount.

Dr. LUBIN. Mr. Nichol, I notice that you talk about your sales in this report. What kind of equipment do you sell other than typewriters?

Mr. NICHOL. Time recorders.

Dr. LUBIN. Well, these bookkeeping machines that you have been talking about, when you talk about your sales, are they sold?

Mr. NICHOL. They are rented.

Dr. LUBIN. So that the word "sale" really should—

Mr. NICHOL (interposing). The word "sales" means billings, really.

Mr. PIKE. I see.

Mr. NICHOL. We both rent and sell our machines, excepting the accounting machines; the electric accounting machine is not sold. It is rented. Our time recorders and typewriters are sold outright.

Mr. O'CONNELL. In your statement, Mr. Nichol, there are some figures about the volume of business machines produced, indicating a volume of \$246,000,000 in 1937, and a statement to the effect that I. B. M.'s share of the value of this business was 7.3 percent. What is the basis of the \$246,000,000 figure; is that a cost figure?

Mr. NICHOL. Yes; that is the value at the plant.

Mr. O'CONNELL. Value at the plant; does that include all the types of machines that your company makes?

Mr. NICHOL. Yes.

Mr. O'CONNELL. Well, 7.3 percent of that would be roughly \$17,000,000 a year, in that year. Does that mean that that was just about the value of the total production of your company in that year?

Mr. NICHOL. Yes.

Mr. O'CONNELL. Well, what kind—taking the machines that you rent rather than sell—

Mr. NICHOL (interposing). I beg your pardon?

Mr. O'CONNELL. I say, I take it that a substantial part of your production was of machines that you lease and do not sell?

Mr. NICHOL. That is right.

Mr. O'CONNELL. Well, what kind of a figure would you use for that type of equipment? There is no selling price for it, is there?

Mr. NICHOL. No.

Mr. O'CONNELL. Well, how would you figure that?

Mr. NICHOL. This was the value at the factory. The sales price has nothing to do with this figure.

Mr. O'CONNELL. Well, what is it, a cost price?

Mr. NICHOL. A cost price at the factory.

Mr. O'CONNELL. You mean the cost of all the machines you made?

Mr. NICHOL. The cost of all the accounting machines is \$246,000,000 and our cost is 7.3 percent of that.

Mr. O'CONNELL. The total cost of all the machines that your company made in 1937 was 7.3 percent of the total of \$246,000,000?

Mr. NICHOL. Of the total. Our total production is about \$17,000,000 in terms of cost. We got this other figure from the Census of Manufacturers. It was 7.3 as our own figure.

Mr. O'CONNELL. Of course, but—

Mr. NICHOL (interposing). Our own proportion of that production cost—

Mr. O'CONNELL (interposing). Do you happen to have in mind what the value, what the total amount of your billings in 1937 was?

Mr. NICHOL. No; I don't. In the vicinity of \$25,000,000 to \$30,000,000, I think.

Mr. O'CONNELL. Between \$25,000,000 and \$30,000,000, you say?

Mr. NICHOL. Yes. That includes a service bureau. We have people who go to business and do their work for them with our machines. There is a human relation involved there. In other words, we take a certain amount of money for the human service, and then we pay those human beings, plus a certain job cost for statistics which are produced. Then there is the sale of cards that go with the machines in addition to the rental. The cost of material purchased was about \$7,000,000 last year.

Mr. O'CONNELL. How much, about?

Mr. NICHOL. \$7,000,000.

Mr. O'CONNELL. Cost of material purchased?

Mr. NICHOL. Yes.

Mr. O'CONNELL. Well, is this 7.3 percent intended to indicate the relative importance of the I. B. M. Co. in the business-machines industry?

Mr. NICHOL. Yes.

Mr. O'CONNELL. Do you happen to have in mind the other substantial companies that make up the other 93 percent?

Mr. NICHOL. Well, there is the Remington Rand; Underwood Elliott Fisher; National Cash; Burroughs; Ohmer; Fare Register; Eastman Kodak (one section of its business); Royal; all the typewriter companies.

Mr. O'CONNELL. At that point, if you were to take particular products of your company and relate those products to the total production of that product, the picture might very well be different. For example, in the typewriter industry you indicate that you represent one-half of 1 percent of the total output.

Mr. NICHOL. That is right.

Mr. O'CONNELL. Now, if we were to take tabulating machines or types of equipment that you lease, the percentage would be quite different, would it not?

Mr. NICHOL. You mean leave the typewriters out?

Mr. O'CONNELL. Well, that was an example of one thing. That would really change the picture substantially, isn't that right?

Mr. NICHOL. That would change it; yes. We use that figure because we are in competition with every known type of business machine; we are in competition on every deal with somebody, not one but many. We are in competition with the adding machine, the comptometer, the bookkeeping machines, and all types of business machines.

Mr. O'CONNELL. Well, the reason I asked the question was that in general, I was under the impression that the I. B. M. Co., in certain

lines at least, was a much more—had control of or was blessed with a more substantial portion of the market than 7.3 percent.

Mr. NICHOL. I think that is a general misconception.

Mr. O'CONNELL. A general misconception? I think the 7.3 percent might give rise to something of a misconception when applied to particular products. I don't think it is at all an accurate picture of the control you have of tabulating machines which you lease to the Government, for example, and to other people.

Mr. NICHOL. Well, we believe it to be accurate because we are in daily competition with all of these machines and that is the percentage of, well, of the value of the machines that are produced by the people with whom we are in competition.

Mr. O'CONNELL. Yes; that is, taking the over-all picture of everything, regardless of whether you happen to be just coming into the business, as in typewriters, or whether it happens to be something that you have been in longer and have a larger control of the market?

Mr. NICHOL. That is right.

Dr. LUBIN. Mr. Nichol, if you took out the typewriting figures for the total output of the industry, what percentage would your figure be of the total?

Mr. NICHOL. I am sorry. I don't know that. There wouldn't be much difference. We can get that for you if you like.

Mr. MAGINNIS. Mr. Nichol, what do you mean by business machines in the use of that figure, \$246,000,000?

Mr. NICHOL. I mean the business machines in the—

Mr. MAGINNIS (interposing). What does it include?

Mr. NICHOL. Machines that are used for keeping records, adding machines, listing-adding bookkeeping machines, and bookkeeping-billing machines, calculating machines, cash registers, fare registers, addressing and billing machines, numbering machines, checkwriting and perforating machines, and typewriters.

Mr. MAGINNIS. You don't make any cash registers?

Mr. NICHOL. Any what?

Mr. MAGINNIS. Cash registers.

Mr. NICHOL. Yes; but the cash register makes an accounting machine. We don't make the cash register, but they make an accounting machine, and we are in direct competition with them.

Mr. MAGINNIS. You are in competition with them as on the accounting machine, but you do not make cash registers?

Mr. NICHOL. That is true; we do not.

Mr. MAGINNIS. And in the typewriter field, it is only 1½ to 1 percent?

Mr. NICHOL. That is right. That one-half of 1 percent would not affect the figure very much.

Mr. O'CONNELL. It wouldn't affect it? Well, it depends on how much of the \$246,000,000 are represented by typewriters, does it not?

Mr. MAGINNIS. Yes; I should think so.

Mr. O'CONNELL. Do you happen to know that figure?

Mr. NICHOL. The typewriter figures we have here, including parts, is about \$43,000,000.

Mr. O'CONNELL. About 20 percent of the total?

Mr. NICHOL. And ours is \$614,000.

Mr. MAGINNIS. Could you say from the figures you have available, Mr. Nichol, what percent your company has in the business in the

particular field you are in, eliminating typewriters and cash registers and any other machines that you do not cover?

Mr. NICHOL. Of course, we feel and we always have felt that we are in the same line of business that all these other companies are, or with any company that does record making of any kind or record keeping by a machine.

Mr. O'CONNELL. Well, I don't think there is any quarrel about that. The only point I think we are trying to make here is that if the comparison were made in lines in which you have a more substantial interest, the percentage of 7.3 would be very materially changed. I think if you merely eliminated typewriters, you reduce it; if you take fifty-odd million from the total figure and deduct the 50,000 figure from your cost figure, you would find that 7.3 percent would be very substantially changed.

Mr. NICHOL. Of course, the typewriter companies sell recording machines; I mean their typewriters are made to record, and bill, and everything else.

Mr. O'CONNELL. I understand, but I still want to point out—

Mr. NICHOL (interposing). It would make a difference, I agree with you, if you take out the typewriters. There is unquestionably a difference.

Mr. O'CONNELL. Or if you take any other number of things out. If we were to make a comparison between the total value of a particular product and your percentage of production of that particular product in any specific case we take, you would probably find it would vary very greatly from 7.3 percent. It would be on the low side, as in typewriters, or on the high side of something else. Isn't that true?

Mr. NICHOL. I should like to make the point—

Mr. O'CONNELL (interposing). Isn't that true, please?

Mr. NICHOL. I should like to make the point that we frequently replace other systems, which consist of adding machines, computing machines, accounting machines of various makes, and sometimes they replace us, quite frequently, and sometimes in competition they get the business and sometimes we get it. So we feel very definitely that we are in competition with all of those record-making and record-keeping machines.

Mr. O'CONNELL. Well, that may very well be true, but that has little to do with the question I asked. Isn't it a fact, please?

Mr. NICHOL. If you took the typewriters out, it would be something like \$43,000,000 that would come out of that total, and if you took those out, it would make a difference in that percentage. There is no question about that. I believe that.

Mr. MAGINNIS. How much would you take out for the cash-register business?

Dr. ANDERSON. Mr. Nichol, might we not achieve the purpose of the member of the committee—I think you wanted to get an answer?

Mr. MAGINNIS. I would like to get it if it is available.

Mr. NICHOL. I don't think it is available right here, but we would be very glad to get it for you any way you wanted it.

Mr. MAGINNIS. Whatever it is, \$50,000,000 or \$75,000,000 or whatever it might be; it would again come off the \$246,000,000, roughly, and would—

Mr. NICHOL (interposing). Only part of it.

Mr. MAGINNIS. And would again change the percentage.

Mr. NICHOLS. I say only part of it, because the cash-register company does a large volume of accounting-machine business.

Mr. MAGINNIS. Well, we are speaking—you don't do any cash register machine business?

Mr. NICHOL. No. If we take—

Mr. MAGINNIS (interposing). Where they compete with you on your machines, that is a different proposition?

Mr. NICHOL. That is right.

Dr. ANDERSON. I was going to suggest, Mr. Nichol, that we might achieve the purpose the committee member is driving at, namely, a better break-down of the amount of business per products done by your company, by asking you to submit to us, if you would, a list or table in which you would have a break-down of the type of business, the type of machine, and the proportion of the business done by you, as compared with all other companies.

Mr. NICHOL. We shall be glad to do that.

Dr. ANDERSON. I think that would solve the problem.

Mr. MAGINNIS. We probably had a misconception as to I. B. M.

Mr. NICHOL. Possibly.

Mr. MAGINNIS. We thought it was a good deal larger than it would appear to be; from the figure of 7.3 percent which you have given—

PHYSICAL AND SOCIAL EFFECTS OF MECHANIZATION

Dr. ANDERSON (interposing). Mr. Nichol, I wanted to ask a question that was not touched upon in your paper, which is of importance in analysis of technology. What are the physical and social effects of mechanization upon workers? Now, I have, for example, before me an International Labour Review publication of the International Labour Office, in which they treat the problem. By way of introducing the topic, I shall read one sentence or so from the subject of fatigue, "The increase in fatigue which often results from mechanization," and then they go on and discuss fatigue, monotony, and effects of that kind as a result of mechanization as compared to hand operations. Have you made any studies, or has your research division made any studies to indicate anything about these matters?

Mr. NICHOL. No.

Dr. ANDERSON. You do not know whether there is increase or decrease in fatigue or mental stability of workers in those physical, psychological aspects that affect production and worker well-being as the result of production of mechanical devices?

Mr. NICHOL: I do not know specifically but from my own observation and experience, I would say that fatigue is relieved.

Dr. ANDERSON. Would you have any figures to indicate whether the introduction of machines has anything to do with the ratio of the sexes employed in clerical work?

Mr. NICHOL. No.

Dr. ANDERSON. Does it have any effect upon the introduction of employment of proportionately more or fewer women?

Mr. NICHOL. I should say more women.

Mr. PIKE. One thing: I don't know how much it has to do with technological unemployment, but I think it fits in here somewhere, Mr. Nichol. I would like to get your philosophy of the leasing as

against the selling and see if it does not fit into this somewhere. What effect would it have? In other words, why you do it. That is purely a business reason, of course, but I would like to see if it doesn't have some bearing on this problem of technological unemployment, let's say, with the customer. I am not sure whether or not this fits in, and it may be off the track, but I would like to get your basic background to that leasing practice.

Mr. NICHOL. We believe that the leasing practice is best for ourselves and for our users. We have an engineering, development, and patent department, which is constantly improving our machines, and we have never held back any development. As soon as it is ready, we put it on the market, often with great costs to ourselves at the time.

So if you were to buy machines today, and we brought out something radically new next year that you should have, you would have bought those machines at a tremendous cost and you would probably feel that you would have to depreciate or amortize them before you traded them in. We trade them in immediately and give you the benefit of the latest technological advances.

We feel that in the long run, we can better serve our customers and ourselves in that respect.

Then there is the question of the service. These machines are highly complicated electrical devices, and we have in the neighborhood of 1,100 service men who are constantly operating in our customers' offices, keeping the machines in maintenance and order.

Mr. PIKE. You accept that responsibility and do it as a part of the renting?

Mr. NICHOL. Yes, indeed; besides which we must give business counsel. We train all of our men as well as we can in our very comprehensive educational system, to know every angle of business, so that they are able to discuss with you sales problems, manufacturing problems and other kinds of problems—counsel with you and apply our machines and systems to your particular problems.

Mr. PIKE. Now, if you sold a machine and after a couple of months, the buyer decided that he had made a mistake and that it wasn't any help to him, he has nobody to blame but himself really, but suppose he leases the machine from you and after 2 or 3 months, he actually finds that it doesn't help him as much as he had hoped, what happens then?

Mr. NICHOL. We try to prevent any such thing from happening before we take the order. In other words, we investigate your situation very thoroughly. Sometimes before we take your order—and if a salesman in overenthusiasm tries to sell us on the fact that you could use our machines for certain purposes and we believe you could not—we don't take the business. But the fact remains that we do have that occasionally occur. We take our machines back in that event.

Dr. LUBIN. How long do your leases run for?

Mr. NICHOL. Our original lease runs for a year with a 3 months' cancellation clause, but I might say that we never enforce it.

Dr. LUBIN. So that—

Mr. NICHOL (interposing). If you wanted to put them back, unfortunately we would have to take them back because we only want satisfied customers. Our machines are in the same category as an

employee. If you don't like him, if he isn't producing for you, you get rid of him.

Dr. LUBIN. Well, I fully appreciate the fact that your time-keeping machines are older machines, they have been in existence for a longer period of time, but they are being constantly improved, aren't they?

Mr. NICHOL. Yes.

Dr. LUBIN. Wherein is the difference between that type of unit and, let's say, a tabulating unit? I mean, if the purpose is to make available to the consumer, I mean the businessman who uses your equipment, the most modern advances, as soon as they are available, why is it that you—if that is the fundamental basis of your sales policy—why is it, then, that you sell time machines and you don't sell any others?

Mr. NICHOL. To answer the first part of your question, there isn't much improvement that you can make on time-recording mechanisms; in other words, they are limited to recording time. You may change the outside and you may do it a little faster, but that is about as far as you can go. It simply records your incomings and outgoings, the time you start a job, and the time you finish the job. That is about what it can accomplish. Those are simple mechanisms, not requiring the degree of service, both mechanical and in a business advisory nature, that other machines do.

Mr. MAGINNIS. Mr. Nichol, I would just like to ask you this question: Are your employees organized?

Mr. NICHOL. No; open shop.

Mr. MAGINNIS. Entirely?

Mr. NICHOL. Yes.

Mr. MAGINNIS. From top to bottom?

Mr. NICHOL. That is right.

Mr. CHANTLAND. I take it that your 1,100 service men are not included in this Endicott plant?

Mr. NICHOL. That is right. They are throughout the United States, in every city.

CLASSIFICATION OF LABOR FORCE

Mr. CHANTLAND. Below the officials of the company, what is the total labor and salary number for 1939?

Mr. NICHOL. Below the officials?

Mr. CHANTLAND. Yes; leaving out the officials and including all other salaried people and labor.

Mr. NICHOL. I haven't got that figure.

Mr. CHANTLAND. Well, approximately.

Mr. WATSON. Is that number?

Mr. CHANTLAND. Yes; number.

Mr. NICHOL. I haven't got it that way. But we can get it for you.

Mr. CHANTLAND. Well, tabulate them by classes and add them up.

Mr. NICHOL. I haven't got it here. I have just the total number of employees here. We can get it any way that you would like to have it.

Dr. ANDERSON. Mr. Nichol, I wonder if you couldn't make a breakdown of "Exhibit No. 2607" into groups which would indicate to us salary and other workers, wage earners, by certain groupings that would clearly bring out the proportionate number and earnings in particular groups? In other words, the average is confusing be-

cause it may conceal a wide range. If you enlarge the table to do that it would give us the data that has been asked for.

Mr. NICHOL. We would be glad to do that. The figure I quoted from that table was the hourly workers—that \$1,850—in the plant.

Mr. CHANTLAND. Is there any objection to having that take in the entire company?

Mr. NICHOL. We would be very glad to get that for you.

Mr. PIKE. You mean that 7,610 did include officials?

Mr. NICHOL. That includes everybody in the United States.

Mr. PIKE. And the 11,478 included everybody in the world?

Mr. NICHOL. The world picture; yes.

Mr. PIKE. Well, by just subtracting the number of officials you ought to come to it. You ought to be able to guess those easily.

Mr. NICHOL. Well, it is a matter of definition of officials.

Mr. WATSON. In the hourly work, that does not include the foremen.

Mr. NICHOL. That is just the hourly workers.

Mr. MAGINNIS. What do you mean by hourly workers?

Mr. NICHOL. The men who are paid by the hour at the plant.

The CHAIRMAN. Then that does not include your salesmen?

Mr. NICHOL. No.

Mr. MAGINNIS. Nor the foremen?

Mr. NICHOL. Nor the foremen. Just the hourly workers.

Mr. CHANTLAND. What Dr. Anderson has called for now will show this, though?

Mr. NICHOL. That is right.

Dr. ANDERSON. In other words, you will supply us with captions?

Mr. NICHOL. We will be very glad to get that.

Dr. ANDERSON. If there are no more questions of Mr. Nichol, I think we might turn to questions of Mr. Watson, who has kindly consented to come down here and spend the morning with us, and who has not only developed this business from its inception to the present stage but who is a man who has done a great deal of thinking, some speaking, and much acting in this whole problem that concerns us and the committee.

I wanted to ask this question first, Mr. Watson: You have placed in your own organization, and I understand elsewhere, great emphasis upon educational training, placement work, and retraining and replacement work of an occupational character; do I take it that in doing so it is your conception that a dynamic technological society, such as we have, in which frequent changes occur, requires some rather substantial program of training and placement and retraining and replacement? Would you care to comment upon that?

Mr. WATSON. I think, Dr. Anderson and gentlemen, the only thing we have to depend on to solve this and the many other problems that confront us is education.

On that point I should like to bring out this fact in regard to the rental of our machines. We cannot figure out any way for our users to service those machines. We constantly run a school in our plant, teaching men to go out in the field and take care of these machines because our users trust entirely to the accuracy of our machines, and they must be exactly right, not pretty nearly right. So that is the basis of our rental program. I know and I believe that our customers will tell you that they would prefer that, because if they had to make their own repairs they would have to train men, and, as we

put new devices on the machine, they would have to retrain those men. I should like to make that point clear.

Dr. LUBIN. Isn't it true, however, that other firms who make complicated machinery, who sell these machines, also maintain service organizations? With such a simple thing as an oil burner, I know if my oil burner goes bad I call up the company that represents the manufacturer and they have trained service men who are available. Isn't that a pretty general practice for all firms, whether they sell or lease, who have a complicated product?

Mr. WATSON. It is with some, and with others it is not, but in our particularly complicated machines I wouldn't want to undertake to build a business where I would put the responsibility of servicing the machines up to the user. To begin with they would have to invest a large amount in the equipment, and if they didn't give them proper service they would say that our machines were no good. The same would be true of all their friends who inquired about it. Then there is the regular inspection that we give those machines to see that they are working correctly. In fact, I consider our service department the most important department in our business. The fact that our customers can return the machines to us at any time they are not satisfied, I think, proves that our policy along that line is a fair policy to the customers. Does that answer you?

Dr. LUBIN. As far as we are concerned, in our own department, we find the service excellent when it comes to getting service on the machines.

Mr. WATSON. Thank you very much. On the matter of education—I beg your pardon.

Acting Chairman WILLIAMS. I wanted to ask if in addition to the regular service you render when you sell or place one of these machines you also train in the office of the customer someone in the use of it.

Mr. WATSON. Yes.

Acting Chairman WILLIAMS. That is part of your sales service?

Mr. WATSON. It is; in addition to training them in the office we have a school that I should say runs at least 10 months of the year where our customers send their supervisors, the man or woman in the business who will supervise the work done by our machines. We give those people training of 2 weeks in our regular school for that kind of work, and then we carry on that training in the various branch offices. Our proposition is a service proposition.

(Senator O'Mahoney assumed the chair.)

Mr. MAGINNIS. Pretty nearly all the machines are extremely complicated and it would seem that it would require a very high degree of mechanical skill to keep them in order.

Mr. WATSON. Yes, sir; it does.

TRAINING FOR REEMPLOYMENT

Dr. ANDERSON. Mr. Watson, you feel that in a society where technology is advancing constantly, some workers will be, as you put it, momentarily displaced. There are some people who feel that the adjustments that people can make cost them a great deal, and that the time it takes a man to find a new job after being thrown out is lengthening. You made some point that a training and retraining program would help. What did you have in mind?

Mr. WATSON. I am not qualified to lay out the entire curriculum, but I would say education in all directions. What you people are doing here I include in what I call the educational program because you are going to learn a lot of things about us, and we are going to learn things that you want us to do. If we cooperate we are going to make progress, we are going to be able to do a better job. Now it is true that as improved machinery, not only ours but machine tools, drill presses, screw machines, etc., will do more work than the old machinery, there is a temporary unemployment that hits some people. That is one of the things we have got to figure out.

The CHAIRMAN. Why do you call it a temporary unemployment?

Mr. WATSON. Because the unemployment as a whole in the country keeps growing greater as we progress, as these figures show, and another thing that was brought out—

The CHAIRMAN (interposing). What increases?

Mr. WATSON. The general employment.

The CHAIRMAN. You meant employment? I thought you said unemployment.

Mr. WATSON. I'm sorry, I meant to say employment, because as was brought out by Mr. Nichol, employment starts in the mines and smelting mills and so forth, and all along the line, before the machine is ready to go into our shop and displace some men there, or if it is one of our machines, before it goes into the office.

The CHAIRMAN. Is that a statistical or a theoretical conclusion?

Mr. WATSON. It is a statistical conclusion which you can verify by the Government records, that in these industries where improved machinery has been used the percentage of employment in those industries has increased faster than the population of the country has increased. I have always contended that the use of improved machinery makes men more valuable and makes the products that they produce cheaper for the consumer, and in our country where we manufacture 47 percent of everything that is manufactured in the world, through that process our working people and all of our people have been educated to want to use these things that they are manufacturing, so the records show that we have been able to consume a little more than 90 percent—I am speaking of the average, you understand.

The CHAIRMAN. Now your contention is that technological advance by increasing efficiency and increasing productivity and creating new industries necessarily creates more employment than before?

Mr. WATSON. Yes, sir; that is not my personal judgment; that is based on the actual figures which you can verify.

The CHAIRMAN. Of course, that assumes that the figures which are collected with respect to specific industries, including new industries, will give a conclusion as to the over-all condition, doesn't it?

Mr. WATSON. That only applies in a progressive country where you are increasing the standards of living and trying to do more for your people through increases in wage rates and reducing working hours and giving them more opportunity to enjoy life.

The CHAIRMAN. Of course, on the other hand, those of us who sit on various committees of Congress are confronted, particularly when the W. P. A. appropriation bill comes before us, with definite statistics of unemployment which do not seem to reflect any substantial decrease. Now in the original statement that was read here this morning you had a very interesting account taken from the Reader's

Digest, of several extraordinary new inventions or discoveries which have come into existence during the past 10 years; that is to say, during the 10 years of the depression, so-called, with the unemployment figures reaching an all-time high; nevertheless, technology has created more new industries than were ever created before in any comparable period. I think that probably is a correct statement, isn't it?

Mr. WATSON. I think so.

The CHAIRMAN. But still we have this unemployment problem.

Mr. WATSON. The things we are speaking of have not gotten under way yet to create the employment which they will create in the next few years, because it takes a long time—you take a new device, you get out a patent, and we figure as a general rule if it is a major machine that it will be 10 years before you are going to make any profit out of it, it will be 5 years before you are ready to put your trial models out for final test with the users.

The CHAIRMAN. Let's take two of the items that are listed in this article from the Reader's Digest, streamline trains and transoceanic passenger air traffic. I haven't used the transoceanic airplane yet, but I do use the streamline trains consistently in traveling home to Cheyenne. They have been a development which has completely matured, practically, during this 10-year period. They are being used daily running out of Chicago.

Mr. WATSON. They are used on that road more than any place else, but they are not used generally on the railroads.

The CHAIRMAN. Throughout the United States that might be, but of course the West is always a little bit more progressive.

Mr. WATSON. I agree with you on that, Senator. That is why I like to go out in that country.

The CHAIRMAN. But with this expansion in the use of streamline trains, during this same 100-year period and with the establishment of regular travel across the Atlantic and across the Pacific, and with all the new jobs created in the air lines, we still have this backlog of unemployment upon which we are apparently unable to make any impression. Does that situation hold out hope that we are going to solve unemployment and, if so, when?

PROSPECT OF FOREIGN MARKETS

Mr. WATSON. I think so; I think we are going to solve it in a very satisfactory way to the unemployed, but I don't mean to say that we are going to do it through the few streamline trains already put in use, but I believe they will be helpful. My honest judgment is that we are never going to completely solve it until we find a market for our surplus in other countries, because I don't believe we can solve the problem for our farmers and our workers until we do increase production.

The CHAIRMAN. Other countries will develop their own surpluses with the same technological advance which we are giving them, will they not?

Mr. WATSON. There is going to be an advance, but you understand that we are only 6 percent of the world's population, our per capita consumption is only seven times as great as the rest of the world's, and as those people become enlightened, if the standard of living among

these other 94 percent went up just a very, very little it would go a long way in solving our problem, because when I say 10 percent, of course you know what happened in our cotton industry, we used to market 56 percent abroad.

The CHAIRMAN. Are we then to wait for the solution of the unemployment problem until we are able to market our surplus cotton and our surplus wheat and our surplus manufacturing output in other countries?

Mr. WATSON. We have to market a certain percentage of it there, and in doing that create more employment here so we can market more here at home.

The CHAIRMAN. Of course, we are trying to do that. Congress has made innumerable appropriations for that purpose. It has subsidized the exportation of some surplus commodities, and the effect of that is not to make any apparent impression upon unemployment nor indeed upon the price which the farmer gets for his surplus product.

Now let me ask you this. In your own institution, or speaking from your experience in your own institution, what is the position of the worker 40 years of age or over who is displaced by technological advance? What are the chances for his being absorbed or of her being absorbed?

Mr. WATSON. I have never displaced anyone in our industry except for cause.

The CHAIRMAN. That is an excellent record, but they do find themselves pushed out of employment in other industries.

Mr. WATSON. I don't know, but in our own industry a high percentage of men whose value we appreciate are people over 40 years of age.

The CHAIRMAN. Do you hire anybody over 40?

Mr. WATSON. Oh, yes.

The CHAIRMAN. That age is no bar to employment in I. B. M.?

Mr. WATSON. If a man has had experience, for example, in tool making, a very important thing in our business and it takes a long time to make a first-class tool maker, we have never made any discrimination. We have tried in our own way to take care of people as they grow old. We have never put people on relief; we maintained our minimum wage during the depression of \$18 for married men and \$15 for single men.

The CHAIRMAN. We had a human exhibit, it was called, here a few days ago in the person of a steel worker who was quite evidently a man of physical vigor. He was about 50 years of age, as I recall, and he told us that though he was a skilled operator of a rolling mill and skilled in the practice of acetylene welding, nevertheless he had been refused employment because he was over 40, so that was what suggested this question to my mind. May I now ask you how many persons over 40 have been hired by I. B. M. during the last year?

Mr. WATSON. I couldn't give you that figure, but I can say to you without any reservation that we have no rules against employing them, and I want to say further that I believe those men should be given consideration, and everything possible should be done to get the man around 40 or 45 into a permanent position so that he will have something to grow old with.

The CHAIRMAN. How would you do that?

Mr. WATSON. Through education. If a man cannot get a job in one thing, to find some other place.

The CHAIRMAN. But who would do the training?

Mr. WATSON. We do it in our business, and the majority of people who employ skilled labor are giving consideration to the same thing and are trying to do the same things we are trying to do. I think that we owe to the workers of this country a certain security. I am speaking now of the men who are willing to work and who are displaced or lose their jobs through no fault of their own. I have always stood on that ground, that these men are entitled to be taken care of until they can get new positions. I think it is the duty of Government and industry to cooperate and study and work along educational lines until they find the proper answer that will be fair to business, Government, and the worker. They have all three got to work together on the job. I am a firm believer that when we do that these people who are out of employment will be consumers because they will have enough to spend to meet their requirements of food and heat and light, and so forth, and continue their children in school.

The CHAIRMAN. It is important, then, that these persons shall be preserved as effective consuming units?

Mr. WATSON. Absolutely; and as operating units when we need them, because we are not always going to be in the position we are in now.

The CHAIRMAN. A person on W. P. A. who receives \$40 or \$50 a month whereas in a skilled occupation from which he has been displaced he was able to earn \$150 to \$200 a month is no longer an effective consuming unit in the economy, is he? So that the W. P. A. wage of itself does not create the market which industry needs to dispose of and distribute its increasing product, so you feel that industry and Government should cooperate.

Mr. WATSON. I do.

The CHAIRMAN. To make certain that all displaced workers are absorbed at the earliest possible moment.

Mr. WATSON. Absolutely; absolutely. I don't think it can be done in any other way.

The CHAIRMAN. Do you have any specific suggestion, with the exception that there should be cooperation to study the problem?

Mr. WATSON. That is the only suggestion I could make, what Dr. Anderson brought up here, education on the part of all of us.

Dr. ANDERSON. Mr. Watson, when Philip Murray was here the other day he made a very strong statement to the effect that the unsolved problem of this decade is the unemployment problem, that it is so great that it becomes the dominant problem. He said further that it was necessary that Government get management and labor into the same room, so that the three could sit down and work out this problem, regardless of how long and involved and tortuous the route might be. Would you care to comment on such a proposal?

Mr. WATSON. I think I did make that statement, that it has got to be worked out through the cooperation of Government and labor and business.

Dr. ANDERSON. So you would be in accord with Mr. Murray's suggestion?

Mr. WATSON. Yes.

Dr. ANDERSON. Is that kind of thinking fairly general among the management of industry at the present time?

Mr. WATSON. It is. I would say that I am quite sure that is the feeling among all the people with whom I come in contact in the industries I am in touch with.

Dr. ANDERSON. In other words, if a proposal came seriously from the proper source to bring the leadership of this Nation together to wrestle with this involved problem, the management of industry would look favorably upon it and participate.

Mr. WATSON. Yes. I would like to add one further word. I believe that we ought to give very serious consideration to reciprocal trade treaties. We know to start out with that we can't have them perfect, but I think we ought—I am not a free trader—to have a fair adjustment of trade barriers, because it is so important for us to import things. I am not thinking now of the exporting, but take a nation as highly industrialized as we are, manufacturing 47 percent of everything that is manufactured in the world. We know, for example, that the American automobile companies would have to go out of business if we didn't import something over 50 different ingredients. If our imports were shut off today, it would create a situation in this country that I wouldn't know how to make a suggestion to meet except turn our standards of living back so far that our people would not be satisfied in any way.

The CHAIRMAN. I suppose you wouldn't import commodities from other countries if they were in competition with commodities being produced here and would have the result of driving down the prices of those commodities, would you?

Mr. WATSON. I am not prepared to speak in detail on that subject because that is a subject that requires a lot of careful thought. While I am interested in international affairs, I think everybody agrees the first thing for us to do is to consider the effect on our own country as a whole.

The CHAIRMAN. As for example, if peace should one day be restored to Europe and Nazi Germany should develop business machines of similar character to your own, would you think it a good thing to have them imported into the United States in order that the wheat farmers out in that country could have a better market abroad?

Mr. WATSON. I would take my chances on meeting that kind of competition if the Government decided that they wanted to handle it in that way.

The CHAIRMAN. Of course, that reciprocal trade business was just settled in the Senate a week or so ago.

RESPONSIBILITY OF INDUSTRY TO DISPLACED WORKERS

Dr. LUBIN. Mr. Watson, I wonder whether you would be willing to express an opinion on just where you feel responsibility of industry ends relative to these people who are no longer needed, as you say, temporarily, but I think there is evidence to show that that period of readjustment is lengthening. For example, Mr. Nichol mentioned instances where machines manufactured by you have been installed, and although the net number of people in those particular instances employed showed an increase, there were people, as he said, who were displaced. What is the responsibility of the employer, in

your opinion, in a case of that sort, say seven people are displaced by a given machine in a given office, for those seven?

Mr. WATSON. First, I think that we should consider what other positions in the business we could train them to fill, and if we have other positions, it is our responsibility to teach those people how to fill them.

Dr. LUBIN. Where they don't do it, assuming apparently in these instances that Mr. Nichol mentioned, that it was impossible, do you feel that the employer should share some of the savings in cost that resulted from this displacement with these workers who are displaced?

Mr. WATSON. I wouldn't want to make a specific statement as to what all the people in industry should do, but I think I am very safe in saying that industrially the country would be very glad to cooperate in working out a solution of that problem because it should be worked out. I agree with you absolutely.

Dr. LUBIN. Of course we have made an approach in the form of unemployment compensation, but apparently that doesn't last for a long enough period.

Mr. WATSON. That is the point. It should last longer, because, as I stated before, if a man is put out of a position through no fault of his own, and is perfectly willing to work and prefers to work, he is in a helpless position if some plan is not figured out to take care of him.

The CHAIRMAN. Referring again to my question a moment ago with respect to the creation of more jobs, the over-all creation of more jobs, and your statement that the Government statistics demonstrated that that was the case I have been checking through the written paper and I wonder if this is the statement to which you refer;

At the 1890 census, the office equipment industry reported the production of about \$4,000,000 worth of office machines for domestic use. Of each 1,000 population, 372 were reported as being employed, of whom 7 had clerical jobs. At the 1930 census, production of about \$114,000,000 worth of office machines for domestic use was reported. Of each 1,000 population, 398 were reported as having jobs, of whom 33 had clerical jobs. That is, in 40 years, the total number reported as having jobs per 1,000 of population gained 7 percent, but clerical employment gained 370 percent.¹

In other words, in 1890, 372 out of 1,000 were employed, and in 1930, 398, or 26 more, whereas clerical jobs increased in the same period from 7 to 33. May I ask whether these figures as to the total number of employed did not refer to the total number who were employed in industry?

Mr. WATSON. No. I might say this—

The CHAIRMAN (interposing). That is the gainfully employed person?

Mr. WATSON. The great increase in those clerical jobs was brought about by the new things that came into use.

The CHAIRMAN. There can be no doubt about that.

Mr. WATSON. Take, for example, the automobile industry alone, the clerical increase there, and the great increase in selling household articles, and so forth, on the installment plan, has created a lot of office and clerical work.

The CHAIRMAN. What I am getting at is this: whether it has not been characteristic of this so-called machine age that a good deal of

¹ See p. 16772.

the work has been merely transferred from the home to the factory, that work which was formerly done in the home or on the farm or on the ranch and which was not therefore reportable to the census as within the category of gainful employment is now performed in the factory and does come within the category of gainful employment. For example we wouldn't contend, would we, that in 1890, 628 persons out of every 1,000 were idle—

Mr. WATSON. Did you say idle?

The CHAIRMAN. I am just reversing the figures on this. We wouldn't say that in 1890, 628 persons out of every 1,000 were idle, or had no occupation, and that in 1930, 602 persons were unemployed or idle, would we?

Mr. WATSON. That figure is the total population, taking in the children and everyone.

The CHAIRMAN. That is right, but even so, that wouldn't directly describe the condition of the country with respect to employment, do you think?

Mr. WATSON. I think it would not.

Mr. PIKE. Were housewives supposed to be idle?

The CHAIRMAN. They were supposed to be idle.

Mr. WATSON. I would like to follow what you have said about the work we have done in the home. If our Government should decide that we should go back to having work done in the home, then we could get along without reciprocal trade treaties with other countries, but we would have to knock out standard of living down. We want our standards of living to go up.

The CHAIRMAN. That is true.

Mr. WATSON. I am looking forward, gentlemen, to higher wage rates.

The CHAIRMAN. Nobody makes any suggestion whatever that we should go back to the old lower standard economy, not at all. I am just trying to develop a correct picture of what these statistics mean, and as has been pointed out, women who did so much of the work of the world before the machine age were not counted in our census as gainfully employed, so that that consideration alone makes a tremendous difference in the interpretation of figures of this kind.

Mr. WATSON. I tell you, I have never taken any statistical figures that I get up myself or get from the Government as necessarily correct. What I mean by that, gentlemen, is that conditions change while you are compiling the figures; it takes some time to compile figures, and by the time you have them compiled the conditions have changed.

If I may inject this thought before I forget it, Mr. Nichol referred to some things that are done in our company for our employees, and I should like to say a word for our employees. The reason we can do those things for our employees, pay them high wages and give them other things in the way of insurance, and so forth, is because they pay us back in more accurate, better work, but I want that in the record because I don't want anybody to get the idea that we were simply giving money away indiscriminately to our employees. I want our employees to get the credit for having earned the money that we paid them.

The CHAIRMAN. The circumstance that we ought to have clear in our minds when we are trying to appraise this problem and when

we are looking at it through the eyes of the census taker, is that we must remember that the woman who ran the spinning machine in the old days before the invention of the power loom was not recorded as gainfully employed, but she was just as gainfully employed as any person working in a mill, don't you see?

Mr. WATSON. And 3,500,000 of them are now doing good jobs right in factories, running machines, doing assembly work.

The CHAIRMAN. And turning out undoubtedly in many respects better work, and more efficiently. There can be no question about that but side by side with that improvement we see this other appalling fact that there is displaced labor, and there is an unemployment problem and that industry, having been unable to solve it, government has had to undertake it, and government has not done it in a particularly effective way, I think we must all acknowledge, so, therefore, we come to the conclusion that in the interest both of business and of government we must find the way to create employment at decent wages for those who do not now have it.

Mr. WATSON. I agree with you, Senator, 100 percent, and another thing, I don't think the government has made a complete failure in the work they have done on this, because it is a pretty hard job, a pretty hard thing to solve.

The CHAIRMAN. I didn't mean to imply that it was a complete failure.

Mr. WATSON. I should like to ask this question, if I may. What is the latest figure that we talk about on unemployment?

The CHAIRMAN. I will let Dr. Lubin answer that.

Dr. LUBIN. There are no official figures.

Mr. WATSON. That is like these figures we were talking about.

Dr. LUBIN. You have 3 sets of figures made public, the American Federation of Labor, the C. I. O. and the National Industrial Conference Board, and they vary by more than 2,000,000 between the high and low. Certain assumptions are made in counting the number of people who are available for employment. If you include a certain number of women as available your figure goes up; if you include a certain number of people between age 16 and 17, the number goes up. It varies according to the assumptions that you make as to the number available. The method is the same. Assume how many people are available for work, subtract from that the number who are working, and that number is more or less the same for all 3 estimates, but the top estimates from which you make subtractions vary depending upon the hypothesis you use as to who is available.

The CHAIRMAN. The Bureau of Labor Statistics does have fairly accurate figures with respect to the number of persons who are actually employed.

Dr. LUBIN. That is right, very definitely so.

The CHAIRMAN. May I ask you now, then, how does this figure according to your latest reports compare with the figure say 10 years ago?

Dr. LUBIN. Well, as compared let's say for the same month in 1929, it is down about 1,000,000.

The CHAIRMAN. In other words for the same month in 1929 we are employing about 1,000,000 less persons in the United States today. Is that correct?

Dr. LUBIN. Yes.

The CHAIRMAN. The Census Bureau has estimated that the total population of the United States is greater than it was in 1929.

Dr. LUBIN. Yes.

The CHAIRMAN. So that actually whatever the correct figures may be there must have been an increase in the number of persons available for employment over 1929.

Dr. LUBIN. Oh, yes.

The CHAIRMAN. So that if there are fewer persons employed than there were in 1929 and the pool of available workers has been increased, then obviously unemployment has increased. There is the center of the problem, and these various disagreements.

PROVISION FOR UNEMPLOYABLES

Mr. WATSON (interposing). I think along with that you will probably find that the number of unemployables has increased, and I think it is very important for us to find out in the number of people whom we list as unemployed how many are unemployable due to mental or physical ailments of some kind, and take those people out of the list of unemployed and provide proper care for all of them.

The CHAIRMAN. Some of that may be due to age. It is a significant thing that we must always take into consideration that hygiene has improved, medical skill has improved, longevity is increasing. We have many more older people now than at any time in history in proportion to the total population; the number of persons over 65 is constantly increasing in relation to the total population. Now how many of those are classed as unemployable because industry has no place for the new applicant over 40 or 45?

Mr. WATSON. That is another group that we should have. That comes under the head of education that Dr. Anderson brought out. I think we should have all those things. We can solve this problem if we just know what we are talking about. We will say here are a group of men who unfortunately lost their savings due to the depression or some other things. Maybe some of them never saved anything, but just the same they have grown old, and the industries they were in feel they can't keep them on. It is our duty and it is in the interests of all of us to solve the problem. It isn't philanthropic, it is just plain good common sense business, gentlemen, and we ought to go about it on that basis. We who are in business are just as anxious to help solve this as you people are down here. Now I believe that nearly everybody representing our Government is doing his very best to help business and to help us solve these problems. On the other hand I believe that nearly everybody in business feels that way. We need to get together and get the information about these things. Now what shall we do with these old people?

The CHAIRMAN. Will you please include the Temporary National Economic Committee in that statement?

Mr. WATSON. I meant when I said—

The CHAIRMAN (interposing). I am merely talking for the benefit of the newspaper men. [Laughter.]

Mr. WATSON. I stated before plainly and voluntarily that the work you gentlemen were doing here is going to be helpful, it is along educational lines. I have learned a great deal from it since you started your investigations. If we will all approach this subject

from the standpoint that we all want to be pretty good citizens, and that we all want to help each other, we can get the answer. We can't get it any other way.

The CHAIRMAN. I am awfully glad to have you say that, because it is most important.

Mr. WATSON. I have said a little here about international trade barriers that I think are holding us back, but, on the other hand, I believe we have got some national trade barriers that are holding us back. I think class feeling in this country is a national trade barrier, and I think all of us in all walks of life ought to do everything possible to eliminate it so we can all work together and help each other. I think unfair criticism of government by business is a national trade barrier; I think unfair criticism of business by government—I say unfair—is a trade barrier. I think constructive criticism both ways would help. I think any form of taxation that affects the free flow of private capital is a trade barrier. I think if we all work together we can solve these national trade barriers and help solve the international trade barriers. There isn't any one thing that is going to do it.

The CHAIRMAN. It has got to be done by cooperation.

Mr. WATSON. It has; no other way is possible.

The CHAIRMAN. And in a spirit of tolerance and good will.

Mr. WATSON. A spirit of tolerance and fairness, and if we all follow the Golden Rule we can't go wrong—treat the other fellow as we want to be treated.

Dr. LUBIN. Mr. Chairman, in view of the fact that the latter part of the discussion dealt primarily with unemployment I would like to say for the record, however, that during the past 7 years there has been added to the pay rolls of American industry something in excess of 8,000,000 more people than were on the pay rolls 7 years ago.

Dr. ANDERSON. Despite that fact, Dr. Lubin, there has been an increase in the amount of unemployment and an increase in the number of workers available for work who have not had it, and an increase in the number of persons who get only intermittent labor.

Mr. WATSON. And an increase in national income, too.

The CHAIRMAN. When you say number added to the pay roll you mean in the sense that they were new individuals.

Dr. LUBIN. No; in other words, there are 8,000,000 more people working today than 7 years ago.

The CHAIRMAN. But not more than 10 years ago.

Dr. LUBIN. No; less than 10 years ago.

The CHAIRMAN. Less than 10 years ago, but more than 7 years ago. Of course, that was borne out by many of the charts which have been presented here.

Mr. WATSON. That is making greater strides and that has been brought about; there has been a great deal of cooperation between labor, government, and business during these past 7 years.

Dr. LUBIN. I think we can say one thing, there has been no 7 years in history in any country where as many people were taken back on the pay roll as during the past 7 years in the United States.

Dr. ANDERSON. That is right.

Mr. WATSON. You ought to feel optimistic because we are going in the right direction, that is one sure thing.

Dr. LUBIN. But not fast enough.

Mr. WATSON. No; let's improve, get into high gear.

The CHAIRMAN. If there are not any other questions now to be asked, we will express our pleasure and our sense of indebtedness for the very interesting presentation you have made this morning, Mr. Watson, with your staff. Thank you very much for having come here. I think it has been very helpful.

Mr. WATSON. If I may, I should like to thank all of you gentlemen for the consideration you have shown us and for the things we have learned since you began this study which has stimulated us to greater activity in this connection.

(The witnesses, Mr. Watson and Mr. Nichol, were excused.)

The CHAIRMAN. The committee will in recess until 2:30.

(Whereupon, at 1:15 a recess was taken until 2:30 of the same day.)

AFTERNOON SESSION

The committee resumed at 2:40 o'clock, on the expiration of the recess.

The CHAIRMAN. The committee will please come to order.

Dr. ANDERSON. Mr. Chairman and members of the committee, this morning we listened to testimony in the field of the white-collar worker from the side of management, having as witnesses Mr. Thomas J. Watson and Mr. Nichol. This afternoon we are to hear the story from the side of labor involved, with Mr. Lewis Merrill, president of the United Office and Professional Workers Union of America, of New York City, N. Y., as witness.

The CHAIRMAN. Do you solemnly swear that the testimony you are about to give in this proceeding shall be the truth, the whole truth, and nothing but the truth, so help you God?

Mr. MERRILL. I do.

The CHAIRMAN. You may proceed.

TESTIMONY OF LEWIS MERRILL, PRESIDENT, UNITED OFFICE AND PROFESSIONAL WORKERS OF AMERICA, NEW YORK, N. Y.

Dr. ANDERSON. Mr. Chairman, do you wish to examine the witness as to his qualifications?

The CHAIRMAN. Why, you might bring that in; yes.

Dr. ANDERSON. Mr. Merrill, what is your relationship to the union you represent?

Mr. MERRILL. I am its international president.

Dr. ANDERSON. Are there other unions of the same kind in the field?

Mr. MERRILL. There is no national union of the same kind in the field.

Dr. ANDERSON. How many workers are organized in the Office and Professional Workers Union?

Mr. MERRILL. Forty-six thousand five hundred.

Dr. ANDERSON. Is that a sizable fraction of the total employees in this branch?

Mr. MERRILL. Well, that is less than 10 percent.

Dr. ANDERSON. Less than 10 percent. How old is the union?

Mr. MERRILL. It is 2½ years old.

Dr. ANDERSON. Is it an A. F. L. or C. I. O. affiliate?

Mr. MERRILL. Affiliated with the C. I. O.

Dr. ANDERSON. What is your own relationship to this field of occupational service?

Mr. MERRILL. In what sense, Dr. Anderson?

Dr. ANDERSON. What have you done?

Mr. MERRILL. Well, I was once a financial analyst in the employ of Moody's Investment Service of New York City, the Credit Clearing House Corporation of New York City; I am a trained economist in the field of stock and bond analysis. That is my own particular qualification as a member of the union.

The CHAIRMAN. What was your education?

Mr. MERRILL. I am a graduate of the University of Toronto. I hold what would be the equivalent of an A. B. degree in this country.

The CHAIRMAN. How long have you been in this country?

Mr. MERRILL. I have been in this country since 1929. I am a citizen of the United States.

The CHAIRMAN. How many members did you say are in the union?

Mr. MERRILL. Forty-six thousand five hundred.

The CHAIRMAN. In how many States?

Mr. MERRILL. In about 23 or 24 States.

The CHAIRMAN. Where are the bulk of the members?

Mr. MERRILL. The bulk of the members of our union are in the eastern States; those being New York, Pennsylvania, New Jersey, and Massachusetts. We also have a substantial number scattered throughout the west coast and in the Middle West, but not as substantial as in the East.

The CHAIRMAN. I suppose that most of these members are employed by large or comparatively large institutions?

Mr. MERRILL. I would say in excess of 75 percent of them.

Mr. MAGINNIS. Might I ask, Mr. Merrill, what do you mean by professional workers?

Mr. MERRILL. Well, that is more or less of a euphemism. We mean anyone who is not engaged in strictly routine work, but who has a special training, despite the fact that he is a salaried employee.

You can take my own instance. I am a professionally trained economist; nevertheless I have been employed by a variety of firms on a salary basis, and had the same relationship to my employer that my stenographer had. I was and am, I believe, quite in the category of a professionally trained individual. I could function on my own basis, I could open up an office, I could put myself forward as a consultant, but I happened to work for somebody else.

The CHAIRMAN. You could teach economics in the schools, I suppose?

Mr. MERRILL. I imagine after some additional training, I could qualify for it. For example, to make the answer a little bit clearer, we would consider a certified public accountant as a professional, and we have several hundred certified public accountants in our organization. They are employed by firms on a salaried basis and are very definitely professionals in every sense of the word.

Mr. MAGINNIS. Do you rate stenographers as professional?

Mr. MERRILL. No; we do not.

The CHAIRMAN. There is a growing number of professional employees, I take it, is there not?

Mr. MERRILL. There has been a growing number of all employees. Consequently, there has been a growing number of professional employees.

The CHAIRMAN. Well, I don't think that that necessarily follows, as a conclusion from the premise that there is a growing number of employees. It would not necessarily follow that there would be also a growing number of professional employees.

Mr. MERRILL. I would say that there are a growing number of professional employees employed on a salaried basis.

The CHAIRMAN. That's right; that is the fact.

Mr. MERRILL. That is right.

The CHAIRMAN. You may proceed.

Mr. MERRILL. The effect of the office machine on white collar occupations cannot be seen in its full import without surveying some of the facts in connection with the ordinary role of these employees in our economic life.

Remote antiquity had its clerical workers. The word "clerk" itself is used because the keeper of official records received the "priest's portion" or the "cleruchy."

Dr. ANDERSON. Mr. Merrill, might I just interrupt you for a moment? I see some confusion on the faces of the committee with respect to following your text. We have a copy before us that is a brief, as I understand it, of your document?

Mr. MERRILL. Well, this particular matter in my hands is in three sections. The introduction, which I was about to read to you and which is not included in the matter which you have, posits some of the statistical facts which should be known, relating to the development of these employees in our economic life, and after I succeed in establishing some of the statistical facts, I proceed to the discussion of the innovation of the machine itself, which you have there.

May I proceed?

Dr. ANDERSON. Yes, sir.

Mr. MERRILL. That is, the extension of the words "clerical workers" to business usage is natural. Business activities always required the making, keeping, handling, and interpreting of records. The increased complexity of business enterprise called into existence a variety of specialists requiring different trainings.

In the office of colonial times, a very simple apprenticeship could be served, most likely by a member of the proprietor's family. In the depersonalized modern office, an integral part of the far-flung and complex commercial and industrial system requiring the constant recording, receiving, analysis, and transmission of information, the apprenticeship is only occasionally a simple one.

But in colonial times and in 1940, the same essential administrative process takes place, without which production could not be organized or commodities distributed.

The growth of the white-collar group has paralleled the developing experience of business itself. Its requirements—that is of business—compelled into existence an army of clerks and professionals of every description. Industry was confronted with an opportunity to push back America's economic and geographic frontiers by exploiting a rich internal market, teeming with profits for the energetic and the keen witted, but those profits could not be secured unless there were goods.

To produce those goods quickly in large volume, and get them into the hands of the consumers became the main source of profit.

Administrative cost, in its broad sense, became a secondary question. As America's economy took a firm hold of its internal market and reached out for foreign ones as well, it was confronted with a basic problem of administration, which it solved as well as it could with what lay at hand. The phenomenal and unplanned rise of the white-collar group and the centralized modern office are the result.

Industry today is setting about solving the problem of administrative costs with all of its accustomed energy and ingenuity. In *Factory and Industrial Management* of September 1930 this general process was discussed in some detail, since post-1929, events urged speedy reduction of costs wherever possible.

"Take your first problem," said a writer, a vice president of an eastern manufacturing concern, "the army of clerks, material clerks, production clerks, cost clerks, ledger clerks, note clerks, planning clerks, inquiry clerks, correspondents—one by one I eliminated the clerks, efficiency department, control department. Each department has 1 foreman and clerk or 1 clerk for 2 departments."

No assistants cut indirect cost by eliminating clerical labor; use fewer forms; rationalize; systematize; introduce machinery.

For management, the machine is only one of the available means of reducing costs. For the employee, too, the question of the machine is only one of the things with which he has to contend. Subject as he is to broad social pressures which are undermining a status which has been his since the industrial revolution, he is confronted with a problem of social adjustment which is receiving inadequate attention from either Government or business.

THE GROWTH AND COMPOSITION OF WHITE-COLLAR GROUP

Mr. MERRILL. Prior to the Civil War, clerical and kindred employees were mainly engaged in service for small proprietors. The shift from employment in agriculture to other fields following the stabilization of industry after the Civil War revealed a greater percentage increase among clerical workers than among any other group in our population. Alba Edwards computes the percentage increase between 1870 and 1930 at 2,067.5 percent, a rate of increment that makes the white-collar worker seem like a guinea pig. Between 1870 and 1930, the percentage ratio of clerical and sales employees to the rest of the gainfully employed population rose from 2.9 to 16.7 percent. On the other hand, figures for Great Britain made available by the National Union of Administrative Workers show that in that country between 1851 and 1921 the ratio rose from 3.5 to 12.1 percent.

Alba Edwards supplies the following table based on the 1930 census, which I wish to introduce, Mr. Chairman, as, I am advised, "Exhibit No. 2609." This table shows the total number of gainful workers and shows the number of white collar workers, the percentage distribution of white-collar workers and the percentage ratio of white-collar workers to the rest of the gainfully employed.

The CHAIRMAN. Do you have a copy of the table?

Dr. ANDERSON. Yes.

The CHAIRMAN. I would like to see it.

Mr. MERRILL. This table reveals some 4,677,235 white-collar male workers, representing a 12.8 percent of all gainful workers in the United States. This table also reveals the distribution of female workers, and then distributes it as between both sexes, as between native white, foreign-born white, Negro, and other races.

Dr. ANDERSON. Mr. Merrill, does that large number include more than clerical workers, as such?

Mr. MERRILL. Yes; I would say that this table includes sales employees and other employees in the distributive trades.

The CHAIRMAN. What is the source of this material?

Mr. MERRILL. This has been secured by Alba Edwards.

The CHAIRMAN. From the 1930 census?

Mr. MERRILL. The United States Bureau of Census for 1930. It appeared in the Monthly Labor Review in March 1934. It was quoted by him and requoted by us.

The CHAIRMAN. The exhibit may be received.

(The table referred to was marked "Exhibit No. 2609" and is included in the appendix on p. 17425.)

Mr. MERRILL. The 775,140 women stenographers reported by the last census is a far cry from the 7 shorthand writers reported 65 years ago. While the clerical group as a whole was increasing some 2,065.5 percent, the percentage increase of females during the same period was 26,615 percent, representing an increase from 11,500 in 1870 to 3,072,220 in 1930. (One writer estimates that by 1950, 1 out of every 3 gainfully employed people, Negro and white, will be women.) In 1870, 96.9 percent of all white-collar workers were men. By 1930, 38.6 percent of all white-collar workers were women. With the exception of domestic service of one type or another, there are more female white employees in white-collar employment than in any other field.

I would like to submit, Mr. Chairman, a table showing the comparative growth of the white-collar workers as between men and women. This shows the growth of the clerical class from the year 1870 to 1930. It shows an increase in the number of men from 297,000 to over 2,000,000, and an increase in the number of women from some 8,000 to almost 2,000,000.

The CHAIRMAN. What is the source of these figures?

Mr. MERRILL. This table has been supplied to me by Dr. Walter D. Polakov.

The CHAIRMAN. Who is he?

Mr. MERRILL. He is a management engineer at present, I believe, in the employ of the United Mine Workers of America.

The CHAIRMAN. What was the source of his information, do you know?

Mr. MERRILL. I believe he made an independent study in the field of office mechanization. I cannot say the source of these particular figures, but I think Dr. Polakov is recognized as a scientist and I think his researches could be accepted as authentic.

The CHAIRMAN. Proceed.

(The table referred to was marked "Exhibit No. 2610" and is included in the appendix on p. 17426.)

Mr. MERRILL. The small percentage of Negro white-collar workers should be noted. The Women's Bureau reports the growth as follows:

1910.....	3,000
1920.....	8,000
1930.....	11,000

Negro white-collar workers are uniformly paid a smaller wage than white workers employed at the same occupations.

Women are generally employed as stenographers, typists, machine operators, and so forth, while the more highly paid white-collar occupations, such as credit men, accounting, collecting, and so forth, are dominated by men. In the in-between field, such as bookkeeping, cashiering, secretarial work, and so forth, women enjoy a numerical advantage, but there is still a high proportion of males employed.

The common belief that women work in offices as a stop-gap between school and marriage is highly erroneous. While there is a low proportion of married women employed in clerical work, 18.3 percent being married as compared with 35.3 percent of the women employed in trade, nevertheless the trend is unmistakably in the direction of the married female office employee. Existing prejudice on the part of many employers to retaining married women as office employees undoubtedly has led to the concealment of this fact, while the age of the employees, which has been uniformly less than in other fields, has also played its part.

INDUSTRIAL URBAN CONCENTRATION

Mr. MERRILL. The 1930 census listed industries employing white-collar workers as follows—and I would like to introduce, Mr. Chairman, as exhibit 2611—and its source is the Committee on Social Security, which issued a publication in which this table was reflected. It is headed in their publication as "Census tabulations in the labor supply in the United States."

(The table referred to is marked "Exhibit No. 2611" and is included in the appendix on p. 17426.)

The CHAIRMAN. This is the same table that was in that publication?

Mr. MERRILL. That is right.

This table shows 357,000 white-collar workers in the fields of banking and brokerage as compared with 624,000 total employees in industry. It reflects 212,000 white-collar employees in insurance as compared with 507,000 total employees in industry. It reveals some 63,000 white-collar employees in the auto factories as compared with some 640,000 total employees in industry. I have just read those 3 sets of figures to indicate the comparative location of white-collar employees. I will not read the table in its entirety unless the chairman wishes me to do so.

Dr. LUBIN. Let me call attention to the telephone and telegraph, 425,000 clerks out of a total of 587,566 in the industry, and your percentage is only 82.4.

Mr. MERRILL. I examined those percentages myself this morning. The figures were supplied to me by my office. I would say not only is that peculiar, but a number of the other percentages don't make sense. I would suggest that we just ignore the percentage tabulations as they are shown there. I really can't say that this is an accu-

rate copy in that respect. I would like to have an opportunity of checking myself and submitting a memorandum to the committee.¹

Office employment shows a constantly increasing trend toward urbanization. Naturally these jobs must be performed in the centers of trade and commerce. Joel Berrall wrote a volume, *The White Collar Class Joins the Labor Movement*, and estimates that between 1890 and 1930 the proportion of white-collar workers in the 10 largest cities has increased from 26.7 percent to no more than 33.9 percent. In the average American community, approximately 5 percent of the population will be engaged in white-collar employment, while in the larger urban centers, this will increase to 10 percent. In communities such as Washington, D. C.; Denver, Colo.; Hartford, Conn.; and so forth, the white-collar worker is overwhelmingly the majority group in the community.

Unemployment among white-collar workers is no longer a personal problem. It is perhaps the outstanding question before employed and unemployed white-collar workers alike, as thousands upon thousands of them find themselves on the relief rolls with no hope of employment in private industry.

Not only are employment opportunities narrowing, but they never can keep pace with the hundreds of thousands being graduated from American schools and colleges every year. In 1938 alone, 148,000 young men and women were graduated from American colleges.

The social wastage involved in training young people for jobs which will never exist is incalculable. For the individual it is a ghastly tragedy. Disillusionment serves to heighten all the normal psychological difficulties of the persistently unemployed, and demoralization results earlier. White-collar W. P. A. projects which have performed notable service in preserving these invaluable skills and training, have most frequently been the victims of the derisive description, "boondoggling." The enormous wastage of training thousands upon thousands yearly and having them join the swollen ranks of the unemployed is truly boondoggling, and on a scale so vast that if permitted to continue uncurbed, may have a profound effect upon the white-collar labor market.

The CHAIRMAN. That criticism is not very widespread actually, certainly not in responsible circles. I think it is always well to bear in mind that when W. P. A. appropriation bills are passed in Congress, even last year, very little if any opposition is registered in opposition to them. For example, the last W. P. A. appropriation bill, which undertook, I thought unwisely, to place some restrictions upon expenditures, and so forth, passed in the Senate without a single dissenting vote, and there were only 23 votes in opposition in the House, so that I think there is a possibility of giving too much weight to—

Mr. MERRILL (interposing). The criticism was not necessarily directed to Congress.

The CHAIRMAN. Of course, what Congress does is ordinarily a reflection of what the people think, and it has been my experience that every survey which has been made of public opinion in the United States bears out the conclusion that Members of Congress for the most part have reached, which is that public opinion believes

¹ Exhibit No. 2611 has been corrected to show the proper percentages.

it is a national obligation to take care of those for whom employment opportunities are denied, so I don't think you need to be very much disturbed about phrases. I think there is too much attention being given anyway to name calling and to various efforts to—you know—paint the picture.

Mr. MERRILL. Frankly, Senator, I am not really terribly hurt and I don't think my membership is. We are not very much upset about this thing.

The CHAIRMAN. That is merely argumentative. It deals with the superficial aspect of the problem that is before us. What we are trying to find out is not what people say about one another but what the facts are.

Mr. MERRILL. I agree with you.

Mr. CHANTLAND. May I ask one question? Just preceding what the Senator was talking about, it seemed to me that you inferred that the graduates were all or mostly all headed toward white-collar jobs. Did you mean that?

Mr. MERRILL. Yes.

Mr. CHANTLAND. On what do you base that?

Mr. MERRILL. Well, I believe that it is statistically proven, and I would be glad to provide the committee with a carefully prepared memorandum based upon some of the reports of the school systems of the country, which would indicate that a vast majority of the people even in the lower grades are prepared for white-collar employment, and an indisputably vast majority of graduates of colleges are headed toward white-collar employment. I think it can be proven as a quotation from the reports of the various school boards throughout the country. I would be glad to prepare such a memorandum for you.

Dr. ANDERSON. I am somewhat familiar with the vocational studies on high-school students. We will have it presented in detail next week when certain educators come before us, but they surely substantiate what you have said, that even in industrial communities the children of industrial parents seek to become white-collar workers rather than industrial workers.

Mr. MERRILL. As a matter of fact, a number of educators have taken up this question with me. They are profoundly disturbed that they are training people for jobs which they are never going to occupy, and I think this problem as a whole comes in for increasing attention. It is a very important problem.

The CHAIRMAN. You don't mean to suggest that you think it would be desirable to train more young people for industrial and mechanical jobs or hard labor?

Mr. MERRILL. Well, I don't think there is anything invidious in being prepared to do a job at labor if you are going to be employed at it.

The CHAIRMAN. Of course the evidence that comes before us is that the machine is making manual labor more and more unnecessary. We had Mr. Murray here the other day with his human exhibit to show how manual labor had been displaced by the continuous strip mill. Now it would seem to me that it would be a rather idle thing for any school, any vocational school even, to train young men to become the operators of handmills because the handmill is on its way out. Likewise, the evidence before us with respect to technological improve-

ments on the railways. What was it they called that machine, the nutter, and the track layer? Both of these instruments and many others are taking the place of hand labor, so personally I can't see any reason why parents shouldn't desire to have their children trained for white-collar jobs and why graduates from high school and college shouldn't prefer to do work of that kind rather than manual labor, hard labor, for which we are bringing the machine into existence.

Mr. MERRILL. You see, Senator, I haven't a single panacea to offer. I am just drawing your attention to the fact that literally hundreds of thousands of people are being trained for jobs which they are not going to occupy.

The CHAIRMAN. That is the interesting point. I was going to direct a question to you when you read this sentence: "Not only are employment opportunities narrowing, but they could never have kept pace with the hundreds of thousands being graduated from American schools and colleges every year." Now that is a very important conclusion, if you have facts to substantiate it. I suppose that is the purpose of your paper.

Mr. MERRILL. I think if you will permit me to continue with this aspect of the testimony you will find that it will be substantially proven.

The Biggers November 1937 Census of Unemployment found 839,693 clerical and kindred workers and 143,766 professional employees totally unemployed. In excess of 1,500,000 employees were totally and partially unemployed or employed on emergency work.

I would like to submit a table from figures of the Biggers November 1937 Census of Unemployment showing the clerical and professional workers employed and unemployed, revealed by this census.

(The table referred to was marked "Exhibit No. 2612" and is included in the appendix on p. 17426.)

Mr. MERRILL. This table shows as follows: Totally unemployed clerical, 839,693; professional, 143,766. Emergency workers, 204,926, professional, 82,213. Partially unemployed, 237,450, professional, 58,159. Total clerical employees, 1,282,069; professional, 284,238.

Mr. CHANTLAND. How was the classification used arrived at in establishing professional?

Mr. MERRILL. I am sorry, I have not examined the original questionnaire. I imagine it followed generally the description I have given.

Mr. CHANTLAND. Many of the professionals are mechanical, engineering, so on. It isn't the narrow sense of professional?

Mr. MERRILL. It isn't in the narrow sense of professional. Sometimes it depends upon the individual investigating. He might make an error in judgment. It is such a peculiar distinction to make, such a very difficult distinction to make, that you might find totally different figures from the same source of facts as between two investigators of the Biggers census.

Mr. PIKE. I don't think there were investigators in that census, were there? Didn't you just fill out a form?

Mr. MERRILL. I meant in the sense of compilation.

I would say that there are a great many people who are, properly speaking, clerical workers in the strict interpretation of the sense but who prefer to be called professional.

We can safely conclude that in every substantial urban community almost 17 percent of the total male unemployed and 35 percent of the female unemployed are clerical and professional employees. On the same basis in large cities, where the main groups of white-collar workers are employed, in New York for example, we find that clerical and professional employees constituted 25 percent of all males totally unemployed and 49 percent of all females unemployed.

The Monthly Labor Review of May 1935 showed that of the workers on relief more than 6.4 percent were clerical and professional workers, taking the Nation as a whole, while in the city of New York clerical workers alone constituted 10 percent of the number of workers on relief. The Division of Social Research of the W. P. A. estimated that 215,500 office workers alone were on the public relief rolls in 1935.

White-collar workers once unemployed are out of work longer than any other group with the exception of the totally unskilled.

There was a time when white-collar workers could hope to advance readily to highly paid jobs in commerce and industry. This is no longer true. Yet it is still more respectable to be a white-collar worker than to be a manual laborer, even where manual labor is more highly paid. It is this will-of-the-wisp respectability which makes white-collar jobs the objection of the majority of young people, particularly students.

Ordinarily office employment of the most routine nature requires at least a high-school diploma, and perhaps in addition, special business courses. For any job outside the range of strictly clerical employment, and in many cases even here, college degrees and long and arduous years of training are necessary.

EARNINGS OF WHITE-COLLAR WORKERS

Mr. MERRILL. The high salaries that are supposed to accrue to white-collar employees constitute one of the most startling myths in connection with American life. Frequently office and professional people, after long years of training, find that in order to secure practical experience in industry they must work for little or no pay.

Stenographers frequently start at salaries of \$15 a week, and at times at less than \$10.

In Michigan, for example, half of the 247,000 clerical workers studied, of both sexes, earned less than \$1,000 a year during 1934. Among the 150,000 clerical workers studied in Pennsylvania, 42 percent earned less than \$17.50 per week, and 56 percent of some 73,000 clerical workers earned less than this amount. Female workers comprise this latter group.

Professionals fare better, but Paul Douglas, in *Movement of Relative Wages, Its Economic Significance*, reports that between 1890 and 1924 real wages of all clerical and salaried employees declined 5 percent. The trend would appear not to have diminished but to have increased.

According to the National Resources Committee, the average income of families of clerical employees was \$1,901, while 6.8 percent had incomes below \$750.

The following table which I would like to submit, prepared by the Wage and Hour Division of the United States Department of Labor,

shows the distribution of clerical employees in 30 cities by earnings for the years 1935-36. I should just like to quote you some of the percentages reflected in this table.

(The table referred to was marked "Exhibit No. 2613" and is included in the appendix on p. 17427.)

Mr. MERRILL. Those earning less than \$700, percentage of workers, 21.8; those earning less than \$1,100, percentage of workers 57.3; those earning less than \$1,500, percentage of workers 75.6; those earning less than \$2,000, percentage of workers 90.8.

I would like also to submit to the committee the following table taken from a study entitled "Labor in the United States," which shows the median annual incomes of clerical and professional employees by age groups.

(The table referred to was marked "Exhibit No. 2614" and is included in the appendix on p. 17427.)

Mr. MERRILL. This shows the clerical employees between the ages of 15 and 24 to be earning a median income of \$630 per year; between the ages of 25 to 34, \$1,080; between the ages of 35 to 44, \$1,285; between the ages of 45 to 54, \$1,270; between the ages of 55 to 64, \$1,180; 65 years and over, \$985. This table also shows for professionals between the ages of 15 to 24, \$585; between the ages of 25 to 34 years, \$1,270; between the ages of 35 to 44, \$1,665; between the ages of 45 to 54, \$1,735; between 55 and 64, \$1,600, and 65 and over, \$1,520.

Mr. MAGINNIS. May I interrupt just a moment? In connection with that table, what do you mean by professionals?

Mr. MERRILL. I am submitting without additional information the table as I took it from the work I quoted, which is Labor in the United States, by W. S. Woytinsky, sponsored by the Social Science Research Council and based upon figures of the Social Security Board. Exactly what he classified as professional I can't tell you, but I am submitting the figures for what they are worth. I think the book is rather widely accepted. I cannot tell you exactly how Mr. Woytinsky established these as professionals.

Hours of work: The white-collar group is substantially on a basic 40-hour week, but work-weeks of 50 hours and more are not uncommon.

I should like also to submit to you a table prepared by Mr. Joel Berrall for the year 1928 revealing the weekly hours of work of office employees in private business.

(The table referred to was marked "Exhibit No. 2615" and is included in the appendix on p. 17427.)

Mr. MERRILL. This table shows the weekly hours of office employees in the fields of banking and finance, insurance, wholesale, and retail, manufacturing and mining, public utility, and so on. I should merely like to indicate the comparative nature of the table. Those on a 40-hour week would seem to number about 25.63 percent in banking and financing; those employed on a 40- to 42-hour week approximately 32.42 percent, and so on. I will not go into the table in great detail. It requires rather careful study in order to secure the information.

Mr. PIKE. It is too old to be given great weight.

Mr. MERRILL. I am quoting it because it is for the year 1928, and profound changes have taken place since that time as business has tried to adjust itself to a different basis of doing business.

Mr. PIKE. It doesn't mean that it should be given great weight at this time.

Mr. MERRILL. Except to indicate the trend. I have some additional information.

Hours of work, like other working conditions of white-collar employees, have been under constant attack since 1929. I don't say we are in a position to say to what degree this change has taken place. Change has taken place on a wide scale. It has undoubtedly changed since 1928, but if we can posit that one fact we might be able to get a better idea as to what has taken place.

Unregulated overtime tends to break down existing work-week standards. Bulletin No. 120, of the Women's Bureau, reveals that in New York 78.8 percent of those firms interviewed reported overtime work. Overtime work is largely uncompensated.

American Business for December 1938 reported a survey among 287 companies covering their overtime compensation policies.

By far the most popular plan for compensating for overtime is the supper-money plan. Out of 287 companies surveyed, 139 pay supper money and no extra compensation for overtime. The next most widely used plan is no compensation whatever, 96 companies finding it unnecessary to give either supper money or any allowance for overtime.

American Business submitted a table based upon this survey which I described as an overtime-compensation table, which I would like to submit to the committee. It breaks down in detail the general summary which I have just read to you.

(The table referred to was marked "Exhibit No. 2616," and is included in the appendix on p. 17428.)

Mr. MERRILL. The operation of the Fair Labor Standards Act has tended to reduce long hours of work and uncompensated overtime. There is, of course, no statistical information yet available which would show its full effect.

Mr. MAGINNIS. Where did you obtain those figures?

Mr. MERRILL. From American Business. It is a publication rather widely read among executives. That should be the December 1939 issue, not December 1938.

Mr. MAGINNIS. That is information given in the table, which we have. Where were the figures obtained?

Mr. MERRILL. Yes, I see, I am quoting to you directly from American Business which made this survey on its own account and did not give, of course, the information behind that table. I presume that the information was submitted in confidence by enterprises or firms that had confidence in them.

Mr. MAGINNIS. My question was purely as to the source.

Mr. MERRILL. The source is American Business.

CHANGING STATUS OF CLERICAL WORKERS

Mr. MERRILL. The clerical workers not only do not form a fixed class in the sense of fixed numbers, but are far from a fixed class in relation to other sections of the population. It is a truism that the white-collar workers occupy a middle position. In terms of economics, the white-collar worker is very much a part of the working class, conforming to every established economic criteria which would justify that description. In terms of his social habits and values he is the

very backbone of middle-class America. One writer estimates the American middle class as about 12,500,000 persons of which 9,200,000 are estimated to be salaried employees. A recent Gallup poll, on the other hand, reports that about 70 percent of all Americans consider themselves a part of the middle class.

As far as the average white-collar worker is concerned, these doubts about his position within society are being resolved daily. The changing economic and social situation more and more exposes him to forces steadily depressing his position within society and his share of the national income. This is the outstanding problem before the white-collar worker, and it is changing his life and values. Ruptured social habits, continued high requirements, even to items of personal appearance, low pay, long hours, and exceptionally large unemployment confront the white-collar worker with an aggravated problem of adjustment. It is not strange that it should be found that

among the white-collar occupations, illness and physical impairment are relatively a more frequent cause of despondency than among laborers.

THE INTRODUCTION OF THE MACHINE

Mr. MERRILL. The machine in the office has not been heralded with any fanfare because it has always been present to some extent. The principle of the typewriter itself has been known since 1712. Its intensive introduction, however, has taken place only in recent times. The broad economic reasons for this have been noted. As long as it results in more economical administration of business enterprise, it will continue apace. Other factors governing the introduction of office machines are very much the same as those of any other type of machine. The office machine is a tool which increases the productivity of the worker because it multiplies the number of things performed by no greater effort. In the case of the office employee, these tools are not always strictly analogous to those used by the physical worker. Yet, the file and filing cabinet and complicated visual and cross-index systems which have been developed are purely memory machines. The typewriter is clearly seen to be a writing machine, as is the shorthand machine; calculating machines of all types clearly multiply the arithmetic process, and so forth. In the words of H. D. Harris of the General Motors Corporation, in discussing the office machine, "A piece of mechanical equipment is only a means to an end." As in the case of the manual worker, the office machine has permitted the greater division of labor and consequent standardization and rationalization.

The office machine has fully justified itself as an aid in increasing productivity. How widely it is used can be shown by an article in *American Business* for March 1940 discussing the problem of costs of administration in which the administrative fate of an order for a Toledo scale is given. The machines mentioned in this quotation have been italicized by us.

After the order is accepted, it is turned over to a clerk who makes a work sheet on a special form for *penoll* writing. On this form all the details of the order are entered and checked for the billers, who use *Royal typewriters* equipped with billing type and *Ditto carbons*. The invoice forms consist of the original or master. From this are run the following copies: Sales tax copy, duplicate sales tax copy, salesman's advance sheet from which checks are drawn (twice a week on *Todd check writer*), commission voucher for posting

to salesman's account, a statistical or cost copy on which is figured the profit or loss on the sale, customer's acknowledgement, branch collection copy (if needed), a consignment tracer copy in the event the scale is delivered from a branch or agency consignment stock. There is also a copy for the credit department. * * * All these copies are run on the *Ditto machine*, near the two *Elliott-Fisher bookkeepers*.

In the course of this article, description is given of "two punches, a sorter, and printer in the tabulating department are kept busy handling a statistical sales analysis job which gives a minute breakdown. * * * Same department handles pay rolls." Captions on illustrations describe bookkeeping machines, visible index systems, mailing room rack systems, mailing machines, and so forth.

American Business for February 1938 cites:

Using multiple-function accounting machines, Individual Towel Co. of Chicago cuts billing costs, speeds all statement writing, and improves record of deliveries at one operation; also uses same machine for pay rolls.

Grace Coyle in Present Trends in Clerical Occupations reports that the Commonwealth Edison Co. puts in 1 room 80 girls, classified by "temperament and ability." They are stenographers, typists, and dictaphone operators. When the executive wants to dictate, he telephones to the central bureau and a worker adapted to his kind of work is sent him. "Exit the private secretary" announces the company, reporting that the plan saves them 15 stenographers. The Chicago, Milwaukee & St. Paul Railway states that by introducing dictating machines they have increased the amount of work done by 20 percent while saving 20 percent in labor cost. The General Electric Co., of Schenectady, introduced 650 dictating machines and centralized the operators in 1 room. To increase efficiency, 3 transcribers are familiar with the work of each executive and thus some continuity in the work is secured. What becomes of the displaced workers is, of course, not mentioned in the company report.

The record of office equipment manufacturers, perhaps more directly than in any other way, reveals the growing use of the machine in the modern office. The number of workers employed in the manufacture of business machines is now in excess of 18,000, an increase in 2 years of 6,000 workers. Its total volume has been steadily growing. The census of manufacturers represented a yearly volume in 1937 of \$138,071,167 as compared with \$98,383,910 in 1925. The Exchange, monthly publication of the New York Stock Exchange, lists in its March 1940 issue a table showing the 1939 dividend yields of listed common stocks assembled into industrial groups. The business and office group was the only group showing a 100-percent payment of cash dividends. This compares with 45.8 percent for the automobile industry, 78.1 percent for the chemical industry, 68.7 percent for retail merchandising, 40 percent for the booming aircraft industry, and 84.6 percent for finance.

RATE OF INTRODUCTION OF MACHINES

Mr. MERRILL. Of course, the manufacture of business and office equipment is still a young industry. The office machine itself is, in a sense, still subject to experimental use. Its full potentialities have yet to be realized. The electrically driven typewriter, for example, may vastly reduce the number of typists. The post-1929 develop-

ments naturally boosted the wider use of office machines as a means of reducing costs in time of depression.

In the periods of relative prosperity since 1929, they have been used to avoid hiring additional employees. Its increasing use today is a warning of its much wider use in the future when it can be secured at less cost and on easier terms.

One of the important factors slowing up the introduction of the machine is the fact that reduction in operating costs is, in small enterprises, frequently offset by the loss of use of the capital invested in the machine. In manufacturing industries, investment in machines is a capital outlay. Generally, however, investment in office machines is charged against operating administrative costs. Regardless of the account practice used, its net effect is to reduce the amount of income going into wages. Yet the working capital embodied in a machine can be most important to small businessmen, consequently they content themselves with the simplest and most widely used machines.

It is primarily because the cost of office machines requires a large volume of clerical work to justify the expenditure that only large-scale employers of white collar labor are using it to an increasing extent. Large volume, of course, is not always the deciding factor. In some cases, office machines enable the assembling of information which would not otherwise be available except at prohibitive cost.

In other cases, the machine secures the information more quickly though not more cheaply. Where the information itself, or speed in securing it, is important in the making of executive decisions, the increased operating cost would be justified.

In these cases the introduction of office machines has led to new employment. It would be quite erroneous, however, to conclude that this is or can be the characteristic result. The net effect of machine introduction is permanent job displacement.

The relatively slow introduction of office machines compared with the ability to use those now available naturally serves to retard abrupt technological changes. Office-equipment manufacturers are unlikely to force the development of new machines. The need to realize on investment in existing plant and equipment is but one phase of this question. Usually, manufacturers do not introduce new types of machines in greater number than their competitors, and reduce competition to its simplest form, or they fail to bring out new competing machines because existing ones are protected by patents or where certain types of machines have a limited market, the venture is deemed too hazardous. A virtual monopoly in many types of machines would seem to exist.

I should like to make it perfectly clear here, Mr. Chairman, that I don't necessarily consider such monopoly a bad thing. The Dictaphone Corporation, for example, does not grant credit terms beyond 30 days and has consistently avoided installment payments of any kind. Yet turning in an old typewriter will result in the immediate delivery of a new one which can be paid for on convenient terms.

One of these days this particular financial knot is going to become untied, and it will become simpler for business to effect the capital outlay for many types of machines. When that occurs, its effect upon the white-collar employee will be to devastate existing standards and aggravate all of the existing trends. The result in terms of personal lives of the salaried employees thus affected is unpredictable.

We have noted that the machine greatly increases the volume of production. For example, H. L. Doherty Co. reports that from 1925 to 1929 its typewriters turned out 144 percent more work while salaries increased only 47 percent.

The 1937 business show in New York displayed a typewriter-computing-billing machine that computes an entire invoice in one operation. One stenographer can operate the new robotyper, pneumatically operated typewriter controlled from a perforated roll, like a player-piano, incidental to her other duties and a single operator can operate up to four robotypers at one time.

Haphazard measurement of clerical production is giving way to scientific measurement. Now, many establishments measure performance on the job, including, for example, the use of typewriter devices, cyclometers and others, measuring strokes, errors, time performed, number of completed letters, and so forth.

In the case of other machines, adaptable controls of some sort are usually instituted to enable management to judge relative performance.

John Mitchell, a management engineer, in an article, *Improvement in Office Methods*, appearing in a publication of the American Management Association, says, "Since 1930, the machine manufacturers have improved their products tremendously. Some of the pioneers in scientific management are applying the principles of motion economy; and it is probable that during the next 10 years radical changes will be made in the method of arranging and utilizing equipment in the office." The more careful study of worker performance obviously is already leading to many refinements of existing machines.

MACHINE DISPLACEMENT

Mr. MERRILL. While production continues unabated or at increased levels, leading to the use of machine terms such as "speed up," "pacing," "timing," and so forth, by white-collar workers, the volume of wages continues to drop, and unemployment continues to increase.

Reference to the section on unemployment in the foregoing will recall that even a marked increase in reemployment by industry would not keep pace with the number of newly trained workers yearly produced by our schools in the many thousands.

In the main, workers who are displaced by the machine must either secure employment with establishments which require their existing skills or be retrained. Retraining is an expensive process and reluctance to finance such retraining by the individual, even when possible, is increased by the fact that there is no assurance that once this occurs there is immediate likelihood of securing employment.

While some concerns do retrain their employees (or, rather, those of them retained to operate the machines) the result of machine displacement is generally permanent. There are no figures available to indicate the number of workers affected by this process. Union statistics merely indicate that it is substantially larger than it was yesterday, and affecting an increasing number of categories of employees.

In the work *Shifting Occupations*, by Louis Dublin of the Metropolitan Life Insurance Co., bookkeepers were noted as among the occupations showing a low proportion of constancy. This is attributed to low wages and youth of the employees, but the incidence of the machine must also be included. It was noted here that

39.2 percent of those engaged in clerical occupations shifted to manufacturing, operatives, skilled building and other trades, laborers, agriculture, railroad employees, in just about that order.

Dr. ANDERSON. What is the date of the study to which you have just referred?

Mr. MERRILL. I regret, Dr. Anderson, that I do not happen to recall that, but there is a very careful abstract of the volume in my office, and I would be glad to send it to you.

Dr. ANDERSON. As far as I know, it is the only study available, and it was fairly well dated, so that even if this were true when this study was made—

Mr. MERRILL (interposing). It might be out of date, that is right. I am sorry I cannot provide that information.

EFFECT ON SKILLED WORKERS

Mr. MERRILL. The increasing use of machines is leading both to a demand for employees with fewer skills and attainments, while the very specialization the machine makes possible is resulting in a requirement for more skilled workers within these narrowing categories. Clerical work generally has required a knowledge of business practice, reliability, honesty, tact, neatness, and such skills as shorthand, typing, knowledge of bookkeeping, as well as in some categories training of a kind usually characterized as "professional." It can be argued, of course, that a bookkeeper remains a bookkeeper even though the accounting process is accomplished through a machine under his direction. But the use of the machine places a premium on mechanical aptitude in its operation, ability to maintain sustained attention, and so forth. These qualities are not quickly developed. The machine process, therefore, leads to a division of the tasks to be accomplished with especial responsibility placed upon the worker who is required to interpret the result. The use of the machine tends to freeze skills and limit advancement, or reduces such advancement to fewer categories of employment.

John Mitchell says, "the department heads were unwilling to weaken their particular units by passing good workers to other departments; consequently when asked for a good worker they invariably passed the poorest one along."

PROMOTION POLICIES

Advancement and development of new skills are retarded not only by the fact that the use of the machine requires fewer skills of the employee, but that it consequently reduces educational requirements and results in inadequate preparation for the filling of vacancies in the higher categories. A small percentage of clerical work still opens the door to higher paying positions, but the levels to which they can rise are becoming more fixed with every turn and twist of the business cycle.

F. G. Nichols reports in "A New Conception of Office Practice" that 88 percent of office managers questioned said that they preferred clerical assistants who could not rise to higher positions. The converse to this is that when employees show a special aptitude in lower-paid positions, particularly in machine operation, there is a

reluctance to promote them, and no extra financial consideration is given for this discrimination in promotions. Advancement and regular promotion has always been haphazard and is becoming less possible with the increasingly routine nature of employment due to the increase of machines.

The CHAIRMAN. Who is F. G. Nichols?

Mr. MERRILL. Mr. F. G. Nichols is not an authority on this question. He has done considerable research in the field. His work is generally quoted in this connection. There has been so little Government study into this question, there are so few Government figures available, that naturally independent researchers who have worked in the field must be drawn on rather heavily. That is why I quoted rather widely from American Business and other publications of this sort, because other information more scientifically prepared and which can be authenticated is just simply not available.

The CHAIRMAN. When did he write this?

Mr. MERRILL. This I believe was written in the early years of the depression; that would be some time in the thirties.

I feel that anything Mr. Nichols might have said in this respect is substantially supported by statements of John Mitchell, and of others, and all of his writings from which I have quoted are recent and have been published within the last 6 months or a year.

Mr. PIKE. Your own experience, you have seen around Moody's, that is reasonably true around the larger organizations—not necessarily Moody's.

Mr. MERRILL. I was drawing attention to a condition. I would say that when you break a person in on a machine, there is a considerable investment. To retrain a person or get a new person to run that machine is going to cost you some money. And some firms make careful allocations as to what promotions are going to cost tomorrow. Others do not, with the result, particularly where there is careless management, that there is a tendency to keep these people in these positions regardless of their ability.

The CHAIRMAN. The statement which attracted my attention was the first one you quoted, namely, that "8 percent of office managers whom we, or whom somebody interviewed, said they preferred clerical assistants who could not rise to higher positions."

In other words, this testimony is, for what it may be worth, that the office manager when he seeks a person to operate a machine, wants one whose capacity is not any greater than that.

Mr. MERRILL. I would say this, and in further explanation of it, that if I were an office manager and I had to retrain a machine operator every year, in my department—or a large number of them—I think I would rather give up the job, because I don't think you can get production out on that basis.

I am merely pointing to this fact; it is a very real problem—how to take care of it is again a different question.

Of course, the union has made proposals of its own to individual employers. We are putting forward no panaceas, but where as in the past this was not an established condition, it is true today. It is growing, and there are sound business practices which justify it. There is no use avoiding the fact that it costs money to train machine operators. I know that one employer with whom I discussed this

question, who was my particular employer, told me this when I wanted to leave. I was offered more money, and he sat down and we figured out that after all, I was a trained employee. What was the cost of breaking me into their particular system? It ran a little over \$1,500, and he said, "That is what I am losing when you leave. You can take any raise up to that amount for the next year, and it would be all right with me."

I mean, he knew exactly what he was dealing with. He knew the cost of actually breaking in someone, a new employee on that job.

(Discussion off the record.)

Dr. ANDERSON. Mr. Merrill, isn't it well to point out, too, the other fact that clerical labor in the earlier stages of its use, say in the early years of the century, was frequently looked upon as a form of work in which a person could begin and then rise through the ranks to something higher?

Mr. MERRILL. That is right.

Dr. ANDERSON. And yet you point out now that with the investment in the worker, with the level of proficiency required, with the mechanization and the load placed upon clerical service, we have what amounts to a definite occupational skill, and management seeks to keep it that way.

Mr. MERRILL. That is right.

And in further explanation of it, I have tried to point out that you cannot say, "Well, management is a big meanie, they don't promote people with ability." It is sound business practice that compels this, and the difficulties of prior notions on the part of white-collar employees to secure exceptions of their situations, and the idea that they are going to become president, just has to give way to the practical necessities.

You have to, generally speaking, operate your office within a reasonable figure commensurate with the volume of business generally done. If it were merely that we are saying that management is a meanie, a great, big meanie, and now, let's all be good people about this, the situation would be different. But it can't be solved that simply. It is a definite social problem, in my opinion.

On the other hand, there is a greater tendency to salary standardization, since performance is susceptible to the same measurements. To offset this in part is the comparatively recent introduction of the bonus and piece-work system in certain types of employment.

No estimate can be ventured of the extent of the human problem involved in technological change. As yet, very few concerns maintain statistics that are useful for anything but determining their own immediate administrative requirements. The Federal and State Governments have only in recent years made an effort to compile statistics relating to white-collar employment. It has been noted that the machine serves to aggravate all existing trends bearing down on white-collar employment. That these trends, including the wider use of the machine, are having cruel effects is to be expected. In this respect the white-collar worker is following in the path hundreds of thousands of manual workers have had to travel. Conditions of work, hours, salaries, standing in the community, security of employment, conditions of health, are being changed for every white-collar worker, young and old. They are being changed partly in terms of the machine innovation, and partly in terms of other

factors. All of them hang like the sword of Damocles, threatening to sever the established familiar habits of conduct. The machine is only one of the guns hammering away at the social fortifications of the white-collar workers. That these fortifications should crumble is to be expected. That there should be casualties is now taken for granted. That these casualties should increase in number from year to year has become familiar. What cannot be known is which gun is causing the greatest damage at any particular time. For the worker slain on the field of economic battle, description of the type of bullet which laid him low can be for him a question purely academic and about which he can hardly testify.

The trade-unions and professional associations of the white-collar salaried employees have not resisted the introduction of the machine. They have bent their efforts to increasing their strength in order to make certain that its introduction would follow an orderly process with appropriate consideration for the human problem involved. The active discouragement of business management to the organization of their employees into self-governing unions has militated against their ability to insure that in given establishments this problem will be dealt with in fairness and equity. While it is the stated public policy of the United States to encourage membership in such organizations, this has not been accompanied by vigorous application of existing laws.

PUBLIC POLICY AND BUSINESS PRACTICE

Mr. MERRILL. The United Office and Professional Workers of America still has pending with the labor boards of the States and the Nation charges covering discriminatory discharges and petitions for elections which are more than 2 years old. Other elections, such as one held covering the employees in the New York district office of the Metropolitan Life Insurance Co., have been abrogated for all practical purposes by long-drawn-out litigation.

The direct intervention of white-collar unions is taking place on an as yet limited scale, and represents only a beginning in this respect. Employers under contract with local unions of the United Office and Professional Workers of America have, during the course of those contracts, introduced new machines. Machine introduction, however, has not been accompanied by the increased speed-up, though production itself has naturally improved. Employees displaced by machines were discharged on a graduated basis, usually after payment of a dismissal wage, while the union, because it follows employees from job to job and is not confined to a single establishment, was able to make provision for their employment. The intervention of the union has served to preserve all of the beneficial features of the introduction of the machine, while mitigating or providing against its ill effects.

The regularizing function of the union has led in frequent cases to the increase of wages for the remaining employees and not reduction of wages, which is the standard accompaniment in nonunion establishments. This has been due not to a policy of fostering this development by the United States Government, but to the initiative of the employees in question. Inadequate appropriation for the enforcement of even existing legal safeguards naturally leads to gov-

ernmental indifference. The social role of the union is consequently limited to the size of its membership. Of course, this is the intent of employers, who, defeated in the field of argument and social policy as stated by Congress, are nevertheless able to have their own way in the field of social practice. The white-collar unions naturally propose to remedy this defect.

Discrimination against white-collar labor in many pieces of social legislation is taken for granted. Unemployment, for example, due to the introduction of the machine and other causes, is greater among white-collar workers than any section of the population, yet their inclusion in the Social Security Act is only partial and a right which has to be constantly guarded against the encroachments of those who would narrow its applicability. Administrative procedures are slow and can be changed only at great expense after frequent representation, and so forth.

The efforts of the United Office and Professional Workers of America to secure inclusion in the Social Security Act of employees of nonprofit social agencies has not been successful, though it did secure the inclusion of bank employees after much expense and effort. Salaried employees are exposed to the same social hazards as bank employees or other groups of white-collar workers. Nevertheless, despite our efforts they are denied the benefits of the act. An employee of a bank displaced as a result of machine introduction can secure unemployment insurance. An employee of a social agency, perhaps working in the same building, displaced as a result of machine introduction, cannot secure unemployment insurance. The social logic is not clear to the United Office and Professional Workers of America. Yet much of its time and income will have to be devoted to overcoming this lapse of the United States Government.

The relatively poor bargaining position of the white-collar employee in the labor market is clear from all the facts given. Yet, an act designed to improve that position, such as the Fair Labor Standards Act, is one whose applicability to white-collar employees is in hourly doubt, and only preserved because of the unremitting efforts of the white-collar unions and the Congress of Industrial Organizations.

The exposed position of the white-collar employees in our economy is clear to all. Yet slashes of W. P. A. are directed more against projects aiding these workers than any section of the working population. The pleas of the white-collar unions are ignored, and their representatives constantly insulted by major and minor administrators.

The white-collar employee in the United States today is penalized by governmental and business practice for a position in society he may once have enjoyed but which is no longer his. His right to belong to a union is under constant attack. His organizations are publicly crucified by a congressional committee in Washington one day, while in Albany on the next the New York State Senate passes a measure barring bank employees from the State Labor Relations Act. This bill was defeated in the assembly only after an intensive campaign by the Bank and Brokerage Employees Union, a local of the U. O. P. W. A.

The white-collar unions today are occupied with problems which are properly within the jurisdiction of the United States Government. They may be compared to a volunteer fire brigade which is trying to

do a job for which a specialized, trained fire-fighting force, with modern tools, is available, but which has not yet decided whether it is proper to put the fire out.

The social policy of the United States is in all its implications progressive and liberal. Its social practice is as little of this as it can get away with, and it does not meet the needs of the white-collar workers in this country. The growing introduction of the office machine, unless modified in the light of the foregoing considerations, spells the opening for white-collar workers of a period of great chaos in standards of living, standards of work, job opportunities, and all of the things which represent the ordinary aspirations of the ordinary citizen of the United States of America.

For its part, the United Office and Professional Workers of America sees its responsibility, as a representative organization of white-collar workers, of expanding its own strength and that of all organized labor; of fighting for its own legislation and the general legislative program of the C. I. O.; of lending its main efforts to securing greater expansion of production and purchasing power among white-collar workers and the whole people. The orderly processes of social adjustment cannot be accomplished without the union occupying its appropriate place as a natural and democratic effort with which every white-collar employee should be associated, to which every employer should accommodate himself, and whose voice, as the voice of people working for a living and speaking together and with authenticity and sincerity by speaking for themselves, should secure the profound respect and attention of all our divisions of government. In this respect, the United Office and Professional Workers of America will be enabled to discharge in its field what the Congress of Industrial Organizations is striving to discharge in all industry in the interests of the United States and its people.

The CHAIRMAN. What modification did you have in mind when you said, "The growing introduction of the office machine, unless modified in the light of the foregoing considerations, spells the opening for white-collar workers of a period of great chaos," and so forth?

Mr. MERRILL. Well, as I said at the opening of my testimony, Senator, I had no panacea. I was hoping that this committee might come forward with one.

The CHAIRMAN. Well, that is a good enough word to tack on to any suggestion, of course.

Mr. MERRILL. Well, I agree, but apart from any facetiousness, I really don't know at the moment just what controls could probably be instituted. For one thing, it is quite certain that all social legislation which is affecting the workers generally in the United States certainly must be allowed to apply to white-collar workers.

Mr. LUBIN. Do you feel that the growth—well, I take it from your testimony that the growth of the trade-union organization and collective bargaining would at least make it possible for those who are affected by the machines, to take part in the formulation of policies which will hurt or protect against the encroachment of the machine.

Mr. MERRILL. Yes; very definitely. Of course, I am a specialized witness; I am not going to say anything but that I think everybody should join the union. As a matter of fact, it is very difficult for an employer to use an experimental machine, to know exactly how it is going to work out, and the counsel of the union has made certain that this thing is going to follow some orderly process.

Now, no employer likes to discharge an employee for machine displacement or for any other reason, generally speaking. If the union can counsel with the employer as to just how it should be introduced, its rate, the types of machines, and give us a chance to find jobs for these other people, we could allow these machines to be introduced without any serious effects from our standpoint.

We want the concerns, particularly those concerns that are contractually related with us, to be profitable concerns. We want them to make more money so that they can pay our workers more wages, and, generally speaking, we are naturally more inclined to support a unionized firm than a nonunionized firm.

With that modification, I would say that we have found that the union has served splendidly as a means of making certain that the human aspects of this problem are properly satisfied, and what can be done is done.

The CHAIRMAN. Well, I come back now to that question I asked you when you were reading your introduction. You remember I referred to this sentence:

Not only are employment opportunities narrowing, but they could never have kept pace with the hundreds of thousands being graduated from the same schools and colleges every year.

Do you think that you have substantiated that in this paper—that conclusion?

Mr. MERRILL. To my satisfaction.

The CHAIRMAN. Well, of course.

Mr. MERRILL. But I—

UNEMPLOYMENT—SECULAR OR TECHNOLOGICAL

The CHAIRMAN. You see, the reason I ask that question is this—before you answer me. You see, the contention is made to us that unemployment is not so much the result of the machine as it is an aspect of the depression. The contention is made that machines actually create more opportunities for jobs, and that removing the depression will remove the whole unemployment problem.

Mr. MERRILL. Well, you see, I can go along with that part way, as it affects my field. I cannot discuss the broad question as it might affect the steel industry or any other industry.

Generally, as it affects white-collar employment, there is no doubt that white-collar unemployment is an aspect of the depression in the following sense: Business generally over the years developed a large oversized clerical force, and it is ordinary business horse sense to reduce the cost of that operation. Now, along comes the depression. It says, "You are either going to find ways of increasing the profitability of your enterprise, or you are not going to be able to show the same profitable return to your stockholders."

So they look at this problem, which has not been solved. They start to find one method or another to reduce that cost. They institute a process which will not stop necessarily with immediate solutions of the depression in its larger sense. In other words, you might be able to find a solution for the depression and still not be able to overcome this particular problem, and that is, that industry and commerce in this country produced as the result of its own intensive

development a clerical group which is greater in size than its needs at the moment, or its apparent needs in the future.

Now, then along comes the machine. It is true, as I can see it, in my everyday life, that certain types of machines in the office field do produce new employment. But, generally speaking, this is not the result. For example, a business firm in business for 50 years, with an established clientele and customers which it is going to service in one way or another, expensively or inexpensively, has a volume of correspondence with those customers; say it runs to 1,000 letters a day. If a machine exists, either the Stenotype machine, which you see here, or a dictaphone machine, which can increase the productivity of the workers employed, they are going to do it. But, generally speaking, that is the kind of problem that industry or business is trying to solve. It is not only getting additional information that enables accurate executive decisions, resulting in greater profitability, but it is also trying to overcome that problem of excessive administrative costs.

The CHAIRMAN. Yes; but what you are telling us is this, as I gather it: that the future does not hold a possibility for employing all the machines and all the clerical workers that are being turned out.

Mr. MERRILL. At the same time?

The CHAIRMAN. Yes.

Mr. MERRILL. No; I don't think so. I don't see how it is possible. For example, you take this radio-typing machine—

The CHAIRMAN (interposing). That is what you are telling us; that is exactly your conclusion?

Mr. MERRILL. That is right. That is exactly my conclusion. Consider this robot typewriter and the other machines that are being experimented with by I. B. M. and Burroughs and all these other companies. They don't know exactly what is going on. How can they? Business has not yet decided. It is making experimental uses of these machines. For example, it may be practical to introduce a patent which is known today; that is, radio-operated typewriters. You can set up in a room 100 typewriters and have a centrally controlled point from which you can control every indentation of that typewriter. That is a fact; it is a scientific fact established. There is no practical use of that being made at the moment, but some day your business, in solving or dealing with its problems, is going to find a practical use for it.

At the moment everything the radio-operated typewriter can give you, the I. B. M. electrically operated machine can give you more cheaply, or in conjunction with existing processes. But that is a fact.

The CHAIRMAN. Of course, the answer to that is—

Mr. MERRILL (interposing). At the moment—

The CHAIRMAN. That every technological advance of that kind in the past has been accompanied by such an increased demand for the product there have been opportunities for the employment of all who came up seeking the employment.

Mr. MERRILL. Well, perhaps in the industry which manufactures it.

The CHAIRMAN. Well, for instance, let's get all the way back to the invention of the linotype machine. When the linotype machine first appeared, it was assumed that it would result in displacing printers. Well, it did displace a particular kind of printer, the old

hand type setter. If he didn't learn to use of the linotype, why, he gradually passed out of the picture except for job work or advertising copy and the like. But the invention of that linotype machine made it so much easier to turn out printed copy that a vastly increased output was the result.

We have on the newsstands, magazines in much greater number than we had 25 or 30 years ago, or perhaps even 10 years ago; isn't that correct?

Mr. MERRILL. Generally speaking, of course; that is manifestly correct.

The CHAIRMAN. In other words, this perfectly remarkable machine which was so extraordinary at the time it was brought in that people commonly said, "Why, the machine almost thinks!"—it is no comparison at all with this radio-operated and controlled typewriter device of which you speak. But the one, as we look back, actually did not have the result of decreasing jobs.

Now, are we to look forward and say that inventions of this kind in the future will not follow the pattern which we have seen in the past, but will displace workers and there will not be an opportunity to employ all of those who are graduated from schools and who are being trained for clerical jobs?

Mr. MERRILL. I hope I have made it clear that it is the contention of the statement which I read, that these machines are not in themselves bad—

The CHAIRMAN (interposing). Oh, no, I understand that.

Mr. MERRILL. But that their benefits must be controlled with the maximum intelligence. I think that your general conclusions might be logically sound, except that the facts are not; that we are faced with the concrete—

The CHAIRMAN (interposing). Now, don't impute any conclusions to me! I am asking you a question. I am outlining the points of view which you have expressed, and I am trying to get your conclusions. I will conceal my own for the present.

Mr. MERRILL. My conclusion as to the effects of office machines—commenting generally on the use of the machines, of course—is that modern civilization, as we know it, would not be possible without machine-method production. If the administrative processes are affected as well, of course, it should be produced. To deny that would be to be willing to insert ancient ignorance in the place of our modern intelligence.

The CHAIRMAN. And, of course, everybody who discusses that question is sometime or another accused of wanting to reestablish ancient ignorance, which, of course, is not the purpose of persons like yourself.

Mr. MERRILL. Well, I would say that the Luddites, who destroyed the first machines which appeared in England, are presumed to have continued right up to the present time in ever-growing numbers. But that is not true. I think there is a great understanding, not only on the part of the white-collar worker generally but of the American people, of the importance of the machine to our economic and political institutions.

I think there is also great need for the intelligent inquiry as to how it can be controlled. For example, I think it is marked stupidity on the part of certain enterprises to shunt aside the possibility of

securing in an orderly way the contribution of their employees on this and like questions. I agree with the general conclusion that in our field particularly the machine is at this time one of the incidental factors. But an incidental factor directly combined with another aspect of the question, the general effect of the depression can be social dynamite. We can say this because it is changing every day under our own eyes, and I can cite instance upon instance out of my own personal experience, of the fundamental change it has worked in the lives and thinking of white-collar workers in the cities of the United States. That change in their ideas—the way they go on, their standing in their community, the respect of their fellow men, the commendation of their employer—these are important things to Americans, yesterday and today, and the machine very definitely, as one of the implements causing this result, must be considered in its proper relationship.

But the broad social factor which it is bearing upon is, in my opinion, outside the scope of any particular enterprise and is part of the general social policy of the United States, which I do not think business enterprise follows closely enough in its own interest and in the interest of the whole country.

FUTILE PROSPECTS FOR EMPLOYMENT

The CHAIRMAN. Still, what is your answer to the question, whether, looking in the future, the machine will or will not produce more jobs?

Mr. MERRILL. Whether the machine is capable of producing more jobs? I am unable to prophesy whether it will or will not.

The CHAIRMAN. No; but you did, you did prophesy. That is where I am trying to pursue. You said, "Not only are employment opportunities narrowing, but they could never have kept pace with the hundreds of thousands being graduated from American schools and colleges every year."

Now, if I understood that sentence of yours, it is a statement to the effect that no matter what happens, depression or no depression, job opportunities never have kept pace with the hundreds of thousands who are being graduated from the schools. Now, is that what you meant to say?

Mr. MERRILL. I think so, Senator, for the following reasons, as I have tried to make clear before—

The CHAIRMAN (interposing). Well, now, what are you doing—are you are making a prophecy now?

Mr. MERRILL. No, I am not making a prophecy; I am making a general statement.

The CHAIRMAN. All right.

Mr. MERRILL. When it comes to prophecies, that is saying that at a specific time, this will happen or may happen. The number of job opportunities today—are they likely to be curtailed?

I have tried to show that business will likely reduce the number of those jobs in its own interest, and I think that American business is going to operate just as efficiently as, say, British business, which manages to get along very nicely with an administrative force representing only some 12 percent of the total gainfully employed population. Yet in this country it is close to 18 percent or close to 17 percent.

The CHAIRMAN. But there may be more business.

Mr. MERRILL. There may be more business, but it is unlikely, in my opinion, that the increased volume of this business will not be taken care of by the increasing use of machines in adaptation, rationalization, and generally a more orderly way of doing your business than under the present form.

The CHAIRMAN. In other words, in looking forward, you have given to us as your considered opinion that you cannot conceive of a sufficient increase in business to provide jobs for all of those who are being trained and educated to work, because of the machine?

Mr. MERRILL. I think that the machine is one of the most important factors; that is correct.

The CHAIRMAN. Well, what other factor is there?

Mr. MERRILL. What other factor is there? Well, it depends upon the quality of the training itself. We do note a trend of reduced educational requirements, although they are still high. There is a tendency to water it down. That might be a factor, too. People might be willing to go into other occupations and shift to them much more easily than they do now.

We have noted the tendency that when people are trained as office workers they will go to almost any length to avoid going into some manual occupation, because of the respectable inference involved in white-collar occupation.

The CHAIRMAN. In other words, the machine is tending to completely displace the white-collar worker in business offices?

Mr. MERRILL. No; Senator, I don't go quite that far. I would say that there is an implication present. I wouldn't say that that tendency has already manifested itself, but the implication within the logic of the premise we have established, that is, including the factors we know, is very definitely there.

At the moment, I wouldn't go beyond saying that it is an implication. I wouldn't say that that tendency has manifested itself beyond the degree to which I have testified.

Dr. ANDERSON. Mr. Merrill, pursuing the topic from a slightly different angle, in the morning's testimony Mr. Watson had a section entitled, "More machines, more employment." He offered evidence from the census indicating that in the 1930 census we had a certain increase in number of gainfully employed per population, in a 45-year span, from 1890 onward, but that in the 40-year span, the number reporting clerical employment had increased enormously above that. The first was a 7-percent increase, the latter is a 370-percent increase.

Now, I should like to offer a little piece of evidence from that occupational trends book referred to by Dr. Kreps on the opening day of the testimony, which Dr. Davidson and I are now publishing, which bears upon the topic you and the Senator have been discussing. I have before me a display of percentage increases and numerical increases in the clerical workers. We have cleared them from the census so we have just clerical workers and no trade workers, from 1910 to and including 1930. In the decade 1910 to 1920 there were added to the labor force 1,319,000 clerical workers. In the decade 1920 to 1930 there were added to the labor force 879,000. In the first decade noted, clerical workers increased in the labor force by 80 percent. In the second decade noted, they increased only by 29

percent. Their numerical increase had fallen off decidedly; their percentage increase had fallen off very markedly.

When we projected the thing into 1940, we found a still further decrease in the number of persons, a decrease in the rate of growth of the number of persons offering themselves as clerical workers.

Mr. LUBIN. How do you define clerical workers there?

Dr. ANDERSON. In this particular instance we took the classifications of the census and broke them into the following groups: bookkeepers; cashiers and accountants; general office clerks; messenger, errand, and office boys and girls; stenographers and typists. For that population, which covers pretty definitely the clerical group so far as we can separate them in the census, that was the trend. I want to ask, then, with that thought in mind, and with that material before you, this question: Can white-collar employment as indicated by this segregation of clerical workers absorb displaced workers from other parts of the economy or new entrants to the field of labor in the immediate future?

Mr. MERRILL. I would say, categorically, no.

Dr. ANDERSON. In other words, despite the usual increase in the number of clerks as compared with the rest of the gainful workers of the Nation, the categories of gainful workers, you can't conceive that white-collar opportunities are the place to go?

Mr. MERRILL. I would say not only despite it, but because of it.

Dr. ANDERSON. What do you mean by that?

Mr. MERRILL. The mere fact that they have already increased to this large extent militates against their ability to absorb any additional employees.

Dr. ANDERSON. So the white-collar labor force is adequate to meet any employment demands that are now available or in immediate prospect?

Mr. MERRILL. I would say yes.

Mr. MAGINNIS. Mr. Merrill, in the light of the last page of your statement, "The white-collar unions are ignored and their representatives constantly insulted my major and minor administrators," what do you mean by "administrators"?

Mr. MERRILL. I mean administrators of W. P. A. We have had a great deal of difficulty about it. Of course the Senator corrected me before, and I don't know whether he wants me to go into this.

The CHAIRMAN. I really think that is just a matter of opinion.

Mr. MERRILL. Of course it is.

The CHAIRMAN. Unless we had W. P. A. administrators here to speak for themselves I think it is a little beyond our function, as a matter of fact. I noted that statement but I didn't think it was worth bringing up.

Mr. MERRILL. I think you anticipated it.

UNION CONTRACTS AND TECHNOLOGICAL CHANGE

Dr. ANDERSON. Mr. Merrill, in your union procedure, in the contractual relationships with employers, what use has been made of any clauses in contracts with respect to technology?

Mr. MERRILL. We have never embodied it in any clause. We have a general governing clause that any dispute arising in the course of employment shall be a subject of negotiation and discussion, and

these matters have been taken up under that clause. The management usually notifies: "We want to introduce new machines in a department," and we discuss it with the union representatives of the employees in the establishment and take that problem up. That has been taken up just in the same manner as employer-employee relationships of the contract. We have never required a specific clause in order to guarantee that we would be permitted to discuss the question. I believe I am familiar with all the contracts signed by our local organizations, and the only case I know of that we ever had a clause specifically referring to the machine was when a small employer sought to introduce machines in order to fight the union. They were organized and ready to sign a contract with us, and we did insist upon a clause governing the machine, but this was not introduced as a matter of business practice; it was introduced as a matter of employer-employee relationship.

Dr. ANDERSON. Did you include a clause in the contract with respect to the relation of the machine?

Mr. MERRILL. Yes. This was a rather harsh clause, and I beg you to remember the unusual circumstances involved. In this particular case the employer agreed that despite the fact that he had purchased these machines, obviously with the intent of displacing a number of workers, nevertheless he would guarantee that no employee would be discharged as a result of machine displacement for the life of the contract.

Dr. ANDERSON. Does your organization intend to proceed with that kind of contractual relationship?

Mr. MERRILL. No; we feel that the general clause providing for discussion of all matters is quite sufficient.

Dr. ANDERSON. You have touched upon the condition of married workers in the clerical field. Do you have anything in your contracts covering the matter of marital status of workers or changing marital status and its effect upon employment?

Mr. MERRILL. Why, I would say no, except that in no firm where the union has a contract has anyone been permitted, to my knowledge, to be discharged because they married. If it were to happen, if there were objection, perhaps for practical reasons (I cannot possibly envision the circumstances that would justify it, but I have come across strange things in the past, perhaps it would occur in the future), we could discuss that perhaps in the case of that individual worker or the category.

Dr. ANDERSON. Do you find any attitude on the part of the management generally or in specific instances with respect to marital status of workers in which married women are not regarded favorably?

Mr. MERRILL. I would say that once was the prevailing attitude. They didn't want married women around, they should be supported by their husbands and not be in offices anyhow, they should occupy themselves more with their homes, and that sort of thing, but I think that is changing. It is changing for two reasons, one I think that the employee who is married is usually a more consistently efficient worker. I couldn't vouch for statistics for this, but I think that in ordinary conversations this is generally accepted; the other, which is a very important reason, is that it is becoming more and more important for women who are capable of adding to the family

income to do so. With the vast majority of people in the low-income brackets in clerical work, obviously the need for additional income exists. If they can go out and get it, it helps to solve a practical problem, because if it is merely supplementing income already available, the pressure to provide a higher level of income, as would be the case with a single wage earner who has to support a family, doesn't become so great.

Dr. ANDERSON. You offer that as a piece of supporting evidence with respect to the reason for reducing wages of clerical workers?

Mr. MERRILL. Why, yes, I think so—well I wouldn't say this was one of the reasons. I would say that in the process of lowering wages, they have taken advantage of this factor as being an effective cushion.

Dr. ANDERSON. And despite wide unemployment you find that management is not pressured to remove its married workers?

Mr. MERRILL. Well, I think that, as I said before, management is not only not being pressured, but would resist it to a much greater degree than it did in the past, because better home adjustment, which is truer of married than unmarried people, results in a better degree of efficiency, more persistent, more sustained, and in office employment I can't tell you how important a factor this is. If an employee, upon whom you cannot always check up, is consistently efficient for 99 days out of 100, and then one day goes awfully bad on you, it can lose you an awful lot of money and can mess up an awful lot of important work. This question of sustained efficiency is so important to management that I think they just naturally give way.

Mr. PIKE. I would like to ask your opinion, Mr. Merrill, on one effect that I don't think you brought out, and that is the effect of going into the office as part of a line of promotion. You used to go in at the shop or at the office to learn the business. Now, in a fair size business you go into the shop and in a year or so you end up tightening a nut and you haven't learned much about the business. More recently you go into the office, let's say, of a large bank or large organization and you get to pounding a comptometer and you don't learn much about the business there. I think industry in general has got its line of promotion almost unconsciously without looking for it, and I wonder if you have ever broken up in both places by the introduction of the transmission belt system, the production system, a method by which people can come through and take those positions which I take it will always be available in one way or another, the managerial, executive functions, which do require a large general knowledge of the business as a whole. It would seem to me that you would have to go back to, let us say, the little man or the little office in order to be able to learn the business as a whole. After you departmentalize so much (the machine does that) you seem to have created a barrier both in office and shop against the person who either wants promotion or deserves promotion or has the innate ability to secure promotion providing the line is open in the upper ranges of the business. It seems to be quite important in one of the phases that you mentioned, that social phase, the feeling of respectability, the feeling that one is getting on and can see his way through better than the other people.

Mr. MERRILL. There is less opportunity of it than in the past. Of course, management must provide in a large corporation for con-

tinuous available new managers; people grow ill, people die, people grow old. There are only two ways in which they can do that, or three ways. One is to recruit them from other firms. The second is to recruit them from the ranks of their own employees. Now, since the process which you refer to has taken place, that is the increasing routine nature of office employment generally, and is not leading to the rapid appearance of these people, management is taking a third step, that is, it is providing itself in advance with people, saying, "We are going to train this man as an executive, and we are going to take him through every one of these departments." They are either known to management already, they come from a friend, they show likelihood, or they show exceptional attributes and abilities in some other respects.

Mr. PIKE. But not so much hope for the fellow who is in there.

Mr. MERRILL. I wouldn't say it doesn't happen; there is not as much likelihood.

CHANGING STATUS OF WHITE COLLAR WORKER

Mr. MAGINNIS. Mr. Merrill, there is this statement in the last of your paper: "The white-collar employee in the United States today is penalized by governmental and business practice for a position in society he may once have enjoyed but which is no longer his." Do you refer to white-collar employees in government service or in private enterprise?

Mr. MERRILL. No; I am referring to white-collar employees in private industry generally in the community. The white-collar employee generally was considered pretty much, and this prevailing idea has continued despite the fact that the physical facts have changed. He isn't paid, relatively speaking, at as high a rate. Paul Douglas, for example, testified that the real wage of the white-collar worker has dropped between the period I referred to. Generally these things have changed. Yet I have read debates in Congress in which Congressmen have got up and said substantially this: "Well, these people enjoy a privileged position in society and in business. Why do we have to provide exceptional things for them?" That has changed and is changing. Even the manager of a certain business enterprise who might be quite realistic as concerns his own enterprise, is likely to attribute to some other fellow's firm the general condition which he believes to exist. For example, you go into insurance today, and they will tell you, "Well, in banks things are that way and the other way," whereas the banking field has equally erroneous ideas about the methods insurance companies employ in directing their employees. Both of them are wrong; they are both pretty much the same. They are both large-scale employers of labor and are following pretty much the same procedures, because they are based upon sensible analysis of what their production requirements are. The individual in the community has changed, but widely speaking, business management, people generally, Government, Congress, and so on, do not understand this, and he is penalized. I think, personally, of course, that white-collar unionism has more than justified itself, yet we are constantly having to fight off this right to secure the advantage and the benefits of the Labor Relations Act. That is penalizing us. People feel that clerical workers don't need it, on account of

the position which they may have held in 1890, but which they certainly do not hold in 1940.

Mr. MAGINNIS. Your membership covers employees in industry as distinct from governmental service?

Mr. MERRILL. Oh, yes; we do not accept into membership any employees in governmental service.

Dr. ANDERSON. We asked a witness this morning to testify as to the effect of mechanization in white-collar fields on the psychophysical characteristics and habits of workers. The literature is becoming increasingly filled with studies of fatigue factors, monotony, and so forth, and their effects on clerical workers. Do you have any comment to make?

Mr. MERRILL. It would only be a recapitulation of already published material. Of course, since this aspect of white-collar employment has secured the attention of people who have been scientifically prepared to make such investigations we would not make any comments of our own, we would defer to them. It is only in the areas where scientific investigation is not taking place that we feel the necessity in the light of our experience to come out and make an opinion. I think that there is a great deal of material, as you say, bearing upon the fatigue factors, and what not, and for that reason I have not gone into that. I could only recapitulate the information already available.

Dr. ANDERSON. But your organization is concerned about the influence of these machines with respect to fatigue and monotony of service and other effects upon workers?

Mr. MERRILL. Yes; we have a health plan, for example, covering some 16,000 workers in the city of New York; in connection with it we are having the doctors who are on our health panel maintain very careful statistics which incidentally have been prepared under the direction of the United States Government.

After that has been concluded, perhaps we may be able to come out with a statement which would bear upon facts which we can actually trace out of our own experience or the experience of our workers. We have found it necessary to an increasing extent to provide these public-health services. We have been doing it on an experimental basis in New York City, and on a somewhat larger scale in Chicago. Certain aspects of hospitalization we are going to be able to do on a national scale, but we have found this an increasing problem as the need for it becomes greater on the part of white-collar workers, and as they are unable to provide for it out of their own incomes.

Dr. LUBIN. Mr. Merrill, as I see the problem, there are two effects rather than one of displacement of labor and the ability of industry to absorb labor, both in the white-collar classes and in the manual classes.

They divide themselves as follows: (1) Is it the machine itself which makes it possible for that man to do more than he would otherwise do? Isn't there a second field equally wide, almost, of displacement due to greater efficiency, and that efficiency may in turn be of two parts: first, just the elimination of waste. I remember a man telling me in 1933 that he learned about so many things during the depression, things he did not need in his plant, that he formerly felt had to be done in this plant. As a result he felt that he could take care of his 1929 business with 80 percent of his 1929 force, not

working any harder, but just eliminating a lot of wasteful things which he formerly thought were important but which he learned through the depression he did not have to have.

Secondly, speed-up. Now, have you any idea as to what extent each of these factors have played a part in the white-collar industry? Would you say that machinery has been the more important, or more important than the two other factors combined?

In other words, the machine itself does not, although it may, increase productivity. It frequently brings with it a type of speed-up that did not exist before the machine was developed, because of the need to get a return on investment, let us say, or because there is a new process that makes you want to get the most out of the new machine.

NON-MECHANICAL CHANGES IN TECHNOLOGY

Mr. MERRILL. I have tried to indicate that we considered the machine only one of the factors. In estimating its relative importance, I would say that the machine for us at the present moment, and perhaps for a limited time only, is the least important factor; much more important is the more efficient organization of work, the other definite increases in the speed-up, as you call it.

In white-collar work that is usually described primarily as "pacing"—"Who is pacing this department?" I don't think that 10 years ago or 15 years ago, management deliberately inserted into departments the man who was going to pace it. For example, you can get someone who is just going to keep the department humming. Well, that has been done deliberately in machinery production, but not in white-collar employment to the same extent as it is done today.

Today it is taken as a matter of course that there is going to be someone just pushing this thing along. I would say that these 2 factors are by far the most important. Their relative order I would say would be first, the question of increased efficiency in the organization of work, and secondly, the very definite question of speed-up which is combined with the aspect of machinery, but I also have to point out that perhaps the machinery might become the most important factor of all of the reasons I put forward.

Dr. LUBIN. Could you cite us any examples of the methods used to bring about speed-up? I know of only a few of them. The one that comes first to my mind, one in large companies where the girls at the typewriters are put on a wordage basis, and they are expected to turn out a certain number of words every hour, and the number of words is counted, and there is an actual production record kept. Are there other methods similar to that?

Mr. MERRILL. Yes. In the credit reporting industry, employing some 25,000 people, they have increased speed-up simply by requiring a larger number of reports to get out, greater and more careful use of stuff in one department to get that stuff over into the next department. They speed it up.

Dr. LUBIN. It is the application of timing systems?

Mr. MERRILL. Oh, yes; time-motion studies are being made to an increasing extent in the office field.

For example, John Hancock Co. went into it in the issuing of policies, and also most of the major insurance companies. The policy starts at one end of the room and they get a completely written

policy at the other end. It is just by simply typing the same thing, and it is just shifted right along. It is a regular time-belt system. Then you have a basis of measuring a performance, and it comes out with lightning speed.

There are very important things sometimes. Suppose 3 or 4 agents were competing for a policy, and this frequently happens, so the companies might endeavor to get it, but the departments hold it up. Well, that agent is going to say, "There is no use pushing me for business, because when I wanted a policy I couldn't get it, and if I had been able to get it sooner, I could have sold it."

And in other cases—and this is also a part of the promotion of a policy—the person getting the policy wants it immediately. There is a tremendous demand on the part of the policyholders to see the policy.

The third important reason why they have to get the policy out speedily is that, generally speaking, the check comes in when the person gets the policy; he says, "I'll pay you when I get the policy." And to get the policy out quickly is going to make all the difference in the world as to the amount of money you are going to have on hand. And if that policy, along with a number of others, comes in 2 days later, you can see that a combination of them would make a considerable difference when you think of the contribution they make.

And the fourth thing is policyholders. Once they go into this thing, they itch for the policy, itch to get their hands on it. They want to see it and show it to the wife or the loved ones. Things of that sort are the pressures to produce speed, and so apart from any economic reasons that would justify cheapness there is a great necessity for speed.

That can be duplicated in a number of places. In brokerage houses, for example, where speed is an important factor, they are going to rationalize this to a great extent. Formerly you could go to a stock-brokerage house to purchase stocks, and you read the board, it was marked up in a chart. Gradually efficiency produced a black-board which could be marked more easily. I have not noticed this in Washington, but you can go into a New York stock firm now and see a man sitting in the corner, just pushing the buttons as they come across the table. He has a relief man, but formerly the stock broker would use 10 or 15 runners to keep that big board marked up. Now 1 man works that by himself. He is a telegrapher, and no longer a stock-board marker. They are practically completely eliminated.

The stock exchange itself is operated, as you know, by machinery, apparently through necessity, but it has cut down the labor force.

The CHAIRMAN. Are there any questions?

Mr. MAGINNIS. I take it this interesting statement you are making was made on the veritytype?

Mr. MERRILL. It is a veritytype of work, not a speedier method of doing it, just nicer.

Mr. MAGINNIS. Also, the interchangeable type to give your set-ups—

Mr. MERRILL. That is an interchangeable collar.

Dr. ANDERSON. Before we adjourn, Mr. Chairman, I mentioned this morning a Government table which gives the salaries and earnings

of clerical workers, and compares machine and hand operators. I should like to offer it as an exhibit.¹

The CHAIRMAN. It may be received.

Is that one of the exhibits which Mr. Merrill was to revise?

Dr. ANDERSON. That is right.

The CHAIRMAN. And your next witness will be?

Dr. ANDERSON. We start Monday with 2 witnesses treating of textiles and new fibers. The following 2 days we discuss the impact of technology in agriculture. One presentation will include a film which I hope will be interesting.

Then we have the problem of what education can do with respect to training and placement and retraining and replacement of workers. Then we discuss coal, and, as a wind-up, Mr. Corrington Gill will appear to discuss in the over-all the implications of technology.

The CHAIRMAN. The committee will stand in recess until 10:30 on Monday morning.

(Whereupon, at 5 o'clock, an adjournment was taken until Monday, April 22, 1940, at 10:30 a. m.)

¹ Previously entered as "Exhibit No. 2608." See appendix, p. 17425.

INVESTIGATION OF CONCENTRATION OF ECONOMIC POWER

MONDAY, APRIL 22, 1940

UNITED STATES SENATE,
Temporary National Economic Committee,
Washington, D. C.

The committee met at 10:40 a. m., pursuant to adjournment on Friday, April 19, 1940, in the Caucus Room, Senate Office Building, Senator Joseph C. O'Mahoney, Wyoming, presiding.

Present: Senator O'Mahoney (chairman); Representative Williams, Messrs. O'Connell, Lubin, Pike, and Brackett.

Present also: S. Abbot Maginnis, Department of Justice; William T. Chantland, Federal Trade Commission; and Dewey Anderson, Economic Consultant to the committee.

The CHAIRMAN. The committee will please come to order.

Dr. ANDERSON. Mr. Chairman, today's hearings will deal with the subject of technology in the field of textiles, with particular reference to new fibers. The entire topic will be discussed, however, and the first witness of the morning will be Mr. Emil Rieve, president of the Textile Workers Union of America, New York City, New York. He has with him the economist for the Textile Workers Union, Mr. Solomon Barkin, and they are prepared to present their testimony at this time.

(Representative WILLIAMS assumed the chair.)

Dr. ANDERSON. Mr. Chairman, neither of these witnesses has been before us.

Acting Chairman WILLIAMS. Will you gentlemen be sworn?

Do each of you solemnly swear that the testimony you are about to give in the matter now pending shall be the truth, the whole truth, and nothing but the truth, so help you God?

Mr. RIEVE. I do.

Mr. BARKIN. I do.

TESTIMONY OF EMIL RIEVE, PRESIDENT; AND SOLOMON BARKIN, ECONOMIST, TEXTILE WORKERS UNION OF AMERICA, NEW YORK CITY, N. Y.

Dr. ANDERSON. Mr. Rieve, it has been customary in these hearings to substantiate the authority of the witness in his field. You are president of the Textile Workers Union of America?

Mr. RIEVE. That is correct.

Dr. ANDERSON. What is that union? What is its membership and what is its importance in the textile field?

Mr. RIEVE. The Textile Workers Union of America has over 1,100 contracts, covering about 350,000 workers in the textile industry.

Dr. ANDERSON. Are there other unions in the field?

Mr. RIEVE. Yes; there is a smaller union, the United Textile Workers of America, an A. F. of L. organization. There are also some independent unions in the field.

Dr. ANDERSON. What is your own experience in the textile industry?

Mr. RIEVE. I have been working in the textile industry since I was 13 years of age.

Dr. ANDERSON. Which means you have spent how many years in the industry?

Mr. RIEVE. You want me to give my age away. Well, I am 48.

Dr. ANDERSON. Have you been in various branches of the industry?

Mr. RIEVE. No; I specialized primarily in one branch of the industry, but I do have some knowledge of other branches of the industry.

Dr. ANDERSON. With what organization is your union affiliated?

Mr. RIEVE. The Congress of Industrial Organizations.

Acting Chairman WILLIAMS. You may proceed, Mr. Rieve.

Mr. RIEVE. The textile industry is a most appropriate field for surveying the social, economic, and human impact of technological change. As one of the first to be modernized and to be established on a factory basis, its recorded history illustrates fully the costs attendant upon industrial progress. The English history of the textile industry is well known to us. Protective factory legislation was required to correct conditions in the industry. The British settings, it may be ventured, predestined similar lines of development in the textile industries of other countries.

While the basic technical processes of the textile industry have been stabilized for many years, there has since developed an unending line of technical improvements. These changes have been particularly disturbing in this maturely developed industry, as it is now less able to cushion these dislocations through expansion or alternative employments for its workers. Moreover, the existence of some of its divisions is currently endangered by new processes and revolutionary departures.

It is our purpose to offer your committee a summary statement of the types of technical innovations in the industry making for marked advances in man-hour productivity and the problems created by their changes. It is also our desire to outline to your committee the attitude and program of our organization.

It is well to appreciate the tremendous importance of the textile industries and the significance of our discussion. There are approximately 1,250,000 persons employed in the industry and its associated branches. The textile workers are predominant in the South, where almost half are located. The welfare of the southern textile worker conditions the life of the South. Similarly, the more than 250,000 textile workers determine conditions in New England. Life in central Pennsylvania is also colored by the life of the textile workers. Any development which affects the welfare of these workers will affect the life of their sections of the country.

TECHNOLOGICAL CHANGE IN THE TEXTILE INDUSTRY

Mr. RIEVE. All types of technological change and all of its problems may be found in the textile industry. The transition from manual to machine processes was accomplished early in the history of the in-

dustry. Textile manufacture began as a tool industry. Machines were developed early. The greatest progress has been made since power machines were applied. First water-driven machines were employed; then they were steam propelled. With the introduction of electricity, the motive power changed. Finally, individual motors replaced the belt. Each alteration meant tremendous industrial advances and higher speeds, higher levels of production.

During the last century, the remaining manual processes were for the most part mechanized, though several gaps have been closed during the last several decades. Most outstanding was the warp tying-in machine, which mechanized the process connecting warping and weaving. There is now hardly a manual operation left in the cotton mill, and relatively few in a woolen mill. The appearance of the automatic welt devices in the manufacture of full-fashioned hosiery presages the early development of completely automatic full-fashioned hosiery machines.

The mechanization process has also been extended to every phase of mill operation. While production equipment received first attention, conveying equipment soon followed. Tractors superseded hand trucks; hoists relieved workers of hard labor; conveyors supplanted tractors; blowers in some instances replaced conveyors. Physical rearrangement of processes and line systems of production frequently eliminated handling and the need for conveying equipment.

The humidification and temperature and air-conditioning controls have been mechanized; the cleaning of floors and other auxiliary processes are minimized by composition floors and chemical compounds. In the powerhouse, in the maintenance department, and in every other phase, mechanization is proceeding apace.

Improvements on machines are an even greater source of advance than original basic patents. This process is continuous; machine refinements are constantly being made. As machine manufacture is improved in this country, machines have been built more soundly, better able to withstand the wear and strain of operation, with better lubrication devices and have been kept in better operating condition. The standardized machine, the expansion of the machine building industry have made replacement easy and added an incentive to constant improvements.

Patents of small and large ideas are being secured constantly on textile equipment. In one issue of a current textile trade magazine, there was a patent for a self-contained cotton cleaning and extracting machine; 8 patents for rayon and cellulose treatment; 2 for winding frames; 1 for twisting frames; 9 for looms; 5 for knitting machinery; 10 for bleaching, dyeing, and finishing of textiles. Most machines are now mechanically more perfect and amazingly more productive than original models.

These and other innovations have transformed the industry from one with manually operated or tended machines to one with semi-automatic and completely automatic machines.

Everywhere in the textile industry workers are being deprived of their former duties. Stop motions have multiplied and photoelectric cells have increased in number and in their applications. Workers have become less necessary as machines perform the work themselves, require no operators and stop automatically when the process goes wrong. For example, a photoelectric seam detector recently installed

on a calendar eliminated the need of an operative to control the pressure on the calendar roll. Pressure controls are everywhere being substituted for workers. Automatic devices are now measuring the intake on machines to prevent overfilling. Recently, a mechanical and electrical stop motion was introduced on a filling wind for spinning frames, to assure uniformly full bobbins. As an indication of the extent to which controls have been developed, we need only refer to a tenter frame for woolen goods which, it is claimed, tenters 16-ounce goods at 38 yards per minute or three times as much as older tenters and can be operated by one man and is completely equipped with automatic guiders, automatic temperature and speed controls, selvage openers and lint screens with starters and limit switches.

These developments have already progressed so far in the cotton textile industry in particular that one can walk through entire spinning and weaving rooms and be overwhelmed by the amazing collection of machinery and encounter difficulties in finding the employees patrolling the machinery, repairing breaks, or cleaning, doffing, creeling, or performing sundry other duties.

The new order of the day in textiles appears to be regular belt conveyors supplying automatic feeders attached to machines with electric or mechanical stop motions and regulating devices for the control of the feeder, the flow of material, the pressure or the tension of the material on its passage through the machine, maintained by automatic tiers and cleaned by moving electrical suction devices. We may possibly look forward to automatic devices to place materials onto conveyors for the next operation. Workers will be around just to repair, to await signals on stop motions, to oil and to perform sundry operations which have not become "robotized."

Machine speeds also have been increased by these advances. Looms which started off at the beginning of the nineteenth century at less than 20 to 30 picks per minute are now operating at 190 picks per minute. Conventional slow speed cotton warpers which ran about 50 yards per minute in 1910, have been replaced by high-speed equipment running 500 to 900 yards per minute. Slashers which operated at about 25 yards per minute have been superseded by slashers which run about 70 yards per minute. Spindles are being run up to 10,000 and 12,000 revolutions per minute on various types of frames. Speed and higher speed is a common place demand.

Production processes are also being simplified. Easier methods are being introduced for older processes. Less time is consumed; the results are better. So the portable warp-tying machine replaced in many instances the stationary warp tier. Flexibility was general and much cost was saved. The addition of a magazine creel to the automatic warper permitted more continuous operation of the warper by making available an additional set of cones on the warper. Progress is also being made in the direction of operations. Single processes are substituted for numerous successive operations. The single-process picker now does the work of the three-process pickers; the long draft drawing frames replaced the three-process drawing frames; the super draft roving frames now stand where formerly were intermediate and roving frames. In the worsted industry, manufacturers hope to duplicate the cotton textile industry by eliminating all operations between gilling and spinning. In throwing a one-process machine which takes yarns on skeins and delivers them

either on cones for knitting or on filling bobbins for weaving is now sought. A completely automatic, single-unit machine for knitting for legs and feet on the one machine is the objective of hosiery manufacturers. Continuous dyeing and finishing is supplanting batch or piece methods.

As competition became more intense after 1933, development, acceptance, and the absorption of these machines have been more rapid than ever before. Modernization programs are becoming popular and more necessary to success in business. The byword of the day is to modernize. Everybody is preaching the scrapping of old equipment and the installation of new machinery. This trend is reflected by the fact that sales of textile machinery in 1939 exceeded those of 1929 by 5 percent. Using 1929 as a base, the *Textile World*, a trade magazine, estimates that textile machinery sales have been climbing back to the 1929 level since 1933. In 1936 the index was 94; in 1937 it was 104; in 1938 it was 73; and in 1939, 105. Manufacturers are investing their funds in new equipment.

Whether the processes of modernization, mechanization, or automatization proceed individually or together, they have increased the productivity of the individual worker. It takes fewer and fewer man-hours and more expensive machinery to produce the same products. In addition to the substitution of old equipment by faster and more automatic equipment, the raw materials are becoming easier to handle. Raw materials are more carefully selected; the preliminary cleaning process is more thorough; the specifications are more exact; the breaks in the yarn are less frequent; the number of processing operations is fewer; the handling is less frequent. All of these factors, in addition to the successful preliminary processing, facilitate the operations through the weave shed, the cloth room, and the finishing departments. These improvements in the yarn mean fewer breaks in warping and weaving, better cloth and fewer seconds, less work in the cloth room, particularly when burling and mending is done. The process is constantly directed toward less work and less labor.

Even more fundamental are the new processes and fabrics which usually result in striking reductions in the amount of labor. The first important substitution in the cotton textile industry occurred when calico printed cloth replaced the hand-woven fancy cloth. Currently, cloth effects are being secured by the use of rayon yarns which react differently to dyes, thereby eliminating much fancy weaving. In the pile-fabrics industry latex and chemical finishes permit the creation of designs on carpets by cutting the required sections from single-colored carpets and pasting them together instead of weaving the patterns directly on a loom, and also insertion of wool in a rubber composition base without weaving. These are only suggestive of the multitude of substitute processes which have reduced work and displaced older methods. We are veritably at the threshold of such changes in the textile industry.

Even more significant than the substitution of processes has been the replacement of fibers. This trend can be measured with great accuracy. Little silk is now woven. Nylon and vinyon threaten silk in the hosiery industry which now consumes some 75 percent of all silk. While 611,302 bales of raw silk were consumed in 1929, the total dropped to 358,931 in 1939. Paper products were made

inroads in the bagging field. Synthetic yarns are entirely or in part replacing older fibers. Besides taking over almost the entire silk industry, synthetic yarn is now being made part of or blended with cotton and woolen fiber and fabrics. New uses are being developed in the manufacture of draperies, filter cloths, felts, fireproofing materials, and thread. The replacement of silk has meant a reduction in the amount of labor required to manufacture. Such cloths as rayon can be processed on more mechanized equipment and is better subject to control. New rayon looms attain 182 picks per minute on wide and heavy rayons. Work assignments frequently range over 30 looms per weaver.

Improved management techniques have also increased man-hour productivity. In its drive to reduce costs, management has constantly sought to minimize the amount of labor in its plant. It has imposed ever higher work assignments. Just as soon as the industry encountered its first important economic set-back, it turned to this customary method for securing lower labor cost. It extended workload; reduced wages; it replaced older workers by newer help; and sought labor-saving machines. During the twenties, so-called scientific management came to the textile industry. Engineers, at management's request, inspected mills and on the basis of time studies and visits recommended what they considered more efficient lay-outs, more modern equipment and better methods of utilizing labor, usually assuming the form of greater job assignments. As competition increased, other employers endeavored to secure the same end, through arbitrary increases in workload, irrespective of whether such were justified. The result is well known. Strikes spread throughout the textile industry in protest against the "stretch-out." Labor productivity rose as job assignments were increased.

All these types of technological change bring tremendous problems in their wake. Each improvement can be spoken of most glowingly; each new invention is a creation of human ingenuity. The development of synthetic fibers out of cellulose either from timber or lint, or noncellulose fibers from coal, minerals, air and water, or out of glass or casein or soybeans, are all amazing adventures in man's conquest over nature. But the effects have been staggeringly tragic. Like the common demand to harness the great rivers, there is a growing insistence and labor wants to reiterate it with particular emphasis, that human inventions and discoveries should become socially useful without incidentally creating human scrap heaps and human tragedy.

Before considering the effects of these tremendous changes, it is well to exemplify the rapid strides in man-hour productivity in three constituent textile industries. Two of these, cotton and wool textiles, are mature industries which have not undergone recent fundamental technical change. The third is the rapidly changing synthetic yarn industry which is experiencing technical transformation of its older processes at the same time as new ones are being developed.

TECHNOLOGICAL ADVANCES IN COTTON TEXTILES

Mr. RIEVE. We are generally acquainted with the major outlines of the technical history of the cotton textile industry. In England the industry underwent radical changes because of technical advances during the latter half of the eighteenth century. Preceded

by the flying shuttle invented in 1733, the drop-box on the loom in 1760, and a series of inventions from 1770 to 1779 which resulted in a practical mule spinning frame, the modern cotton textile industry appeared with the mechanical power loom in 1785, which replaced the old manual weaving process. The factory soon replaced the home as the work shop. The tragedies following in the wake of these new mills are abundantly recorded in human annals.

The first period of the industry in this country witnessed the replacement of home manufacture by factories. The mills for the most part substituted for incidental home manufacture. The displacement of commission weaving by the factory did, however, cause some protest, particularly in Pennsylvania.

American technology developed largely on the basis of English inventions adapted to American conditions. The first mill which fully employed power equipment for both spinning and weaving was established in 1813 in Waltham, Mass. Improvements in the methods of manufacture were numerous with particular emphasis on spinning and weaving, as cotton was relatively cheap.

From 1813 to 1860 significant improvements completed the mechanization of the industry. The power loom displaced the hand loom by 1825. Hand weaving was completely dislodged by 1829. Water power met severe competition from steam power in the late forties. The same period saw the introduction of belt-driven machinery; speeders, ring spindles, applied primarily to twisting; mule spinning frames, cam looms, and automatic stripping on stationary flat cards. Stop motions appeared on a number of operations. Man-hour productivity rose sharply. While operatives handled only 8 spindles in 1790, the number rose to 22 in 1831, and 62 in 1880. Production per day is reported to have risen from 100 yards per operative in 1821 to 233 yards in 1840. Labor cost per yard of sheeting, 18 cents in 1815, dropped to 4.5 cents in 1830, and to 2 cents in 1860. From 1850 to 1860, yardage production per worker increased 29.5 percent.

During the latter half of the century, additional advances jumped productivity. Ring spinning replaced mule spinning. While the number of mule spindles equalled the number of ring spindles in 1870, the proportion of ring spindles increased to 77 percent of all spindles at the beginning of the present century. Revolving cards replaced stationary cards; wire bobbin holders made the spooler practical; slashers were imported in numbers by 1866, and dobby looms came in 1878.

The loom itself was made automatic in 1894, through automatic bobbin changing devices. Work assignments increased simultaneously. The weaver who in 1832 tended 2 to 3 looms, running 70 picks per minute, in 1879 tended 5 to 6, running 130 picks; and in 1905, 8 to 10 nonautomatics or 15 automatics. Between 1838 and 1876, productivity per man-hour is estimated to have increased some 300 percent.

The last 30 years witnessed further advances in every phase of cotton textile manufacture. Every type of technological change was found in this industry. The automatic loom, introduced at the beginning of the century, was widely applied during the twenties. Only 7 percent of the cotton looms are now (1937) nonautomatic. Spoolers were made automatic. Other important developments have been the 1-process picker, controlled humidity, 1-process drawing, long

draft roving mechanisms, and long draft spinning, making possible the spinning of coarser roving. Automatic knotting machines, portable warp tying-in machines, are all current. Firmer and speedier automatic looms are now used. In the cloth room, shears and brushing machines are high speed and automatically controlled.

The rapid advance of the cotton textile industry has not stopped. In a single year, 1939, marked improvements were made. New automatic looms run 192 picks per minute. New equipment brought on to the market includes new warp drawing-in machines; automatic drop wire inserting machines to replace the drop wire girl; paper spinning tubes, and improved spindle assemblies. Automatic winders are being sold to permit an operative to handle 18 to 20 bobbins per minute.

Technical progress in cotton mills has been continuous. Competition is keen and each employer attempts to get ahead of the other. Modernization, efficiency, labor-saving devices and practices, automatic equipment, single process machines, process control devices, are all the passwords of management in the cotton textile industry.

The effects are rather evident. In the period from 1910 to 1936, according to a survey by a prominent textile engineering company, man-hours required to produce eight standard cotton cloths declined between 31 to 60 percent, depending upon the type cloth, simply because of the improved equipment in the plant. The largest reductions took place on terry cloth and lawns, for which there were no automatic looms in 1910. The other 6 cloths witnessed reductions in labor time from 31.7 to 37.7 percent.¹ It required approximately one-third as many hours to produce a yard of cotton cloth in 1936 as it had in 1910 because of machine improvements. The rapid strides in the respective departments of the mill may be observed in this table.

(The tables referred to were marked "Exhibits Nos. 2617 and 2618" and are included in the appendix on pp. 17428-17429.)

Mr. RIEVE. The great advance in production of cotton textile fabrics is exemplified by the calculation of the same engineering concern that the manufacture of a yard of carded narrow sheeting requires a total of only 1 man-hour in a well-organized cotton textile mill. The longest amount of time required for any of the eight cloths studied was combed broadcloth, a very fine construction, which reported fifty-eight hundredths of 1 man-hour.

Estimates of over-all increases in production place the rise beyond the above percentage because factors other than machine improvements must be taken into account. The elimination of inefficient producers, the increased rate of introduction of new equipment, new physical layouts, and new methods of management affect the results. Estimates made by the National Research Project of the Works Progress Administration, on the basis of some 30 products, indicate a 16-percent increase in man-hour output between 1919 and 1929, primarily because of the South's acceptance of automatic weaving and the construction of modern textile mills. From 1928 through 1939, production per man-hour increased according to the National Research Project by 45.7 percent, primarily in the North because the elimination of backward textile mills and the modernization of the existing mills raised

¹ See "Exhibit No. 2617," appendix, p. 17428.

productivity.¹ That these calculations are conservative is indicated by the estimates of the United States Bureau of Labor Statistics, that the increase in man-hour productivity between 1928 and 1939 was 59 percent.²

(The tables referred to were marked "Exhibits Nos. 2619 and 2620" and are included in the appendix on p. 17429.)

The total rise as estimated by the National Research Project from 1919 to 1939 was 64 percent.

Mr. RIEVE. The rise in man-hour productivity in the mature cotton textile industry during the last few years by reason of the intensive application of current methods of production and modern equipment has been impressive. The changes in the offing appear to be even more fundamental and disturbing than those of the last 2 decades.

TECHNOLOGICAL ADVANCES IN WOOLEN AND WORSTED INDUSTRY

Mr. RIEVE. The woolen and worsted industry experienced the same marked changes. Starting under special difficulties, the industry first supplemented home operations by performing mechanically carding and fulling operations. By 1830, the modern full process woolen enterprises appeared with equipment secured in England but improved through American invention. The carding equipment was made power driven; the spinning operation was made semiautomatic; water power drove the hand loom; and the cloth-finishing operations were developed and made power driven. The advances in carding through the invention of the condenser eliminated the slubbing processes and resulted in better quality roving. Spinning jacks increased their spindles from 120 to 200.

The 40 years between 1830 and 1870 saw further mechanical improvements. The industry spread and gained maturity. Worsted industry started well after 1850 when the modern combing process made the industry commercially practical. Important improvements mechanized the process of cleaning and scouring of wool; a labor-saving mechanical burr picker eliminated all hand labor; the woolen card was widened, made more automatic, and improved to produce better quality roving. A pattern chain in place of a cam for the control of harnesses made the loom better suited to the manufacture of varied cloths. Looms were made broader and their speed increased.

From 1870 onward, most advances in this industry were labor-saving in character, since the basic techniques of a mechanical industry had been established. New types of cloth; new and larger machines; new and more efficient methods of production; and improvements on old machines constantly raised production levels. Cards were increased to a width of 72 inches. They were equipped with many labor-saving devices such as automatic feeds, intermediate feeds, transferring devices, and final condensers. The automatic mule spinning frame substituted for the jack spinning frame. Speedier looms registered 100 to 125 picks per minutes on worsted and 105 picks on woolen cloths. Wholesale and ready-made clothing forced the industry to wider looms. And more significant from the point of view of labor, automatic filling-changing devices were attached to the looms which doomed the hand loom, particularly during recent years. So mech-

¹ "Exhibit No. 2619," appendix, p. 17429.

² See "Exhibit No. 2620," appendix, p. 17429.

anized has the industry become that for the most part only the wool sorting and burling continued to be done by hand.

The last 30 years witnessed innovations which accentuated these same tendencies. During this period large package ring spinning substituted for small bobbin spinning and cap spinning. Just as the jack spinner was scrapped by the mule spinner, so now the male mule spinner is being replaced by the female frame spinners. Large packages and high speed automatic warpers have junked slower methods. The automatic loom is now dominant. While 19 percent of all woolen and worsted looms were automatic in 1927, the percentage had risen to 62 in 1937. In the finishing room the same trends are evident.

As an indication of the rate of current changes we can report that our organization is witnessing the complete revamping in one mill of the entire card, spinning, and dyeing rooms. In the same mill, automatic looms were introduced last year. In another very large chain of mills, new automatic winding machines were displacing three-quarters of these winders. In 1939, significant mechanical changes were introduced in many departments. A new method of wool scouring will produce softer and cleaner wool, which will spin better and dye more easily. A new wool spread will prevent the separation of stock when wool and shoddy mixes are being blown into bins. An improved shoddy picker is being sold, as is also a new high-speed worsted garnett card. New models of woolen spinning machines result in savings in floor space, more production per spindle, less time, and finally better yarn. Changes are being made constantly.

These and other changes have created measurable increases in labor productivity. A recent study of the effect of the mechanical improvements between 1910 and 1936 upon the man-hour productivity in the industry indicates for four typical woolen and worsted constructions that the amount of time required for the production of these materials has been almost halved. It required 45.8 percent less hours to produce a 32-ounce woolen overcoating in 1936 than it did in 1919. The percentage reduction in man-hours for a 12-ounce wool flannel cloth was 46.7 percent; for a worsted serge, 46.3 percent and for a cotton warp worsted filled suiting, 46.5 percent.¹ In some departments, a worker could produce from two to three times as much in 1936 as he could in 1910. So, in the manufacture of woolen cloths, production per man-hour increased in the blending and picking departments by 208 to 237 percent; in the spooling and dressing departments by 85 to 114 percent; and in the weaving department by 102 to 112 percent. In the manufacture of worsted cloth, production per man-hour had risen about 100 percent in the sorting, scouring, and picking departments.²

(The tables referred to were marked "Exhibits Nos. 2621 and 2622," and are included in the appendix on p. 17430.)

Mr. RIEVE. These mechanical advances do not represent the full measure of the rise. As in the cotton industry, inefficient and less productive units have been eliminated; management has improved its techniques and its ability to secure more production from its workers.

¹ See "Exhibit No. 2621," appendix, p. 17430.

² See "Exhibit No. 2622," appendix, p. 17430.

Scientific management is more recent in the woolen and worsted industry than in the cotton-textile industry. Outside consultants for the revamping of the production, equipment, and methods of operation are as yet rarely employed in this industry. Nevertheless, workloads and job assignments are constantly being increased, frequently on the basis of rumors of similar efforts by other mills. Man-hour production has jumped beyond that suggested by direct mechanical progress.

The same study made by the National Research Project which has been referred to previously also reports that the increase in man-hour productivity between 1919 and 1931 has risen 23 percent for the woolen and worsted industry as a whole, while the rise for the woolen industry was 31 percent, and for the worsted industry 19 percent.¹ However, the increase subsequent to 1931 was more rapid. From 1931 through 1939, the above group estimates an increase of 43 percent for the entire industry, making a total of 77 percent for the 20-year period. Each woolen worker is now producing almost 80 percent more, per hour, than he could during 1910. Woolen and worsted manufacturers are now attempting to reduce man-hour time per yard of cloth to the level in the cotton-textile industry.²

TECHNOLOGICAL ADVANCES IN SYNTHETIC YARN

Mr. RIEVE. The synthetic yarn industry presents a more complicated condition. The viscose filament division has attained a degree of maturity which is not shared by the other divisions. Basically, the chemical processes have changed little since the practical introduction of the viscose rayon process in this country in 1910 by the American Viscose Corporation at Marcus Hook, Pa. But this branch of the industry has grown extensively and undergone very significant mechanical and engineering changes. Most of these modifications have been in the direction of continuous operation, speeding up and larger-sized equipment.

The most impressive advance toward continuous operation has occurred in the spinning and finishing operations as developed by the Industrial Rayon Co. at its Painesville, Ohio, plant. It has reduced spinning and finishing time from the customary 85-hour period in the plants maintaining discontinuous procedures to less than 5 minutes. The elimination of numerous batch processes and the construction of the compact spinning equipment permits the yarn to be washed, desulfurized, bleached, finished, dried, and twisted successively on the same machine. Large package bobbins have reduced the doffing time to once every 19.5 hours in comparison with the customary 4- to 9-hour doffing periods.

With competition increasing and the profit margin narrowing in the viscose filament rayon industry, manufacturers are seeking every possible method of reducing their labor force. One concern changed its method of attending to spinning and doffing and thereby displaced directly 1,100 persons. This same concern is contemplating the substitution of the cake wash method for its current procedure of reeling the skeins before washing. It is estimated that some 4,000 girls will be displaced without any opportunities for reemployment

¹ See "Exhibit No. 2619," appendix, p. 17429.

² See "Exhibit No. 2617 and 2621," appendix, pp. 17428 and 17430.

in their communities. In one relatively small plant, production per man-hour increased some 100 percent in a 2-year period through the installation of faster, more continuous and larger machines, and the introduction of the cake wash methods. Employment at the same plant declined 46.25 percent and production rose 10.2 percent during this 2-year period from June 1937 to June 1939. At another small plant, employment declined 26 percent and production increased 60 percent in a 2-year period. Production per employee increased some 116 percent.

In the acetate yarn industry, the Celanese Corporation of America declared in a recent annual report that actual production in 1939 was 700 percent greater than in 1929, and that the actual investment in fixed assets had risen only 137 percent. The president of the corporation declared that it had been made possible "by our intensive maintenance and modernization policies." Constant improvements have been made which reduced the man-hours required at the customary employments.

While the older processes of manufacture of filament yarn are requiring less and less persons, the industry is expanding by producing newer types of yarns. Staple fiber production has increased to the point where 1939 production amounted to 53,000,000 pounds, most of which has been made in plants built since 1937. New yarns now in commercial production include nylon for which a new mill was built at Seaford, Del.; vinyon, which is now being produced at the American Viscose plant at Meadville, Pa. Glass fibers are in their elementary stages of application.

The Works Progress Administration, National Research Project, has made estimates of the increase in man-hour productivity through the year 1937. Between 1923 and 1929, the rise was 228 percent. The total increase from 1923 to 1939 was 333 percent. The increases between 1936 and 1939 have been 41 percent.¹ At best, the above estimates are very conservative as the same organization declares.

As a chemical industry, in which there is a highly developed technical and laboratory staff and in which most of the units carry on constant research to improve the methods of manufacture and their products, we may expect even more phenomenal developments than those which have hitherto appeared.

TECHNOLOGICAL ADVANCES IN OTHER TEXTILE INDUSTRIES

Mr. RIEVE. Without offering an extended outline for the other branches of the textile industry, we will summarize available estimates on increases in productivity. The National Research Project has estimated a total rise in man-hour productivity in the knit-goods industry from 1919 through 1935 of 86 percent, with the most striking developments taking place in the outerwear and knit-cloth branches and relatively little in the underwear division. The hosiery industry is currently experiencing very significant developments through the automatization and speeding up of full-fashioned hosiery machinery.

In the silk and rayon industry, the advance has been most impressive, particularly since rayon has supplanted silk. When figures become available after the 1939 census, we might well expect man-

¹ See "Exhibit No. 2619," appendix, p. 17429.

hour productivity to have risen well over several hundred percent. Between 1919 and 1935, the National Research Project estimates a rise of 145 percent.¹

A study of the effect of mechanical changes on the carpet and rug industry from 1910 to 1936 indicates a rise of man-hour productivity due to mechanical advances of 23.6 percent for velvet carpets and 39.6 for Axminster, with a 23 percent rise for Wilton carpets.

The textile industries have witnessed every type of technological change. These improvements have transformed the manual processes into highly mechanized and automatized ones. Man-hour productivity has risen phenomenally. While the rate of increase was most marked during earlier periods while manual operations were being converted into mechanized ones, the rise has been no less impressive since the major sections have attained economic and mechanical maturity. Available measures of the rise in man-hour productivity illustrate the effects of the constant flow of improvements in the manufacture of textile products. The cotton-textile industry which long ago completed the process of mechanization was able to increase man-hour productivity by at least 64 percent from 1919 to 1939. By the same process, the woolen and worsted worker now produces at least 77 percent more per hour than in 1919. The carpet and rug worker can produce a minimum of 30 percent more than in 1910.

In the knit-goods industry, the rise between 1919 and 1935 was 86 percent. But the most phenomenal jumps have taken place in the rayon-yarn industry in which the increase has been well over 333 percent in man-hour productivity. These summary calculations are in all cases most conservative. They are indicative of the veritable revolution which has taken place in every phase of the textile industry. The textile worker is now measurably more productive than ever before. He can produce more goods in less time than was true even 5 years ago. The rate of technological advance has been increasing and man-hour productivity has been rising fast. The problems of technological advance are becoming more pressing now than ever before.

ECONOMIC AND SOCIAL EFFECTS OF TECHNOLOGICAL CHANGE

Mr. RIEVE. The impressive stream of technological advance brought many problems with its tide. It is our desire to direct the attention of your committee to the lot of the textile worker following on this history of technological progress and increase in man-hour productivity. Too frequently, people have resolved glibly the problem of technological change into bright contrasts between the goods and services now available with those available 100 years ago. They have allowed years to erase memories. It is our purpose to speak both of the long-run effects and the immediate consequences of these changes. We believe that technological advance is pregnant with too much good for all people to allow such progress to be discredited by its present human toll.

The question uppermost in everybody's mind is whether employment in the textile industry has decreased as a result of these vast

¹ *Ibid.*

technological changes. We know that there has been a marked rise in total production in the textile industries. While 3,252,000,000 pounds of textile fibers were consumed annually during the first 5 years of the 1920's, the total volume rose to approximately 3,809,000,000 pounds annually during the latter half of the 1920's, with most of the increase occurring in cotton and rayon consumption. Since 1936, we have had another impressive rise, which brought the average annual consumption for 1935-39 to 4,080,000,000 pounds ("Exhibit No. 2623").

(The table referred to was marked "Exhibit No. 2623" and is included in the appendix on p. 17431.)

Mr. RIEVE. Three of the last five years witnessed consumption of approximately 4,300,000,000 pounds or more of all textile fibers. In 1936 the total poundage was 4,293,000,000; in 1937 it was 4,435,000,000, and in 1939, 4,558,000,000. Consumption for the last 5 years has been about 25 percent above the level in the early part of 1920. Actual textile yardage has risen even more impressively, since finer cloths are now employed and more yardage is being secured per pound of rayon than is possible from other fibers.

As further illustration of the expansion in production, one may refer to the estimates of the Association of Cotton Textile Merchants in New York that cotton textile yardage for 1929 was 6,448,000,000, and 9,145,000,000 in 1939, a jump of 42 percent. The Textile Economics Bureau of New York estimates that rayon filament yarn yardage in 1939 was three times greater than in 1930.

Clothing and industrial fabrics are absorbing the increased volume. The wholesale prices of textile products have been dropping because of technological developments in manufacture, lower raw-material prices, and the diversion from silk to rayon and other cheaper substitutes. The United States Bureau of Labor Statistics reports that the wholesale price of textile products has declined from the high price level of 1920 by 58 percent.

(The document referred to was marked "Exhibit No. 2624" and is included in the appendix on p. 17431.)

Mr. RIEVE. While people at the same income level are now spending less on clothing than during previous periods, there is usually more yardage consumed for such expenditures and the incomes of many groups have been lifted sufficiently to account for the absorption of the increased production. Industry is also consuming more textile products in various forms.

This glowing picture of expansion in the volume of textile fabrics is marred by the lot of the textile worker. The percentage increases in man-hour productivity in most branches of the industry exceeded the percentage increases in the volume of production in all but one subdivision. The new expanded production was not sufficient to maintain man-hours of work.

A study of 5 major branches of the textile industry indicates that the total number of man-hours of work contracted by 20.4 percent between 1919 and 1939, despite the increase in the total volume of production of a minimum of 25 percent. The story of the individual branches is startling.

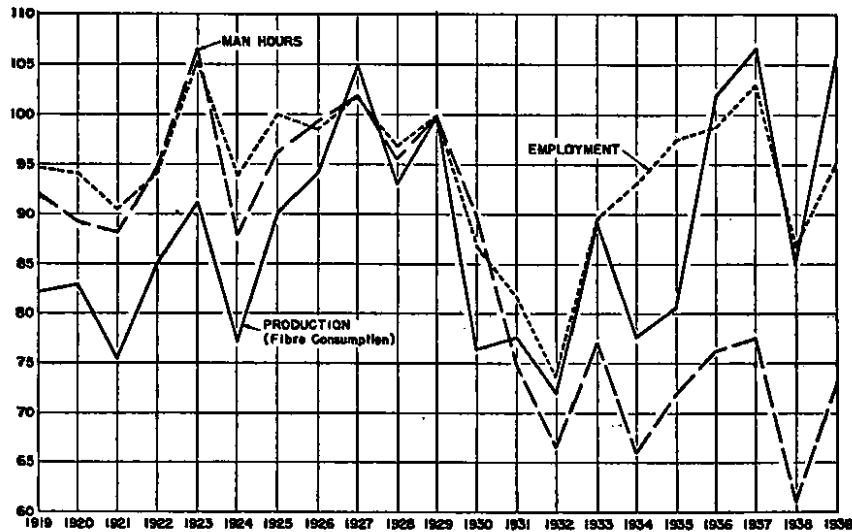
I think at this point we might as well refer to a chart that all of you gentlemen have before you.

Acting Chairman WILLIAMS. It may be received for the record.
 (The chart referred to was marked "Exhibit No. 2625" and appears below. The statistical data on which the chart is based appears in the appendix on p. 17431.)

EXHIBIT No. 2625

[Submitted by the Textile Workers Union of America]

INDEXES OF
 PRODUCTION, EMPLOYMENT & MAN HOURS
 IN THE TEXTILE INDUSTRY, 1919-1939



TEXTILE WORKERS UNION OF AMERICA

Mr. RIEVE. Employment in the textile industry reached its peak about 1923. Man-hour productivity or man-hour employment also reached its peak in 1923. Since then, however, production of fiber reached its peak in 1927. Employment in the textile industry, with all its fluctuations, reached its low in 1932 and since then has been going up so that today it is about on a par with the 1919 levels, but man-hours worked today are 20 percent less than in 1919.

On the other hand, productivity, production, is 25 percent above the 1919 levels, so that while we have fewer working hours, and employment is about the same as 1919, productivity, production, far exceeds these levels.

In the cotton-textile industry, production increased 18 percent between 1919 and 1939, but man-hours of work declined 28 percent. The overall increase in production of 21 percent in the woolen and

worsted industry between 1919 and 1939 was offset by a sharp decline in man-hours of work of 32 percent. The probable doubling of production in the silk and rayon industry was accompanied by a reduction in man-hours of 38 percent. In the knit-goods industry, the total volume of man-hours declined 38 percent but actual production increased 87 percent. Only in the rayon industry man-hours increased by 108 percent, while production rose by 962 percent. In all but one branch of the industry, total man-hours dwindled. Employment opportunities were shriveling up.

This sharp contrast between a rising volume of textile production and a reduced volume of working hours for the textile worker is the essence of the problem which we are discussing. More and more goods are being produced; their prices are declining; demand is expanding; but man-hour productivity is rising at a more rapid rate than the development of demand, so that the actual volume of available work continues to contract. The absolute number of work opportunities within the textile industry is declining; the challenge of unemployment exists.

To meet this challenge, organized labor has advocated shorter hours. Insofar as shorter workweeks have been introduced, the amount of unemployment has been reduced. Textile labor succeeded in establishing the 48-hour week shortly after the World War, and thereby protected the jobs of many workers. But during the 1920's, working hours increased in the North, and ranged from 55 to 60 hours per week in the South. The second major attempt to offset the diminishing number of jobs through shorter hours was made by the N. R. A. The textile industries by and large accepted the principle of the flat 40-hour week. As a result, job opportunities immediately opened up. As many employers offset these shorter hours with higher work loads, tighter managerial procedures, and production economies, the increase in labor demand was not equivalent to the reduction in hours. But many thousands of workers who had lost their jobs secured employment in the industry. The N. R. A. 40-hour week offered a breathing spell in the adjustment to the continuous displacement of labor and the ever-rising productivity of textile workers.

Employment during 1937 approximated the 1927 and 1928 levels of employment, even though man-hours had declined. But employment in 1939 was 5 percent below 1929 levels and 10 percent below 1923 levels. Employment in 1939 was back to 1919 levels despite the rise in production of 25 percent.

(The table referred to was marked "Exhibit No. 2626" and is included in the appendix on p. 17432.)

Mr. RIEVE. Employment in the industry has been maintained during recent active years at slightly below 1923 levels by reason of the sharp reduction in working hours. The total man-hours of work contracted by 20.4 percent between 1919 and 1939 despite the impressive expansion in the industry's volume of production. There is not now available any number of new jobs in the textile industry to take care of the growth in the number of wage earners. Besides failing to provide jobs for new-wage earners, it is not succeeding in maintaining the volume of jobs formerly in the industry despite the shorter workweek. The textile industry is declining in importance as a source of employment. The increased productivity

of the textile worker is the major reason for the contraction in available working hours and employment. A chronic condition of unemployment has appeared in this industry.

The effects of technological change cannot be told merely in terms of the long-run effects of the absolute number of jobs in the textile industry. True enough, these studies point to a chronic unemployment problem in the industry when taken as a whole. But the individual worker stranded in a community with a closed textile mill can find little solace in the fact that the total number of jobs in the industry has been maintained through the shorter workweek. The problems are infinitely more serious than even the absolute decline in jobs would suggest. It is our desire now to offer to your committee summary observations of the dislocations resulting from or accompanying technological advance which illustrates as serious a phase of the effects of technological displacement as an absolute decline in jobs.

The examples of dislocation are legion. But before suggesting examples, it may be well to underscore the particular seriousness of displacement in the textile industry. Most textile mills are located in small cities and towns in nonurban areas, with only one textile establishment, or at most, two. The mill is frequently the major, and often the only, source of income, in these communities. The fortunes of the mill workers determine the financial status of the town's middle and professional classes. The overwhelming importance of these small towns in the textile industries is illustrated by a tabulation made for the cotton-textile industry in 1933 which indicated that 29.7 percent of all wage earners were employed in cities of 100,000 or more. In the same year, in the woollen and worsted industry, 23.9 percent of the employees were employed in cities under 2,500 and 41.8 percent were in cities under 10,000, while 15.4 percent were employed in cities of 100,000 or more. Similar observations could be made about many other divisions of the industry, though several subdivisions, such as outerwear, are located primarily in large cities. Most major plants in the synthetic yarn industry are located in small cities and constitute the sole source of employment in them.

Displacement from the mill in most textile communities strands the worker. There are no other opportunities. He must seek employment in other communities. He must move on or remain unemployed. Moving costs money; and knowledge is necessary of the whereabouts of jobs, and both are lacking. The Joad family described recently by John Steinbeck in *Grapes of Wrath* could well be duplicated a thousand times by the stories of industrial workers displaced by technological developments in search for jobs and hanging on each rumor to find a lead for new employment. Our State employment services have the most elementary facilities to guide our displaced workers or to assist them in finding jobs in other communities. The above is, in short, the desperate plight of thousands upon thousands of textile-mill workers left unemployed by technological change. Increases in employment in mills located a thousand miles from their community cannot be of much help to these workers.

To bring directly to your attention this scrap heap built up in individual communities by technological change, we shall cite only a few instances scattered among the many textile States.

In the State of Maine a textile mill furnishing the major source of employment in a small community recently determined after an engineering survey to modernize its operations and released permanently the least efficient of its 300 employees.

A Massachusetts worsted mill, in a town of 1,200 workers, recently decided that it was overmanned and eliminated 10 percent of the workers in the dressing room, 9 percent in the weaving room. Near this mill is one which is introducing automatic winders and displacing three-quarters of its present one-hundred-and-fifty-odd winders.

There are no other mills in these towns. Recently the Connecticut velvet-weaving concerns insisted upon a 4-loom stand for weavers instead of 2, with the result that one-half of the weavers lost their jobs and there are no other velvet mills to absorb them. Automatic stop motions on narrow ribbon looms in a New York State mill left narrow-loom weavers high and dry, as there are no similar mills in the community. The doubling of the loom load for rayon weavers at another plant created a serious problem, as it is the only rayon plant in the vicinity. The introduction of automatic looms in a Philadelphia woolen and worsted mill sharply reduced employment in a city already suffering from unemployment. Technical progress in a small rayon-yarn plant reduced employment by 47 percent in a 1-industry town of 3,900 people. Several hundred people were displaced at one time in a 1-industry Pennsylvania community of 14,000 inhabitants where 35 percent of the employable persons were already unemployed.

Similar instances can be cited for the southern cities where the process of displacement is proceeding apace. A mill located in North Carolina introduced long-draft spinning with large packages and cut down its work force on battery hands and doffers by 40 percent. Complete reorganization of South Carolina cotton mills in a 2-mill town reduced the work force by 20 percent. A Georgia 2-mill town experienced simultaneous reductions in the work force in both of its mills through technological change.

Dislocation results also from the complete closing of mills. At times, plants are shut as part of the process of consolidation and modernization as in the case of the American Woolen Co. which has reduced its former 55 mills to its present 25. At other times, technological changes which have made the existing mill obsolete accompany other factors such as inducements in new locations. As a result, the new equipment and methods are installed in new mills in new places, leaving the older plants stranded. Or, new capital may be invested in the more modern equipment and plants in new location with the same ultimate effects. The rapid rate of technological advances facilitates this process. Older mills thereby become denuded of machinery and people; and dead silence replaces the hum of the frames and the cluck of the loom. At times the mills are converted into other uses; and in other places they are torn down to make place for new developments. Ghost textile towns and mill villages abound through New England and the Middle Atlantic States, and are beginning to be known in the South. A few summary references may suffice to exemplify the facts well known to all concerning the migration of textiles from New England to the South, which was accelerated from the lower wage scales in the latter area, but which found its root in the advance made by southern manufacturers in introducing

modern equipment and methods and the reluctance of New England manufacturers to modernize.

The process of dislocation is not at an end. Technological change made possible the development of rayon weaving plants and their displacement of silk weaving plants. Now the introduction of staple fiber, the development of wool blends, and the increased ability of cotton mills to manufacture woolen blends is threatening part of the New England woolen business and is prompting consideration of the transfer of such business to southern manufacturers, paying lower wages. Simplification of processes and technological changes are opening up to the southern employers with lower wage scales great possibilities of wresting part of the remaining northern divisions of the textile industry, thereby threatening additional hundreds of thousands of textile workers in older centers.

We can only call your attention to several outstanding instances in order to exemplify this development. The Amoskeag Manufacturing Co. closed in 1936 at a time when it was employing some 17,000 workers. Drainage of capital, and obsolescence of equipment, management practice and marketing organization, and wage differentials doomed this company and left these workers unemployed in a town already suffering from a considerable volume of unemployment. Only 14.8 percent of these displaced workers found employment by October 15, 1936, and only 81 of these found it in textiles, principally outside of Manchester. The city's relief load increased. A government survey concludes that "a once prosperous manufacturing city has been left stranded by the decline and failure of its largest company. The loss of employment opportunities (for its workers) created more social and economic problems than are visualized in the unemployment figures alone." This study of the company and the fate of these displaced workers is well worth reading as the intimate, exhaustive study of the meaning of technological displacement. The story is repeated in New Bedford, which has shrunk to 30 percent of its former self; Fall River, which declined to one-eighth of its former activity; Lowell, which now has about 60 percent of its former textile industry. Literally, more than 100 other New England towns have suffered in a similar manner. More recently, complete plant shut-downs occurred at a woolen mill in Bennington, Vt.; a cotton mill in Dover, N. H.; a spun silk mill in New Bedford; and a rayon yarn plant in Easthampton, Mass. Last week's newspapers reported 2 plant liquidations in New Bedford. Towns of New England which once had textile mills and do not have them now, include Glasgo and Plainfield, Conn.; Auburn and Kennebunk, Maine.; Chicopee, Saundersville, Three River, Mass.; White Rock, R. I.; and Danville, Lynchburg, and Petersburg, Vt.

Similar situations can be found in other parts of the country. In New York State, Cohoes was the birthplace of the knitting industry. Now it can hardly boast of an important and stable plant. Paterson, N. J., has suffered the fate of the silk industry. With the disappearance of silk woven fabrics, Paterson, N. J., has lost a major section of its industry. Most manufacturers failed to adjust themselves to the times. More than 50 small silk throwing mills have disappeared from the landscape of Pennsylvania as their equipment proved inadequate to meet the changing demands and they proved unequal

to the shift to rayon. Hosiery mills which failed to modernize and to keep their equipment in line also suffered similar consequences. To those in the textile industry, the following names conjure up memories of ancient glory and of great activity: United States Worsted, Farr Alpaca, S. Slater & Sons, American Printing Co., Everett Mills of Lawrence, Royal Weaving, International Collar Mills, and Lyman Mills.

The South also has its roll of industrial casualties. Plants such as the following have closed, never to reopen: Erwin Manufacturing Co. and Lowe Manufacturing Co. of Huntsville, Ala.; Irene Mill in Gaffney, and a cotton mill at Landrum, S. C. Towns such as Athens and Cottdale, Ala.; Beverly and Cochrane, Ga.; and Cowpens, S. C., where industry once buzzed, now have no textile mills.

The total effects can be suggested most fully in terms of the trends in the cotton textile industry. Cotton spindles in place in the New England States, which numbered 18,856,000 in 1921-22, dropped to 6,143,000 in 1938-39, a loss of 67 percent. In the other States, the drop was from 2,014,000 in 1921-22 to 799,000 in 1938-39, a decline of 60 percent. The cotton-growing States increased their spindleage until 1933-35 and since that year have dropped 1,021,00 spindles.¹ Each area is now losing cotton spindleage. Displacement is rampant.

(The table referred to was marked "Exhibit No. 2627" and is included in the appendix on p. 17433.)

Mr. RIEVE. Cotton textile mills are closing down and plants are being abandoned. Five New England States which claimed 506 cotton plants in 1923 lost 205 by 1933 and witnessed the scrapping of an additional 131 plants by 1937, so that only 170 were left. Connecticut, which had 69 plants in 1923, had only 23 plants in 1937. Massachusetts saw its 245 plants in 1923 dwindle to 96 in 1937.

In the five major southern States, the number of plants has remained approximately the same between 1927 and 1937, except for North Carolina, in which a number of plants have been consolidated and closed. While there were 764 plants in North and South Carolina, Georgia, Alabama, and Virginia in 1927, the 5 States had lost 61 by 1937. The latter total represents a recovery of 53 plants from the number in 1933 when these States had 650 plants. North Carolina's 383 plants in 1927 dropped to 297 in 1933, and increased to 325 in 1937. Only Alabama had more cotton textile mills in 1937 than in 1927, an increase of 8 mills, to a total of 76.

EFFECT ON SKILLED WORKERS

Mr. RIEVE. The effects of technological change do not end with the elimination of a number of jobs. Workers who retain their jobs are only in a comparatively better position. They have their troubles and problems. Their lot is seldom fully happy. They are usually fewer in number and know that their ranks have been thinned. A textile engineering company calculated that on a 40-hour basis the number of people required in a cotton mill to produce the same amount of carded broadcloth in 1936 as in 1919, would decline from 174 persons to 84; combed broadcloth, from 218 to 108 persons; sheet-

¹ See "Exhibit No. 2827," appendix, p. 17433.

ing, from 238 to 112 persons; carded filling sateen from 156 to 86; canton flannel, from 290 to 148; print cloth, from 166 to 86; lawn, from 148 to 74; and terry cloth, from 242 to 114. So in a woolen mill, the decline for the same period would be from 270 to 155 persons for 32-ounce overcoating; from 272 to 154 persons for 12-ounce woolen flannel; from 1,196 to 642 for worsted serge; and from 797 to 425 for cotton warp worsted suitings.

Simultaneously with the reduction in the number of jobs is the alteration of job contents; unskilled jobs increase in proportion to the total; less skill is necessary. Employers segregate unskilled job elements of skilled occupations and assign them to unskilled workers to conserve the skilled worker's time and restrict him exclusively to the skilled processes.

So the weaver has been relieved of all battery filling work, and battery fillers have taken over their tasks. Beam hands have frequently taken over some of the weaver's work. Spinners have been relieved of much cleaning by cleaners. This replacement process has meant demotion for many workers. There are less opportunities for the skilled worker to exercise his craft and skills. The chances for securing work at the old craft become limited. A lower paid job is the fate of many of those who remain in the plant.

In addition to reducing the relative number of skilled jobs the aptitudes and skills required in industry are changing. Even if the jobs remain skilled in character, the type of skill at the new job is at times very different from that which had been formerly required. As never before the workers have to remain plastic enough at all ages and ready to take new duties and responsibilities when jobs do open up.

As an example of this process of change, we may refer to the weaver. Before the development of the automatic loom, weavers generally attended to all work around a loom with the exception of major repairs which were usually made by loomfixers. With the introduction of the automatic bobbin or shuttle filling devices and the application of scientific management, these duties changed. Various specialized workers appeared on the floor. Warp hangers—persons with considerable physical strength—now put in warps. Beam hands take away the rolls of cloth. Battery hands fill batteries with filling yarn and are only required to be deft and dexterous. Loom cleaners hose looms. Smash hands repair major warp breaks; pickout hands remove flaws in the cloth; reed-over men replace broken reeds. The weaver's own job has been sharply limited. No longer is it necessary to have an all-around weaver.

The current weaver must be a person who can patiently patrol the long aisles of looms running in some instances well over 100 and generally, in the cotton industry well over 40. The weaver must now keep his eyes on the warps to see that the looms do not stop and the ends are tied together when they do break. For this work it is not necessary to be as skilled as weavers were formerly required to be.

In the woolen and worsted industry, we are witnessing the displacement of the male mule spinner by the female frame spinner. Employers are dismissing their skilled male mule spinners and are hiring women for frame spinning. This change is completely dislodging an old occupation.

In some instances, there has been an increased need for more skilled workers, but they have been few in number. More fixers and second hands have been required to repair the new complicated machines. The substitution of a machine for a hand operation as in the instance of the warp tying may increase the need for more skilled workers, usually male.

The worker has not been the only one affected by the technological changes. The type of overseer and second hand required in the textile industry is changing. It had been customary to advance workers to the position of section hand, to second hand, and to overseer. Practical training on the job was valued above all else. But now mill-trained supervisors are being displaced by college-trained executives able to meet the needs of new engineering techniques.

The above summary review of changes in textile personnel indicates that the workers, besides being fearful of losing jobs through direct technological change, are also finding employment slipping from their own community to some other locality, frequently thousands of miles away from the original site of job. He is also faced with the possibility that his skills may not be needed, as new jobs develop which require new aptitudes and personal qualities.

The woolen mule spinner can obtain very little solace from the fact that a spinning job is open if the employer has only a frame spinning job for which he prefers a woman and for which he is willing to pay two-thirds of the rate being paid to male mule spinners.

One significant concomitant of technological advance is the worker's suspicion of all change. The introduction of new machines, new methods of production, or new work assignments have long been the cause of much industrial unrest and many bitter strikes. Besides causing widespread discontent because of displacement; besides sowing the seeds of general dissatisfaction through frequent demotions and loss of bargaining power, the fear of overwork, the knowledge that neither industry nor Government will protect workers against these hazards; besides feeling that he is increasingly dependent upon management for careful and expert coordination and synchronization of production, workers are suspicious of the need for changes, their desirability, and their effects. They fear these changes, for they know that in their wake lie many unsolved problems. They fear them, since they have no opportunity to review them, or to determine their necessity; to regulate their introduction; to control the process of hiring; to protect their service record; to pass on their installation; to share in their benefits; to mitigate the difficulties of the displaced employee. These and many other fears and alarms dominate the worker's attitude. He dreads the machine. Customarily he has taken to the only weapon of protest that he has—the strike. The textile industry has a long recorded history of strikes against technological change. The last general strike of 1934 was basically rooted in this protest.

Any program dealing with technological displacement and advance must take clear account of the problems of industrial unrest which follow in the wake of technological change.

THE CHANGING CHARACTER OF THE TEXTILE INDUSTRY

Mr. RIEVE. The increased importance of machinery and highly refined engineering procedures have affected the economic problems of

the industry. In the first place, investments in and maintenance of machinery and fixed assets have come to represent a large proportion of the industry's costs. The Federal income-tax returns for 1937 indicate that the capital assets less depreciation and depletion of 7,128 textile mills corporations of \$1,549,608,000 were required for total gross sales of \$4,343,598,000. In short, approximately \$1 of capital assets either in the form of land, buildings, or equipment was required for each \$3 worth of sales. This figure may be contrasted with the situation in the clothing and apparel industry in which the ratio was \$1 investment to each \$20 worth of sales.

The size of establishments has also been increasing. In the cotton textile industry, for example, 36 percent of the concerns employed 257 persons or more in 1919. The percentage had risen in 1937 to 49 percent. Moreover, there is a large number of chains of mills and there is greater concentration of economic power in the industry. Technological advance has fostered larger units, more capital investments, and greater concentration of financial control.

The social and economic effects of technological change have been so far-reaching that they have given rise to the consideration of the desirability of these changes. There have been definite proposals to prevent technical changes which bring unemployment and other forms of social disaster. In our review of the effects in the textile industry, we have observed that the increased productivity of the textile worker has far exceeded the expansion in the volume of output, with the result that the total number of man-hours of work in the industry has declined by some 20.4 percent in 1939 in comparison with 1919, despite an increase in fiber consumption of some 25 percent and a probably larger increase in yardage. The drop in employment in 1939 was 10 percent below 1933, though the volume was equal to 1919. It has not been sharp, since working hours have been reduced from an average of 47 hours per week in the twenties to an average of 36 hours, largely because of the establishment of the maximum 40-hour week in the industry. Nevertheless, employment has been declining, the number of jobs is shrinking. There is no place in the industry now for the expanding population; even workers in the industry are lacking jobs.

We have also observed that the loss of work in specific plants, among a smaller number of workers, even in the face of a compensating increase in the volume of production in the industry as a whole, leaves many workers stranded while new opportunities open up a thousand miles away. Plant migration results in even greater difficulties as entire communities become economically depressed. Active communities are converted into ghost towns. Workers frequently also lose much of their bargaining power as skills and jobs change and new aptitudes and qualities become necessary. Unrest is general, and much dissatisfaction follows on the installation of technological improvements.

At present, technological advance, instead of being welcomed by all concerned as a form of liberation from exhausting tasks and long grueling days, as a means of securing a higher standard of living, as a method of producing wealth with less cost and in greater abundance, and as a tool for assuring more leisure time, is a mixed blessing. While it has brought some of these advantages in varying degree or has made them possible, the cost has been tremendous. The

human toll has been heavy; the disturbances created have been far reaching and frequently devastating. Instead of bringing new advantages, technological advance has brought depression to many communities. In fact, many of the problems which afflict our economy are rooted in our inability to harness our greatest asset, human ingenuity, and assure ourselves that it will be used constructively. The solution of the problems created by technological change will go a long way toward increasing the stability of our democracy.

So grim has been the future of the textile worker in the face of these problems presented by technological advance, so inadequate the provisions made by industry and the community that labor has long fought technological change. Benefits are recognized to result in the long run but industry has not met the immediate problem of the worker and has granted him concessions only after long struggles. While theoretical considerations might prompt the hope of reduced prices, these are quite remote and unimportant to the direct victim of change. He is faced with the immediate problem of existence, adjustment, and reemployment. While the advantages of increased productivity might be argued, the worker knows the immediate casualties and visible suffering; he knows also of the existence of millions of unemployed even in relatively active periods. The worker can only conclude that the answer to the problem of mechanization has not been secured. Until practical solutions have been developed and industry and community have evidenced an ability to provide employment and facilities for adjustment, labor cannot be expected to welcome changes.

Practically, the national unions have developed two lines of approach toward the technological change. They have formulated policies for the control of technical innovations for the protection of their members and for the mitigation of the effects of such changes. These policies and programs are applied to their own industries insofar as it is economically feasible. But their success has been limited both by the extent of organization and the opportunities and practicability of applying such policies in highly competitive industries.

These unions have realized that such policies cannot solve or even begin to meet the issue of technological displacement. Besides being unable to prevent displacement in their own industries or to direct price and marketing practices in such a manner as to assure wider markets, they know that technological change has frequently resulted in the diversion of work from one industry to another. As such, they are beyond the control of the individual union. The industry program can be considered only as a part of a full program advocated by organized labor for the handling of the problem of technological displacement. This program embraces a wider course of action.

It is my desire to present to your committee the practices which have been developed in the textile industry by the Textile Workers Union of America for the purpose of controlling technological progress, protecting the worker and for mitigating the effects of displacement. We shall follow this discussion with our views as a constituent organization of the Congress of Industrial Organizations as to the program which might properly be followed to meet some of the broader economic issues.

UNION POLICY REGARDING TECHNOLOGICAL CHANGE

Mr. RIEVE. The Textile Workers' Union of America has developed several practices for the control of the introduction of technological changes within the industry. While control is desirable, its extent and character vary markedly from places where the union has no review or control over the introduction of these changes to those in which all changes must be submitted to review by the union before their final application. In no instance can the union really stop or prevent the introduction of mechanical and technological change, for all of the contracts of the Textile Workers' Union of America provide any differences between the management and the union may in the final instance be submitted for resolution by an outside arbiter. Where the local union has taken a position against the introduction of a specific change or the conditions of the change proposed by the management, these are subject to review by an outside party.

We shall herein describe the procedure which obtains in the limited number of instances where the union exercises the greatest degree of control. In these plants, employers may present two major types of proposals concerning technological change. The first involves minor changes arising from adjustments of basic work assignments to specific constructions of yarn or cloth. In other words, a spinner may be assigned 12 sides of the spinning frame on 20s cotton yarns. Should the concern introduce 30s yarn, it may desire to establish 14 sides as a normal job, without changing the basic terms of employment. These are adjustments to take care of the differences in the character of work due to the varying construction of materials. In these instances the company will ordinarily notify the local union. Adjustments are usually quickly agreed upon. In one contract provision is made for the right of the company to proceed with these changes following 24 hours' notification of such proposed changes and the failure of the union to interpose objections. Should the local union dissent, the arbitrator may be called upon to stop the change pending his final decision unless local management and the union arrive at an understanding.

The second type of technological change involves basic changes in work assignment or in procedures. They may be due to a variety of reasons, such as improvements in the physical surroundings, the construction of the machine, the physical lay-out of equipment, the quality of materials, or any of the other types discussed previously. At times, changes are proposed which have no such basic cause. They are motivated by the employer's desire to get more out of labor than had been secured before. Employers in such instances may have heard that other employees tend more machines or produce more units per hour and desire to duplicate these production records at their own plants. The latter type of change has been the source of many serious industrial disputes in the industry and have thrown all change into disrepute. They have aroused labor to the point of labeling all innovations as "stretch-out."

In organized plants, where provision has been made for careful review, managements submit these changes to the labor union. The latter consults with the national office of the Textile Workers Union of America which maintains a research department conversant with the practices on specific jobs, current levels of produc-

tion of different machines, and the various machine assignments and methods of labor arrangement. The proposals are reviewed by this department and the local union is furnished with the requisite information on current practice. The local union consults the particular workers affected by the proposed change. Their reactions and their opinions are secured concerning the practicability of the proposals. With this information, the local union committee starts negotiations with the management. It is prepared to review the proposed changes from the point of view of competitive necessity, practicality, savings, and their effect upon workers in the form of displacement, demotions, and wages. In each instance the employer is requested to furnish such information as might be required to complete the full picture of the nature, need, and effects of the proposed change.

The local union in each instance negotiates with the employer to prevent unnecessary and impractical changes, to minimize the number of workers displaced, assure proper jobs, to secure a share of the increased productivity in the form of higher earnings and other concessions, and to secure financial allowances for those released.

In a highly competitive industry such as textiles, relatively few changes can be stopped. The industry consists of more than 7,000 companies, many of which are ever ready to forge ahead to exploit new processes or to gain some special advantage over competitors, in the form of lower costs. The problem which the union faces is primarily that of controlling the pace and terms of the change.

Probably the most significant advance made by the Textile Workers' Union of America toward the rational review of technological change has been in the field of assuring proper job assignments. The cry of the "stretch-out" has long been heard in the textile industry. Workers have protested against unjustified work assignments. During the N. R. A. special work assignment boards were established. No successful machinery for the consideration of the charge of overwork can be founded until there is a bona fide union in a plant prepared to deal with this problem in a realistic manner and affiliated with an international union ready to give it the technical advice and assistance necessary for the handling of these problems.

The Textile Workers' Union of America has made great strides toward the rational handling of the problems of work assignment. In the first place, it has recognized the necessity of establishing competitive parity as among the members of the industry. In the second place, it demands that no job be excessive. It has preached this basic assumption and is happy to report that this conviction is finding wider and wider acceptance in industry. Management is increasingly willing to test the propriety of a given job assignment where labor finds or believes it to be excessive. When new assignments are proposed, local unions review such proposals, also in terms of their practicability or their excessiveness. If necessary, the local calls upon the national office to have its research department study the proposed jobs and to determine whether the job is excessive. The Textile Workers' Union believes that a thorough study of the job by competent, technically trained people, together with the workers on the job, will disclose the practicality of any particular job. The union insists that the worker be allowed sufficient personal and

recuperative time on the job in the form of rest allowance and tolerance for interference and delays so that the worker is not exhausted when he leaves the job at the end of the day. For this purpose it has set as a minimum a 15 percent personal and rest fatigue factor for all jobs and has established higher percentages for the more fatiguing jobs which require exceptional physical exertion. It has, moreover, sought and in some instances secured the rotation of workers on especially hazardous or exhausting jobs so that they may be relieved of exposures and hazards. In the synthetic yarn industry, the union has succeeded in having spinners who are exposed to the carbon bisulphide fumes alternate their employment during the day with other jobs. Compulsory rest periods of fixed duration have been established on a number of jobs in various plants.

Where agreements cannot be reached between the local union and the management concerning the propriety of a specific job, the union and management submit such differences to arbitration. Frequently the arbitration step is preceded by an effort at conciliation first made by the technical representative of the national office and the second, by the Technical Division of the Conciliation Service of the United States Department of Labor. In the latter instance, both parties agree upon the jobs in dispute and request the Conciliation Service to make an impartial study of the job. The results are made available to both parties as a basis for discussion. In other instances the results are made available to an impartial arbitrator. The usual arbitration procedures are followed so that each side has an opportunity to present its case. The arbitrator may consider other aspects of the technological installation, such as wages, dismissals, promotions, seniority rights, job guaranties, separation allowances, and pensions. But with reference to the job assignment itself, he ordinarily determines permanent assignments on some of the disputed jobs and places other jobs on a trial run. During the trial period, usually 90 days, the arbitrator keeps control over such jobs. The local union and the management may settle their differences and negotiate an understanding. If not, the arbitrator will resolve the difference through a final decision, usually after further study of the job.

The above procedure is being introduced in an increasing number of plants and is becoming more and more typical of the procedures followed in the industry in the resolution of their differences. Both parties learn to consider these problems in the spirit of understanding and frankness and are able to resolve these problems without reference to outside parties. The arbitration procedure serves as an intermediate stage in the development of permanent democratic and rational collective bargaining between the two parties.

Many problems have yet to be solved before completely satisfactory handling of these questions is possible. There are still differences of opinion as to what is fatigue and relief time; how it is to be calculated; whether continuous rest periods should be allowed; what allowance should be made for delays; and the percentage of rest and personal time which should be established for different jobs. However, the groundwork has been laid for the more rational consideration of these problems and for more intensive study by management and labor of these issues. In fact, plans are afoot for such studies.

IMPROVEMENT IN EARNINGS

Mr. RIEVE. We are determined that the textile workers should enjoy higher earnings as a result of the rising productivity. The more a man produces, the more money he is entitled to. Advanced technology has meaning only if the working population enjoys some of its benefits. It is the proud boast of our American economy that there has been an ever-rising standard of living. If that result is to be realized, workers must be assured of greater earnings. The rising productivity is now translated into lower prices, if at all, only belatedly, slowly and haphazardly. The workers directly involved in such change have a claim to a special share of the increased productivity in the form of higher wages, particularly in the textile industry in which wages are low and productivity has been rising by leaps and bounds without automatically affecting the wages of these workers.

The Textile Workers' Union wants to assure the textile workers of a share of the benefits of the rising productivity. Definite agreements have been made with a number of concerns specifying the exact proportions of the increased productivity which should be distributed to the workers, to management and the public in lower prices. In one agreement, it is moreover specified that the local union and management may distribute the savings among the various classifications of workers in the manner they believe most desirable. Furthermore, wage standards of entire industries, such as rayon yarn, have been raised because of its phenomenal rises in productivity.

The union has encountered special difficulties in securing part of the savings in costs of production for the workers in the highly competitive divisions of the industry. Changes are very frequently made to keep abreast of, rather than to gain particular advantages over, competitors. Mills which are paying lower wages often lead the way in technological change or readily duplicate those being made in higher areas. The chaotic wage situation in these industries deters these increases.

Our organization has made definite efforts to protect workers during the periods of experimentation with new machines or methods. Guaranteed hourly earnings are established which assure employees that they will receive wages comparable to that which they have been receiving prior to the experimental period. In the full-fashioned hosiery industry, the experimental rate has been set at 98 percent of the average normal earnings of the individual for the previous 5-week period. In other instances, it has been set at the equivalent of average hourly earnings. This protected level of earnings is of great value in carrying on the negotiations for the determination of new rates of pay and assures the maintenance of the wage scale.

We consider it fundamental to any sound system of economy that labor share in the rising productivity of industry through higher wages and lower prices. In highly competitive industries, such as textiles, it is desirable to utilize the legislative recourse provided by the Labor Standards Act to assure this result. Periodic increases in minimum wages in line with jumps in productivity will achieve this purpose. Until our organization made extensive progress in the textile industry this principle was hardly known, not to speak of being practiced. It is only with the extension of unionism that the practice is being adopted.

JOB TENURE

Mr. RIEVE. Besides limiting changes to those which are absolutely necessary, preventing excessive work loads, and attempting to secure higher compensation for the workers who are affected, the Textile Workers Union has constantly endeavored to establish greater employment security for the workers already in the industry in face of highly rapid rate of change. The principal means of achieving these ends has been regulations governing lay-offs and rehiring; and the special rights of employees displaced by technological change.

Seniority systems are now widely recognized in all union contracts. Initiated both by employers and organized labor, these plans are generally accepted. Under seniority plans now in existence, length of service with a company is given foremost consideration in determining the comparative rights of employees to their jobs. Many qualifications are frequently added to the consideration of service with the company which limit the protection to long-service employees. Some companies have introduced merit-rating plans which seek to minimize the importance of service by giving it a limited value in the determination of the total rating of the employee. The worker's equity in his job is therefore restricted.

Insofar as the seniority or merit-rating systems protect the longer-service employees, they tend to place the cost of technological change upon those who are younger, and upon those with shorter service records, who may include older persons as well.

The Textile Workers Union has in several instances succeeded in securing additional protection for the workers in the plant which protected them against arbitrary and discriminatory discharge. In several instances management agreed to introduce the changes in such a manner as to protect its personnel. They have guaranteed jobs to all workers, and moderated the pace at which the changes were made so that the normal turn-over of labor would provide sufficient jobs for those who remained. In the second place, the changes have frequently been accompanied by a definite program for expansion which opened up job opportunities. In the third place, the companies have installed the changes during periods of expanding business so that there would be no immediate repercussions. Whatever the form of guarantee, the organization has at all times sought to find some formula to protect jobs.

When this alternative was not possible, the Textile Workers Union of America has secured preferential rehiring rights for displaced workers. In addition to enjoying the ordinary seniority rights in their respective departments and occupations, they obtained reemployment rights for all jobs in the plant.

In advancing the security of the workers against technological change, the Textile Workers Union has gone one step further in the case of the American Viscose Co. It succeeded in assuring the workers a right to new jobs developing not only within the plant at which they are working but also in other plants of the company. This provision is of particular importance in this industry in which technological progress has been sharply reducing the volume of employment in established plants and prompted the construction of new plants at times close to the site of the older plants but in most instances away from these older plants in other communities and fre-

quently in other States. The union has established the right of the displaced worker to jobs in new plants built either at the old site or in new communities.

New plants established at older sites are frequently governed by existing seniority rulings so that employees gain a preemptive right to their jobs. In the agreement with the American Viscose Co., provision is made that "employees displaced by technological changes shall be placed on a preferential list for rehiring as and when vacancies thereafter occur." The arbitrator determined that the displaced workers had to be "placed on a preferential list for rehiring when appropriate vacancies occur in any of the plants of the corporation." The preferential rehiring lists are handled by the central industrial relations department of the company rather than by the individual plant offices.

In practice, employees displaced by technological changes are generally employed at the older plants located either at Marcus Hook and Lewistown, Pa.; Parkersburg, W. Va., or Roanoke, Va. On being placed on the preferential hiring list, they become eligible for rehiring at the Front Royal, Va., or Nitro, W. Va. or Meadville, Pa., plants where are located the more recently constructed and expanding plants. The employees on being displaced file applications indicating the plants to which they prefer to move. When vacancies occur they are notified and informed of the nature of the employment and the rates of pay. They are selected on the basis of qualifications, training, and experience. Seniority at the old plant is given secondary consideration. If the persons are found desirable, they are notified to report at the new plant. The persons so transferred enjoy no seniority record at the new job but immediately become permanent employees. If they refuse employment at another plant they remain on their own departmental preferential list for a period of 1 year and on the plant list for 3 years. It must be noted that the new opportunities for rehiring at the older plants are rather limited.

The most outstanding application of this program to date resulted from the reorganization of the spinning departments of four older plants during which some 1,100 persons were displaced. Of this number 598 signed transfer cards since about 1 year elapsed between the actual displacement and the determination by the arbitrator of the right of these employees to jobs in other plants, and many had secured other jobs. Some 200 persons have been reemployed on permanent jobs and 15 on temporary jobs at the new plants. Only 29 workers to whom the jobs had been offered refused them. It is expected that in May 1940 the largest number of those willing to accept jobs will be absorbed as the Front Royal plant will then get into operation.

Many difficulties have arisen in making these transfers. Persons have been reluctant to break long ties in their communities. They have property, friends, and family. Others found the cost of moving prohibitive. Others felt reluctant to accept lower wages. The union, it may be added, has proposed the establishment of a fund through joint employer-employee contributions to assist individuals in moving to new jobs. The lack of housing and other facilities in the new communities have discouraged other workers. In the near future, it is expected that some 2,000 women will be affected by the

cake-washing process. In their case, employment in new plants will be difficult if not impossible to find.

No one can look upon this plan as adequate nor as complete; it must be considered as part of a larger program to meet the insecurities and cost of technological displacement.

In an industry such as synthetic yarn, which is constantly expanding, the possibilities for this plan are promising. New plants are being built; the companies are enjoying huge profits. They are, in most instances, financing the expansion out of their own profits and surpluses. They can afford to grant workers preemptive rights to new jobs and to assist them in making these transfers. We look forward to the time when complete union organization in the industry will provide workers displaced by technological change with the preferential hiring rights to jobs in all new plants.

SEPARATION ALLOWANCES AND PENSIONS

Mr. RIEVE. The preceding two efforts at mitigating the effects of displacement must be supplemented by other programs. One method employed is to arrange a separation allowance or pension for employees displaced by technological change. Three specific plans have been developed through the initiative of the Textile Workers Union. We are, I must add, recommending to companies with adequate financial reserves a separation wage plan. Two companies have adopted the principle of the separation allowance in case of technological displacement. The Bigelow-Sanford Carpet Co. accepted this principle in its agreement with our organization and we are currently negotiating the terms of a separation allowance. The contract with the Celanese Corporation of America, employing some 9,000 workers, provides that persons displaced by technological change shall be entitled to a separation allowance or to be placed on a seniority list for future employment on a job suitable in the company's opinion. Employees with 2 years or more service with the company choosing the separation allowance, receive 1 week's pay for each year of service up to 10 years. A fund of \$250,000 was established by the company to provide for these pensions. Employees obtaining these allowances may be rehired by the company at a future date but do not enjoy any seniority rights. Along with unemployment compensation benefits these separation allowances provide the worker with some income for the period during which he is determining his future course and seeking other employment. It is our hope to extend this principle to as many companies as possible in order to establish some form of compensation to persons displaced by mechanical progress.

This plan, moreover, has prompted the management to minimize the number of persons displaced. Instead of releasing persons, the company planned the introduction of technological changes in such a manner that persons likely to be affected might be absorbed at other jobs. As a result, we may testify that the most significant effect of the plan has been to reduce the number of displaced workers.

The plan developed by the Textile Workers Union, together with the American Viscose Co., for the Marcus Hook plant, provides even more satisfactory financial arrangements. The company desired to close the plant. After considerable negotiations, a plan was worked

out for the continuance of the plant for a 6-month trial period. In the meantime, all persons 65 years of age and over have been retired with a pension and persons under 65 entitled to jobs by reason of their seniority position for whom no suitable opening could be found, were paid a dismissal wage. Pensions amounted to 1 percent of current earnings times the number of years of service with the company. Persons between the ages of 60 and 65 years are granted pensions equivalent in value to deferred pensions at the age of 65 years so that a male of 60 years of age received for the same number of years service, 61.1 percent of the monthly allowance which a person 65 years of age and over receives. All persons under 60 years received a permanent lay-off allowance which was figured on the basis of the average weekly earnings of the employees during the last 12-month period in which they worked. They received 1 week's pay for each year of service, from 10 to 24 years, inclusive, plus 3 weeks for each year of service over 24 years, with one additional week for each 3 years over 45 years and a deduction of 1 week for each 3 years' age interval below 45 years. In addition, 1 week's notice was granted to persons with 1 to 4 years' service, 2 weeks' notice for 5 or more years of service or pay in lieu thereof. The purpose of the plan was to give additional protection to workers 45 years of age and over and for those with 25 years of service and over, to compensate for their service and offset their special difficulties in finding new employment and for the fact that employment is likely to be secured at a relatively lower wage. An employee aged 30, with 5 years' service would receive only the 2 weeks' notice or pay in lieu thereof. An employee 45 years of age and over with 15 years of service would receive 15 weeks of pay, while an employee 57 years of age with 15 years of service would receive 19 weeks of pay. An employee 57 years of age with 25 years of service would receive 31 weeks of pay. Here also the plan has resulted in planned placements so that the number of displacements has been kept at a minimum.

The technique developed by the Textile Workers Union of America to control the installation of changes, to protect jobs, and to assure better earnings to employed workers and preferential treatment to displaced workers, as well as the program for separation allowances and pensions can find wider application in a national plan to protect workers against the undesirable effects of technological change. They must become part of such a larger program.

The right of workers to organize must be protected in every plan to meet these problems. Without bona fide unionism, it will be difficult to find an answer to the extensive problems of technological advance. The recent growth of industrial unionism has made it possible for workers to develop a control over technological advances and to devise programs for dealing with the issues in their individual plants which they present. The unionization of an industry is the best guarantee that installations will be made in a rational and controlled manner. Unnecessary innovations will be discouraged; but backward concerns may be prompted to make them as had been the case in a number of instances. Wherever changes are made, job assignments set by collective bargaining are more nearly satisfactory than those set in any other manner. Unions endeavor to secure direct benefits for workers and also set up some

control over the process of lay-offs and rehiring to minimize the number of displacements and assure these workers such new jobs as may be found within the plants of the same company or within the industry. Constructive collective bargaining will produce arrangements for the movement of workers and other techniques to facilitate the adjustment of the individual worker and minimize the hardships.

The demand for collective bargaining and unions is not founded primarily on these considerations. But it should be emphasized that the urge to organization is rooted in the workers' desire to share in the determination of his own conditions of employment. There is no matter in which he desires to participate as much as in the decisions concerning technological innovations. It is important for democratic and healthy industrial relations in this country that all questions arising about the necessity of these changes, their manner and rate of application, new job assignments, wages to be paid, and provisions to be made for the displaced worker, shall be subject to collective bargaining. While such negotiations will not in and by themselves solve the problems of technological advance, they will facilitate more rational handling and possibly prevent some of the undesirable social effects. When negotiations are carried on on a national industrial basis the results can be even more profitable and constructive. Moreover, wage increases and shorter hours offer great possibilities for facilitating national economic adjustment to these changes and for establishing a more balanced national economy.

The social and economic problems created by technological change are national in character and also must be dealt with by the Federal Government. Legislative measures such as the wage-and-hour law, the social-security law, and provision for the Federal Employment Service can be of immense value in meeting these problems. Individual industry efforts must be supported by such legislation. Wage-and-hour legislation can be of great assistance in raising wage standards and in providing a facile method of assuring labor some of the benefits of the increased productivity through constantly rising minimum wages. This is particularly true of the textile industry in which competition is very keen and national in scope and wages are low. Our social-security laws must be liberalized to provide for those displaced from industry either at an advanced age or during active years. Workers affected by technological change after middle years find it particularly difficult to adjust themselves. It is therefore particularly important that provisions be made for their assistance in our old-age security legislation. The experience of the Textile Workers Union with the technological separation allowances suggests that further study might well be made of this technique to supplement present unemployment compensation benefits both to aid the worker and to afford additional inducements to employers to plan their installations in such a manner as to keep the number of displaced workers down to a minimum. It will also place a proper charge on technological developments. We, of course, suggest extension of the services of our employment agencies to facilitate the reemployment of displaced workers.

Insofar as the technological change affects the individual worker, the above suggestions are indicative of the type of program it is imperative that we adopt in order that the human toll of technical advance be reduced and that more persons enjoy some of the advantages

occurring from these phenomenal advances. We are also in need of more planning of the location of our industries so that there be fewer ghost towns and depressed areas.

The economic issues presented by technological change are fundamental. They relate to the absolute number of jobs in this country. They concern themselves with all of our basic economic problems. Real adjustment to technological advance can only come when we have learned to increase the number of available jobs or provide them through public works or governmental enterprise. Higher wages and shorter hours constitute significant means of increasing national income, distributing work more widely, and facilitating greater balance in our economy. They are indispensable to making technological advance a blessing rather than an evil.

Dr. ANDERSON. Shall we proceed with the questions?

Acting Chairman WILLIAMS. Yes.

Mr. CHANTLAND. May I ask a question, Mr. Chairman?

Acting Chairman WILLIAMS. Yes.

UNIONS AS A FACTOR IN MECHANIZATION

Mr. CHANTLAND. Mr. Rieve, you said legislative measures such as the wage-and-hour law, the social-security law, and provision for the Federal Employment Service can be of tremendous value in meeting these problems. Do you mean to say that they have not been?

Mr. RIEVE. No; I mean that they can be extended.

Mr. CHANTLAND. You said that backward concerns may be prompted to make them, as has been the case in a number of instances, in moving forward and planning. How many of these backward concerns have been prompted by your union to adopt such measures?

Mr. RIEVE. Well, I—

Mr. CHANTLAND (interposing). I won't ask you to name them, if you don't want to. But I was planning to get the number and the size and the location, perhaps.

Mr. RIEVE. In one division of the textile industry—that is in the full-fashioned hosiery—I would say about 60 percent of the industry was prompted through that method to modernize their plants, mostly located in the North and Middle West.

Mr. CHANTLAND. Do you want to elaborate further?

Mr. RIEVE. It was self-evident that if these mills were to continue in business they would have to do something because of the highly competitive nature of the business. The union approached them and worked out a scheme with the employers for the purpose of modernizing their mills.

Mr. CHANTLAND. To save the jobs and save the mills?

Mr. RIEVE. To save the jobs for the people involved. The wage scale was readjusted and rearranged so that the worker on the new improved job probably earned as much, and a little more than on the old job, but it brought about material saving to the employers because of the nature, the productivity of the job. That is the primary instance where this type of thing occurred.

Mr. CHANTLAND. That is concrete with me. Are there other instances that you want to tell?

Mr. RIEVE. No; I think that is sufficient as an example of what can be done.

Acting Chairman WILLIAMS. I notice your statement here, running perhaps through this paper, of the control of the union over the installation of changes in the plant. To what extent has the union influenced or controlled the technological improvements that have gone into the plant, and what is your procedure by which that is done?

Mr. RIEVE. The procedure? I may say this, that our outline gives examples of what can be done. In industries where the strength of the union, not in a plant but in an industry, is greater, these questions can be worked out more satisfactorily. In the synthetic yarn industry, for instance, which is a highly profitable industry and in which the extent of our organization is quite large, we have been able to work out through collective bargaining all kinds of schemes, not to solve the technological problem but to cushion it. In some instances it was delayed for 6 months or a year.

A company may be expanding its business, in which instance it might be prevailed upon to delay installation until the workers that would be normally displaced could be absorbed. In other instances we have been able to prevail upon employers to pay dismissal wages and put the workers on a preferential list, and so forth. This statement primarily tries to show how these technological changes may be mitigated through proper collective bargaining in any industry. The wider the bargaining agency is, the better the problems can be worked out.

Acting Chairman WILLIAMS. I was just wondering what your set-up is for that. In case a plant or the management decides to install some new improvement, some new invention, some labor-saving device that you have referred to, do they give the union management notice of that intention?

Mr. RIEVE. They do; yes, sir. In many instances they do.

Acting Chairman WILLIAMS. And then do you go into conferences and a discussion of the merits of the proposed installation?

Mr. RIEVE. That's right. The company notifies the union, providing it is one of our regular unions, and when they notify us we try to check whether it is a real technological change or whether it is just a camouflaged speed-up, which in many instances happens. If it is genuine, we start to negotiate with the company, to go more into the detail of what their plans are, and try to work out the best possible arrangement to mitigate the shock of such displacement. In many instances we cannot do anything about it.

There is one concern that is employing about 20,000 workers. We knew, and we knew for a year, that technological change was coming in that was going to throw out about 2,500 girls. There was little we could do about it.

Acting Chairman WILLIAMS. That is what I wanted to find out. In the last analysis, who has the final say?

Mr. RIEVE. In most instances, arbitration has the final say. If we cannot agree, if we take the position that the change should not go in and management takes the position that it should, we submit the question to arbitration.

Acting Chairman WILLIAMS. Who is the arbitrator?

Mr. RIEVE. Usually an outside person chosen by both parties, sometimes the Mediation Service of the Department of Labor, in some instances the American Arbitration Society. Sometimes we have a named arbitrator.

Acting Chairman WILLIAMS. Is the decision of the arbitrator final?

Mr. RIEVE. Final and binding.

Acting Chairman WILLIAMS. That is bound by contract, and in that case there would be no occasion for a strike if you did not agree. Strikes have not resulted from the disagreement between labor and management with reference to the installation of new devices.

Mr. RIEVE. Too many strikes have resulted in the textile industry from the installation of new technological equipment, but they have not occurred in plants that have collective bargaining with the union. In plants where the union is recognized as the collective-bargaining agency these matters are resolved, if by no other method, by arbitration.

Acting Chairman WILLIAMS. Then, in other words, finally the determination of what is introduced in the way of new improvements in a plant is in the hands of the labor unions where they exist and are effective, and the plant management?

Mr. RIEVE. Yes.

Acting Chairman WILLIAMS. And there isn't any such thing as a disagreement to such an extent that it isn't settled by arbitration; and further, labor difficulty is avoided.

Mr. RIEVE. That's right.

Acting Chairman WILLIAMS. Is that the situation?

Mr. RIEVE. That is right. The union does not interfere—I will put it this way—in management's right to mechanize its plants, to improve the mechanization of its plants. All that the union is trying to do is to protect the worker so that in such changes the burden of that type of mechanization shall not be entirely borne by the worker. In other words, we try to work out something so that the workers who are displaced will be absorbed, or given some dismissal pay, or something of that kind. We try to prevail upon management that if they have plans for expanding within a year or so, they will postpone their installation of the new modernized equipment until they expand, so as to reabsorb in that manner the displaced workers.

But in no instance does the union say to management, "This installation, this invention, you can't have." We are practical enough to realize we can't just stop invention and we probably wouldn't want to stop it if we could.

Acting Chairman WILLIAMS. You try to persuade them and to at least get them to see your viewpoint in the matter, and if you can't do that and they see fit, they go ahead and install it anyway; is that the situation?

Mr. RIEVE. No. When we can't agree on the method of installation we may submit the matter to arbitration.

Acting Chairman WILLIAMS. That is what I understood you to say a while ago, and there is after all no such thing as having a final disagreement on the installation of new appliances in the industry.

Mr. RIEVE. That is right.

Acting Chairman WILLIAMS. In your opinion, have the benefits of technological advance in the reduction of cost of production and increased productivity been properly and equitably adjusted and distributed between the industry, labor, and the public in general?

Mr. RIEVE. I wouldn't say so. I don't think the savings derived from improved productivity in the textile industry have been equitably distributed. I don't think that labor got its share, generally

speaking. I hesitate to say it; I would guess that most of the savings derived have been passed on to the consumer.

Acting Chairman WILLIAMS. Then you feel—and is that just merely a guess, or is that opinion based upon a thorough, rather thorough, investigation of the situation in the textile industry by a man of your experience—that the industry itself has not unduly benefited by reason of these technological improvements?

Mr. RIEVE. The industry as such probably benefited unduly up to about 10 years ago, but I venture to say that in the past 10 years the industry did not benefit unduly as a result of technological changes.

Acting Chairman WILLIAMS. In other words, the income which they have received on their investment, and proper compensation for efficient and skillful management, has not been overpaid?

Mr. RIEVE. Well, of course, when we go into that I wouldn't want to make that statement, because that goes into the very beginning, into the financing of the company. I think that in days gone by, in the 1920's, and so forth, that the industry overcapitalized itself. It put out too much watered stock, and so forth, and I am not prepared to say whether they are earning enough on that type of thing or not. As a matter of fact in the past 10 years I think the woolen industry shows, as an industry, losses and not earnings.

Acting Chairman WILLIAMS. I am rather confining, so far as I am concerned, myself to the last 10 years.

Mr. RIEVE. I will say that the industry has not unduly profited as a result of technological improvements.

MIGRATION OF TEXTILE INDUSTRY

Acting Chairman WILLIAMS. I got the impression from your statement that during the last 10 years there had not been an excessive migration of the textile industry from the East, from New England, and the eastern Atlantic States, to the South.

Mr. RIEVE. That is correct so far as the cotton-textile industry is concerned, but it is not correct as far as other branches of the industry are concerned, such as hosiery, which has had a terrific migration within the last 5 years. The woolen and worsted industry is beginning to move in that direction.

Acting Chairman WILLIAMS. What is the reason for that?

Mr. RIEVE. Lower costs, primarily; lower labor costs, lower taxes, all kinds of attractions that industries are getting from communities and from States.

Mr. PIKE. You have to differentiate a good deal, when you talk about the industry, between the cotton, woolen, and synthetic fibers.

Mr. RIEVE. The industry can be divided into five distinct parts. There are more, but five will cover the principal parts. There is the cotton-textile industry, the woolen and worsted industry, the synthetic-yarn industry, the carpet industry, and the hosiery industry.

Mr. PIKE. And the qualifications are quite different?

Mr. RIEVE. That is right. It does not necessarily follow that the occurrences in one of the divisions of that industry will occur in the other.

Acting Chairman WILLIAMS. Now, taking it as a whole, I understood you to say—I want to see if I am correct about that—that the

number of employees in the industry as a whole had decreased some 5 percent in the last 10 years, or from '27 to '37.

Mr. RIEVE. There has been no change in the number of employees in the industry as a whole since 1919. There are about the same number of people employed today in the industry as were employed in 1919.

Acting Chairman WILLIAMS. Well, now, what about the productive output per unit? I am talking about the industry as a whole, in general.

Mr. RIEVE. It has increased about 25 percent during that period; that is, total production.

Mr. PIKE. That was in pounds, as I remember.

Mr. RIEVE. That's right.

Acting Chairman WILLIAMS. You are using, of course, the same unit of production in both periods.

Mr. RIEVE. That is right.

Acting Chairman WILLIAMS. Which would indicate the extent of increased production. That is only 25 percent? I got the impression it was much larger than that.

Mr. RIEVE. I am sorry I don't have man-hour productivity for the industry as a whole. I have it in the 5 divisions of the industry, if you are interested in that. In the cotton-textile industry production increased 18 percent from 1919 to 1939, but man-hour output increased 84 percent, and man-hour employment dropped 28 percent.

Acting Chairman WILLIAMS. What was the cost per unit, comparatively?

Mr. RIEVE. That would depend entirely upon the fabric that was made.

Acting Chairman WILLIAMS. I mean an over-all picture of it. Have you that?

Mr. RIEVE. There are no figures in the textile industry so that you can make an over-all cost. The cost varies so much, depending upon the fabric, that you can't arrive at that kind of figure.

Acting Chairman WILLIAMS. I understand that there are varying fabrics, but I was wondering whether there are figures available which would show the over-all cost of the entire industry in 1929 as compared with 1939.

Mr. RIEVE. There are no such figures available. I haven't seen any. I don't think the Department of Labor ever prepared those.

Mr. PIKE. You find it difficult to average out between a cotton sheet and a silk stocking?

Dr. LUBIN. You also have the other factor, that the same plant may have two fabrics, upon one of which they are making money, and the other on which they are losing money.

Mr. RIEVE. If you go a little further, you can't compare a cotton sheet with a carpet. You can get the figure for the carpet industry or the cotton-textile industry, but you can't lump the textile industry together and get an over-all cost that way.

Acting Chairman WILLIAMS. Have you got it, then, for the different branches of the industry?

Mr. RIEVE. Yes; we have it for the different branches of the industry.

Acting Chairman WILLIAMS. All right, what is it?

Mr. RIEVE. Man-hour output in the cotton-textile industry—

Acting Chairman WILLIAMS (interposing). I am talking about cost.

Mr. RIEVE. Oh, no, we don't have that.

Acting Chairman WILLIAMS. You seem to think you can get that.

Mr. RIEVE. That probably could be got.

Acting Chairman WILLIAMS. But you haven't it, and that's that.

Dr. LUBIN. I might say that the Federal Trade Commission has some figures on earnings of the various branches of the industry for a series of years starting in 1933, I think. I think they run up to 1937 or '38.

Mr. BARKIN. To '36.

Acting Chairman WILLIAMS. To what extent have you applied through your bargaining agency with industry, some kind of separation allowance in the textile industry?

Mr. RIEVE. To a very, very limited extent. We have it with a very few companies. I think I stated in my presentation that we only have it in three companies. I brought it in as an indication that through legislative methods, or through other means, that type of arrangement ought to be explored further and brought about, to thus cushion—

Acting Chairman WILLIAMS (interposing). What kind of legislative arrangement do you think could be made about that?

Mr. RIEVE. There are several things that could be done. Something could be worked out. As I say, that would have to be studied. As an example, we have social security, by which employers are taxed and workers are taxed, and when a worker reaches 65 years of age he is entitled to unemployment compensation. Why couldn't industry be taxed in the same manner, to set up a fund to pay workers as they are displaced by technological changes? That would be one way. I don't say that it is the proper way. I am just indicating that it is one way to do it. There might be many other ways.

Mr. PIKE. You said, Mr. Rieve, that you had not much trouble in dealing with the prosperous units of this industry, and I take it that means pretty much the synthetic fiber end. Now, I think it is notorious that in the cotton mills there are a great many nonprosperous members, to put it mildly. We have had a great many large mills go out of business and disappear in the last several years, and in circumstances like that it almost always means there are other mills on the edge who just don't have the capital to do things. There has been technological displacement of dollars as well as men. Sometimes that can be painful to the owners of those dollars. But that does make a real problem there.

Mr. RIEVE. That is correct. That is why I stated that if we were to adopt a dismissal wage principle, it must be adopted through governmental agencies and not through individual mills, because if a marginal mill wanted to enter into an agreement with a union that if technological change came they would pay a dismissal wage, I don't know whether I would accept the agreement, because I don't think they could fulfill it when the time came.

Mr. PIKE. That is one of the things I am driving at. A fairly good indication is the price of mill shares, and you see very frequently where the total selling price of the mill, multiplying the number of shares by the price of the share, is less than their net current assets on hand, allowing nothing at all for mills and ma-

chinery. You remember probably a dozen of those in the last several years, so that on the face of it it would be profitable for the mill to close up shop, liquidate its current assets and quit, and one might think a mill management might always have that under consideration, and a new consideration might turn their decision either way. It is a very difficult situation for all concerned. I think you recognize that. And with this very competitive industry, one person who is profitable can do it, this other fellow who is on the ragged edge won't or can't do it unless he is compelled to.

Mr. RIEVE. It cannot be done voluntarily. It has to be done by action of some governmental agency.

Acting Chairman WILLIAMS. I noticed you discussed to some extent the question of skilled labor being supplanted by unskilled labor. Is that the situation generally? Is that the trend?

DIVISION OF LABOR IN TEXTILE PLANTS

Mr. RIEVE. The trend is to separate the skilled worker in the textile mills. In days gone by he performed various tasks. It didn't necessarily follow that every minute of his time was consumed on a skilled task. Probably the bulk of his time was consumed on skilled tasks, but he was also doing some unskilled work. The tendency now is to separate that. As an illustration let me take a weave shift. A weaver in days gone by operated, say, 4 or 5 looms, and he would tie the cloth on the bobbins, yarn, and all these operations. Today he is not doing that. He is only weaving, and they have battery hands who do the other tasks, and the result is that the weaver, instead of taking care of 4 or 5 looms, is taking care of 50 or 60, and, in one or two instances we know, of 120 looms.

Acting Chairman WILLIAMS. Let me ask you this. Has the technological improvement in the textile industry changed the nature and character of the skilled workman to such an extent that a man who formerly would be considered a skilled workman in his particular line, by reason of these improvements, was not fit, and didn't have the skill to carry on under the improvements, and in that way displaced many of the skilled workers?

Mr. RIEVE. That is correct, very much so.

It necessarily follows, as I explained in the weaving shed, that there were many improvements on that loom. The weaver was able to take care of more looms because he confined his activities entirely to skill, and unskilled people came in and did the other work. That means that other skilled weavers were laid off.

Now, you have other technological changes, such as in the woolen industry, where you still have the old mule spinning system that is being replaced by a new system where the spinner, a skilled operator is being displaced by a woman.

Acting Chairman WILLIAMS. I don't believe that is the idea that I had, as I understand you. We have had evidence here, for instance in the steel industry, of the old hand roller mill skills. When they introduced the strip-mill process, while the old worker, the former employee, was skilled in his line of work, the inauguration of the new machine made him entirely an unskilled worker so far as managing that machine was concerned, and he was out entirely. He could not continue at all, because while he was skilled under the original process

when it was supplanted by an entirely new process his skill was gone, and he was out.

Mr. RIEVE. Well, that is true in some instances, as in the instance that I described between the mule spinner and the ring spinner. A mule-spinner operation was an operation that was entirely operated by males. Now a new operation came in. It is also called spinning, but that operation is entirely different in character from the other one, much simpler, and the result of it is that women are employed in that operation, and the mule spinner is out of a job.

Now, I wouldn't take the position that the mule spinner could not become a ring spinner. Probably he could. I would question, however, whether he could become as efficient as a girl can be on that job. So he is entirely out.

Dr. LUBIN. Mr. Rieve, as you went through your material I was impressed by the fact that there were four factors operating in the industry, and I wonder if we could stop them. In the first place, we are creating unemployment by mills moving away. As you say, communities make offers of free taxes and subsidize the cost of building the mills, and mills move away from a certain part of the country and go into a new section. I take it that that movement has nothing to do, or little to do, with technological change. It is a question of costs; you can get cheaper labor some place else, somebody puts up the mill.

Mr. RIEVE. I think it is somewhat accelerated by technological changes.

Dr. LUBIN. But the movement itself could take place without any technological changes.

Mr. RIEVE. Yes; it could.

Dr. LUBIN. Secondly, speed-up. In other words, there is evidence to the effect that certain mills have increased productivity without changing their machinery, but by speeding up the operation.

Mr. RIEVE. That is right.

Dr. LUBIN. And, thirdly, you have what might be considered technological change, in the sense of better organization of the plant, which eliminates certain wasteful practices, and, finally, you have machinery. Which of these are the most important, and which can we expect to play the greatest part in the immediate future? In other words, can we break those four factors down and measure the extent to which each is responsible for unemployment?

Mr. RIEVE. Well, of course, any prediction for the future would be a guess. I would say that probably the greatest amount of unemployment is caused by the physical layout of the mill, improved operations through rearrangement of processes, and so forth, secondly, probably by machines, unless something new and revolutionary happens that is not now in the making.

Dr. LUBIN. There have been no revolutionary changes in the industry during the last 10 years?

Mr. RIEVE. No; new things are coming in, but I wouldn't call them revolutionary. They are speedier, and so forth.

Dr. LUBIN. Would you say that the bulk of this—

Mr. RIEVE (interposing). Only in the rayon industry. When you talk about the synthetic rayon industry—

Dr. LUBIN. That is an entirely different situation. Would you still think that as far as cotton and wool are concerned that machinery would be the second factor?

Mr. RIEVE. In wool, especially in wool.

Dr. LUBIN. What effect is the nylon development going to have upon the hosiery industry; that is, employment in the manufacture of silk hosiery?

Mr. RIEVE. First I think we will have to find out what nylon really will be. There has been considerable in the public press. I do not think that it will have an effect on the hosiery industry as such, but it will have on the throwing industry, the silk throwing industry; all that equipment will become obsolete and will have to be scrapped. You cannot use silk throwing equipment for synthetic yarns. The hosiery machine can be used for nylon. It is claimed that the nylon will wear longer. If that is true, probably to that extent sales will be curtailed, but outside of that I don't anticipate any difficulty in that industry as a result of nylon development.

Dr. LUBIN. Following up this whole question of displacement, you state in your brief that the number of spindles has been very markedly cut down and yet the output of the industry has gone up. I take it that increased output is the result of using synthetic yarns in mixture with cotton.

Mr. RIEVE. That is one, and also as the result of shifts; the remaining spindles are used two and three shifts as against one shift up to about 7 or 8 years ago.

Dr. LUBIN. But that would increase the man-hours of employment proportionately, wouldn't it?

Mr. RIEVE. No; but it would the spindle hours.

Dr. LUBIN. It is a question of spindle-hour increase?

Mr. RIEVE. And there is more productivity in spinning equipment. The new spinning equipment is much more productive. As a matter of fact, the only appreciable technological changes that the cotton industry made in the last few years were in the spinning departments.

Mr. CHANTLAND. Is there a difference of pay rate on the different shifts?

Mr. RIEVE. No. In the bulk of the cotton industry the pay rate is too little whatever it is.

Mr. CHANTLAND. Whether it is the night shift or day shift?

Mr. RIEVE. Whether it is the night shift or day shift. Some individual concerns may pay slightly more on the third shift, but it is not a factor in the industry.

Mr. PIKE. You mentioned in your statement the fatigue factor, which I presume still shows up in several places in the textile industry. Of course, that must be getting reduced pretty well to a minimum with the short hours, isn't it, now, or do you still find that is a considerable factor?

Mr. RIEVE. Oh, it is a factor, because no man or woman can work, even assuming that there is a lunch period, on an 8-hour employment day 4 hours without some rest period. The fatigue question is not as important an item on an 8-hour workday as it would be on a 10- or 12-hour day, but it is still a factor.

Mr. PIKE. Most of that work, or a great deal of it, requires close mental attention rather than hard physical work, doesn't it?

Mr. RIEVE. That is right; it is tedious work.

Mr. PIKE. Waiting for a break?

Mr. RIEVE. Most of it is walking, these days. In the weaving room the man who is patrolling just keeps on patrolling. It is so

mechanized that he gets tired from walking; at least, he walks probably as much as a policeman on a beat. The only difference is the policeman walks in fresh air while he is walking inside a factory.

Mr. PIKE. Sometimes the policeman would be willing to swap, I think.

Mr. RIEVE. I suppose, sometimes.

Acting Chairman WILLIAMS. Did I understand you to say there were 1,250,000 employed?

Mr. RIEVE. That is right, in all the divisions of the textile industry.

Acting Chairman WILLIAMS. How is that divided, approximately, between men and women?

Mr. RIEVE. I don't have the figures. It would be just a guess as far as men and women are concerned. I would say about 50-50.

Acting Chairman WILLIAMS. Has there been a tendency to employ one or the other more in the last 10 years?

Mr. RIEVE. Yes; the tendency has been right along in the direction of more women.

Mr. PIKE. What percentage are organized of that 1,250,000?

Mr. RIEVE. We have, as I stated, 350,000.

Mr. PIKE. And the total amount organized wouldn't be very much in excess of that? Would it run 450,000?

Mr. RIEVE. I wouldn't even claim that. I don't think it necessarily follows because we have 350,000 workers covered by collective bargaining contracts that we claim we have that big a membership; because we act as the sole collective bargaining agency it doesn't necessarily follow that all of the people are members of the union.

Mr. PIKE. Would you say it would be more than a quarter and less than a half?

Mr. RIEVE. Oh, it is less than half; I wouldn't claim more than a quarter.

Dr. ANDERSON. Mr. Rieve, a quarter of the workers of the industry are fully covered by agreements?

Mr. RIEVE. Yes; about 350,000 covered by agreements.

EFFECT OF UNIONIZATION ON PRODUCTION COSTS

Dr. ANDERSON. What are the possibilities of price competition between union and nonunion plants in an industry so keenly competitive, and where only a quarter of the workers are covered by agreements?

Mr. RIEVE. I think the possibilities are very good because we are not foolish enough, even though we have the shop organized, to make exorbitant demands of the employer if his competitors are not organized.

Dr. ANDERSON. In other words, the advantages that the unorganized plants have in regard to technological change are not so great but that you can compete with them?

Mr. RIEVE. That is right, that is right. The union shops, just as well as the nonunion shops, are putting in technological improvements if they have the money to do it.

Dr. ANDERSON. How far are technological advance, and the other problems of this rather sick textile industry, related to market expansion itself, to increased sale of goods?

Mr. RIEVE. Well, I don't know. The sale of textiles has been mounting for the last few years. Where the limit of it is I don't know. I suppose that technological improvements, mill lay-outs, and so forth, have had a tendency toward broadening the market. I suppose that because of the tendency to sell cheaper, more people are buying textiles, but to what extent I cannot say.

Dr. ANDERSON. Do you think that is the hope for the solution of the problem—a greatly expanded consuming market which will absorb the workers not now used?

Mr. RIEVE. I think that is one way of approaching the problem, if we devise some means of giving the consumer the purchasing power necessary to absorb these goods, but I wouldn't say that that alone will solve the whole problem.

Dr. ANDERSON. Given present market trends, and the present 1,250,000 workers in the field, is there any prospect that the textile industry will absorb the workers not now employed?

Mr. RIEVE. No, not in my opinion, unless the European war continues and we start to buy textiles in this country. Not under normal processes, no.

Dr. ANDERSON. Is the problem of child labor still a serious problem in the textile field?

Mr. RIEVE. Not since the wage-and-hour law passed. The wage-and-hour law has in itself a provision that no children under 16 years of age be employed.

Dr. ANDERSON. Was there a shift then to children above 16?

Mr. RIEVE. Yes.

Dr. ANDERSON. So that you did accent that problem?

Mr. RIEVE. Yes.

Dr. ANDERSON. What is the reason for the increased use of these youngsters from 16, say, to 20? Is it linked with technology?

Mr. RIEVE. No; I would say it was linked with wages more than technology.

Dr. ANDERSON. But the industry is such that youngsters of those ages can perform the necessary operations?

Mr. RIEVE. Yes; some operations. Of course, when a new technological process comes in, an employer would rather teach youngsters that process than to retrain older people, for two reasons. It has to be admitted, I think, that a young person, never knowing an operation, can probably learn given operation much quicker than an older person who has been trained in another operation, because the older person has to be untrained, and the new one does not. Secondly, the hope is that after that younger person acquires the necessary skills or routines the employer will have a longer period of use out of that person than out of an older one. Therefore, in new processes the employer tends to train new people for these processes rather than retain the older ones.

Mr. CHANTLAND. I thought you answered the chairman when you were talking about the tendency toward unskilled workers, by telling him that the technological situation by which a man could supervise as many as 100 or more machines let them hire these boys that Dr. Anderson was inquiring about in unskilled positions. That is technology, isn't it?

Mr. RIEVE. Yes.

Mr. CHANTLAND. Which position do you want to take? I thought your answer to Dr. Anderson was that technology had nothing to do with hiring these 16- or 20-year-old boys.

Mr. RIEVE. I don't think that either my answer to the Chair or to Mr. Anderson is contradictory. What I said about these weavers who control as high as 100 looms is that that is not a changed technology.

Mr. CHANTLAND. Isn't it?

Mr. RIEVE. No; that is a changed process; they use their experienced men but fewer of them. They don't have to retrain these people.

Mr. CHANTLAND. You mean that it isn't technology that gives a man the power to supervise so many as against so few?

Mr. RIEVE. It is not technology in the sense of some new, radical, revolutionary invention that comes in. It is only technology to the extent that a separation took place between the skilled operations and the unskilled operations.

Mr. CHANTLAND. Apparently we don't agree on where technology begins and leaves off.

Mr. RIEVE. We may not talk the same language.

Mr. CHANTLAND. May I ask one more question if I am not interrupting? You said "customarily he has taken to the only weapon of protest that he has—the strike." How can there be any reasonable probability of improving the position of the laborer by a strike in a decreasing labor market such as you described?

Mr. RIEVE. I did not say that that was the right thing to do. I gave a statement of fact, that that is what happened. It wasn't the proper way to approach the problem. It did not improve the welfare of the textile worker.

Dr. LUBIN. Mr. Rieve, you mentioned something about speed-up, and you probably are still very conscious of the terminology that was used in the early 1930's about the load. What has the union done to handle that problem? How does the union take care of these tendencies toward speed-up?

Mr. RIEVE. I don't know, Dr. Lubin, that I entirely follow your question.

Dr. LUBIN. There was a tremendous amount of discussion about the load that each worker had to carry in the textile industry in the early 1930's. The matter of fact is that you state one of the reasons for the strike in 1934 was that the speed-up system had been put in effect as the result of the shortening of hours.

Mr. RIEVE. We are trying to make the worker think a little different from what he had formerly been thinking. I think to a very limited extent we are succeeding. We do not subscribe to the theory that as a result of a technological improvement the remaining worker necessarily works harder; he may, but it does not necessarily follow that he does. We are rather trying to get the worker to forget about this type of terminology and this type of psychology and try to think in terms of how he is going to protect the job for the people that are being replaced. I think we are succeeding remarkably well in that direction. That is about all that has been done in that. Wherever we have contractual relations, when a work assignment is put in effect, we send our own engineers, our own time-study men, in

to find out whether it is a regular speed-up, or whether something in the processes is being changed.

Dr. LUBIN. There is one thing that interested me about your testimony that raises a question as to whether this is a permanent phenomenon, or whether it is temporary. After all, the textile industry is a very old industry. It is an industry which has been criticized very frequently because of the fact that it has been old-fashioned in the sense that there have been many, many mills in this country that are still operating with equipment that was installed in the nineties. In fact, I think an engineering study made some years ago showed a tremendous number of firms with equipment more than 30 years old. How far has the competitive situation that has arisen in recent years forced these mills to be modernized? Once that modernization is completed will that mean that the rate at which displacement takes place will tend to fall?

Mr. RIEVE. I think that the casualties in one form or another in these mills that you describe have been terrific lately. I think that probably the cotton-textile industry by and large today is modernizing itself. There probably are some mills that have this 30-year-old equipment, but they probably are very few and far between, because the competitive situation would not permit that to continue.

Mr. PIKE. They, in general, have been forced out of business rather than modernized?

Mr. RIEVE. Well, some have had to put in new capital and modernize, and others have had to pass out of existence. I would rather say that the number that put in new capital is probably less than the number that passed out of existence.

Dr. LUBIN. Does that mean, then, that the rate of change will tend to decline because these mills have done most of their modernizing?

Mr. RIEVE. No; I wouldn't say so, Dr. Lubin. In the cotton-textile industry today the equipment is not so much being modernized as the mill is being systematized and more and better fibers are being used. Put it this way: When they made silk the weaver operated probably 4 or 6 looms; in synthetic yarn the operator is operating as high as 25 and 30 in many instances, partly because of improvement in the loom, but also in great part because synthetic yarn runs better, there are fewer breaks, and so on, than cotton. This type of change is more predominant in the cotton-textile industry today than the real mechanical changes.

PROSPECTS FOR INCREASED EMPLOYMENT

Dr. ANDERSON. Your industry is particularly subject to it. We would like your comment on this subject of ghost towns, to which your industry is particularly subject. You say a cotton-textile plant is frequently the single industry in a town. What is the prospect of ghost towns in the future in your industry?

Mr. RIEVE. The prospect in the textile industry is an increased number of ghost towns.

Dr. ANDERSON. Do you have any figures or any indication of what that looks like?

Mr. RIEVE. Well, I don't have exact figures. The American Woolen Co., for example, at one time had about 55 mills scattered throughout the country, most of them in very small communities, and now has

about 22 or 23, or something like that. They announced last week that they were closing up a mill in a small one-mill town in New Hampshire. That means that that community is going to be another ghost town. The prospects are increasing in that direction.

Dr. ANDERSON. Do you, as the union representative, have any suggestion to make to the committee as to what should be done with respect to the social assets of these towns and the prospects for the future?

Mr. RIEVE. I think that one thing can be done. I believe that, first, we will have to adopt a more uniform taxation system in this country. When I say taxation I mean in all of its forms. I think that any State or any community that indebts itself in order to put up buildings and attract industry is robbing something from another community that has those mills.

Mr. PIKE. Do you feel the same way about wage differentials?

Mr. RIEVE. I certainly do, I certainly do.

Mr. PIKE. Do you still have the problem of a rather different form of town, that is the out-and-out company town which was built for the company and has been a source of a lot of trouble in your industry and some others? That is not as serious, I take it, as it was.

Mr. RIEVE. It is not as serious as it used to be. The company town is tending to disappear. If the Housing Authority—and they can do a very good job in these company towns—would get around there and build a few Government houses the company town would disappear over night.

Mr. PIKE. But you don't have that problem of there being only one store in the town?

Mr. RIEVE. Oh, yes; it is still there, it is still acute, and union organizers are still kidnaped and thrown out of towns. It is still there, but I am rather inclined to believe that it is not quite as acute as it was. It is declining in importance.

Mr. PIKE. That would be my general view.

Mr. RIEVE. But it is still there.

Acting Chairman WILLIAMS. Are you through with Mr. Rieve?

Dr. ANDERSON. Yes, sir.

Acting Chairman WILLIAMS. Thank you very much for your appearance. We have enjoyed your presentation. It is very useful to us.

What have you for this afternoon?

Dr. ANDERSON. We have the management side of the same problem, Mr. G. H. Conze, president of the Susquehanna Silk Mills.

Acting Chairman WILLIAMS. The committee will recess until 2:30. (Whereupon, at 12:45 p. m. the committee recessed until 2:30 p. m. of the same day.)

AFTERNOON SESSION

The hearing was resumed at 2:40 o'clock, upon the expiration of the recess, Mr. Joseph J. O'Connell presiding.

Dr. ANDERSON. Mr. Chairman, this morning we had a witness who discussed the textile industry from the standpoint of labor. This afternoon we are to hear Mr. G. H. Conze, president of the Susquehanna Silk Mills, of New York City, and Miss I. L. Blunt, secretary

of the National Federation of Textiles. They are ready to be sworn and to testify.

Acting Chairman O'CONNELL. Are both of these people to testify?

Dr. ANDERSON. Yes.

Acting Chairman O'CONNELL. Do each of you solemnly swear that the testimony that you are about to give in this proceeding will be the truth, the whole truth, and nothing but the truth, so help you God?

Mr. CONZE. I do.

Miss BLUNT. I do.

TESTIMONY OF G. R. CONZE, PRESIDENT, SUSQUEHANNA SILK MILLS, NEW YORK, N. Y., AND MISS I. L. BLUNT, SECRETARY, NATIONAL FEDERATION OF TEXTILES, NEW YORK, N. Y.

Dr. ANDERSON. Mr. Conze, you are president of the Susquehanna Silk Mills?

Mr. CONZE. I am.

Dr. ANDERSON. What is the nature of that mill?

Mr. CONZE. It used to be silk weaving; recently rayon weaving.

Dr. ANDERSON. How long have you been identified with the textile industry?

Mr. CONZE. I began 30 years ago.

Dr. ANDERSON. In this country?

Mr. CONZE. Yes.

Dr. ANDERSON. In that time have your operations extended to other than the silk field?

Mr. CONZE. No; only the silk field, and the rayon field later.

Dr. ANDERSON. And it is in the rayon and silk field that much of the change which we have been discussing has taken place?

Mr. CONZE. That is correct.

Dr. ANDERSON. And you are prepared to discuss what has occurred?

Mr. CONZE. Yes.

As in many other industries, technological development in the textile industry has meant the supplying of its products at lower cost to the public, and expansion of the industry's activity for management and worker alike. But in considering the effects of such changes on the stabilization of employment, and, equally important, the stabilization of business investment as the incentive for greater industrial development, we have seen both a bright and dark picture in the last decade. The principal tools used in effecting the change have been the introduction of so-called man-made fibers and the perfecting of the automatic machinery that could use those fibers in finer fabrics at lower cost of production. These changes have proven a boon to the consuming public in that they have brought within the reach of the modest pocketbook fabrics of luxurious appearance and excellent durability. They have also proved a boon to the workers in the new rayon yarn plants and have meant increased employment in the textile machinery establishments. But some of the long-range benefits are lost sight of in concern over the future of mill owners and workers whose income has been disrupted and whose future working life has been already killed or seriously threatened. Prominent in this group are the people whose life work was invested or being spent in the plants of the fabric-weaving industry formerly using silk for its raw material.

SHIFT FROM SILK TO RAYON

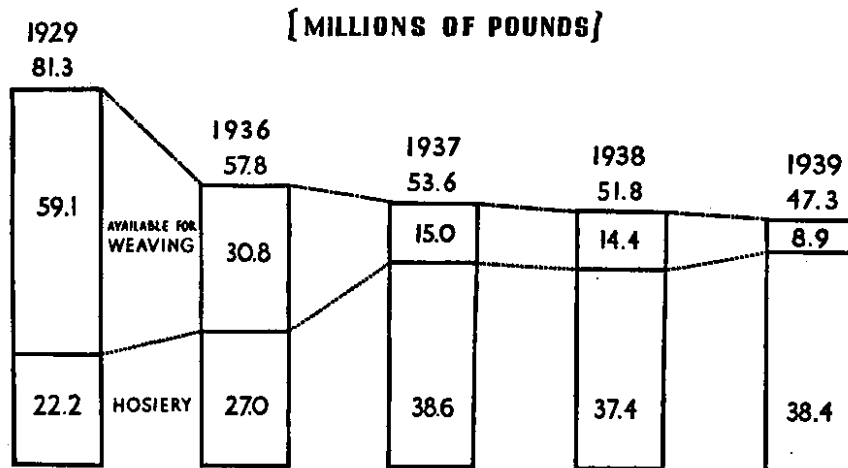
Mr. CONZE. Today, to all intents and purposes, the silk-weaving industry no longer exists. The fabric-weaving industry uses only a very small percentage of the silk imported into this country, as you will see from "Exhibit No. 2628," a chart showing the distribution of silk between the two principal consuming industries, weaving and the knitting of hosiery.

Acting Chairman O'CONNELL. The exhibit may be received. (The chart referred to was marked "Exhibit No. 2628" and appears below.)

EXHIBIT No. 2628

[Submitted by the National Federation of Textiles, Inc.]

**DISTRIBUTION OF SILK
BY TRADES**



SOURCE: RAYON ORGANON

You see on this chart that in 1929, 81,300,000 pounds of raw silk were imported into this country, of which 59,100,000 were used for weaving. At that time 22,200,000 pounds were used for hosiery and you see how the weaving share has progressively decreased and the hosiery share has increased, so that for the year 1939, while the total of silk used dropped to 47,300,000, weaving used only 8,900,000, hosiery 38,400,000. I might say that for 1940, I am positive the weaving will be less than last year.

It is the latter field, the hosiery field, which today can be more properly described as the silk industry, and even there a new man-made fiber, nylon, looms ominously over the figure of silk.

Because of my long association with silk-weaving mills, I have been asked to describe to you, as a matter of interest in considering

the effects of technological change, what has happened to this group of mills which in 1927, according to the census of manufacturers, had 1,648 establishments employing 127,643 wage earners, with an annual pay roll of \$140,054,000. It was located principally in Pennsylvania, New Jersey, and in the New England districts. Today, the industry has changed so in character that the 1937 census combines the figures for silk and rayon, and we are only part of a large group making rayon fabrics.

Dr. ANDERSON. May I interrupt to call the committee's attention to the fact that the charts are in large form on the easel.

Mr. CONZE. This group comprises now three types of mills: 1. Former cotton mills which reorganized for rayon weaving. 2. New mills organized solely for rayon weaving. 3. Former silk mills which adjusted their existing equipment to rayon weaving.

As some indication of what has happened in 10 years, we find that the 1937 figures show that the combined establishments of these three groups total only 848, about half the 1927 figure; that the wage earners are now 116,839, a reduction of 10.5 percent; and the total pay rolls are \$92,440,000, a reduction of 34 percent. And it should be remembered that this latter figure includes substantial increases in wage rates for the lower paid workers following the N. R. A. The amount of the reduction reflects the limited amount of work available for many workers. And it is the workers in the silk mills who represent a large part of this part-time or no-time activity.

From the economic point of view, our problem might be described as the difficulty of coordinating the most economical methods of production with the distribution methods most acceptable to all our consuming trades, starting with the retailer. In the textile industry, the maximum efficiency of a loom is a production schedule which will bring the fabric to its lowest unit cost. Such a schedule calls for the latest type of automatic looms operating on a continuous basis, that is, 24 hours a day every workday of the year. The manufacturer who wants to make the most of his machinery and give his workers steady employment must follow such a schedule. In contrast to this, consumers and wholesale purchasers of textiles follow a policy of close hand-to-mouth buying at most irregular intervals, dictated by season or style changes. This can mean only that any producer of style merchandise finds stability impossible. The necessity of making merchandise to fit in with these seasonal and style changes is likely to wreak havoc with any plan of the fabric manufacturer for stability in operation and employment.

The group of mills with which I am most familiar is engaged in a life-and-death struggle to reconcile these two divergent elements. It is a struggle shared by labor and management. To make the circumstances more understandable, consider the background of the so-called silk industry in the United States.

Up to the 1860's silk manufacturing was confined to crude experiments in the making of silk thread, silk handkerchiefs, and so forth, but cloth was still an import. But the development in Europe of the power loom for weaving silk cloth heralded the beginning of the real American-silk industry. The handicap of few skilled workmen was overcome. For the teaching of new workers, the industry was indebted to a large group of experienced English weavers who emi-

grated to America as a result of the closing down of the British silk industry. Following a reciprocal trade treaty between Great Britain and France, all duties on manufactured silk entering Great Britain were removed, and the result crippled the English mills. The emigrés settled largely in Paterson, N. J., and it was here that the first weaving mills were started on a large scale.

Rapidly the industry grew through the last part of the nineteenth century and the first two decades of the twentieth century. Improvements in some of the preparatory machinery, in the process termed "throwing" (an old Anglo-Saxon term meaning to twist), enabled the New Jersey weavers to move to new territories where unskilled operators could be used at a lower labor cost. The silk-throwing mills appeared in many villages and hamlets in the coal-mining regions of Pennsylvania to give employment to the women folk of the miners. Operation of this machinery provided light work that women could do efficiently.

That period was the prologue for a fabulous period of prosperity, and demand for silk fabrics, that followed the World War. Silk became the everyday dress of the average woman. The ready-to-wear manufacturing industry began to take hold, with its consumption of thousands of pieces of 60 yards each, instead of the few hundred yards that the average retail store could handle. "More and more machinery," was the cry. Every effort was made to speed up the loom action; new plants were built rapidly. Prices for the finished fabrics were whatever the manufacturer wanted to ask. A new development took place with the advent of crepe-twisting machinery, that is, the twisting of several single threads of silk into a tight twist to produce an effect of creping in the fabrics. This brought with it the development of a fabric that must be woven directly from the raw threads, without previous dyeing. We term such fabrics "piece dyed," meaning the fabrics are dyed in the piece rather than in the skein. It was the introduction of piece-dyed fabrics, or, rather, the weaving of fabrics in the "greige" or natural silk thread, that was at first the fortune and then the handicap of the industry. Previously, silk fabrics were woven from dyed yarn or "skein." Skein-dyed silks cannot be turned out hurriedly, and it is a complicated procedure. Piece-dyed fabrics, on the contrary, can be turned out quickly and steadily and kept in stock until ready for dyeing into popular colors of the moment. It was about this time that many mills began to realize that continuous operation of the machines would lower the unit cost of the product, as the overhead could be shared by that much more yardage. The result was year-by-year increase in production.

As profits were substantial, because of high demand for silk fabrics in this era, there was additional inducement to continue producing at a high peak. This hectic period was abetted by the introduction of new processes that permitted the weighting of silk fabrics so that the same amount of raw material would go farther in producing a yard of fabric. The weighting of silk involves the soaking of the silk thread in a solution that, through some characteristic of the silk thread, is absorbed into the fiber and can make the thread increase its normal size. As raw-material cost in a silk-manufacturing plant is a very important factor, the evolution of successful weighting of material was another big step in reducing costs and making silk fabrics avail-

able to more people of lower incomes. Huge plants were established, and there seemed no end to the demand for the merchandise.

But here and there, doubts were expressed. A group of manufacturers in their trade association, the Silk Association of America, Inc., discussed in 1922 the formation of a statistical reporting service on production and sales so as to get some idea of the stock on hand. As indicative of the times, one of the difficulties in establishing the service was to secure figures from some firms on the amount of their sales. It could be expressed only in dollars; records were not kept of yardages. The only yardage record was production and, once a year, inventory. Sales records were a minor consideration in the industry's plan of operation except to boast of increased dollar volume. Inventory control, or the idea of gauging production to demand, was unheard of.

But in the next 5 years increasing concern was felt about the burdensome stocks of fabrics on hand. Idle machinery became more common. Competition was being felt from small operators who had bought at very low prices looms discarded by the larger manufacturers as new models appeared.

By 1927 appeared a new factor, the rising development of a new fiber originally termed "artificial silk," subsequently given the generic name "rayon" and destined to do exactly what its inventor, Chardonnet, dreamed it would do—supplant the natural thread of the silk cocoon. And following rayon came another problem, the growth of the automatic loom.

INTRODUCTION OF AUTOMATIC LOOMS

Automatic looms were being used to a small extent in the silk industry. They made it possible to give 6 to 8 looms to a weaver instead of the customary 2 and 4 nonautomatic looms. But when the same looms were used on rayon, the loom assignment could be doubled. The reason is that rayon yarn is made with chemical and mechanical precision, which permits more rapid and smoother running than silk. The unit cost of a yard of goods was reduced to some extent, but the real reduction of costs has been made through the improvement in the automatic rayon looms built within the last 10 years. Loom improvement and greater speed, combined with greater perfection of rayon yarn in uniformity and strength, has meant an increase of the looms per worker from 24 to 36 and more. Nor has loom improvement reached its peak. In some cases looms manufactured in 1937 and considered extremely modern are being offered for sale at half price by used-machinery dealers today. Three or four years from now the looms rated today as the last word in weaving ingenuity will be as out of date as the nonautomatic looms of yesterday are now.

A recent case was reported to me of a rayon-weaving mill in New England, formerly a cotton mill, which today has 320 modern looms cared for by 8 weavers, 2 loom fixers, and 2 bobbin hands, a total of 12 men for each shift. Ten years ago 320 looms of that time would have required at least 40 weavers and 6 loom fixers, a total of 46 men for each shift. As significant of the change in the manpower required to produce a given amount of merchandise, consider the comparison

of yards produced to wage earners, based on data from the United States Census of Manufacturers.

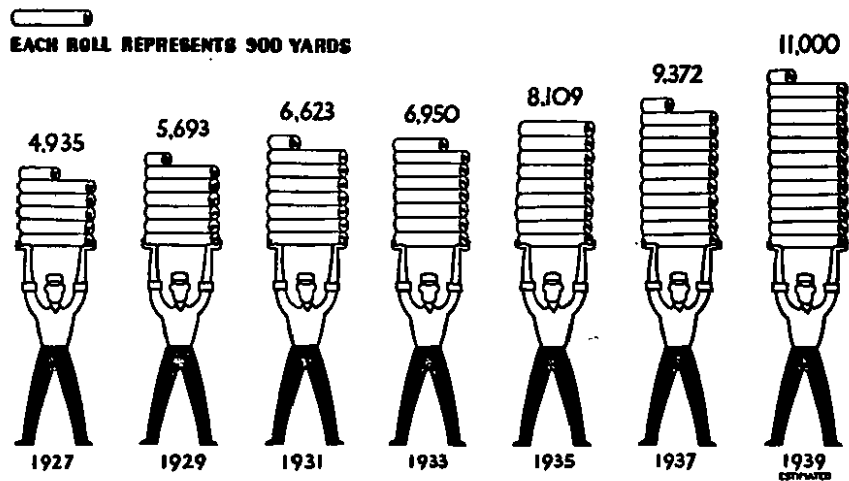
You see there that, from 1927 on, the output per worker has more than doubled, and I am quite positive that this tendency is going on. As the old looms disappear, the output per worker will show a rising curve, as it has right along over the last few years.

(The chart referred to was marked "Exhibit No. 2629" and appears below.)

EXHIBIT No. 2629

[Submitted by the National Federation of Textiles, Inc.]

PRODUCTION OF SILK & RAYON WOVEN GOODS PER WAGE EARNER [AVERAGE FOR YEAR]



SOURCE: CENSUS OF MANUFACTURES

CHART NO. 2

Mr. CONZE. This new textile fiber, the first in all the centuries since the discovery of cotton, wool, and silk, the product of man's research and ingenuity, has carried on the job begun when silk first became the luxury of the multitude, and has far outshone her older cousins. Rayon has been termed the "great common denominator" of the textile industry, for today it is found in the cotton, silk, and wool mills to a greater or lesser degree. It has provided men, women, and children with attractive clothing at the lowest prices ever seen, and has supplied luxurious draperies, bedspreads, and other household articles that would have been considered the sign of ostentatious wealth a few years ago, at a price within the reach of the most moderate.

The use of rayon on highly efficient machinery has advanced to undreamed-of heights during the past decade. The census figures show a clear picture of what has happened. "Exhibit No. 2630" shows

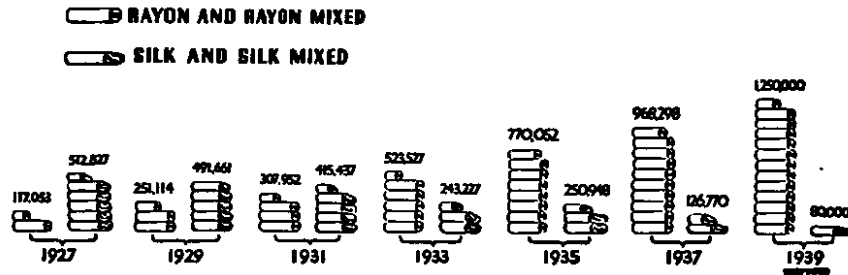
that in 1929 the combined production of rayon and silk woven goods was 742,775,000 yards. In 1939, this had grown to 1,330,000,000.

(The chart referred to was marked "Exhibit No. 2630" and appears below.)

EXHIBIT No. 2630

[Submitted by the National Federation of Textiles, Inc.]

PRODUCTION OF WOVEN GOODS (THOUSANDS OF YARDS)



SOURCE: BUREAU OF MANUFACTURES

CHART NO. 3

Mr. CONZE. The significant fact is that the 1929 production of rayon or rayon-mixed fabrics was 251,115,000 yards and the 1939 production 1,250,000,000. Silk, on the contrary, showed in 1929 a production of 491,661,000 yards and in 1939 only 80,000,000. In the case of rayon, production increased in 10 years, 397.8 percent. In the case of silk, there was a decrease of 83.7 percent. The production record of the two fibers in cloth is shown in "Exhibit No. 2630." I am positive that in the current year rayon will increase and silk will drop materially.

The first rayon fabrics were woven in a silk plant in 1914. The silk mill was the normal place for the development and use of rayon. By the time the National Industrial Recovery Act was enacted, in 1933, many of the former silk manufacturers had turned to rayon for all or a major part of their production. From the viewpoint of convenience in use, rayon offers many advantages over silk. Silk is the natural fiber of the cocoon. It is subject to all the vagaries of any natural product. It must be carefully and painstakingly handled if the resulting fabric is to pass the critical eye of the consumer. All of the fiber is purchased abroad either directly or through agents in this country, and commitments were usually made for months in advance. Constant fluctuation in price of raw material is another of the hazards that makes silk manufacturing a precarious business compared with plants engaged in other fiber processing. Rayon on the other hand is most uniform in size, strength, evenness, and so forth. Because it is made by a limited number of producers it shows a fair

stability in price. In fact, rayon has shown a price structure typical of large industries in this country, like automobiles, where the greater the production the lower the cost. To the silk manufacturer, a steady supply of raw material at low cost and steady price presented an entirely new picture of production planning than had been the case in silk.

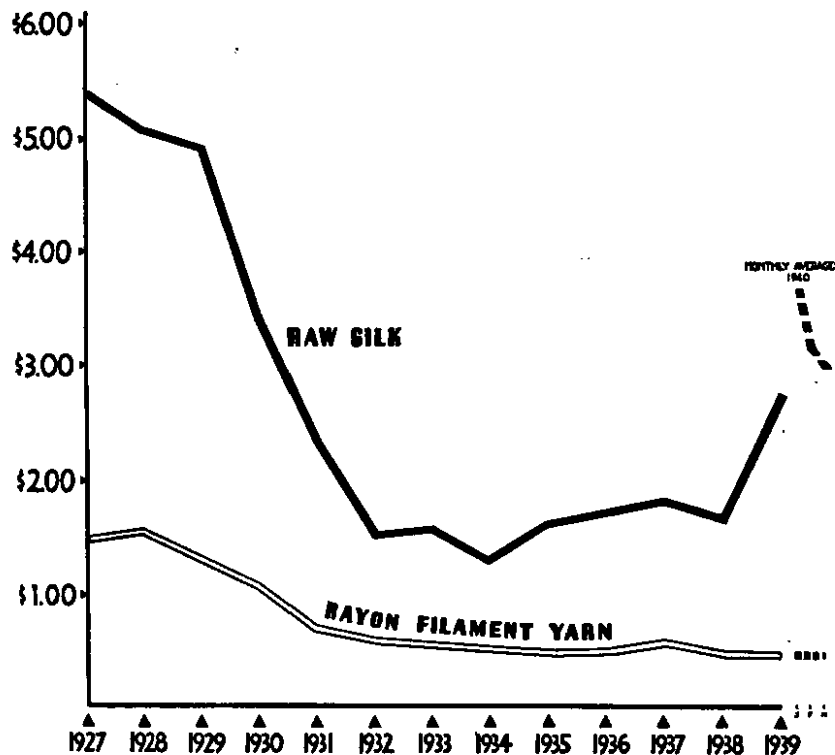
The next chart will show you the contrast between silk and rayon prices over the last 13 years. You find there that silk dropped from \$5.50 in 1927, touched \$1 in 1934, went back to over \$4 this winter, and has dropped to \$2.50 now.

(The chart referred to was marked "Exhibit No. 2631" and appears below.)

EXHIBIT No. 2631

[Submitted by the National Federation of Textiles, Inc.]

SPOT SILK AND RAYON PRICES YEARLY AVERAGES



Source: Rayon Organon

Chart No. 4

Acting Chairman O'CONNELL. I understand you attribute the relative stability of price of rayon to the fact that there are few producers in the field, few large units?

Mr. CONZE. Few very large units.

Acting Chairman O'CONNELL. And in the silk industry you have a multitude of small establishments, or have had.

Mr. CONZE. Raw silk is a product of the farmer. It is reeled in Japan and is in the hands of a multitude of small farmers, and is subject to speculation or trading on exchanges in Japan.

Acting Chairman O'CONNELL. The instability is to a substantial extent in the raw silk.

Mr. CONZE. Yes.

Acting Chairman O'CONNELL. That is the raw-silk price?

Mr. CONZE. Yes.

Mr. PIKE. Do you have crop years there?

Mr. CONZE. Exactly. Silk, being the product of the farmer, is subject to nature.

Mr. PIKE. There are great ups and downs in the various years and difference in the amounts from year to year?

Mr. CONZE. Yes; different in amount from one year to another.

Acting Chairman O'CONNELL. Have you anything showing what sort of picture the woven product would show in price? Does the finished product fluctuate as much as this?

Mr. CONZE. I have something here on that.

Then you have the rayon yarn which for 7 or 8 years has been quite stable, it has fluctuated very little.

The next chart shows the consumption of these two fibers in millions of pounds in the United States.

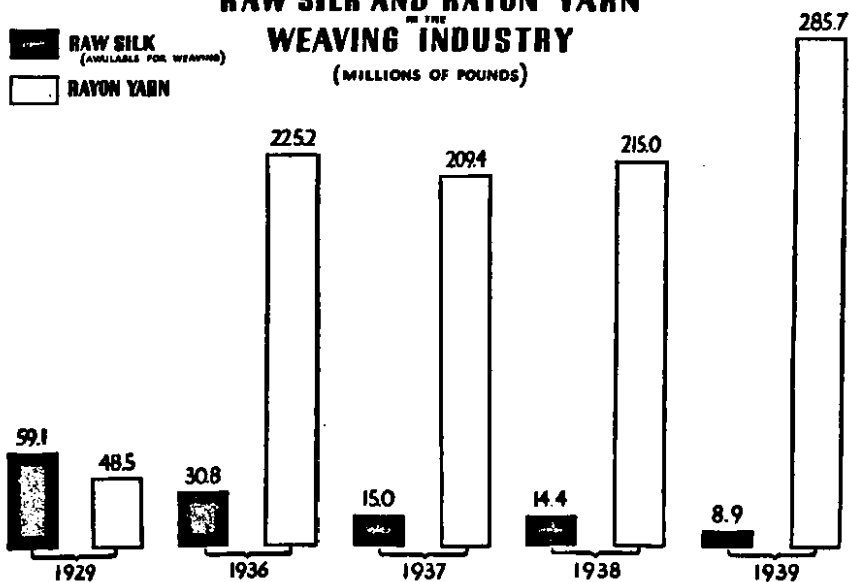
Acting Chairman O'CONNELL. It may be received.

(The chart referred to was marked "Exhibit No. 2632" and appears below.)

EXHIBIT No. 2632

[Submitted by the National Federation of Textiles, Inc.]

UNITED STATES CONSUMPTION RAW SILK AND RAYON YARN



SOURCE: RAYON ORGANIZER

CHART NO. 5

Mr. CONZE. This shows the annual consumption in the weaving industry between silk and rayon in millions of pounds. You see the phenomenal growth of rayon used in weaving, from 48,500,000 pounds in 1929 to 285,700,000 last year, whereas silk dropped from 59,100,000 to 8,900,000. That is why I say the silk industry no longer exists, and if you take the year 1940, this 8.9 will look big in comparison.

SHIFT OF PRODUCTION AWAY FROM SILK MILLS

Mr. CONZE. While the silk industry was transferring its interests to rayon, another group had also started—the cotton manufacturer of fine goods. He had lost his cotton fabric market to the silk manufacturer following the boom days of silk after the World War. He now started the manufacture of rayon fabrics, with the advantage of generally lower wage costs, at the time, than the silk mills.

In addition to the cotton group new units were formed for rayon weaving exclusively. These new firms started operations with new plants, new machinery, and new methods of production and distribution.

By 1933, then, we have the three groups operating on rayon fabrics. By 1940, the bulk of the rayon yarn was being woven by reorganized cotton mills or new rayon mills. What about the silk mill?

In a few isolated cases, former silk manufacturers have installed the same high-speed machinery as the other groups. But mills not equipped with machinery in this class, or whose operations are concentrated in certain specialties in which they excel, have found it difficult to overcome the already existing general difficulties of bad coordination between production and demand, as mentioned previously. The silk manufacturer was accustomed to working on high-style merchandise. Expensive raw material was used. Distribution cost was high due to special services in designing, style obsolescence, the smaller volume sold. The fabric price structure, in dyed and finished materials, 15 years ago, averaged from \$1.25 to \$2 a yard. The selling price included a sufficient margin of profit to allow for expense. Rayon fabric prices, on the other hand, today do not carry the same opportunity for meeting overhead costs. Their prices, in the dyed and finished material, average from 35 to 65 cents a yard. The margin of profit must be figured in pennies. The silk manufacturer has found it very difficult to adjust himself to thinking in terms of mass production at low unit cost and a small profit per yard.

Because the ordinary silk loom could make the rayon fabric satisfactorily from the quality viewpoint, many silk manufacturers during the last 10 years have made a desperate attempt to compete with the better equipped and therefore lower cost mill for the rayon-fabric business. In the race with lower and lower costs in the newly equipped mill, the silk manufacturer fought a losing battle.

Incidentally, in addition to the problem of competing with low-cost producers, silk men frequently also had on their hands the problem of carrying their fixed investments, and in referring to those I would like to express my feeling of discouragement over the attitude of many localities in respect to old and new plants. While it has been for many years a widely practiced policy, I believe that offering

tax exemption and other inducements to bring new plants into a community is uneconomic from an industry viewpoint. The new manufacturer starts off with a big advantage over his longer established competitor, because he usually has newer equipment. If, in addition, he is given tax favors, it intensifies the competitive problem of the older mill, sometimes even in the same town. (In our industry plants are not widely separated over the country and in these days of automotive transportation, no village is too far from the nearest mill town. We are a relatively concentrated industry geographically.)

I can appreciate the ambitions of smaller communities who out of local pride desire to see their industrial life added to, but it is not helpful to industry in general. If they must do something to help industry, they might consider giving preferential treatment for already established plants. This community aid is responsible in large part for the migration of plants in our industry, although the silk industry has not suffered from that as much as cotton. In recent years the standardization of labor rates by law has been a great help in preventing competition through decreased labor costs, so that a change of policy on the part of community would help to stabilize conditions.

Today, the 108,308 silk looms recorded by the Census of Manufacturers for the silk industry in 1927 are virtually obsolete. In a report issued in 1937 by the Crompton & Knowles Loom Works, it was stated that, "only the looms that are less than 10 years old can be classed as modern from the economic standpoint." This same report shows that in 1936, 86 percent of the nonautomatic silk and rayon looms (owned almost entirely by the silk manufacturing industry) were obsolete. Today, it may be said that they all are; in fact, nonautomatic looms for rayon are no longer built.

In commenting on this situation, the report states:

Automatic loom is replacing rapidly the nonautomatic loom in the silk and rayon class * * * the cessation of nonautomatic loom buying which took place in 1931 when the automatic shuttle changing S-3 loom was introduced. Increased activity in rayon weaving was accompanied by curtailed operation in silk weaving, in which nonautomatic looms predominate.

In terms of financial records, the silk industry is not a pleasant picture. Consider the reports of the Bureau of Internal Revenue on profits in the silk and rayon industry for 10 years.

I turn to the next chart.

(The chart referred to was marked "Exhibit No. 2633" and appears on p. 16889.)

Mr. CONZE. It goes only to 1936, but I don't think there would be a material change for the last 3 years. You see a constant decline.

This report gives only the number of establishments. It does not give dollars and cents.

Dr. ANDERSON. What would the dollar figures look like?

Mr. CONZE. It certainly would not change the picture materially.

Dr. ANDERSON. Is it true that many corporations which were on the verge of bankruptcy at the bottom of the depression have since gone bankrupt, and this is, therefore, a clearer picture than we had in '33?

Mr. CONZE. Yes; I would say so.

Dr. ANDERSON. So that even with the selective basis that we now have, a very substantial percentage do not show profits.

Mr. CONZE. That is quite right.

Dr. ANDERSON. Is the liquidation process still going on?

Mr. CONZE. Yes, it is.

As an example of the mortality rate in the industry, also consider a record given to me by our trade association, the National Federation of Textiles, Inc. (the significant current name of our old association, the Silk Association of America, Inc.). In an analysis made

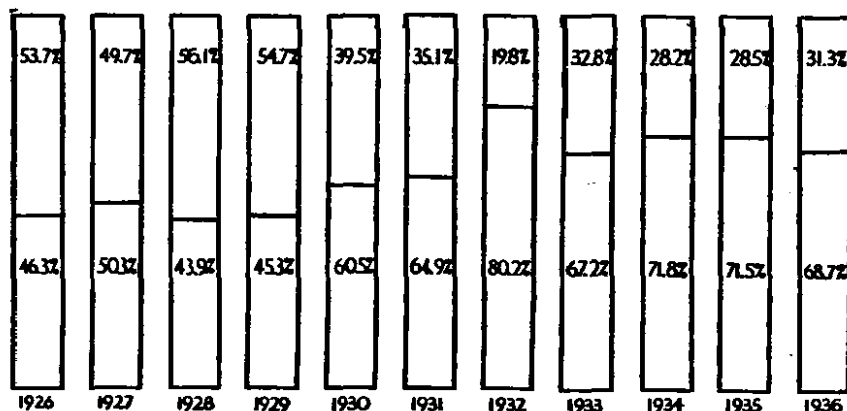
EXHIBIT No. 2633

[Submitted by the National Federation of Textiles, Inc.]

**INCOME REPORTS
OF
SILK AND RAYON WEAVING MILLS**

CORPORATIONS REPORTING NET INCOME

CORPORATIONS REPORTING NO NET INCOME



SOURCE: BUREAU OF INTERNAL REVENUE

in December 1938, it was found that of 131 weaving firms enrolled as members of the association in 1924, only 14 years earlier, 84 had disappeared completely and of the 47 remaining, 17 were in the hands of receivers or had reorganized after bankruptcy proceedings. The year 1939 did not make the picture any brighter.

At the present time, those who have weathered the storm so far are those who have been able to install the new machinery necessary for efficient production of staple fabrics, in competition with the old cotton mills or new rayon firms, or to specialize on particular fabrics that are less commonly made. It is an industry considerably shrunken in size, both in machinery owned and in the number em-

ployed. Plants have been sold or written off for a nominal value. The number of establishments has decreased from 1,648 in 1927 to 848 in 1937. Value of products has dropped from \$750,000,000 in 1927 to \$405,000,000 in 1937, and the 1937 figure includes all rayon, not only that in silk mills. Former silk workers have found their way into other fields, and it may be that the future of the industry will follow along the lines described by Dr. Bell of Brookings Institution. During his testimony earlier in these hearings, Dr. Kreps quoted Dr. Bell as saying that when "output of workers exceeds the expansion of productive capacity, new employment is created, and a prosperous condition results which brings mutual benefits to all three major divisions of industry—wage earners, salaried workers, and investors."

REDUCTION IN SILK AND RAYON PRICES

Mr. CONZE. Certainly the industry is following his recommendation that consumers be given the benefit of any saving in lower cost of production, through the supplying of better merchandise at lower price. The consuming public today is getting excellent value for very little money in the purchase of fine dress fabrics. And the production per worker is vastly increased as was shown in "Exhibit No. 2629," giving the ratio between the number of wage earners and the yardage produced from 1927 to 1939.

Acting Chairman O'CONNELL. May I interrupt? Some general picture of what has happened to prices can be obtained by comparing the total production of woven goods, which I think has more than doubled between 1927 and 1939, although you have just indicated the value of the product in comparable years is not much more than half.

Mr. CONZE. That is why I gave you a price range. Ten years ago the average price, wholesale, ranged from \$1.25 to \$2, and today it runs from 35 to 60 cents. It is very difficult to give you an exact comparison, because we are dealing with styles, and what was fashionable 10 years ago is no longer fashionable today. I can give you a price range, and it is, at wholesale, about one-third of what it was 10 years ago.

Using a fiber-like rayon, that is stable in price, easy to secure, uniform in quality, on looms that can be operated for less cost at higher efficiency, points favorably to the possibilities of better planning and steadier operations in the future for those who can survive. With these two factors must also be considered the reduced risk in manufacturing operations caused by the fact that the raw material is much lower in price and that the improvement of rayon yarn production is eliminating more and more of the auxiliary machinery we needed for silk; moreover, the heavier nature of the rayon yarn means that it takes less threads per inch of fabric to achieve a yard of merchandise. For example, new high-speed warpers, the machines that prepare the lengthwise thread for the loom, have eliminated many of the workers in that department, formerly one of the most highly skilled operations. Today warps can be woven in much longer length, reducing the handling in the loom and loom delays. The longer warp ties up more yarn in the preparatory stages of weaving,

but with the reduced cost of our raw material that is not a serious objection. It has been estimated that the new automatic auxiliary machinery has reduced the help in these departments by about two-thirds. Today 3,000-yard warps are not uncommon where 300 yards was about the limit 10 years ago.

One big problem still remains, the buying habits of our consuming groups. The average worker wants steady employment, but as far as textiles are concerned, his buying habits are quite to the contrary. And because of his buying habits, his immediate suppliers, the retailers, follow an irregular, at times erratic, policy of demand for specific fabrics and garments. The garment maker in turn makes equally erratic demands for delivery of needed material. He follows closely the demands of the retailer for seasonable and style merchandise. As long as he does, he is unable to sustain any stability in operation, since he cannot accumulate stock. As a result, his demands upon the fabric manufacturer are for immediate delivery, frequently for fabrics or colors not being made at the moment. Not uncommonly, by the time the fabric he demands is woven and ready for delivery he is no longer as eager for it, or rather his customers are not. The result is too often a sacrificing sale on the part of the mill man of merchandise which is still as desirable in quality as it was before, but which a style change makes a drug on the market. The garment manufacturer, in his predicament, is helped somewhat by the employment situation in his industry. It is the custom to take on and lay off workers as they are needed, often without any previous notice, at the end of the day's work. Fortunately or unfortunately, the industry is so concentrated in New York City that workers are available immediately. On the other hand, the fabric manufacturer finds it very difficult, if not impossible, to operate on such a basis. He must keep his workers in the mill if he is to maintain any kind of standard of workmanship, and does the best he can to guess what the dress trade will want. The result, however, is not helpful in maintaining a balance between production and demand and a stable price level.

Remedies for the situation are not easily defined. There has, for a long period, been a strong feeling among a large group of manufacturers that the elimination of the so-called night shift, or the third shift, would not only be a mark of economic improvement but constructive social progress as well, from the viewpoint of the workers in the mills. From the economic viewpoint, the supporters of this plan believe that what the industry needs is more stability and regularity of production. With the amount of equipment available for use, such regularity has a better chance both from the interests of betterplanning by the management and steadier employment for the worker, if production is based on two shifts. From the social or health point of view, both management and labor groups believe that the worker on the third shift suffers both mentally and physically, and without any real necessity, if real demand for that production is considered. Furthermore, limitation of operations to two shifts will mean more rapid installation of new machinery. More machinery will be needed in the 2 shifts to attain the same production as 3 shifts of a smaller number of looms. The supporters of continuous operation contend, on the other hand, that if free enterprise and free competition for the public market are to be

maintained, then whatever system of manufacturing brings the lowest cost to the public is the most desirable. It has been demonstrated that continuous operation of the newest types of automatic machinery is the most economical method of producing fabrics, and the prices at which the public buys today are proof that the resulting saving is being passed on to the consumer. Furthermore, in direct connection with our own industry, the advocates of third-shift operation point out that in a style industry, the answer to maintaining balance between production and demand is rapid production keeping up, not trying to catch up, with style cycle requirements. By keeping up, a mill can meet the demand while it exists and promptly start in with new demand when the style changes. The plant with slower rate of production frequently finds that by the time they are ready to deliver goods for which a style demand is apparent at the beginning of the production schedule, the merchandise is no longer wanted, and it is obsolete stock.

There are advocates of both policies, with no indication that their divergent views can be reconciled. At the present time, much seems to depend on whether the machinery owned by the proponent of either side is of the new or old type.

PROSPECTS OF CONTINUED MECHANIZATION

Mr. CONZE. On the basis of the 10 years past, however, both management and labor must look forward to continued mechanization of the industry. The tendency is definitely toward reduction in the number of wage earners necessary to turn out a given quantity of production. This will go on more and more as the old machinery is replaced. It will become more rapidly true if business conditions improve and there is new money available for the purchase of that machinery. Management will have the problem of finding a market to absorb the production of more and more efficient machines. Labor must look forward to finding new employment either in new processes in textiles or elsewhere. The use of man-made fibers, with their constantly decreased cost, to the exclusion of the natural fibers of silk, cotton, and wool will mean more merchandise at lower prices to the public at large, but less work for those accustomed to gain their livelihood in our mill. Indeed, one of the prominent silk manufacturers, when asked what he saw in the future for our industry, said that at the rate changes had taken place in the last 10 years, he did not consider improbable a future production of fabrics from man-made fibers that would begin with the raw material of the fiber and continue through highly efficient machinery through to the loom weaving the finished fabric, all with a modicum of human labor. The period of transition is even more difficult in some respects for the man who has built up a business than for the worker, whose investment is his labor only. Progress cannot be stopped, but whether the hardships of change can be lightened, I do not know.

Technology or no technology, what the average American wants is an opportunity to secure a fair income. If he is a textile manufacturer he wants to operate a plant that will produce fabrics with a fair profit and provide steady employment for the workers for whom he is responsible. If he is a textile worker I think he wants to feel that he can find employment in a well-equipped mill that will

give him an opportunity to show what he can do, and to earn a wage that is not only fair but relatively dependable. That has been possible during the past 10 years only to a limited extent, and the period in the meantime between old and new developments is not easy for either employer or employee. The reasons for the difficulty are complex, it is true, but what some of the difficulties are I have tried to outline to you in this history of the technological problems of the silk industry.

Since the textile industry in general was discussed here this morning, I want to say I am only competent to talk about the silk and rayon industry and not about cotton, wool, or rayon yarns, or the carpet industry.

Dr. ANDERSON. I notice you have some samples of materials there, and I wonder if you would explain to us what, precisely, is the difference between rayon and silk, and why rayon has moved into the field so rapidly.

Mr. CONZE. I brought these samples along to show you that it is very difficult for the layman to see the difference between silk and rayon.

Here, for instance, is a silk cloth that sold for around \$2 10 years ago. They are almost relics, some of them. One is a weighted silk and the other is pure silk.

Dr. ANDERSON. Weighted with what?

Mr. CONZE. A chemical composition of tin tetrachloride.

Mr. PIKE. Would these pieces be very much the same except for the weighting?

Mr. CONZE. The weighting makes it very much heavier and also makes it relatively cheaper.

Mr. PIKE. And it wears out a little faster?

Mr. CONZE. No; it wears perfectly all right.

Here you have an all-silk material which played a very important role years ago as a printed fabric, which also sold on its heyday around \$1.75.

Dr. ANDERSON. And how long ago was that?

Mr. CONZE. Twelve years ago.

Dr. ANDERSON. You paid \$1.75 a yard for that silk?

Mr. CONZE. Easily, wholesale. The public pays 50 percent more. The retailer would have a 50 percent mark-up over these prices, which are wholesale prices.

You have the relics of the past there. Now we are talking of what is going on today. This blue one is around 65 cents. You have two prints, one silk and one rayon, and I am quite sure that the rayon one today is just as satisfactory to the public as the other one, which was silk.

That is why rayon fabrics have taken such a hold; the public could not see any difference in them.

Mr. PIKE. What is the practical difference to the wearer, Mr. Conze?

Mr. CONZE. No difference.

Mr. PIKE. That's the trouble.

Mr. CONZE. In fact, I don't want to take sides between silk and rayon, but I am inclined to believe that rayon wears better than silk.

Dr. ANDERSON. What is rayon, really?

Mr. CONZE. Degenerated cellulose.

Mr. PIKE. Is this an acetate or viscose rayon?

Mr. CONZE. That is viscose. I have an acetate here, too.

Here again, for comparison, are a piece of acetate rayon and one of pure silk, used for the same purpose. They are both used for lining purposes, and the price of the silk is at least double that of the acetate.

Dr. ANDERSON. How long was it after rayon was invented before it became commercially practicable?

Mr. CONZE. I don't know when Mr. Chardonnet made his invention, but when I started in business it was quite on its way. I think it was before 1900, in the late eighties if I am not mistaken.

Dr. ANDERSON. It was invented in the late eighties, and became commercially used, I suppose, early in the century.

Mr. CONZE. Yes; 1909 or '10.

Dr. ANDERSON. And about how long was it before it began to compete successfully with silk?

Mr. CONZE. I would say from 1930 on it became a serious competitor.

Mr. PIKE. They had to get their yarn sizes down.

Mr. CONZE. That is a development of the last few years, to get fine sizes. I think I have a chart here from 1929 on; 1929 was still a big silk-consuming year.

Acting Chairman O'CONNELL. Relatively, rayon was about half the production of silk in 1929.

Mr. CONZE. The last 10 years have really seen the greatest change.

Dr. ANDERSON. It took, then, about 15 or 20 years to move it into a position where it supplanted silk? Why was the time so long? Was there something wrong in the fabric itself, or did you have to overcome consumer prejudice? What was it?

Mr. CONZE. No; I think the perfection which rayon has attained during the last 10 years is due to improvement in the yarn itself. A rayon thread of then and today don't compare at all, particularly from a millman's viewpoint. A rayon thread of 10 years ago wouldn't run, and one of today is perfect.

Mr. PIKE. For the wearer, too, the early rayon fabrics, when they got wet, gained a lot of weight and wouldn't hold their shape.

FUTURE OF FIBER INDUSTRY

Mr. CONZE. That is all a matter of the past. Rayon is an article which gives perfect wearing satisfaction.

Dr. ANDERSON. You hinted at the possibility of new fibers and resulting new fabrics. Did you have anything in mind when you did that?

Mr. CONZE. At the present time there has been much publicity given to nylon. Nylon is going to be used first of all in hosiery, but that doesn't mean at all that either nylon or similar projects will not revolutionize the rayon products.

Mr. PIKE. Has it been put on the loom at all?

Mr. CONZE. It is relatively expensive and does not give any advantage over the viscose or acetate yarns.

Another thing, I think the viscose and acetate yarns will make further progress. In fact, I think the Celanese Corporation, in its

annual report only a few weeks ago, spoke of having a yarn which was twice the strength of their normal yarn. What that is going to mean in the fabric market in the future is very hard for anybody to see.

Mr. PIKE. We haven't brought out any of these casein products in this country, the Italian wool substitutes?

Mr. CONZE. They would go more into spun rayon. I have not touched on the spun rayon. I think those products would go into spun rayon, wool spun, and mixtures of wool and cotton.

Dr. ANDERSON. Do you think it would take a new fiber as long to move in and capture the market, as it did rayon?

Mr. CONZE. No; I think it would go faster this time.

Dr. ANDERSON. And what do you think would be the effect upon the technology of the industry and its labor force?

Mr. CONZE. I don't want to prophesy. If you had asked me 10 years ago what rayon would do to the silk industry or to those that were making rayon, I don't think anybody could have foretold what happened. So I don't want to prophesy what is going to come because I know that 10 years ago no one could have foreseen the tremendous change that all of us have witnessed.

Dr. ANDERSON. That leads to a question of great importance. You as a silk manufacturer 10 years ago did not foresee this possibility?

Mr. CONZE. No.

Dr. ANDERSON. Ten years ago you had a heavy investment in silk mills?

Mr. CONZE. That is right.

Dr. ANDERSON. What occurred? How did you meet this changing technology in fiber?

Mr. CONZE. As I said in my brief, the machinery which manufactured silk could also manufacture rayon, so we could just put rayon on our looms and manufacture as we did before. But the new rayon machinery that was developed beat the old silk equipment, so that today it is totally obsolete.

Dr. ANDERSON. In other words, you had to meet a new machinery that had been developed.

Mr. CONZE. We had to do two things—meet a new machine and a new material. The new material we could have coped with; in fact, we did, but the new machine was so superior to what we had, because it has been adapted to the new fiber, that the silk loom and all its equipment is obsolete.

Dr. ANDERSON. What happens when a manufacturer like yourself must meet such a problem?

Mr. CONZE. You must either completely mechanize your mill or concentrate on specialties, as my concern has done.

Dr. ANDERSON. There are two outs, then, for you—go into specialties or meet the competition in the same field.

Mr. CONZE. Or a third: fold up.

Dr. ANDERSON. And that third has been pretty generally practiced, has it not?

Mr. CONZE. To a great extent; a very great extent.

Dr. ANDERSON. When you amortize your machinery, you mentioned in here that you would have to cover the cost within a very brief period of time. Do you anticipate such drastic changes as have occurred, and do you amortize over a brief period of time?

Mr. CONZE. I don't think anybody expected any such developments 5 or 6 years ago. The latest machinery, which is so far superior to what existed before, has, overnight, made obsolete a lot of machinery which was fairly good 4 or 5 years ago.

Dr. ANDERSON. So there is no way to amortize that?

Mr. CONZE. No.

Dr. ANDERSON. Is that the condition of the industry now, or are you amortizing your new machinery over a brief period of time?

Mr. CONZE. I would say that it is individual. Individual concerns have to use their own judgment.

Dr. ANDERSON. But the factor of machinery is the outstanding factor in this change?

Mr. CONZE. It is new machinery for a new product. If you had built this same machinery for the rayon of 10 years ago it would not have worked.

Mr. PIKE. It wouldn't work on silk, either then or now?

Mr. CONZE. No; it is only adaptable to rayon, but the rayon of 10 years ago wouldn't work on the present machinery. Rayon has increased so much in evenness and elasticity and strength that these developments have become possible.

Dr. ANDERSON. In your own plant, what was the effect upon labor of the change-over as you changed from silk to rayon?

Mr. CONZE. In our concern we had a great number of plants, and we closed a great number. The ones in which we were running a staple fabric we sold.

Dr. ANDERSON. And dismissed the workers?

Mr. CONZE. We had plants distributed all over Pennsylvania and closed a good many of them, keeping only the specialized plants.

Dr. ANDERSON. Did it generally happen that where the change-over occurred workers were dismissed?

Mr. CONZE. Either they put in new machinery or closed up.

Mr. PIKE. Were most of these mills in towns where there was some other primary employment of labor, such as in coal towns? They were in a great measure auxiliary to some other industry?

Mr. CONZE. That is correct. As was mentioned this morning, I think, there are very few so-called ghost towns in the silk and rayon industry.

Mr. PIKE. At least not due to that.

Mr. CONZE. Not due to that; no.

LABOR DISPLACEMENT IN SILK MILLS

Acting Chairman O'CONNELL. From your figures I notice that from 1927 to 1937 there is a reduction in the wage earners in these three groups of mills of about 10.5 percent, so that is only a rough indication of the amount of displacement of labor.

Mr. CONZE. As I said, this reduction of 10 percent includes the two new groups of mills, the cotton mills that went into rayon and the new mills. If you refer to silk alone, for which there are no statistics available, I think you will find the old silk industry has dismissed 70 or 80 percent of its labor.

Acting Chairman O'CONNELL. What has happened to those men? Would they be skilled in working in rayon?

Mr. CONZE. Oh, yes; but these new rayon groups have grown up by themselves, either cotton mills going into rayon or new rayon establishments in the South.

Acting Chairman O'CONNELL. But a man skilled in the old work—

Mr. CONZE (interposing). Could go into rayon.

Acting Chairman O'CONNELL. There would be no retraining necessary?

Mr. CONZE. No.

Mr. PIKE. He would have to move to a new locality, however.

Mr. CONZE. He would have to move to a new locality, which many people have done.

Mr. MAGINNIS. Mr. Conze, what has been done in the silk mills around Paterson?

Mr. CONZE. I think they are closed up.

Mr. MAGINNIS. They are just closed, are they?

Mr. CONZE. At the present time Paterson, I understand, has quite a boom on account of the aviation industry.

Mr. MAGINNIS. They didn't change over to rayon at all?

Mr. CONZE. Very little, because rayon requires a lot of capital, and most Paterson mills were small concerns who could not buy new equipment.

Mr. MAGINNIS. I was interested because several years ago when I was practicing law in New York I had some business dealings with the mills over there, and I know there were some large silk mills all through Paterson.

Mr. CONZE. The largest ones had disappeared by 1930. In the last 10 years the small ones, whatever were left, disappeared.

Mr. MAGINNIS. United was still operating at that time.

Mr. CONZE. That is a dyeing concern. I was speaking of weaving. Since United was a leader in weighting they dropped out when weighting dropped out. They are operating on a reduced scale now.

Dr. ANDERSON. The introduction of this new fiber placed the silk manufacturer directly in competition not only with itself, but with other elements in the textile industry with which he didn't compete before?

Mr. CONZE. That is correct.

Dr. ANDERSON. In other words, it intensified competition?

Mr. CONZE. Very much so.

Dr. ANDERSON. What do you feel is the final solution? Is it desirable to unify the industry into a few larger units, or is it best to keep it as it is now, broken up into small competing unit?

Mr. CONZE. I don't think it has a tendency to consolidate itself into a few big units.

Dr. ANDERSON. There is no such tendency?

Mr. CONZE. While there are a few big units, they have not been accomplished by consolidation.

Dr. ANDERSON. Mergers do not seem to be the way to solve this problem?

Mr. CONZE. The textile industry is an industry of individual initiative and individual management.

Dr. ANDERSON. When you have to meet this new competition with installation of new machinery, what happens to the capitalization of your plant? Do you go into the market for money?

Mr. CONZE. If you can get it. You have to procure it. Either you have it or you have to find it.

Dr. ANDERSON. Is the industry in such a condition that you can go into the market?

Mr. CONZE. The survivors of the old silk industry, hardly. The new ones in the market got money for an entirely new enterprise. People preferred to go into an entirely new venture instead of financing a new project in an old one.

Mr. PIKE. This new material, I think I saw a picture of that in Life a few weeks ago.

Dr. ANDERSON. You spoke of limiting production. There seem to be at least two schools of thought, one in which textile operators hoped to make their way successfully by limiting the amount of product and the other in which they hoped to make their way successfully by expanding and increasing production as much as the traffic would bear.

Mr. CONZE. There is no question of that.

Dr. ANDERSON. Which school do you hold to?

Mr. CONZE. Since I don't have the new machinery, I am of the school that likes the 2 shifts. The fellow who owns older machinery likes 2 shifts and the fellow who has the latest machinery like the 3 shifts. It is quite obvious.

Dr. ANDERSON. In other words, it is self-protection?

Mr. CONZE. I think so.

Dr. ANDERSON. Would you care to comment on the effectiveness, in connection with technological unemployment, of dismissal wages and technological clauses in labor contracts with labor?

Mr. CONZE. Such procedure may be feasible in part of the industry. I particularly have in mind the rayon yarn producer, because I understand that is where these contracts have been made. First, the concerns that write such contracts must have the money to pay the dismissal wages. Second, if relatively few competitors are involved and they all do the same thing, it doesn't matter. In the case of the rayon yarn producer, as I said before, there are a relatively few big concerns involved so that it might be feasible there. It is certainly utterly unfeasible when it comes to the textile industry at large, because you deal with thousands of concerns.

Acting Chairman O'CONNELL. As a competitive proposition?

Mr. CONZE. The competitive proposition would make it impossible.

Acting Chairman O'CONNELL. If you don't do it, it puts those who do it at an entirely competitive disadvantage?

Mr. CONZE. It increases their cost.

Mr. PIKE. That would also hit pretty hard the company which went into quick style changes where you must stop on very short notice.

Mr. CONZE. That is right.

Dr. ANDERSON. What, if any, effect has this change-over from silk to rayon had upon international trade with the country concerned?

Mr. CONZE. Well, it happened to coincide with a very substantial increase in silk consumption by the hosiery industry. If that had not been the case, undoubtedly the Japanese trade would have suffered materially, but as "Exhibit No. 2619" shows, if you compare 1929, an exceptionally good year, with 1936, it is only a drop from 57,000,000 pounds to 47,000,000 pounds. That is not such a tre-

mendous figure, but if the silk had been limited to weaving only, that would have been a very substantial figure.

Mr. PIKE. Isn't it true that during this same period Japan has expanded its rayon manufacture so it is supposed to be the largest in the world?

Mr. CONZE. If I am not mistaken Japan is the biggest producer of rayon.

Mr. PIKE. I think so.

Dr. ANDERSON. Is that material competing with your product in this country?

Mr. CONZE. Once in a while, very little.

Acting Chairman O'CONNELL. Rayon products from Japan?

Mr. CONZE. Rayon yarn and rayon products.

Acting Chairman O'CONNELL. It does not represent effective competition?

Mr. CONZE. The importation of rayon yarns is very small.

Dr. ANDERSON. I have no further questions.

Acting Chairman O'CONNELL. Thank you very much, Mr. Conze. (The witness, Mr. Conze, was excused.)

Dr. ANDERSON. Mr. Byrl Whitney is here from the Brotherhood of Railroad Trainmen, and he is speaking as the representative of Mr. A. F. Whitney, president of the Brotherhood of Railroad Trainmen, Cleveland, Ohio. Mr. Whitney has a prepared statement, which is an important document, and should be included in the section on American railways.

Acting Chairman O'CONNELL. Do you solemnly swear that the testimony you are about to give in this proceeding will be the truth, the whole truth, and nothing but the truth, so help you God?

TESTIMONY OF BYRL WHITNEY, BROTHERHOOD OF RAILROAD TRAINMEN, CLEVELAND, OHIO

Dr. ANDERSON. What is your position?

Mr. WHITNEY. Byrl A. Whitney is my name, director of education and research of the Brotherhood of Railroad Trainmen, Cleveland, Ohio.

Dr. ANDERSON. You are speaking now for Mr. A. F. Whitney, president of the Brotherhood?

Mr. WHITNEY. That is right.

If it is agreeable with the committee, in view of the lateness of the hour, instead of reading this statement, which contains a lot of statistics, some of which you may be familiar with, I will just extend it into the record and highlight it in a few words.

Acting Chairman O'CONNELL. It will go in the record.

Mr. WHITNEY. The Brotherhood of Railroad Trainmen, an organization representing approximately 145,000 members employed in railroad-train and yard service and on bus lines in the United States, Canada, and Newfoundland, is keenly interested in the investigations and hearings sponsored by the Temporary National Economic Committee. We have long hoped that out of the great store of information amassed by various Government agencies, concerning the American economy, there would come some practical conclusions pointing the road toward the elimination of the Nation's No. 1 problem: unemployment.

Until the current inquiry, little had been done to show us a way out of our dilemma. There appears to be no end to the capacity of Congress to appoint investigating committees, but research cannot go on forever. It is not an end in itself. Moreover, there is a limit to the patience of the American people, particularly the jobless industrial workers, the migratory farm workers, the youth, and other exploited sections of our population, who desire, before all else, an immediate, practical, and effective solution to the problem of unemployment.

It is a sad commentary on our civilization that the forgotten man of the hour is the job hunter. Such injustice should stir the heart of every man of decency and of good will. Common sense should dictate the need of restoring opportunity to our citizenry and of giving everyone his rightful niche in society.

I am happy to say that the published reports of the hearings before this committee reveal that at last a serious and intelligent effort is being made to understand our economic problems with a view to correcting the evils and abuses that are manifest. I am particularly pleased that the T. N. E. C. has seen fit to project its studies into the railroad industry field, one of the most important branches of our national economy, and I appreciate the opportunity that has been afforded me to enter into the discussion on technology and unemployment in the railroad industry.

As you know, the railroad industry is the most statisticized industry in the country. I am sure that your committee has had access to the reports of the Interstate Commerce Commission and of the Bureau of Labor Statistics of the United States Department of Labor; therefore, I do not think it necessary to consume time by presenting all the statistics necessary to an understanding of the railroad industry. It will suffice if, in touching upon various phases of the topic under discussion, I cite merely pertinent data to illustrate my points.

EMPLOYMENT AND PAY ROLLS

Mr. WHITNEY. For the railroad worker, the depression began long before the 1929 debacle. Like the farmer, railroad labor suffered immediately following the World War. And now, after two decades, the railroad industry has been closed to more than a million men, and the pay roll has been cut by almost \$2,000,000,000. Truly a one-two knock-out punch!

The average number of workers employed by class I carriers in 1920 (excluding switching and terminal companies) was 2,022,832. Between 1920 and 1929, employment declined by 17.9 percent. In 1933, at the depth of the depression, the number was down to 971,196, or 48 percent of the 1920 figure. By 1937 employment on class I railroads had recovered to 1,114,663, but in 1938 it dropped to 939,171, the lowest point reached since the turn of the century. Estimates for 1939 show that employment rose last year to 987,943.

The extent to which railroad labor has suffered for lack of jobs is further revealed through a comparison of the index of employment in manufacturing industries with a similar index for railroad employment. This is illustrated by this table which I offer for the record.

(The table referred to was marked "Exhibit No. 2634" and is included in the appendix on p. 17433.)

Mr. WHITNEY. Between 1933 and 1937 employment in manufacturing industries had recovered 44.1 percent, whereas rail employment increased but 14.7 percent. By 1937 factory employment was 5.8 percent above the 1923-25 average, but rail employment was 37.6 percent below the 1923-25 average. Factory employment has shown a tendency to approximate the 1923-25 levels, but railroad employment lags far behind. Of course, we must not overlook the fact that our economy as a whole has failed to provide employment for the millions of new workers who have since entered the labor market. Current estimates of total unemployment cluster about the 10,000,000 mark.

There are certain unchallengeable facts with regard to the incidence of railroad unemployment. Railroad workers ordinarily have difficulty in finding employment in other industries, because the skills which they develop in their chosen occupations are not transferable. In times of depression, these difficulties are multiplied.

The unemployment of railroad workers has been the subject of investigation by the United States Department of Labor and, more recently, by the National Research Project of the W. P. A. The latter study found that, because of the almost universal application of the principle of seniority, for which labor has fought for so many years and succeeded in incorporating in contracts with the carriers, the unemployment which set in after 1923, and which was intensified after 1929, affected the younger workers much more, and more immediately, than the older workers. The investigation further revealed that unemployment resulting from permanent separations was supplemented to quite a large degree by short-period unemployment.

As the depression deepened in the years 1930 to 1932, furloughs increased in number and began to bear heavily on the longer-service employees. The rate of furlough among employees with 15 to 20 years of service reached an annual average of 9.8 percent for the 3-year period 1930-32, while even among employees with 30 or more years of service an annual average of 3.0 percent were furloughed during this period.¹

The National Research Project also reported that the longer the attachment to the industry, the more difficult it appeared to be to find work outside the industry.

The Department of Labor study which has been referred to (Carter Goodrich, *Earnings and Standards of Living of 1,000 Railway Employees During the Depression* (U. S. Department of Labor, May 22, 1934) has been summarized by the Brotherhood of Railroad Trainmen in a book entitled *Main Street—Not Wall Street*, published in 1938. I shall take the liberty of quoting from this summary, because it will serve to remind us of the human tragedies which befall the jobless.

This study encompassed 1,000 families of railway men in 18 localities from all parts of the country. Sixty-four percent of the men interviewed were at least 40 years of age. All these men were working in April 1933. "Any group of workers who still held jobs in 1933 was a selected one, and on the railroads the policy of seniority preference determined that the selection should be of men relatively old in years and service * * *. These were men who were in many ways better prepared than other employees to meet the emergency of the depression * * * a number of agents wrote back from the field that the basis of selection understated the degree of hardship among railroad employees."

¹ W. P. A. National Research Project, Summary of Findings to Date, March 1938, p. 136.

Despite the fact that the group selected was one with high seniority rating, nevertheless even this number was visibly affected by the ravages of the economic depression. The earnings and income of the 980 railroad men proper, in 1932, were such that 38% made less than \$1,000 in that year, two-thirds less than \$1,500. One hundred and two earned as little as \$500 in 1932, whereas 18% earned as much as \$1,750. Only 60 of the 980 men succeeded in supplementing their income by outside work. Other sources of income helped but little: "For the families included in the study the total income for the year 1932 was not much greater than the income of the chief breadwinner. In more than half the families, 58%, the income as calculated was less than \$1,500; in practically three-fourths it was less than \$1,750."

In the course of the depression, community services bogged down, failing to keep pace with increased community needs. Consequently the burdens of these families increased. Their incomes reduced, 38% of the families also had to contribute cash and groceries to relatives and friends in 1932. Families doubled-up in order to save on rent. At the same time, home lives were shattered as families, unable to maintain a single roof, scattered throughout the country in search of shelter.

Capital losses became the order of the day. Forty-four of these families lost their homes through foreclosure or forfeiture between 1929 and 1933; 38 of them lost all their investment. Half of the 884 families reporting had cash reserves at the beginning of the depression, but at the time of the study only 31 families had their savings intact. Forty-seven per cent of the families, or 464, dropped their life insurance policies to raise needed cash. For most of them, it meant that they could never take out new insurance, because rates would be prohibitive for men of their age. Accident insurance was also dropped, and to railway workers this was no small loss.

Not only did these families lose their homes, their savings, and their insurance, but they also incurred debts which, at the time of the study, were making life miserable for them. Seventy-four per cent of the families stated that they had outstanding debts or obligations incurred only since the beginning of the depression. "These debts were not only a strain on the meager resources of the chief breadwinner but also a source of worry and fear, since in normal times garnishment proceedings usually mean discharge for a railroad worker." One-fourth of the property owners were in arrears in tax payments; 39% were in arrears in payments of principal and interest on mortgages. One hundred and sixty-six families had borrowed money from friends or relatives, 135, in desperation, had gone to loan companies, where some of them were fleeced. Fifty-nine per cent of the families, or 583, reported unpaid bills. A little more than half owed \$100 or more. "By far the largest single item is for medical care."

How did these families live under such depressing circumstances? One man reported: "And so Sunday comes and we just sit." Thirty-eight per cent of the families said they had no recreation whatsoever. Many reported that they had not seen a moving picture for two, three, even four years. Trips and outings were no longer possible for the railroad employees, even though they had passes. Memberships in lodges, clubs, and churches were given up. Even social visits were out of the question, because the cost of refreshments for guests was prohibitive. Reading became a luxury.

The education of the children of these railway workers suffered markedly. One hundred and fifty-seven boys or girls either had dropped out of school or college or had deferred their entrance into the next higher course. One hundred and twenty-eight children had abandoned special instruction in music, drawing, dancing, and the other arts.

Two hundred and twenty-five families moved within four years prior to the time of the study, mainly to reduce rent. "Families accustomed to furnaces and hot-water facilities were living in 'cold flats,' often without electricity or running water. To give up inside toilets and baths, as many families had to, seemed like a reversion to barbarism."

These were the railway employees who suffered a 10% wage cut in 1932. Their incomes were further reduced by part-time employment.

That they went about improperly clad goes without question. "There comes a time when no amount of thought and care will revitalize old garments, when the important problems are warmth and decency. Many families of railroad workers had reached this point * * *. Many older children abandoned school because of shabby clothing. Parents confided that they had borrowed clothing in order to appear respectable at a child's graduation."

Wide-spread neglect of health met the eyes of the investigators for the Department of Labor. In 30% of the families one or more members required medical attention but could not afford it. Fifty-nine per cent of the families reported a need for dental care, and 26% of the families reported that at least one member needed eye examination or treatment. "Many families were reduced to monotonous and unhealthful diets * * *"

A study made recently by the United States Public Health Service of a group which like this had been reduced from comfortable to moderate or poor circumstances further illuminates the situation. Those who had dropped from "comfortable" to "moderate" incomes showed a rate of disabling illness 15 per cent higher than the "comfortable" group, which had suffered no reduction; and for those who descended from "comfortable" to "poor" incomes this rate was 60 per cent higher.¹ The chief significance of this report in connection with the railroad workers is that it reveals a close connection between illness and reduction in standards of living.

Summarizing the findings of this Department of Labor study of 1,000 railway workers during a depression, the author writes: "For these veteran railway men, in a well-organized and thoroughly regulated industry, the study records a slow retreat from relative security toward destitution."

With our economic machine stalled on dead center, it is little wonder that there is widespread unemployment in the railroad industry. The T. N. E. C. report to the President on July 14, 1939, that "evidences of the failure of the economic machine have not disappeared," could be repeated today with more emphasis. It is more true than ever, despite even the short flurry of unhealthy war trade, that:

People are still without jobs. Farmers are still without satisfactory markets. Industry is still without sufficient purchasers. We are still enmeshed in an economy the rate of growth of which is decreasing.

But besides general economic stagnation, there have been other factors making for unemployment in the railroad industry, among these being the loss of business to other forms of transportation; the abandonment of lines; technological changes; and the increased productivity of railroad labor.

Instead of enjoying the one-time virtual monopoly of freight transportation, today railroads perform about two-thirds of the freight service, and the balance is handled by highways, pipe lines, and waterways. Thus, while employment on steam railroads constituted 10.2 percent of the working force in 1920, it was only 7 percent in 1935.

The Interstate Commerce Commission reports that between 1921 and 1938, inclusive, class 1 railroads abandoned 8,067 miles of road and constructed only 2,811 miles, leaving a net decrease of 5,256 miles. Obviously such a deflationary program cut rather sharply into railroad employment.

PRODUCTIVITY OF RAILROAD LABOR

Mr. WHITNEY. There are numerous evidences of the increased productivity of railroad labor—a factor which has tended to aggravate the problem of unemployment. Before these are considered, however, let us note that, paradoxical as it may seem, unemployment itself has increased the productivity of railroad labor. Because of the application of the principle of seniority, employees with the least years of service are bumped first, with the result that the average years of service of those remaining on the job has a tendency to rise. Experience, measured by years of service, is closely correlated with efficiency,

¹"Comfortable" income is defined as that of \$425 and more per capita per year, "moderate" income as from \$160 to \$425, and "poor" income as less than \$150. U. S. Public Health Service: *Public Health Reports*, vol. 28, No. 41 (Oct. 13, 1933, p. 1261.)

and efficiency with productivity. In this negative sense, therefore, unemployment has increased the productivity of those remaining on the job.

How efficient is railroad labor? The answer to this question has been given by numerous investigators. For the purpose of this hearing, it should suffice to understand in general outline the extent of the rise in the productivity of railroad workers and some of the technological causes therefor.

The National Research Project of the W. P. A., which has been cited before, makes the following observations with regard to the productivity of railroad labor:

In terms of traffic units, the average output per work-hour increased from 109 in 1923 (on a 1920 base) to 128 in 1929, to 140 in 1933, and to 175 in 1936. This increased productivity of railroad workers was a result of the technical reconstruction of the railroads through managerial and mechanical changes, made possible by large capital expenditures during the period 1923-29 and through the further managerial changes made during the depression to reduce labor costs.

Increasing output per hour of railroad labor is not a new phenomenon. Output per hour nearly doubled during the first quarter of the present century. In 1900, railroad labor moved an average of 62 traffic units an hour, while in 1925, it moved 117. In the past, however, the growth of the volume of traffic was greater than the rate of increase of productivity, so that employment, too, continued to expand. After 1923, the rate of expansion of railroad traffic fell behind the rate of increase in productivity. Between 1923 and 1929, the average number of workers declined 11 per cent, the number of hours worked declined 13 per cent, railroad traffic increased by 3 per cent; productivity increased by more than 18 per cent. Between 1923 and 1936 the traffic volume increased by almost 43 per cent, but employment increased by only 3.3 per cent and hours of work by only 2.6 per cent; productivity per man-hour thereby increased 39 per cent.¹

With only slight variations, these findings are corroborated by data contained in "Exhibit No. 45," appearing on page 223 of part 1 of the hearings before this committee. In that exhibit output per man-hour on steam railroads is given for the following years:

(1923-25 AVERAGE=400)	
1914	75.3
1923	96.3
1929	113.8
1932	111.8
1936	140.4
1937	143.1

Witt Bowden, of the United States Bureau of Labor Statistics, found that "Productivity in terms of average output per man-hour worked in 1936 was 32.8 percent greater than in 1926, and 80.9 percent greater than in 1916." (Monthly Labor Review, July 1937.) This study has been discussed rather fully in chapter VI of the Brotherhood's book, *Main Street—Not Wall Street*—which was published in 1938 as a reply to the railroads' demands for a 15 percent wage cut.

It was found that the index of productivity of all employees is not materially less when based on hours paid for than when based on actual man-hours worked.

On the basis of transportation traffic units (a formula derived by the American Railway Engineering Association to measure operation and wear and tear of equipment), the increase in productivity of all

¹ Summary of Findings, March 1938, p. 111.

employees, excluding the principal salaried groups, increased 37.7 percent between 1926 and 1933, and 43.8 percent between 1926 and 1936.

I quote further from page 166 of *Main Street—Not Wall Street*:

Attention is called to the fact that in 1916 it required the services of 88,715 freight conductors and brakemen to move 362,444,397,129 revenue freight ton-miles, while in 1937 it required the services of but 60,455 freight conductors and trainmen to move 360,667,773,000 revenue freight ton-miles. In other words 28,260 fewer employees of these classes were required to move substantially the same amount of business.

Certain indices indicate the trend of productivity:

In 1920, as of December 31, the number of steam locomotives in service on class 1 railroads was 64,368; in 1926, 62,342; in 1938, 42,637.

But the average tractive power of steam locomotives in 1920 was 36,365; in 1926, 41,886; in 1938, 49,803—or an increase of 37 percent.

The average length of freight trains, including cabooses, was 36.6 cars in 1920; 45.2 cars in 1926; and 48.1 cars in 1938.

The average gross tons per freight train in 1920 was 1,443; 1,736 in 1926; and 1,895 in 1938.

In 1920 freight cars had an average capacity of 42.4 tons; in 1938 the capacity had increased by 16.5 percent, to 49.4 tons.

The average speed of freight trains between terminals was 10.3 miles per hour in 1920; 11.9 miles per hour in 1926; and 16.1 miles per hour in 1937.

The average speed of freight trains between terminals in 1939 was 62 percent greater than in 1920.¹

The speed with which passenger trains operate today is amazing. Between 1938 and 1939, the number of separate runs operating daily at 60 miles and more per hour increased from 864 to 997. American railroads now have 85 runs booked at 70 miles and more an hour. Contrast this with the year 1928, when, except for 1 or 2 short runs in New Jersey, there was not a single train in the United States scheduled to average more than 60 miles an hour.

Certain labor-saving devices and technological improvements have resulted in throwing railroad men out of work. Among these are the following: improved rails and tools—spike drivers, wrenches, drilling machines—the mechanical oiling of tracks; radical changes in the design of the steam engine; reduction in the number of manual block-signal stations; centralized traffic control; and automatic signal devices. Chemical treatment of railroad ties has doubled their life-span.

In discussing the matter of unemployment in the railroad industry, we cannot overlook the possibility that 200,000 to 350,000 jobs are at stake, should Congress adopt legislation calculated to open the flood-gates to widespread railroad consolidations. It is a known fact that the Wall Street interests that control the railroads would like to solve their financial problems by operating only the most profitable lines, abandoning the so-called unprofitable lines, and leaving in the wake of this destructive program many ghost communities and several hundred thousand workers without employment. Current railroad legislation before Congress, as embodied in the omnibus transportation bill (S. 2009), answers the problem for Wall Street.

¹ Source: Press release, Association of American Railroads, March 15, 1940.
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The Brotherhood of Railroad Trainmen, however, does not propose to acquiesce in such a vicious program. We have caused to be introduced what is known as the Harrington amendment to the omnibus transportation bill, which would offer complete protection to railroad labor in the event of the consummation of consolidation schemes. A large majority of the Members of the House of Representatives have declared themselves in favor of this amendment, as have thousands of citizens throughout the land who have signed petitions endorsing our proposal. Such wide support is indicative of a majority public opinion which says: "Congress must not pass any legislation which has the effect of destroying job opportunities."

At his inaugural on March 4, 1933, President Roosevelt said: "Our greatest primary task is to put people to work." I submit that the blackout of unemployment is still the first point on the Nation's agenda.

If we ponder the fact that the remarkable rise in industrial production which came at the end of the last year was accompanied by no appreciable rise in employment, then we shall begin to understand why we are now tobogganing downward at the fastest rate in history. The products of the machine are not bought by another machine. They are bought by employed people.

The usual question is asked of those who laboriously demonstrate the existence of unemployment, and the technological causes for it, as we have done today as respects the railroad industry: What do you offer as a remedy?

While I am not certain that it is possible to solve the problem in its entirety under our present economic system, which, in the last few years, has proved to be of more benefit to the profit takers than to the wage earners, we should nevertheless be able to take some steps that would alleviate the situation. The shorter workday is one such measure. Even the *Wall Street Journal* recognized this possibility when it declared, on February 3, 1940, that the ability of manufacturers to increase the number of their employees from December 1929 to December 1939, while there was a general 1-percent decrease in total employment, in a period "in which productivity of machines has increased as much as it has since 1929 is undoubtedly due to the reduction in the length of the workweek."

The 6-hour day should therefore be considered as an immediate and practical remedy for the problem of unemployment. Such a solution was urged in a resolution adopted unanimously on June 9, 1939, at the Second Quadrennial Convention of the Brotherhood of Railroad Trainmen, held in Cleveland, Ohio. This resolution embodied a comprehensive reemployment program for the railroad industry, advocating such measures as the shorter workday, rehabilitation of railroad properties, grade-crossing elimination, train limit and full-crew legislation. It is a clear-cut expression of the railroad worker's desire to see America free itself, in a democratic way and through peaceful means, from the economic dilemma with which it is confronted. The resolution follows:

REEMPLOYMENT PROGRAM IN THE RAILROAD INDUSTRY

Whereas the average employment of 940,000 workers on class I steam railroads last year was the lowest recorded for any year since 1899 and weekly wage payments to railroad workers in 1938 averaged 13 percent smaller than in 1937 and 41 percent below the 1929 average; and

Whereas the problem of reemploying tens of thousands of railroad workers who have been laid off in recent years, and the problem of promoting a high degree of safety in railroad operations are undeniably questions of first importance confronting railroad labor today; and

Whereas hundreds of thousands of railroad employees are anxiously seeking a solution to these problems in the form of a practicable program which will secure their jobs and incomes and reduce the hazards connected with this work; and

Whereas the Wall Street bankers who control the financial, and, therefore, the business, policies of the railroads have forced railroad management—often against its own better judgment—to curtail services, to lay off thousands of loyal employees, to attempt to slash wages, to allow equipment to deteriorate without adequate repair or replacements, thereby endangering the safety of the trainmen and the traveling and shipping public, in short, to carry through in the railroad industry the same policy of sabotaging the reemployment and industrial recovery program of the New Deal which the United States Chamber of Commerce and the National Association of Manufacturers pursue in other basic industries; and

Whereas this sabotage of our economic institutions is coupled with a diabolical attempt to strike at the political and economic liberties of the American people, so clearly evident in the Tory attacks on the Railway Labor Act, and efforts to destroy the principle of collective bargaining as embodied in the National Labor Relations Act; and

Whereas the preservation of democracy in this country demands a speedy bringing together of unemployed citizens and unemployed capital, to the end that this Nation may accomplish a complete economic recovery; and

Whereas the reemployment of men and money in the railroad industry would provide a great stimulus to the employment of idle labor and idle capital in all other industries, because the railroad industry is the very lifeblood of our economic system; and

Whereas this brotherhood—in fact, all railroad labor—has in the past recognized that the ultimate solution to the railroad problem lies in Government ownership and operation of the railroads; and

Whereas pending the attainment of this ideal, railroad labor must initiate practical steps to reinvigorate the industry: Now, therefore, be it

Resolved, That the Second Quadrennial Convention of the Brotherhood of Railroad Trainmen, while reaffirming the action of the previous convention with regard to Government ownership of the railroads—namely, empowering the president and the grand lodge officers to press for Government ownership at the most opportune time—does hereby go on record in favor of an immediate reemployment program in the railroad industry, sponsored by the Federal Government in cooperation with railroad management and railroad labor; and be it further

Resolved, That such a program shall embody the following minimum features: (1) The rehabilitation of railroad properties to the extent of several billion dollars in order to reemploy idle railroad workers, to increase the safety of the employees and the traveling public and shipping public, and to provide greater efficiency and speed. (2) The elimination of the many thousands of grade crossings. (3) The improvement of the conditions of railroad labor by (a) enactment of train-limit and full-crew legislation; (b) amending the Adamson 8-hour law to provide for the 6-hour day; (c) increasing the basic rates of pay; (d) reimbursing trainmen for away-from-home expenses; (e) securing vacations with pay; (f) liberalizing the disability features of the Railroad Retirement Act and giving credit for time spent in military or naval service; and (g) offering to every able-bodied railroad man a railroad job; and be it further

Resolved, That such a program shall be financed jointly by the Federal Government; by the State governments, insofar as the elimination of grade crossings is concerned; and by the railroads themselves, requiring them to reduce their capitalization and therefore, their debt burden; and that in extending reemployment loans to railroads, the Federal Government shall be given a voice in determining business and financial practices of these roads which shall be at least equal to the voice given the railroad banker; and be it further

Resolved, That the president of the Brotherhood and the national legislative representative be instructed to work for the enactment of Congress of legislation providing for the carrying out of such a program, and to invite all railroad labor to unite with us in backing up this practical program of reemploying idle men and idle money in the railroad industry; and be it finally

Resolved, That copies of this resolution be sent to the President of the United States, to the chairmen and members of the House and Senate Commit-

tees on Interstate and Foreign Commerce, to the railway labor executives, to the press, and printed in the forthcoming issue of the Railroad Trainman."

In conclusion, let me state that the logic, or rather the lack of logic, of the contention that technology does not reduce total employment opportunities is well illustrated by a pamphlet entitled, *Ten Facts of Technology and Employment*, published in 1936 by the Machinery and Allied Products Institute. I quote:

If technological advancement did not make possible a greater volume of production the standard of living could be raised only by increasing hand labor. Had it been necessary to increase hand labor in the same proportion as production between 1900 and 1930, every adult man and woman in the Nation and several million children would have been needed in jobs. It would have required more than 60 percent of the entire population, whereas only about 40 percent ever seeks gainful employment, the remaining 60 percent being constituted chiefly of women and children supported by the 40 percent.

Thus, the Machinery and Allied Products Institute started out to prove that labor-saving machinery does not destroy jobs and ended up by proving that were it not for machines and modern technology there would not be enough men and women workers in the Nation to accomplish the work now being accomplished with extensive use of machines and power.

That great American inventive genius, Thomas A. Edison, once said:

Human slavery will not have been fully abolished until every task now accomplished by human hands is turned out by some machine.

In the middle of the nineteenth century Dr. Ure, an expert English economist, advised the manufacturing classes of England that the goal of the manufacturers should be the development of machinery to the point where they could use the labor of women and children, which was cheaper than that of men, and that the ultimate goal was to displace all labor, as nearly as possible, through the development of the machine.

We should ponder the words of Dr. Ure in the light of the great increase in the industrial employment of women in this technological age. We should ponder Thomas Edison's words in the light of the dire consequences to human society. If Dr. Ure's goal should be achieved, the male portion of humanity would live only by the grace of employers and female income earners. If Mr. Edison's goal should be achieved, all of us would live, if at all, only by the grace of the machine owners.

And may I add one vitally important thought? He who considers that technological displacement of labor comprehends only the machine displacement of labor loses sight of a most important consideration. For the most part, in a machine age, the labor cost of making a product that will last for many years is no greater than the labor cost of making a product that has only a short period of serviceability. As competition and discovery force the improvement of products, a great displacement of labor thereby results. House paint that lasts for 5 years instead of 2½ years not only results in a 50 percent reduction in job opportunities for house painters, but there is a like reduction in employment in paint manufacturing, independent of the fact that machine methods of paint manufacture may also eliminate many workers. Likewise, with automobile tires that last for 30,000 miles, instead of 10,000 miles, storage batteries that last for 3 years instead of

1 year, and so on. Not only does such longevity of these products reduce by two-thirds the employment in their manufacture, apart from machine efficiency, but also such longevity greatly reduces the business opportunities of the cross-road garages throughout the Nation.

Gentlemen of the committee, we are face to face with the fact that the requirements of human existence cannot safely be left to the mercy of an unbridled private-profit motive.

Acting Chairman O'CONNELL. You will supplement this statement?

Mr. WHITNEY. With just a few highlights, if I may.

I might begin by saying that I would like also, if it is agreeable to the committee, to introduce a document entitled *Main Street Not Wall Street*, which was a portion of the *Brotherhood of Railroad Trainmen's case* before the 1938 President's Emergency Board in the wage controversy that was up at that time, and I would direct the committee's special attention to chapter 6, page 162, of that book, entitled "Productivity of Railroad Employees," which tells quite completely the statistical story of the productivity in our industry. I have only one copy today, but if it is desirable I would be glad to furnish a copy for each member of the committee.

Acting Chairman O'CONNELL. That will be accepted. Do you wish to substitute another copy for that one?

Mr. WHITNEY. No; the committee may have that copy, and I can furnish additional copies for each member of the committee.

Acting Chairman O'CONNELL. If you will make other copies available to Dr. Anderson, it will be appreciated.

Mr. WHITNEY. We will be glad to do that.

(The document referred to was marked "Exhibit No. 2635" and is on file with the committee.)

Mr. WHITNEY. My organization, I might say, has for a number of years been quite keenly aware of the problem you are discussing—technological displacement of workers. In March 1936 our official publication, the *Railroad Trainman*, published an article entitled "Machinery Creates Jobs—What of It?" I believe that has a lot of data that would interest this committee. I don't insist upon it, but if you are willing to receive it as an exhibit I should be glad to put that in also.

Acting Chairman O'CONNELL. How lengthy is that?

Mr. WHITNEY. It is four pages.

Acting Chairman O'CONNELL. Without objection, that will be accepted and printed in the record.

(The document referred to was marked "Exhibit No. 2636" and is included in the appendix on pp. 17434-17439.)

Mr. WHITNEY. That is a little more inclusive than just our testimony today because it covers the problem as a whole.

To highlight my president's testimony I might call your attention to a rather lengthy quotation from a study made by Mr. Carter Goodrich, of the United States Department of Labor, in May 1934, entitled "Earnings and Standards of Living of 1,000 Railway Employees During the Depression." The human considerations there are sufficient to move anyone to want to do something. It shows how railroad men descended, as it were, into the dark ages through having to give up all of their insurance, their standards of living, going together several in

one home, sacrificing their protection in the form of accident insurance, and all that.

That is a story which should move us all to deep consideration, but I would like the committee to read that bearing in mind also the businessman's viewpoint, the terrible deflation to business that comes to landlords and builders when people are thrown together several in one home. It seems to me that sometimes we become so deeply concerned with the human considerations of these things that we overlook that we are actually working against ourselves from a business standpoint in the deflationary effect upon our whole economy.

RAILROAD CONSOLIDATIONS

Mr. WHITNEY. Then I would like to move on to a consideration in our testimony which is very prominently before the country at this time, and that is a new technique for getting rid of labor and getting greater productivity—consolidations. I think we are pretty generally agreed that what we need in this country today is the employment of men and money, capital and labor. The outstanding characteristic of railroad consolidation, the very purpose of it, is to employ less money and fewer men, so it is of very genuine concern, it seems to me, to this committee, to ponder the possibilities of consolidations. We estimate that if a widespread consolidation program which would completely satisfy the ambitions of railroad bankers were put into force, at least 250,000 men would be eliminated in the railroad industry alone.

Mr. PIKE. From what sort of jobs would those people ordinarily come?

Mr. WHITNEY. I think it would affect all classes of railroad workers, from the engineer down. There would be fewer trains run, fewer train crews, tracks would be abandoned, there would be less maintenance work, and certainly the clerks would be greatly affected.

Mr. PIKE. That is what you usually hear, that there would be less work at the terminals and division points and things of that sort.

Mr. WHITNEY. Oh, yes, indeed.

Dr. ANDERSON. Of how much immediate concern is that problem of merging the railroads into a unified system?

Mr. WHITNEY. I was going into that. There is before Congress what is known as the Wheeler-Lea transportation bill, which admittedly was designed to facilitate and encourage consolidations. Our organization opposed that very strenuously because while there are many features of the bill we favor, we felt there was no law worth 250,000 jobs in this day and age of unemployment. I just want to call to your attention one of the prominent characteristics of our economy today, the tendency to pay men a pauper income for nonproducing. So economically unimportant has man's labor become that we have financiers actually willing in their desire for profits, to pay men to do nothing to get rid of the labor; that is inherent in the dismissal wage. Now we have never thought, as a social policy, of paying a group of bondholders a certain portion of their future worth to force them to surrender their bonds, but some seem to think that jobs and labor are less sacred. Therefore, capital proposes to pay men to take their jobs away from them and the

Brotherhood of Railroad Trainmen regards the dismissal wage as a relic of the dark ages. We believe that men should be entitled to work for a decent income and we don't believe they should be driven out of their jobs, especially when the reason for the dismissal wage is not improved service, it is not better incomes for workers, it is not lower rates to the shipper. It is to improve earnings to the bondholder, so we are absolutely opposed to the idea and the concept of a dismissal wage. We consider it a bribery offered to workers to surrender their opportunity to pursue their life's calling.

We introduced in the Congress, when we were threatened with this loss of 250,000 jobs, what is known as the Harrington amendment, which simply said to the railroads: "If you must consolidate, if you must make ghost communities throughout the land, you can't throw these men out overnight in mass numbers; you can't take the men of shortest periods of seniority and throw them into the bread lines. You will have to take care of them, and then you may take them off at the other end as they die, resign, or retire."

We consider that a very modest program. It does not offer much for the future in the way of increased employment, but at least it stops the crowding of bread lines in order to create better earnings and better profits.

I might tell the committee that we state in this document that 275 Congressmen signed a petition on behalf of the Harrington amendment, and we found an overwhelming majority of the Senators—in fact, only 1 Senator really opposed the idea of the Harrington amendment, so I believe that our Senators and Congressmen are becoming aware of the fact that disemploying men, for whatever cause, is not socially desirable. That was the full implication of the Harrington amendment, and, as I say, the dismissal wage is only a manifestation of the growing unimportance to profiteers of human labor.

I heard over the radio only Saturday a man speaking on behalf of the rural-electrification program, who said a farmer for a nickel could buy enough kilowatts to equal a full day's labor of a man, so that on that basis human labor is reduced to 5 cents a day. Now, if we are going to listen to the arguments that capital efficiency brought about this efficiency, that labor didn't bring this about, that labor should be paid what it is worth but no more, on that standard a farm laborer would be worth 5 cents a day.

RAILROAD FINANCES

Mr. PIKE. You don't think that capital isn't taking a spanking in the railroad business, too, do you?

Mr. WHITNEY. I don't know what you have reference to, but the thing that would loom in my mind would be \$100,000,000 lost in gambling in stocks and things like that.

Mr. PIKE. Another \$100,000,000 was used to extend the Chicago, Milwaukee & St. Paul to the Pacific coast, on which 98 percent is lost on today's quotations. You wouldn't call that gambling particularly.

Mr. WHITNEY. I am not particularly familiar with the financing shenanigans that went on in that case, but I do know the Chicago & North Western has been paid for two and seven-tenths times and still owes its average capital indebtedness.

Mr. PIKE. Yes; and the owner of those bonds hasn't received any income on his investment in some years. In the case of the Missouri Pacific, which sold common shares at \$100 a share, that is wiped out; in the case of the Rock Island a great many of its bonds are running around here at 5 to 20 cents on the dollar. I don't want to minimize your statement, but if there is any implication that capital hasn't been displaced by technology and other features in the railroad business, it is an entirely mistaken feeling. Its quoted value is about half of its stated value, though for purposes of the record I think the United States valuation showed very little water in the railroad business at the top, and whatever there was has been more than squeezed out by this deflation. The New Haven is another one which sold preferred shares at \$100 a share and during the last week the I. C. C. has said there is not enough left in the entire investment to deserve any consideration in the receivership.

I am not minimizing your story, but this technological change is not to the profit of the bondholders and the shareholders in the railroad industry. Everybody has taken a licking.

Mr. WHITNEY. I agree with you. I think we are just forcing ourselves up on a precipice to destruction. I think after the depression set in—I think I am correct on this—the railroads paid the highest dividends in history; they had such a momentum of big profits and big dividends that they couldn't stop, but, naturally, you have gradually washed up labor until now we are all upsetting the boat. I agree with that analysis of the situation very much.

Mr. PIKE. I think if you can point to anybody who foresaw where we would be in 1939 from the point of view of 1929, I believe we would like to have him appear before the committee.

Mr. MAGINNIS. Let me make this comment. Isn't the railroad industry the one industry that to common knowledge since the depression, in the last 10 years particularly, has been in terrible financial condition; and it is not due to technology, it is due to economics, isn't it?

Mr. WHITNEY. I have a friend, and I have never seen the time yet when he wouldn't take an hour off to tell me how busy he is. I sometimes think that about a lot of things we read in the newspapers about the railroads. When in a period of around 15 years the railroads can spend \$200,000,000 to tell you how poor they are, they are kind of like my friend who will take an hour out any time to tell you how busy he is.

Mr. MAGINNIS. Don't you think that is exaggerating it slightly?

Mr. WHITNEY. No; I do not. I am very sincere in making that statement. For instance, wouldn't you say any corporation that pays out more in dividends than it pays in wages is a pretty sound corporation?

Mr. MAGINNIS. What corporation does that?

Mr. WHITNEY. The Chesapeake & Ohio Railroad did that as recently as 1936, but that part doesn't get in the newspapers.

Mr. MAGINNIS. How many other railroads have been able to do it?

Mr. WHITNEY. I don't know that very many have. However, and this may shock you, but it is a fact, in 1931 and again in 1936 the Bessemer & Lake Erie paid 1,100 percent dividends.

Mr. MAGINNIS. What railroad?

Mr. WHITNEY. The Bessemer & Lake Erie.

Mr. MAGINNIS. That is a freight railroad.

Mr. WHITNEY. Sure.

Mr. MAGINNIS. In the steel industry.

Mr. WHITNEY. But when you talk about the abject poverty of railroads you are talking about certain railroads, not all railroads.

Mr. MAGINNIS. But you are talking about the railroad industry. Now, isn't it a fact that due to a great many conditions, including the economic conditions of the country during the depression period and the buses, the railroads have lost in revenue to such an extent that everybody knows that most of the railroads have been struggling against tremendous odds. The Interstate Commerce Commission has been trying to work out their problems to prevent more receiverships.

Mr. WHITNEY. What you say is true, but it can be said about other industries that we don't hear so much about. I read a piece about the railroad industry back in 1890, and I swear it sounded like the morning's newspaper. They were complaining then just like they do now.

Mr. PIKE. They were in trouble then.

Mr. MAGINNIS. They were in trouble then, but they didn't have the busses.

Mr. PIKE. They were in pitiful trouble then.

Mr. WHITNEY. Of course, but we understand there are conditions in the railroad industry that are serious. Any industry which can afford to waste \$1,000,000 a day must be in bad shape. Senator Burton K. Wheeler, after making a very thorough investigation of the railroad industry, solemnly announced that the railroads were wasting \$365,000,000 a year, \$1,000,000 a day. Now that, of course, we don't read about every day in the papers.

Mr. PIKE. That wasn't in wages.

Mr. WHITNEY. No; they haven't wasted a thing in wages; they are getting more now for their wage dollar than ever before in history. Whatever is wrong with the railroads, they can't lay it at the door of their employees, because the labor dollar today is worth more in the railroad industry than ever before in history.

Mr. CHANTLAND. Mr. Whitney, would you accept Mr. Pike's suggestion that the Rock Island and New Haven and that west coast extension of the Milwaukee are typical examples of good railroading and financing?

Mr. WHITNEY. Oh, not at all. I don't accept the statement either that our railroad industry is not overcapitalized. I still think there is a lot of water to be wrung out of the railroad industry.

If you read the history of the New Haven, it would put the Teapot Dome scandal to shame. I think that is the road that was mixed up in the Westchester, that spent \$1,500,000 a mile for the construction of the railroad. Well, when we go out on a drunk, we naturally have headaches afterward.

Mr. PIKE. That is gone, too.

Mr. MAGINNIS. That is water under the bridge, largely.

Mr. PIKE. I didn't mean to bring those up as cases of good judgment in the railroad industry at all.

Mr. CHANTLAND. I rather thought you did and I wanted to know if Mr. Whitney accepted those as good samples.

Mr. WHITNEY. Not at all.

Mr. PIKE. You can pick out a great many cases of bad judgment in the railroad industry, and I do think, though, that it isn't fair, that

when half the stated capital has gone in market quotations it is extremely probable from the evidence in hand of valuation that the waste has been eliminated and a great deal of the actual investment. It is particularly true in the case of that St. Paul extension; there was some funny business, in my opinion, on the bond financing, but the railroad was built, the money was spent on it, a great portion of it—perhaps there was a fair margin for what was regarded at that time as legitimate construction profit, but whatever money was put properly into that railroad at the time is gone. I think those St. Paul adjustments they were selling at one and a half the last time I looked at them, but they were the ones that finally came out of the Puget Sound extension. In the case of the Missouri Pacific—

Mr. CHANTLAND. Considerable was said about the cost of the receivership administration of the road, wasn't there?

Mr. PIKE. I think it is fairly true. Several insurance companies had a set-to over that.

Acting Chairman O'CONNELL. I think it might be well to let Mr. Whitney proceed. We are getting too far afield.

Mr. WHITNEY. I don't want to pose as an expert in railroad financing. I think to clear the record, though (I thought I heard you say the waste had been eliminated), it should be said that only a little over a year ago Mr. Wheeler made the statement that the railroads were wasting \$1,000,000 a day.

Mr. PIKE. I didn't mean waste in operation, I meant in original construction that had probably gone out the window in the decline in quotation of bonds or lack of unearned interest. That money has proved to be wasted by the fact that it didn't earn enough to pay its board. I didn't mean the annual day-to-day waste.

Mr. WHITNEY. Just the other day I read a statement that the railroads overpay on supplies purchased, through favors to shippers, and that they could save \$100,000,000 a year on purchases if they got value received, as you and I are supposed to when we buy.

Acting Chairman O'CONNELL. Can you tell me where the Wheeler-Lea bill is now?

Mr. WHITNEY. It was just reported out. The conferees announced that they agreed Friday night.

Acting Chairman O'CONNELL. Did they include the Harrington amendment?

Mr. WHITNEY. I am sorry to say they didn't. They struck out the entire consolidation section of the bill, dealing with the facilitating and expediting of railroad consolidation.

Acting Chairman O'CONNELL. There is really no point to the Harrington amendment without the consolidation?

Mr. WHITNEY. The Harrington amendment was conceived because of this threat of facilitation of consolidations.

Of course, I can't too strongly urge the necessity for shorter work hours as one means of meeting this problem.

Dr. ANDERSON. In that connection, I have just received a distribution of working time from Dr. Parmelee, in response to our request. That statement indicates that a very substantial proportion of all railroad workers now work very brief hours, which would not permit reducing their hours any further; many of them were employed for a few days in less than 2 months of a year. You weren't talking about reducing hours for such part-time employed workers.

SIX-HOUR DAY

Mr. WHITNEY. Absolutely not. I mean reducing a normal month's work without any reduction in pay, in other words, making the standard day of work 6 hours instead of the present 8 hours.

Dr. ANDERSON. And how would you cover the increased costs of such a procedure?

Mr. WHITNEY. Well, I sometimes think there are a lot of great economic truths which cannot be stated in terms that an economist would understand. I refer, of course, to the so-called "expert" economists who write for the financial pages of newspapers.

What I mean by that is this: in 1932 the railroads asked us for a 10-percent deduction in pay rolls. They solemnly told us that if we would take that 10-percent deduction for 1 year only—that is all they were asking for, and they emphasized that—it not only would solve the problems of the railroad industry but would restore national and world prosperity. Of course, that made us feel pretty important, and in our weaker moments we accepted the 10-percent cut, although our organization never felt that it was good for the country or the industry. In 1 year that deduction, I think, took something like \$24,000,000 out of the purchasing power of the Chicago area alone.

You asked about the increased cost. This supposed reduction in cost meant a net increase in costs, because it didn't help the railroad industry. The industry got worse, and the country got worse, and it certainly didn't solve the problem of world prosperity. I think as we distribute wealth through shortening hours and dividing up the work, we don't decrease costs on an economic basis, because the social values far outweigh the economic costs. Most economists would want proof of that generalization. However, I believe observation indicates that the natural consequences of constant deflation are more costly, even to the businessman, to say nothing of society, and it seems to me that that is the answer. We can do more work today in 6 hours than we could in 10 or 12 hours back in 1910.

Acting Chairman O'CONNELL. But assuming that the railroads are in general in a rather bad state, in part because of attempting to meet competition from other areas, as a practical railroad man I am afraid it would be a little bit difficult for him as a businessman, looking at his costs, to take the long-run view, as an individual, that a reduction in his wages is going to decrease mass purchasing power and is going to be part of a deflationary spiral which will make him worse off in the long run, because he is confronted with the day-to-day situation of meeting competition. While I would be inclined to agree with you on the social desirability of the long-range policy, most businessmen today confronted with the problem of making money are not so apt to take that broad view.

Mr. WHITNEY. I think that is very true. I don't think you can point to a thing in our industry, whether it be shorter work hours or increased wages or safety legislation, that the railroads haven't solemnly predicted it would bankrupt the industry. The Safety Appliance Act, which was designed to save the lives and limbs of working men, was hotly argued against as being a device that would completely bankrupt the railroads. We have grown in social conscience, and we haven't bankrupted anybody. Where we went bank-

rupt is when we let millions of people go and destroyed their purchasing power. That is what bankrupts us all.

Mr. MAGINNIS. Mr. Whitney, your remark about dismissal wages as being a form of bribery to the employee, isn't it a fact that every other industry, or we will say most of the other industries, in trying to meet the changing situation of progress and technology are working for that very thing of having some sort of a system of dismissal wages or displacement wages, which you term bribery?

Mr. WHITNEY. If you are talking about the legal definition of bribery, it obviously isn't.

Mr. MAGINNIS. I don't mean legal definition, I mean as a characterization.

Mr. WHITNEY. It is an inducement to a man to part with his job, without knowing what you are going to do with him after you get him separated from his job. I am condemning the social conscience which builds up these mechanisms designed to offset the economic cheapness of human labor, the change from the days of the wilderness, when probably all economic production was 95 percent human labor, to now, when it is 2 or 3 percent human labor. When you give a man a dismissal wage, and separate him from his job, have you solved anything? Haven't you only aggravated the problem?

Mr. MAGINNIS. But if a certain railroad, being operated in a businesslike manner, finds that the economic conditions in the territory in which that railroad is operating are such that its revenues are not keeping up to operating costs, would you argue that rather than cut down on the operating costs, even to the extent of letting some of the men out, that it wouldn't be better to keep that road in operation, than to try to get the I. C. C. to let them abandon the road completely?

Mr. WHITNEY. Of course, that is the threat that the railroads constantly hold over us. "If you don't do something here, we are going to abandon, and you will lose all your jobs."

DISPLACEMENT AS A RESULT OF CONSOLIDATION

Mr. WHITNEY. That was the argument for the Wheeler-Lea bill. It was argued on the floor of the House, "If you boys will just give up 250,000 jobs everything will be rosy, and in the end you will have more jobs than if you gave up none." That just doesn't appeal to me. The way the banker and the butcher and the candlestick maker get more is by getting more, but railroad employees are supposed to believe that by giving up a large part of what they have they will get more. I don't believe that.

Mr. PIKE. Do you use that 250,000,000 pretty accurately?

Mr. WHITNEY. Two hundred and fifty thousand.

Mr. PIKE. I had three too many ciphers on it. I was trying to remember the figure they gave us the other day of those working in the railroads. As I remember, it was just about a million or a little under. If my memory is correct, that would mean a quarter or more of all railroad employees displaced under such a bill.

Mr. WHITNEY. That is right.

Mr. PIKE. I think that would require some demonstration to me.

Mr. WHITNEY. I can demonstrate to you in just a moment. I have been arguing it for the last 2 months, so I have the data at my fingertips, fortunately. In the first place, the Prince plan, which was advo-

cated about 4 years ago and which didn't depend upon any enabling legislation at all, as I understand it, proposed to eliminate one-third of the railroad employees. The *Wall Street Journal*, I think, on January 17, 1940, said that if they could get this enabling legislation they could look forward to saving \$500,000,000 annually through railroad consolidations.

President Daniel Willard, of the B. & O., says that in consolidations 80 percent of the savings come from labor. Well, 80 percent of \$500,000,000 would be \$400,000,000. You are going to eliminate the lower-paid groups, mostly. But, let's say the average elimination will be of men who have \$1,000-a-year jobs. Four hundred million dollars would eliminate 400,000 jobs, so I am basing my estimate on Wall Street's ambition. I don't say it will be 400,000 jobs. I believe Mr. Willard included in his 80 percent some indirect labor, so it seems to me that 250,000 or 225,000 is rather conservative.

Mr. PIKE. We just don't see along the same line. I was trying to see where the consolidations of corporations would have that effect. I would see a few runs eliminated where there are now, say, competing runs not doing very much business, but I can't get the mental picture of more than a quarter of the railroad employees being eliminated. I don't take your demonstration as a complete demonstration. You have taken one quotation from one source and another from another and come to a conclusion that I still don't quite feel can be warranted.

Mr. WHITNEY. Are you familiar with the Prince plan of railroad consolidation?

Mr. PIKE. That this Chicago fellow put out a few years ago?

Mr. WHITNEY. He is a Boston banker.

Mr. PIKE. I think it was the same man.

Mr. WHITNEY. Mr. Prince boldly admitted that his plan would eliminate one-third of the employees, so I have pretty good authority back of me. I am telling you what the ambitions of the railroad bankers are. I am not admitting that we will ever consent to the elimination of that many.

Mr. PIKE. You are not going to stand for it?

Mr. WHITNEY. Consolidations offer one very interesting aspect. They are the one thing that brings organized labor and the chambers of commerce together. When we have a threat of a railroad consolidation, the chambers of commerce all along the line threatened with elimination join hands with us, and we raise so much trouble about it that the Interstate Commerce Commission is convinced that it isn't a good thing, and they don't approve the consolidation. I am not admitting that we are going to lie down and let them eliminate 250,000 men, but I am saying that is the ambition of the men who pretty largely determine the destiny of our economic system.

Mr. MAGINNIS. That may be a plan, but it is a long way from being carried out, a consolidation plan of that size, don't you think?

Mr. WHITNEY. I would feel a lot happier about your prediction if you were a railroad banker, because I know what their ambitions are, and I know that they want to do that. Whether they can do it is a question of how much we will protect ourselves.

Mr. PIKE. I will put it to you this way, that not one of the railroad

consolidations put through during the twenties eliminated anywhere near that proportion of men from the railroads involved.

Mr. WHITNEY. You bring up another question that is very important and that probably should be answered, if we aren't getting too far from the subject.

Mr. PIKE. This is the subject, this elimination of men. We are not going far from the subject.

Mr. WHITNEY. If you read the hearings and testimony and the argument before the Senate, including the speech of Senator Cummings himself, at the time of the enactment of the 1920 Transportation Act, you will find that the purpose of consolidation then was entirely different from the purposes now hoped to be achieved. I understand that since 1920 some two hundred railroads have been consolidated, which is apparently what you have in mind.

Heretofore consolidations in the railroad industry have been what is called end-to-end consolidations, the completion of lines, the throwing of two partially complete routes together. The whole purpose of the consolidation section of the 1920 act was not to eliminate men, or even to achieve economy. The word "economy" was not even mentioned in connection with it. The whole idea was to establish rates which would give a fair return to the railroads. They had a very mean problem, which still exists today, which accounts for the huge dividends of the C. & O. and Pennsylvania and some of the other big roads. Their problem was this: If they fix a rate low enough to make a fair return to the C. & O., it will be so low that the struggling roads can't live on it.

On the other hand, if they make a rate high enough for the weak roads, then the Chesapeake & Ohio and the Bessemer and Lake Erie will pay huge dividends, and the returns would be unconscionable. So, they said, "The way to solve this problem is to even the thing out by having the strong roads absorb the weak." Now, of course, it was placing too much faith in railroad bankers to assume that they would ever go around and pick up these poor-paying roads and consolidate them, so nothing has happened and we haven't had many major consolidations since the 1920 act went in force. But now we come along with a law where the whole idea is not to consolidate the weak with the strong but to consolidate for improved profits. Now, that is a major change in the purpose. I think if you will give that a little thought, you will see that when the whole purpose of consolidation is economy, you will get a greater elimination of men than when the purpose of consolidation is to complete routes or make the strong and weak come together.

Mr. PIKE. There is certainly something in what you say.

Mr. WHITNEY. I want to make just 2 or 3 more points. I might call your attention to an article entitled "Ten Facts on Technology and Employment," published in 1936, by the Machinery and Allied Products Institute. I won't read that quotation, in order to save time, but the rather humorous part of that pamphlet is this. They started out to prove that machines do not destroy jobs, and they ended up by proving that if it were not for machines and power there wouldn't be enough men, women, and children in the whole Nation to fill the jobs that would be required. To me that represents the lack of logic of the contention that machines do not eliminate jobs. Then, I want to call to your attention that Thomas Edison once

said, "Human slavery will not have been fully abolished until every task now accomplished by human hands is turned out by some machine." And way back in the middle of the 19th century, Dr. Ure, an English expert economist, advised the manufacturing classes of England that the goal of manufacturers should be the development of machinery to the point where they could use the labor of women and children, which was cheaper than that of man, and that the ultimate goal was to displace all labor as nearly as possible through the development of the machine.

Now, gentlemen, if we have in mind Thomas Edison who said all work should be done by machines, and bearing in mind the great growth of women in industry, we can see the tendency pointed out by Dr. Ure in the middle of the 19th century, and we are brought to the conclusion: How are we going to live if a few people own our natural resources and a few other people own our machines and machines do all the work or most of it? We will be living pretty largely by the grace of the few owners. I think that is a very serious matter.

Another point that I want to impress upon you is this: Most people think of technological displacement of labor in terms of the machine. I would say that is only a small part of the problem. The improvement in products, for instance, paint which lasts for 5 years instead of 2½ years—what does that mean? It displaces men who manufacture the paint, it displaces house painters, and it displaces transportation workers, and so on. Bear in mind that the improvement in the quality of a product does not necessarily call for greater labor cost. For instance, I think for a pair of pliers that you buy in the 10-cent store the labor cost is about the same as if you got a good pair of pliers that would last a lifetime. As invention and discovery force us into better and better products, that in itself will probably eliminate more jobs even than the machines as such.

You know there is a tendency to bring the manufacturing centers closer to the point of consumption, to spread out Mr. Ford's idea. What is that going to do us railroad workers? Naturally, it is going to mean less transportation.

Finally, most all industries have a great increase in productivity with a very small increase in labor. It doesn't take any larger train crew if the passenger cars are filled or if the freight cars are filled than if they are partially filled.

I don't want to be too much of a pessimist here today. I heard a story the other day that said the difference between an optimist, a pessimist, and a skeptic was well illustrated at the breakfast table. The optimist says, "Please pass the cream." The pessimist says, "Pass the milk." The skeptic says, "Pass the pitcher." I am asking that we pass the pitcher. I think these are problems that we have just got to do something about. I am not a pessimist. I think they can be solved, but I think they are ominous, to say the least.

Acting Chairman O'CONNELL. Have you any further questions?

Dr. ANDERSON. No.

Acting Chairman O'CONNELL. Thank you very much, Mr. Whitney, for coming. We will recess until tomorrow at 10:30.

(The witness, Mr. Whitney, was excused.)

(Whereupon, at 4:35 p. m., the committee recessed until 10:30 a. m., Tuesday, April 23, 1940.)

INVESTIGATION OF CONCENTRATION OF ECONOMIC POWER

TUESDAY, APRIL 23, 1940

UNITED STATES SENATE,
TEMPORARY NATIONAL ECONOMIC COMMITTEE,
Washington, D. C.

The committee met at 10:40 a. m., pursuant to adjournment on Monday, April 22, 1940, in the Caucus Room, Senate Office Building, Representative Clyde Williams, Missouri, presiding.

Present: Representative Williams (acting chairman), Senator O'Mahoney (chairman), Messrs. O'Connell, Pike, Lubin, and Brackett.

Present also: William T. Chantland, Federal Trade Commission; S. Abbot Maginnis, Department of Justice; and Dewey Anderson, economic consultant to the committee.

Acting Chairman WILLIAMS. The committee will be in order, please.

Dr. ANDERSON. Mr. Chairman and members of the committee, we are beginning today two important days of hearings on the subject of employment in agriculture and the whole broad field of agriculture. Today's witnesses are from the United States Department of Agriculture, and together they form a panel which will attempt to present the range and scope of this problem. In working out the testimony with each other they have split it up into parts, each man appearing in the field in which he is expert. It is hoped that it will be possible for them to present their testimony without too much interruption. They will all be present after that for the questioning of the committee, but I know we will expedite matters greatly if we can proceed in that way.

The experts to be heard are Dr. Carl Taylor, of the Division of Farm Population and Rural Welfare, Department of Agriculture; Mr. Ernest Holcomb, who is reading Dr. William T. Ham's paper (he is of the Division of Farm Population and Rural Welfare); Dr. Sherman Johnson, Division of Farm Management and Costs of the Department of Agriculture; Dr. Louis Bean, economist, of the Bureau of Agricultural Economics of the Department of Agriculture; and Dr. Norman Wall, Division of Agricultural Finance, of the Department of Agriculture. It is presumed that they will take the day for their testimony.

The first witness this morning will be Dr. Carl Taylor, followed by Mr. Ernest Holcomb. I would suggest swearing both witnesses at the same time.

Acting Chairman WILLIAMS. Will you be sworn, please? Do each of you solemnly swear the testimony you are about to give in the matter now pending shall be the truth, the whole truth, and nothing but the truth, so help you God?

Dr. TAYLOR. I do.

Mr. HOLCOMB. I do.

TESTIMONY OF DR. CARL TAYLOR AND ERNEST HOLCOMB, DIVISION OF FARM POPULATION AND RURAL WELFARE, DEPARTMENT OF AGRICULTURE, WASHINGTON, D. C.

Dr. ANDERSON. Might we have a brief résumé of your professional experiences and background to determine your competency as witnesses in this particular testimony?

Dr. TAYLOR. Well I was born and reared on an Iowa farm. After going through college I taught in the Agricultural College until I came to the Department here in Washington. I taught at the University of Missouri and the North Carolina State College of Agriculture and came here with some of the newer agencies and for the past 5 years I have been head of the Division of Farm Population and Rural Welfare.

Dr. ANDERSON. Dr. Taylor, you have published works in this field?

Dr. TAYLOR. Yes.

Dr. ANDERSON. Will you give us some indication of its character?

Dr. TAYLOR. I have a book on rural sociology which is just a textbook. I have a number of pamphlets, experiment-station pamphlets, having to do with farmers' organizations, community organizations, and so on.

Dr. ANDERSON. And scientific organizations?

Dr. TAYLOR. Yes.

Dr. ANDERSON. Mr. Holcomb, what is your professional background?

Mr. HOLCOMB. I was reared in Texas on a small poultry farm and educated at the Texas Agricultural and Mechanical College and have been with the Department of Agriculture for the past 4 years. Prior to that I worked at an experiment station in Texas.

Dr. ANDERSON. We will proceed with Dr. Taylor.

Dr. TAYLOR. I think Mr. Chairman, I will read a short statement, to give a sort of background for all the testimony that will be presented during the day.

TECHNOLOGY IN AGRICULTURE

Dr. TAYLOR. The information to be presented here has to do with the development of science and technology in farming, and their influence upon efficiency in production, employment, population movements, and the capital debt structure in agriculture. The story in brief consists of:

(1) an increasing efficiency in the production per man in agriculture, but a steadily diminishing opportunity for employment on farms;

(2) an increase in out-of-pocket and fixed costs of farm operations, and an increase in the economic risks involved in farming, due to expenses incurred in the purchase and operation of machinery, and interest charged for debts and tax services;

(3) an increase over several decades in the farm-mortgage debt in relation to farm values, resulting in a decreasing percentage of farm real-estate equities owned by those who till the soil:

(4) a cityward movement of farm population during periods of prosperity, and a tendency of this movement to reverse itself during periods of depression, which has resulted in recent years in the accumulation of a great surplus of persons of working age in the farm population;

(5) a fairly steady shift from owner to tenant operated farms since 1880, resulting in an ever-increasing number of persons in agriculture occupying the lower rungs of the agricultural ladder;

(6) an increasingly larger share of farm income now spent for farm implements and machinery and for their operation, which contributes to the rigidity of the farm operating cost structure and the disparity of farm income and parity income, and increases the competition between operating costs and farm family standard of living;

(7) a sizable shift in the ownership of farms from farmers to centralized lending agencies in satisfaction of debts, and an increase in the proportion of farm-mortgage debt held by the centralized lending agencies; and

(8) the effect of these trends to technological developments is seen in part in a somewhat different distribution of the number of farms in relation to size and to income. In a number of types of farming, we now have a somewhat larger number of small-sized farms and a more marked increase in the relative number of large-sized farms. Similarly, we now have a relatively larger proportion of income in the relatively low-income brackets, and marked increases in the proportion of income in the farms of the highest-income brackets.

That is an attempt to give a sort of over-all of the testimony to be presented during the day.

My particular part of the testimony has to do with the population movements, unemployment in agriculture, the increase in percentage of farm people who are in the working-age group.

The first chart that is before you presents the shift in the percentage of gainfully employed between the different occupations of the Nation, and shows a steadily diminishing percentage of all gainfully employed who are occupied in agriculture.

Acting Chairman WILLIAMS. It may be received.

(The chart referred to was marked "Exhibit No. 2637" and appears on p. 16924.)

Dr. TAYLOR. This chart gives information from 1870 to 1930. I don't think I need to say much about it because it is pretty graphic in its display, but the percentage of the total gainfully employed in the nation who were employed in agriculture fell from about 53 percent in 1870 to about 21 percent in 1930. This was undoubtedly chiefly due to the shift to urban centers of many occupations and processes at one time carried on on the farm: canning, smithing, milling, and things of that kind, to a point where a great deal of canning and even bread making and things of that kind have shifted into the city.

The occupations which picked up the losses in gainfully employed from agriculture during this period were manufacturing and mechanical pursuits, which picked up steadily until about 1910, but have held about steady since 1910, the domestic, professional, governmental services of all kinds, and the trade and transportation and finance group, which is in those groups at the top, which increased from around 25 percent of all gainfully employed in 1870 to about 38 percent now.

The next chart simply takes that agricultural block and projects it by estimation from 1930 to 1940, although the estimation is not complete because it is now 1940.

(The chart referred to was marked "Exhibit No. 2638" and appears below.)

Dr. TAYLOR. During that period the decline has been stayed, due to lack of opportunity for rural born and reared people to continue to shift into urban industries. The percentage, therefore, in 1940 is pre-

EXHIBIT No. 2637

[Submitted by the Bureau of Agricultural Economics, Department of Agriculture]

SHIFTS IN OCCUPATIONS, 1870-1930

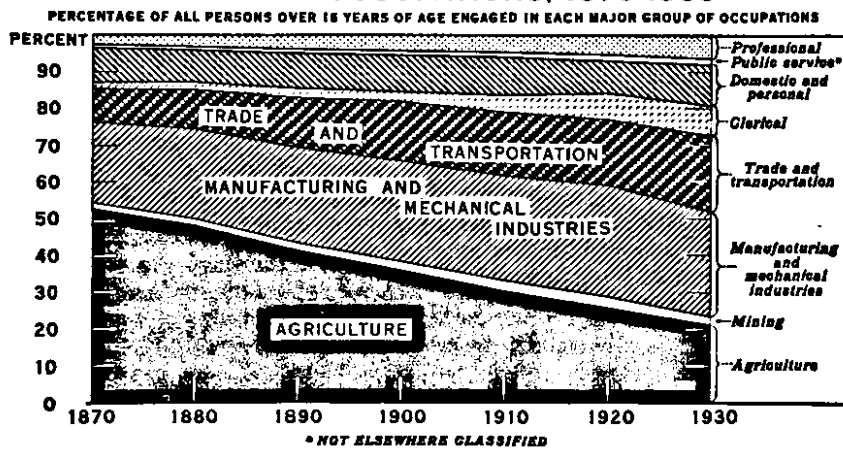
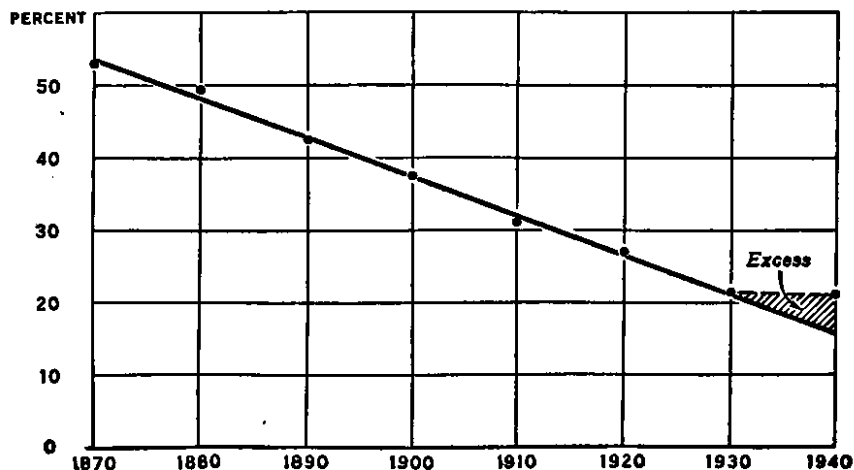


EXHIBIT No. 2638

[Submitted by the Bureau of Agricultural Economics, Department of Agriculture]

WORKING POPULATION IN AGRICULTURE, PERCENTAGE OF U.S. TOTAL, GAINFUL WORKERS 10 YEARS OF AGE AND OVER



sumably about the same, 21 percent as in 1930, but of course the increase in population makes that a considerably greater number of people. I have not attempted to estimate just how many those people were. It simply tells the story that over a long period of time there has been a steady shift of the people of employable age out of agriculture into urban industries.

The next chart is Movement to and From Farms, 1920-38.

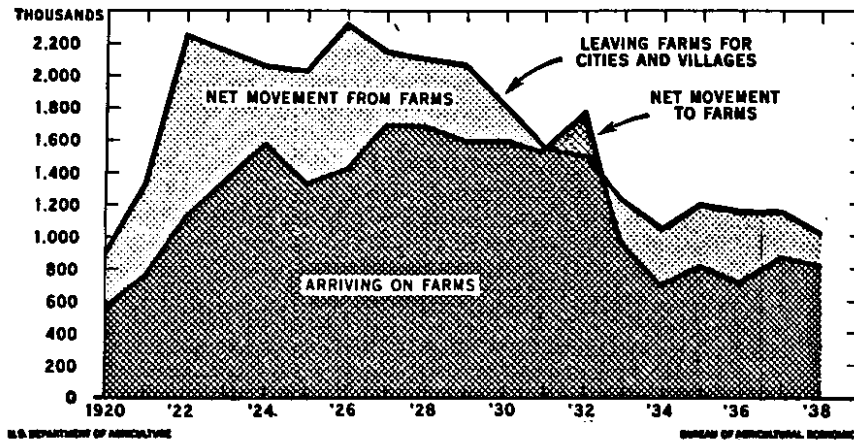
(The chart referred to was marked "Exhibit No. 2639" and appears below.)

EXHIBIT No. 2639

[Submitted by the Bureau of Agricultural Economics, Department of Agriculture]

MOVEMENT TO AND FROM FARMS, 1920-38

BIRTHS AND DEATHS NOT TAKEN INTO ACCOUNT



Dr. TAYLOR. That shows the story for the last 20 years of that movement of population, presumably either attracted by opportunities for employment in cities or pushed by lack of opportunity on the farms. The lower block of the chart shows the movement annually from 1920 to the end of 1938 (the estimates for 1939 are going through the mill at the present time) of the people who left cities to return to farms; there is a constant movement back and forth from farms to towns and cities and from towns and cities to farms. The upper curve, the one running from the bottom of the chart to the top, represents people who move from farms to cities, and the mottled section of the chart between the two curves is the net movement. You can see that for most of the period there has been a net movement of population from farm to city. Between 1922, which is the first high point in the top curve, and 1926, which is the second high point in the curve, there was a net movement; that is, there were 3,480,000 more people, or more moves, from the farm to the city than there were back, leaving a net migration to cities from farms during that 5-year period of 3,480,000. That was a period of relative urban prosperity, and I think you may safely conclude that was largely the reason for the great flow from the farms to the cities. From 1926 until 1932 there was an almost steady decline annually of the people flowing from the farms to the cities, with the result that in 1932, the only year of which this was true,

there was a net flow back to the farm. Taking the 5-year period preceding 1932, there was a net flow of 1,588,000, or less than half what there was in the first 5-year period; in 1932, at the depth of the depression, there was a net movement of 266,000 people back to the land from farms and cities. In 1933 there were 318,000 moving in the other direction, so 1932 and 1933 approximately balanced each other for that period.

Then take the 5-year period since that time: there has been a movement back to the city again, fairly steady, but you will see that it has not been as great in the last 2 years as it was in the 2 years preceding that. The net movement from farms to cities in the 5-year period since 1933 is about 1,604,000, or about \$320,000 per year. This movement, as you can see, is not a depression phenomenon. The shift back and forth is something that is going on in our national life all the time, and yet I suspect we can draw the conclusion that it does vary with the opportunities for employment in agriculture as contrasted with those elsewhere, except that when both agriculture and industry are down there seems to be a tendency for the people to seek shelter on the land.

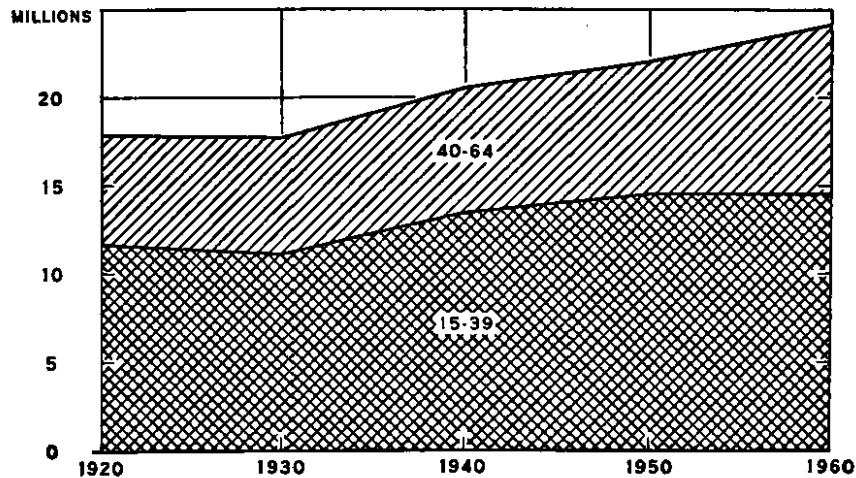
The next chart is, Estimated Rural-Farm Population 15-64 Years Old.

(The chart referred to was marked "Exhibit No. 2640" and appears below.)

EXHIBIT No. 2640

[Submitted by the Bureau of Agricultural Economics, Department of Agriculture]

ESTIMATED RURAL-FARM POPULATION 15-64 YEARS OLD, 1920-60
(ASSUMING THAT MIGRATION AFTER 1930 IS HALF AS GREAT AS BETWEEN 1920-30*)



*WARREN S. THOMPSON AND P. K. WHELPTON
BASED ON ESTIMATES OF FUTURE POPULATION BY STATES, NATIONAL
RESOURCES BOARD, WASHINGTON, D. C., 1934

U. S. DEPARTMENT OF AGRICULTURE

BUREAU OF AGRICULTURAL ECONOMICS

LABOR FORCE ON THE FARM

Dr. TAYLOR. This isolates the working-age group in the farm population and shows you the trend in numbers of those people, that is

people from 15 to 65 years of age. That doesn't mean that no one works on a farm before he is 15 years of age and that everyone quits at 65, but we use census data and say those of working age are from 15 to 65. You have a regularly increasing number of people in this group, because the migration to the city has slowed up, reversing itself in 1932, and recovering a little less than half the migration of the twenties, and because of the number of births in the farm population. That rural birth rate feeds a great many more people into the lower end of the age limit than move out at age 65, so the number of people in this group constantly increases.

That chart is projected to 1960, two decades in the future.

That is not a very wild guess, because all the people who are born in 1940 or before 1940 are now in existence and therefore the youngest of them will be 15 years old in 1955, so you don't have to guess on how many of them are going to be born. All you have to do is to take the mortality rates and the expectancy of deaths, and your calculation is pretty safe as to how many of those people will have reached 65, or 64, and so on down, because they are all in the population at the present time.

If the amount of migration from farms to cities which prevailed in the twenties, when in 1 year over a million net moved into the cities off farms, were to take place again, our farm population would gradually diminish, as it did fairly steadily between 1910 and 1930. It was about 1,900,000 less in 1930 than it was in 1910 because of this cityward migration. If that happened, our farm population by 1960 would fall to about 29,000,000. There is no evidence, however, in the present trend that it will fall that rapidly. On the other hand, if we were to have the phenomenon that we had in 1932 and 1933, when there were just about as many people coming back from the cities and towns as went into the cities and towns, and the farm population retained all of its natural increase, we would have about 45,000,000 in the farm population by 1960. We undoubtedly have today the largest farm population we have ever had because of this increase since the depression. So taking the migration from 1930 to 1940, which you saw in Exhibit No. 2639 was around 300,000 a year, or assuming that the migration in the next two decades will be one-half of what it was between 1920 and 1930 (and that is higher than it is running at the present time) we would then probably have in 1960 37,500,000 farm population.

I think I had better read the last paragraph of the explanation that you have before you.

Should the rate of net migration away from farms during the next two decades (1940 to 1960) be half as great as during the pre-depression decade of the 1920's (and half is considerably above the rate during the decade of the 1930's), the increase in farm population (by 1960) will be 16 percent, or 5,000,000 people.

Now because most of the people are in the age group from 15 to 65, 4,000,000 of those people would be in the working-age group, so we would add to the people now seeking employment in agriculture about 4,000,000 more people trying to find the way to make a living in agriculture.

The next chart shows that a little more graphically.

(The chart referred to was marked "Exhibit No. 2641" and appears on p. 16928.)

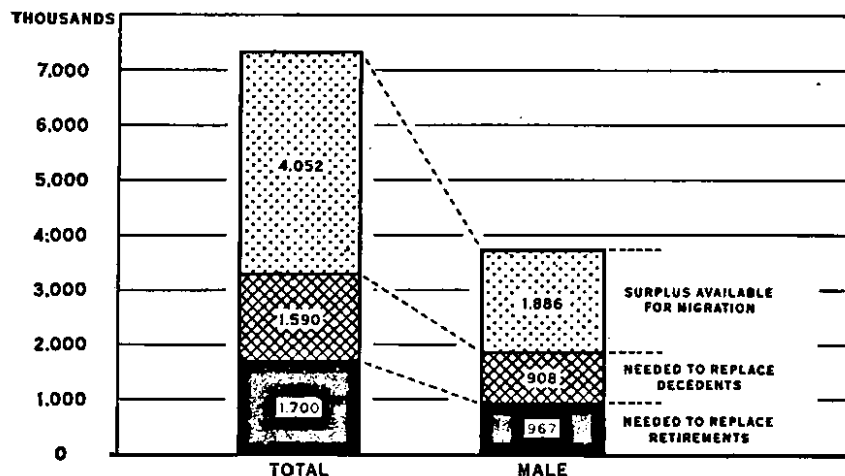
Dr. TAYLOR. The block to the right shows the male farm people of working age and the one to the left both male and female. The story of that chart is a continuation of the one which I just mentioned, that we have a steadily growing number of farm people of working age in agriculture.

And that number is far greater than the number needed to replace the people who die in agriculture, and far greater than the number needed to displace or to replace all the farmers who reach 65 years of age, if all of them quit farming at that age, so on the right-hand block even assuming that all farmers will retire at 65—and they won't—and that they have the normal death rate according to the experience tables of the life insurance companies, you will have

EXHIBIT No. 2641

[Submitted by the Bureau of Agricultural Economics, Department of Agriculture]

RURAL FARM POPULATION: TOTAL ENTRANTS TO AGE GROUP 15-64, 1930-40



U. S. DEPARTMENT OF AGRICULTURE

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1,886,000 boys in the farm population either hunting for opportunities to migrate into other enterprises or piling up on the farm trying to make a living there.

Now the last chart, which is a map.

(The chart referred to was marked "Exhibit No. 2642" and appears on p. 16929.)

Dr. TAYLOR. There are two maps, in fact, but this one is the important one. It is an attempt to get some judgment on what sort of an economic environment these 1,886,000 boys coming on in the farm population have. That doesn't assume that anybody is moving out from the city, but includes only boys who are on the farm now, who will graduate at 15 years of age. What sort of economic environment they are going to face, as best we can calculate? Those data are from the Unemployment Census, and with your permission I will read the page here, because while we may not know exactly how to interpret these as we project them into the future, they

present a pretty serious problem. This increased farm population of working age is not only confronted with the lack of farms to which to go, and a not too rosy picture from the standpoint of farm income, but they are immediately thrown into competition with a lot of people out there who are already unemployed. In the face of an almost certain increase in the number of farm-born persons seeking employment in agriculture, there is a great volume of unemployment already existing on farms. In 1937, according to the Unemployment Census, 1,547,000 males living on farms were either totally or partially unemployed, or had only emergency employment.

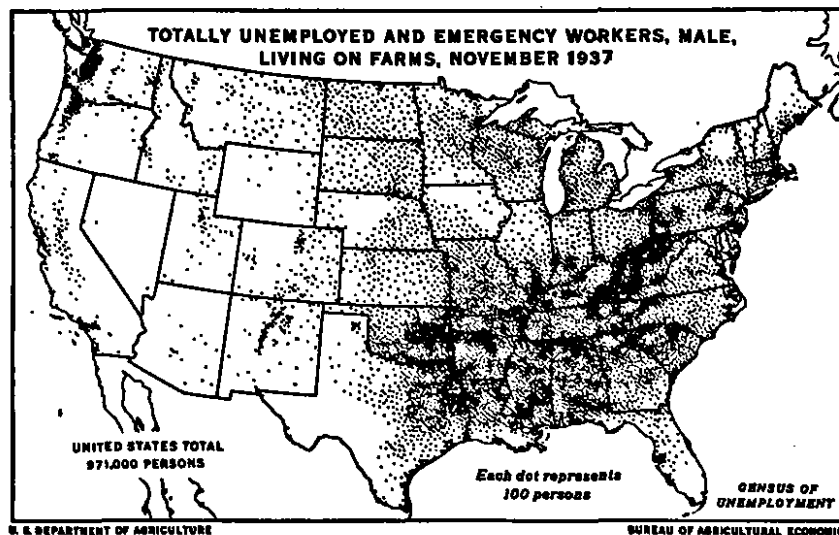
Acting Chairman WILLIAMS. At what age, just in that connection?

Dr. TAYLOR. That age, again, was, I think, 15 to 65, or was it 18 to 65? I think it was 15 to 65.

Of this number, 576,000 were partially employed and 266,000 were employed in emergency public works—W. P. A., C. C. C., N. Y. A., and so forth; the remaining 705,000 were totally unemployed.

EXHIBIT No. 2642

[Submitted by the Bureau of Agricultural Economics, Department of Agriculture]



Unemployment on farms is not entirely due to the economic depression but in part to a combination of long-time trends. As has been noted, the proportion of the total gainfully employed in the Nation who were employed in farming declined at an almost constant rate from 1870 to 1930, but during this period the increase in nonfarm employment created opportunities for those not needed in agriculture. The result was a net migration from farms to cities, which reached a maximum of 500,000 to 1,100,000 each year from 1922 to 1926. This annual net migration now is only a little more than 300,000 per year.

In other words, as these people came on in the past they found an opportunity to leave the farm and find employment elsewhere. But that is not true now—neither the migration flowing to the cities as it did and unemployment piling up on the farm.

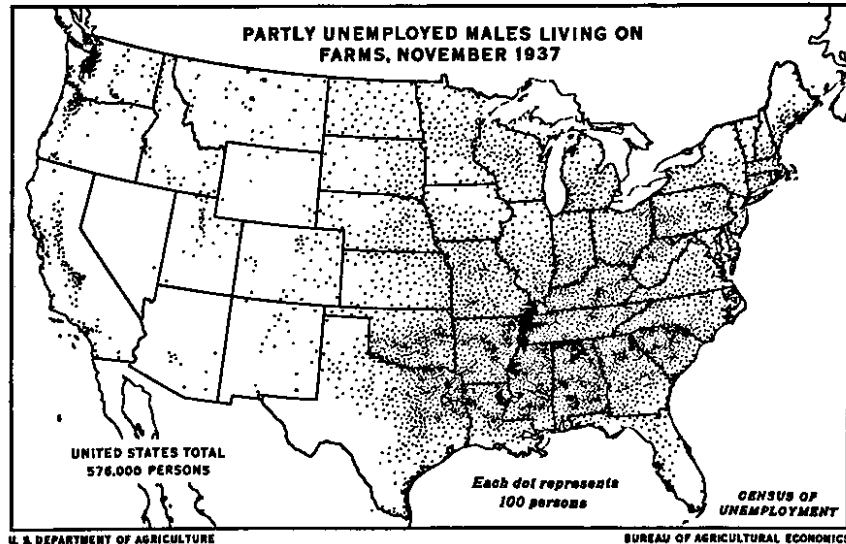
It does not, therefore, appear that the unemployment situation among farm families will correct itself through natural migration away from farms unless we have an industrial pick-up far beyond anything that has happened up to the present. Should the rate of net migration away from farms during the next two decades be half as great as during the decade from 1920 to 1930, the increase in the farm population of productive age from 1940 to 1960 would be 23 percent, and the problem of unemployment on farms would become one of the major problems of the Nation. Unless therefore net migration to the cities from farms develops in great volume, or new opportunities for employment are developed in agriculture, the problem of unemployment in the farm population will grow steadily worse.

The next chart simply shows the partially employed.

(The chart referred to was marked "Exhibit No. 2643" and appears below.)

EXHIBIT No. 2643

[Submitted by the Bureau of Agricultural Economics, Department of Agriculture]



Persons living on farms who registered in the unemployment census of November 1937 as partly unemployed were numerous in the Cotton Belt, particularly in the Mississippi River bottom lands of eastern Arkansas and southeastern Missouri. But large numbers registered also in the Appalachian region, extending from Maine to northern Georgia and Alabama, in Ohio, Indiana, Missouri, and the Lakes States, also in the valleys of the Pacific Coast. Relatively few registered in the Corn Belt and the Wheat Belt.

Dr. TAYLOR. The only thing I do not comment upon in the written statement you have there is anything concerning the location of these unemployed and partially employed people. I might make one generalization concerning that, and that is that the greatest number of unemployed, partially employed, and employed in emergency works programs of different kinds appear in those very areas of the Nation where the birth rate is highest and where the farm population is stacking up in competition with itself in a most marked way.

Acting Chairman WILLIAMS. In that connection what is considered "partly unemployed" on a farm? What is the definition? What class do you cover with that term?

Dr. TAYLOR. These data are from the unemployment census and I'm sorry I don't know what they used for that. In the regular census \$150 income off the farm would make you partially employed in industry, but I am sorry I can't say what the unemployment census figures used. I don't know whether any of the other men know that definition for their unemployment or not.

Mr. Holcomb, Mr. Chairman, will take this story of the farm population and farm labor on through the next charts.

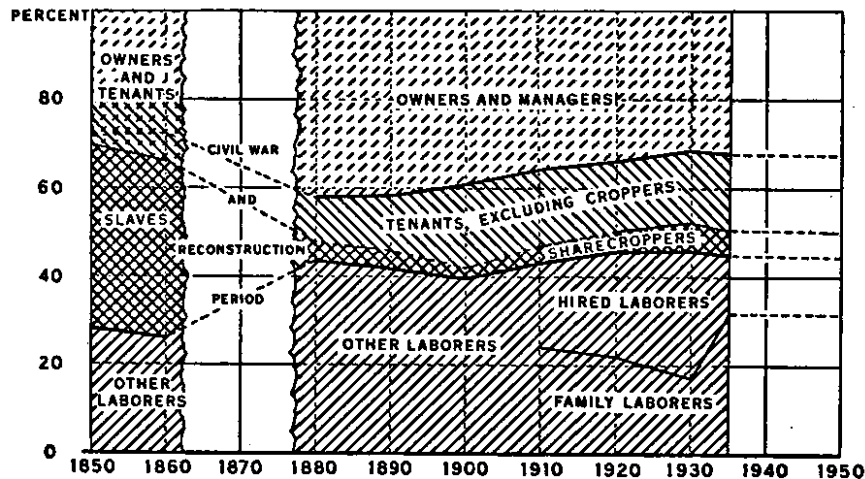
Mr. HOLCOMB. Dr. Taylor has already shown in the first chart that there has been a steadily diminishing percentage of the gainfully employed in agriculture. I am submitting a chart showing the percentage in each tenure class gainfully employed in agriculture.

(The chart referred to was marked "Exhibit No. 2644" and appears below.)

EXHIBIT No. 2644

[Submitted by the Bureau of Agricultural Economics, Department of Agriculture]

PERCENTAGE IN EACH TENURE CLASS GAINFULLY EMPLOYED IN AGRICULTURE, UNITED STATES, 1850-1935, WITH ESTIMATED CONTINUATION OF TREND LINES PROJECTED TO 1940 AND 1950



U. S. DEPARTMENT OF AGRICULTURE

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INCREASE OF FARM TENANCY

Mr. HOLCOMB. Since 1880 there has been a continuous decrease in the proportion of farm owners and an accompanying increase in the proportion of farm tenants. In 1880 owners were 42 percent of all those engaged in agriculture; in 1935 they were 31.8 percent. Because of debt, the real equity of operating owners was less in 1935 than these figures indicate. In 1880 the tenants formed 14.4 percent of all the persons employed in agriculture; in 1935 they formed 23.1 percent.

A part of the reported growth of tenancy in the United States since 1880 has consisted of movement from the status of laborer to that of cropper, which in many cases means little or no advance up the agricultural ladder, since the status of southern croppers is more like that of laborers than of tenants elsewhere. Between 1920, when it

first became possible to classify croppers separately from other tenants, and 1935 the proportion of tenants other than croppers increased from 16 to 17.3 percent, and the proportion of croppers from 4.7 to 5.8 percent of all persons employed in agriculture. In 1920 croppers constituted 22.9 percent of all tenants, and in 1930, 29.1 percent. Between 1930 and 1935 their numbers declined from 776,000 to 716,000, or to 25 percent of all tenants. As further technological improvements are made, their numbers are likely to decline still further.

The figures upon which this chart is based indicate a downward trend from 1880 to 1900 in the proportion of laborers and thereafter a trend upward. The imperfections in the census data for those years are such that, on slightly different assumptions as to the corrections to be made in the census figures, an increase in the proportion of farm laborers up to 1910 could be shown, and thereafter a definite slowing up of the rate of increase in the proportion of farm laborers. The main point to be observed is that during the past 30 years there has been no decrease in the proportion of laborers, but rather a tendency toward increase of that of hired hands. This development is as significant as the increase in the proportion of tenants. It is likely to continue. In many areas it has been offset to some extent by increasing use of power machinery.

I would like to point out, in connection with "Exhibit No. 2644," the line sloping upward between the family laborers and hired laborers between 1930 and 1935. We do not attach any particular significance to the magnitude of that change, but the direction of the change I think is significant.

Acting Chairman WILLIAMS. Have you got a reason for that?

Mr. HOLCOMB. Dr. Taylor has already pointed out one thing—the movement of population during that period. There was a net migration back to the farms, and during that period I believe the following witness will show that there has been a more rapid increase in mechanization. It is probably a joint phenomenon of increasing farm population and mechanization.

Dr. TAYLOR. May I add a remark, Mr. Chairman?

Acting Chairman WILLIAMS. Yes.

Dr. TAYLOR. I think it is partly due also, as Mr. Holcomb said, that when you get in a tough spot on a farm you simply quit paying the son, therefore he is no longer hired labor but a family worker; you quit hiring a hired man and you and the children do the work, so in a period like that you naturally have fewer hired men and more family labor. I would like to tie this chart up also a little bit to the testimony I gave by saying that I think it gives a part of the result of the heavy competition of farmers with each other when your population piles up, and they do compete heavily with each other. You find a greater and greater number of them shifting to the bottom rungs of the agricultural ladder, as is shown with the number of decreasing owners, and the increase of tenants and laborers and share croppers. That is happening in our total farm population, an ever greater number of them appearing on the lower rungs of the agricultural ladder.

Dr. ANDERSON. Dr. Taylor, if you substitute actual numbers for the percentages shown in this chart, would the number of owners be decreasing?

Dr. TAYLOR. Yes; over the period the number of owners would decrease. When you get down into the tenant group, during the last

few years the numbers would increase but the percentage would not increase, so your numbers would be different from your percentage figures.

Dr. ANDERSON. Is that true with respect to laborers as well? The number of laborers has grown.

Dr. TAYLOR. By and large I think the number has remained pretty steady in the labor group itself. After you drop below the owner group, you have a different meaning for labor there than you may have in hired labor. You have in the upper part of the chart owner operators, and below that "all others"; and you have the total farm population in considering your percentages, rather than just those operating farms.

Acting Chairman WILLIAMS. In order that we may have in the record a clear understanding of tenant and share cropper, what is the distinction upon which that chart is based?

Mr. HOLCOMB. The distinction is largely the one used in the census. The matter of ownership of work stock and equipment was the basis in the several censuses. The share cropper does not own his work stock and equipment, the renter does.

Acting Chairman WILLIAMS. And then what is the difference between the laborer—or is there such a term? You don't seem to designate it, as a farm laborer and sharecropper.

Mr. HOLCOMB. The wage laborer is the second group from the bottom. He works for a wage, monthly, weekly, or piece rate, while the sharecropper works for a share of the crop.

Acting Chairman WILLIAMS. Is that hired labor in cash or part crop? Always in cash?

EARNINGS OF FARM LABORERS

Mr. HOLCOMB. Yes. Of course, in many areas there is a custom of allowing them a dwelling place and garden patches and grazing privileges for their livestock, I should say, in addition to their money wage.

Acting Chairman WILLIAMS. That was my understanding of those terms, but I thought it might be well to make it plain.

Mr. HOLCOMB. In the next two tables we present some information as to the earnings of sharecroppers and wage laborers.

(The tables referred to were marked "Exhibits Nos. 2645 and 2646" and are included in the appendix on pp. 17440-17441.)

Mr. HOLCOMB. The first one compares the income of sharecroppers and wage laborers. The data of incomes of hired farm workers are so scattered and incomplete as to defy comparison. However, it is apparent that such incomes are low, and that they are lower in some farm areas than in others. Comparable data from cotton farms indicate that in recent years the net cash earnings of hired workers, whether sharecroppers or wage hands, only occasionally exceed \$100 per worker per year, and that even when goods for home use and perquisites are added, total annual net income per worker seldom exceeds \$150. Low net cash incomes of sharecroppers were reported in recent studies from both the eastern Piedmont and the Mississippi Black Belt and Delta areas. The highest net cash earnings were in the Piney Woods area of Texas in 1938, with an average of \$152 per worker. In the case of cotton wage hands, the lowest average

cash earnings reported were \$65 per worker per year in the Black Belt in 1934, while the highest earnings were in 1937 in the Delta areas at \$112 per worker.

The data indicate that as regards income the cropper is little better off than the wage hand. The slight income differential in favor of the former is almost wholly accounted for by the differences in the value of production for home use. Per family the difference is greater because of the larger average size of the cropper family.

I would like to point out, in addition, in connection with this, the percentage of their total net income that accrues from home-use goods and perquisites, as is shown in the third column. That ranges from about 30 percent in 1936 for the Yazoo-Mississippi Delta area to approximately 52 or 53 percent in that same area in 1932; the dollar values attached to those home-use goods and perquisites were not greatly different between the 2 years, but the percentage of the total increased materially.

For the wage hands, the percentage represented by home-use goods and perquisites did not range quite so widely. Their home-use goods and perquisites are quite a bit lower than that of sharecroppers, I think principally because of the relative instability of that group of workers, for at least the sharecropper has 1 year that he can count on being on the farm.

Passing on then to the next table, we show income figures for wage hands in various areas in the United States, from studies that have been made from time to time.

(The table referred to was marked "Exhibit No. 2647" and is included in the appendix on p. 17442.)

Mr. HOLCOMB. These are for the period between 1930 and 1938. With respect to other areas and crops than cotton, few comparable studies have been made, owing to variations with respect to home-use products, perquisites, total family earnings, and total earnings throughout the year. However, taking the figures as they stand, incomes of farm laborers in the various areas, the studies may be grouped as follows:

Arranging them from lowest to highest, from these spot studies, the lowest income appears to be in the tobacco area of Kentucky, between 1935 and 1936, with cash earnings of \$188. In the small-grains area of Minnesota and Kansas those earnings amounted to \$206 and \$205, respectively. In the truck area of New Jersey, in 1936, the earnings amounted to \$265, and in the Corn Belt in Illinois and Iowa in 1935-36 the cash earnings of wage hands amounted to \$306 and \$312, respectively.

A study made in four sugar-beet States in 1935 indicated that their earnings amounted to about \$340.

In the State of Washington, laborers working in hops earned \$352; that is, single persons. Heads of families earned \$496.

In California we have two studies during this period. The first was made in 1935 and indicated that the earnings of migrant workers who had applied for relief at the close of that year were \$261; and in another study in Placer County, a fruit county in California, the earnings amounted to \$651. That study took the workers as they came in the fields, irrespective of whether or not they were on relief.

Acting Chairman WILLIAMS. Does that mean that there has been that much increase in the earnings of the hired laborers in California during the period?

Mr. HOLCOMB. As a matter of fact, you will notice in section IV of "Exhibit No. 2647," between 1930 and 1935, there was an actual decrease in the earnings of these workers. These are migrant workers who applied for relief at the close of the particular year.

Acting Chairman WILLIAMS. What is the significance of the big difference between those two figures in the same State, of \$261 and \$651?

Mr. HOLCOMB. The figures shown under section IV (A) on the chart are obtained from the entire State from relief applicants who had worked as migrant workers in agriculture during the past year. Under IV (B), the study made by the Department of Agriculture was made in one county in California, and they obtained information from workers irrespective of whether or not they obtained relief.

Mr. PIKE. You got the lowest section, though.

Acting Chairman WILLIAMS. I don't quite understand yet what you mean by "relief." Does that mean the workers who were on public relief?

Mr. HOLCOMB. That is a study made by the State Relief Administration of California, and they obtained this information from clients as they applied for relief.

Acting Chairman WILLIAMS. Take the figure of \$261 in California in 1936. What does that represent?

Mr. HOLCOMB. That probably represents the lowest-down group employed in agriculture.

Acting Chairman WILLIAMS. But if they are employed, they are privately employed?

Mr. HOLCOMB. Yes.

Dr. ANDERSON. Mr. Chairman, I can explain the figure, because I know something about its source. Applicants for relief at the State relief station stated that during that year their earnings per family had totaled this amount.

Mr. PIKE. They were irregularly employed.

Dr. ANDERSON. They were casuals, migrants, and seasonal harvesters employed during that year at some sort of agricultural labor.

Mr. PIKE. That wouldn't be a fair section of the agricultural laborers in the State.

Dr. ANDERSON. That is precisely what Mr. Holcomb said. It is the lowest rung of the agricultural group.

Acting Chairman WILLIAMS. Is the 651 intended to be a fair average?

Mr. HOLCOMB. I think it is a fairly representative figure for that one county.

Acting Chairman WILLIAMS. Oh, just for the one county. That is what kind of industry, the fruit industry?

Mr. HOLCOMB. Fruit. It is in the section north and east of Sacramento.

Acting Chairman WILLIAMS. What, in addition to cash income, do these hired laborers receive? What other kind of income do they have, if any?

Mr. HOLCOMB. Most of them receive some perquisites. It varies from area to area. Some studies have been made along that line. In

the South and East it amounts to quite a bit. What it amounts to in the western areas I don't know.

Acting Chairman WILLIAMS. What is the nature of it?

Mr. HOLCOMB. Fruits, perhaps culls, lodging, occasionally board, and in some instances washing and ironing for the men.

Acting Chairman WILLIAMS. A garden patch for married men?

Mr. HOLCOMB. For those regular workers, yes; but not the seasonal workers.

Acting Chairman WILLIAMS. And a house or hut to live in?

Mr. HOLCOMB. That is right; a place to live.

Dr. ANDERSON. You wouldn't imply that the workers receiving \$651 in Placer County were year-round workers in that county who were provided these perquisites.

Mr. HOLCOMB. No; many of them were, as a matter of fact, migrant workers, and I don't know what the amount of perquisites amounted to in that particular study. I don't know that they obtained information with respect to perquisites. That figure probably should be taken into account, or it should be taken into account in that figure that the expense of moving about was not obtained in the study. How much that moving around from place to place was, I don't know.

Dr. TAYLOR. That includes the very best and the very lowest. It averages up pretty high, because it includes those permanently employed and those who have a house, and so forth.

Colonel CHANTLAND. Isn't it a fact that in certain sections the common practice is, in the employment of labor, that they are founded completely—they have their board and washing and ironing, so that what they get is net in that sense? These migrants are not in that class, are they?

Mr. HOLCOMB. No. Occasionally they do receive fruits, though.

Colonel CHANTLAND. I heard you say that.

Acting Chairman WILLIAMS. Have you made a study to indicate what influence this especially large migration in California has had on wage rates there when they hire farm labor?

Mr. HOLCOMB. A study was made a year or so ago. The tabulations are now going on in our regional office in Berkeley, Calif. Just what that will show I am not certain yet. The tabulations are not complete.

Acting Chairman WILLIAMS. I was just wondering whether John Steinbeck's portrayal was anything like accurate in his *Grapes of Wrath*.

Dr. ANDERSON. I might interrupt to say that Dr. Paul Taylor, who will be on the witness stand tomorrow afternoon, is the authority on this western problem. We brought him particularly because of the interest in it, and he is prepared to give such data as are available on that subject.

Acting Chairman WILLIAMS. Proceed.

Mr. HOLCOMB. These data are not shown on that chart. There were studies made in 11 different areas in the year 1936 by Folsom and Vasey of the Department of Agriculture which show cash earnings of workers in 11 different areas. The cash earnings range all the way from \$126 in the self-sufficing area of Tennessee to this same \$651 figure in Placer County, Calif. The lower incomes were in the southern areas, and the higher incomes were in California, the dairy areas, and in the Corn Belt.

Acting Chairman WILLIAMS. Is there any indication—let me ask you in connection with the various figures that you have given here—as to the time in which these laborers were employed during the year; for instance, whether their period of employment was much longer in one area of the country than it was in another, and for that reason perhaps their wages might be higher or lower, depending upon the period of regular employment? I am talking now about the ones who are regularly employed and considered so.

Mr. HOLCOMB. There is some data available on the seasonal distribution of employment, and we parleyed once about presenting that information, but we decided against it because of the length of testimony and the shortness of the time we were permitted to use. That information could be made available. I don't have it with me now.

Concerning the seasonal distribution of workers in the Southern States, they have two peak periods, particularly in cotton, around the cotton chopping and hoeing times, and again in the cotton-harvest times. That varies from one part of the Cotton Belt to the other. In the Southern States the first peak in cotton chopping and hoeing is far more significant than it is in the western end of the belt, in western Oklahoma and Texas. That particular peak is negligible in the Cotton Belt, but in the cotton harvest it is quite significant in all areas.

Acting Chairman WILLIAMS. The annual income might not be an index as to the hourly wage he received.

Mr. HOLCOMB. That is right.

Acting Chairman WILLIAMS. By reason of varying periods of employment in the same year in one place and another.

Mr. HOLCOMB. We have two studies, the manuscripts for which have been completed. One is for two counties in South Carolina, one in the Piedmont cotton area, and one in the Coast Plains tobacco section. Also, there is another study in Arkansas. A mimeographed bulletin has been released to three counties, and the manuscript is now in hand to be published in the near future for six additional studies, three of which are in the delta and three in the hills.

In those studies the seasonal distribution of employment and the earnings by month are shown. There is quite a significant change in earnings from January to May, the first peak, and it dropped along about in August, which is comparable, perhaps, with March or February, the peak rising again and continuing until early November, when it drops off to a low during the winter months. With that distribution of earnings and the hours of work, from the number of days worked, it is possible to show the daily earnings in terms of real wage rates received by sharecroppers and wage laborers, and as I recall in the South Carolina study, it runs around 70 cents a day.

Acting Chairman WILLIAMS. Of course, I believe you stated that it was a fact that the annual income, perhaps as the daily income, of the farm laborer in the South was lower than it was in Northern and Western States. That is pretty generally recognized, isn't it?

Mr. HOLCOMB. I think it is fairly true. There haven't been many studies made that can be used to compare it to make it a statement of fact, but there is reason to believe that.

"GAINFULLY EMPLOYED" IN AGRICULTURE

Mr. HOLCOMB. The next table shows the number of gainfully employed persons in agriculture. The table shows the total employment between 1909 and 1939. The index of the trend line, based upon the 1924-29 average, shows the number of family workers, which includes the operators of the farms themselves, and their dependents who worked with them without pay, and the number of hired workers.

(The table referred to was marked "Exhibit No. 2648" and is included in the appendix on p. 17443.)

Acting Chairman WILLIAMS. I don't believe we have had a definition in connection with this study here as to what you mean by gainfully employed.

Mr. HOLCOMB. I think, according to the Census definition used by the Agricultural Marketing Service in developing this series of data, it is those persons 10 years of age and over gainfully employed in agriculture.

Acting Chairman WILLIAMS. Just the expression "gainfully employed" itself is what I am inquiring about.

Mr. HOLCOMB. In this it is the number of persons who worked 2 weeks or more during the month of January, so it is conditioned by census enumeration data. However, these data were adjusted to indicate an average for the year, to eliminate the bias of a particular date of enumeration.

Acting Chairman WILLIAMS. I must confess that that isn't very clear to me yet. It may be to all the others, and I don't want to labor the question any further. It isn't entirely clear in my mind what is meant by the expression "gainfully employed."

Dr. TAYLOR. It simply means that the person does work. He may be past 10 years of age, but if he does no work in any occupation, he is not classed as gainfully employed.

Acting Chairman WILLIAMS. Regardless of the amount he does. If he worked 1 day during the year, he would be gainfully employed.

Dr. TAYLOR. If he earned money; yes. You asked a moment ago about the partially employed in the unemployment. I don't know what definition they used there, but if a fellow works and earns \$5, he would be partially employed.

Acting Chairman WILLIAMS. Let me see that I understand it. As I understand you now, it would mean anybody that was employed for any length of time during the year would be considered gainfully employed.

Dr. TAYLOR. That is right.

Acting Chairman WILLIAMS. If he did anything for which he received money during the year.

Dr. TAYLOR. That is right. And the figure that Mr. Holcomb gave of those who were employed for a given period of time preceding the taking of the census applied only to farm labor, as to whether he would be counted a farm laborer or not, provided he had been employed then, but there is a difference of meaning in the descriptions as to whether you are a farm laborer of working age, or gainfully employed. They are all different things.

Acting Chairman WILLIAMS. You might say all those who are available for employment within certain ages during that year, because if

he is only employed for an hour or a day, it would cover the entire field.

Dr. TAYLOR. It can't be quite all those who are available, because there would be some in there who didn't work.

Mr. HOLCOMB. As a matter of fact, I believe the census in 1930 showed about 8 percent of the females 10 years of age and over who lived in rural farm areas were employed in agriculture, and about 69 percent or 70 percent, something like that, of males working, came from employment in agriculture, but these figures are the average number of persons employed on the first of each month.

Acting Chairman WILLIAMS. It doesn't, then, include the family workers, the boys, and I will say the girls, who were working at home for their parents.

Mr. HOLCOMB. Yes; they are included in that middle column, family workers.

Acting Chairman WILLIAMS. They are included as gainfully employed, are they?

Mr. HOLCOMB. Yes; they are helping produce on farms—the number of family workers employed on farms, including the farm operator himself, on the first day of each month.

Acting Chairman WILLIAMS. Then it really includes everybody who does any work on the farm?

Mr. HOLCOMB. That is right—10 years of age and over.

Acting Chairman WILLIAMS. We are getting about down to it now, I think.

Mr. HOLCOMB. It appears that from 1909 to 1915 there was a slight decrease in agricultural employment which, after a slight increase in 1916, fell rapidly until 1919, owing to the competition of other industries with agriculture for manpower. From 1919 there was a slight increase until 1926, when a downward trend set in which continued without interruption in 1935 until 1939.

Wage laborers in agriculture numbered 2,868,000 in 1909, while in 1939 this number had been reduced to 2,479,000. However, between 1909 and 1929 the trend was slightly upward. Thereafter, until 1934, there was a decrease in hired laborers and an increase in the number of family workers. Although from 1935 to 1937 there was an increase in the number of hired laborers, in 1938 the trend was again downward.

Dr. ANDERSON. Mr. Holcomb, what was the proportion of hired laborers to family workers, including the farmer himself, in 1939—2,479,000 to 8,150,000?

Mr. HOLCOMB. The proportion of hired laborers represented by family workers?

Dr. ANDERSON. The proportion hired laborers are of the total, which would give the percentage rate.

Mr. HOLCOMB. I am not sure that I follow you.

Dr. ANDERSON. Let me put it this way. It would appear from this that about 30 percent of farm employment is hired-labor employment.

Dr. TAYLOR. Only about 25 percent.

Mr. HOLCOMB. About 25 percent of all persons employed in 1939 were hired labor. I think there is quite a variation in those proportions with changes in prices and changes in wage rates. You take both of them into consideration.

Dr. TAYLOR. It varies greatly in certain sections of the country, too.

Dr. ANDERSON. Well, I would like to have comment on this other point. In the census of gainful workers—and this will explain partly the chairman's question of a moment ago—which includes both employed and unemployed, but available for employment, the total in 1930 was 4,392,000 agricultural laborers. In your segregation of hired workers actually employed at a given time in the month average employment for the year 1930 was 2,850,000.

Mr. HOLCOMB. Yes; the census, I believe, obtained their information as to the number of hired workers as of the date of enumeration.

Dr. ANDERSON. That is right.

Mr. HOLCOMB. These are monthly averages as obtained from the crop reporters from the farmers.

Dr. ANDERSON. Would the difference, roughly, approximate the number of agricultural laborers available but unemployed? In other words, there is apparently a plentiful supply of agricultural labor.

Mr. HOLCOMBE. Yes; I am sure there must be.

Dr. ANDERSON. Would this indicate an oversupply of agricultural labor in terms of employment, available employment opportunities?

Mr. HOLCOMBE. I suspect that it would. I haven't that accurately.

Dr. ANDERSON. Mr. Chairman, that concludes the testimony, and we can go on to the next witness.

Acting Chairman WILLIAMS. Thank you, gentlemen.

(The witnesses, Dr. Taylor and Mr. Holcombe, were excused.)

Dr. ANDERSON. The next two witnesses are Dr. Sherman Johnson, Division of Farm Management and costs; and Dr. Louis Bean, the economist of the Bureau of Agricultural Economics; and I would like of have Dr. Kifer, of the Division of Farm Management and Costs, at the same time.

Acting Chairman WILLIAMS. Have you been sworn?

Dr. BEAN. I have, sir.

Acting Chairman WILLIAMS. Do you and each of you solemnly swear that the testimony you are about to give in this proceeding shall be the truth, the whole truth, and nothing but the truth, so help you God?

Dr. JOHNSON. I do.

Dr. KIFER. I do.

TESTIMONY OF SHERMAN E. JOHNSON, HEAD OF DIVISION OF FARM MANAGEMENT AND COSTS, UNITED STATES DEPARTMENT OF AGRICULTURE, WASHINGTON, D. C., AND LOUIS H. BEAN, ECONOMIST, BUREAU OF AGRICULTURAL ECONOMICS, UNITED STATES DEPARTMENT OF AGRICULTURE, WASHINGTON, D. C., AND DR. R. S. KIFER, DIVISION OF FARM MANAGEMENT AND COSTS, UNITED STATES DEPARTMENT OF AGRICULTURE, WASHINGTON, D. C.

Dr. ANDERSON. Mr. Chairman, we just asked for a definition of partially employed workers according to the 1937 census, and learned that the Census Bureau made no precise definition at the time for use by enumerators. The enumerators left cards with farmers, and they

were filled out on each farm according to approximation of partial employment on the farm.

Acting Chairman WILLIAMS. Have you a statement to make first?

Dr. ANDERSON. The witness may proceed.

Dr. JOHNSON. My testimony will be concerned primarily with four points: First of all, the reduction in the amount of labor used for producing different crops, largely accounted for by increases in mechanization; then some tendencies of increases in mechanization on the farm, shown by increase in tractors, and so on; thirdly, the effect of mechanization on physical efficiency in the use of labor on farms; and, lastly, the effect of mechanization on the investment in the farm business, and on operating expenses.

The first two charts show labor used in producing wheat and oats.

(The charts referred to were marked "Exhibits Nos. 2649 and 2650" and appear on pp. 16942-16943.)

PRODUCTIVITY IN AGRICULTURE

Dr. JOHNSON. They show the changes in the amount of labor used in producing wheat and oats. The first chart refers to the amount of labor used in producing wheat by different areas and in different periods from 1909 to 1936. The different perpendicular bars show the amount of labor used for these different periods, reading from left to right. The bar labeled A refers to the period 1909-13, the B bar, 1917-21; the C bar, 1927-31; and the D bar, 1934-36. That information is shown for different regions in the country, which are labeled. The first set of bars indicates the changes in the amount of labor used in wheat production for the United States as a whole. Then we come to the Corn Belt region, next the eastern dairy, which is largely the northeastern part of the country, and next the western dairy region, the Lake States.

Acting Chairman WILLIAMS. Before you go any further, I think I would like you to tie up those with the years.

Dr. JOHNSON. The first one is 1909-13, the second is 1917-21, the third is 1927-31, and the fourth is 1934-36; roughly, we can say pre-war, the World War period, the late twenties, and the post-war.

On the amount of labor used per acre in wheat production, taking it first for the United States as a whole, you will notice that only about half as much labor was used per acre in 1934-36 as was used in the first period, 1909-13. This is largely accounted for by the use of tractors, tractor equipment, combines, of course, along with tillage equipment for use with the tractor. There is also the question of shifting of wheat production to the plains areas, to the more level areas, where machines can be used to better advantage. The least amount of labor per acre is used in the small grain area which, as indicated in the exhibit here, includes the Dakotas, Montana, Nebraska, and Kansas; and also the region called the western cotton area, which is the wheat-producing area of Texas and Oklahoma.

Only about 3 or 4 hours of labor per acre were used in the small-grain areas and in the western cotton area, and those areas or regions actually used less labor in 1909-13 than some of the Eastern and southern areas did in 1934-36.

Mr. PIKE. Those are the highly important areas in grain growing?

Dr. JOHNSON. Those are the most important areas in grain pro-

EXHIBIT No. 2049
[Submitted by the Bureau of Agricultural Economies, Department of Agriculture]

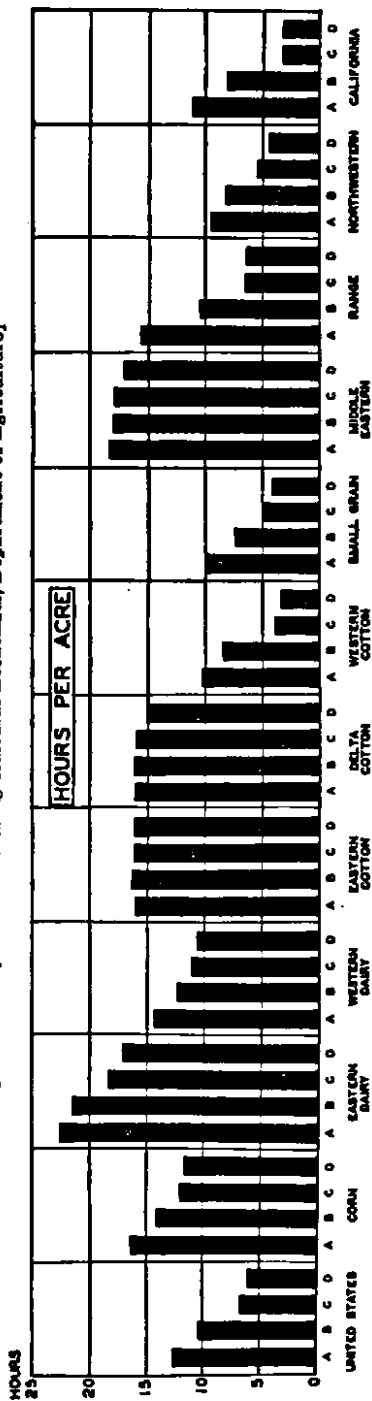
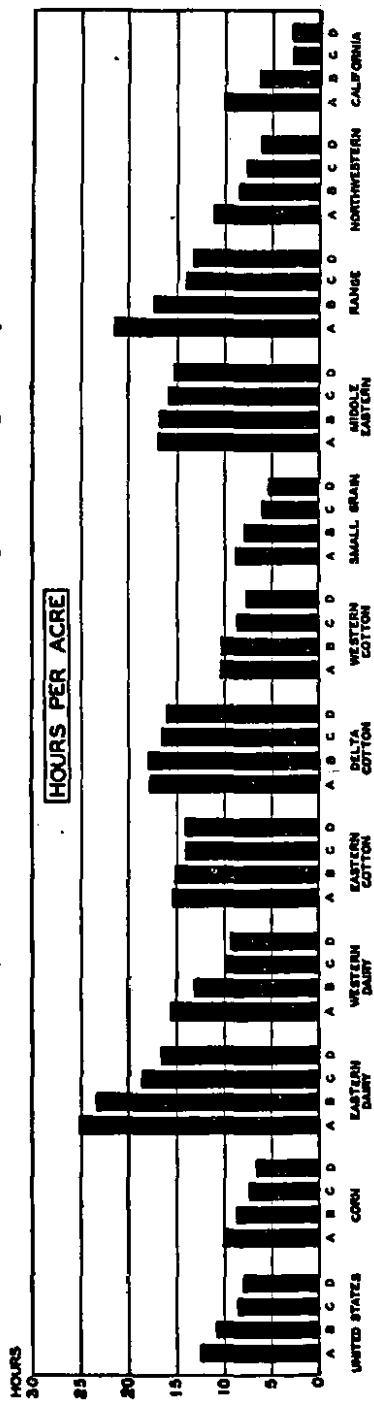


EXHIBIT No. 2650
[Submitted by the Bureau of Agricultural Economics, Department of Agriculture]



duction. One should include also the northwestern area, Washington, Oregon, and Idaho.

Dr. ANDERSON. Why do you use the measure of hours per acre?

Dr. JOHNSON. Hours per acre? Well, of course, one could use hours per hundred bushels, or hours producing a bushel of wheat.

Mr. PIKE. You have done that on potatoes?

Dr. JOHNSON. We have done that on potatoes, that is right, and also in the wheat tier; for the western cotton area and for the small grain area it runs from 0.3 to 0.4 hours per bushel. The average yield out there is about 10 bushels per acre. I might say that that is the customary method.

Dr. ANDERSON. That is the commonly accepted method?

Dr. JOHNSON. That is the commonly accepted way of portraying the amount of labor used in production.

Turning to the next set of charts, I want to discuss corn first.

(The chart referred to was marked "Exhibit No. 2651" and appears on p. 16945.)

Dr. JOHNSON. The labor used per acre for corn production does not show as marked a proportional decrease as does the labor used per acre in wheat production. The most outstanding evidence that we have of the effect of mechanization is on wheat production. However, as far as labor used per acre, the reduction in actual hours per acre is concerned, it amounts to about the same reduction in corn production for the country as a whole as it does for wheat production, namely, about 6 hours per acre; a change for the country as a whole from 29 hours in the 1909 period to 23 hours in the 1936 period.

A part of this decrease in corn production is due to the use of corn pickers in the Corn Belt, but probably more resulted from the use of tractors and multi-equipment. I think that is much more important.

I want to call attention also to the fact that a relatively small amount of labor is used in corn production in the winter wheat and spring wheat areas. They have less cultivation, less tillage, and very often, of course, the yields are much less.

The next chart is Labor Used Per Acre Producing Cotton in Major Areas.

(The chart referred to was marked "Exhibit No. 2652" and appears on p. 16946.)

Mr. PIKE. The chart is not complete?

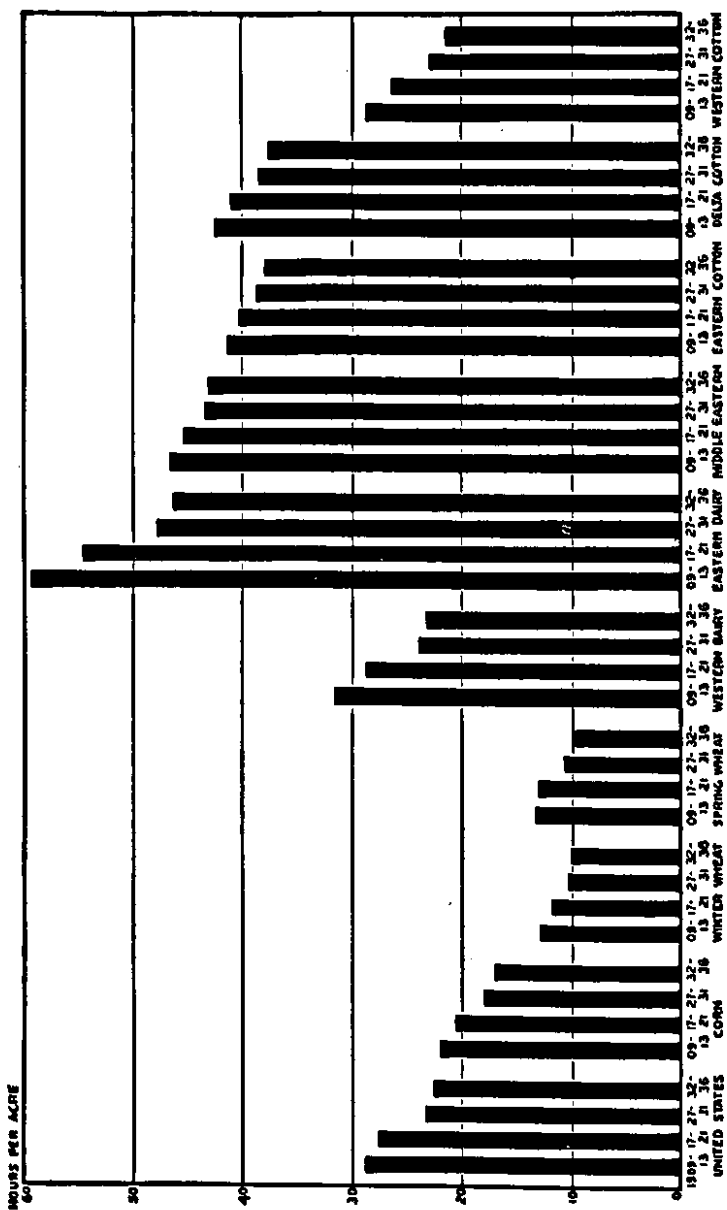
Dr. JOHNSON. That is right. They were borrowed from another source. Reading from left to right, the first set of 4 bars is for the United States as a whole; the second one is for the eastern cotton area; the third set is the Delta area, Arkansas, Mississippi, Louisiana; and the last set is for the western area, Texas and Oklahoma, the latter representing the newer cotton areas where mechanization up to picking time has become very important. As a matter of fact, it is the only area where there is outstanding evidence of a reduction of labor in cotton production. Most cotton is still picked by hand.

The decrease shown, then, for the country as a whole is largely due to the shifting of cotton production during that period to the western cotton area.

I might say that the development of an acceptable cotton picker would, of course, make a revolution in cotton production comparable to that which has already taken place in wheat production, perhaps.

EXHIBIT No. 2651

[Submitted by the Bureau of Agricultural Economics, Department of Agriculture]
Variations by Areas in Labor Used Per Acre in Producing Corn, 1909-36



WPA - National Research Project
A-29

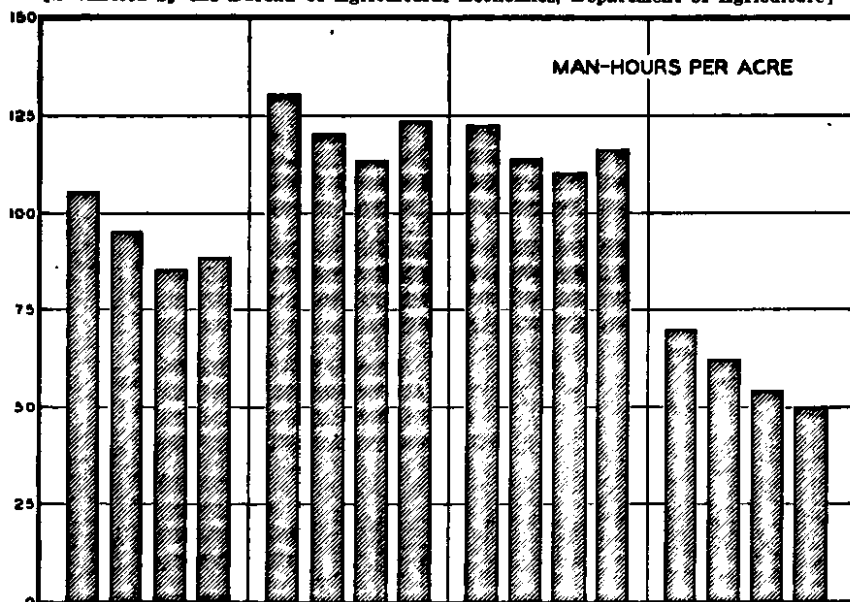
The next chart shows the amount of labor used in potato production by selected counties rather than for areas as a whole, and those counties are, first, Clay County, Minn.; second, Waupaca County, Wis.; third, Montcalm County, Mich.; fourth, Steuben County, N. Y.; fifth, Suffolk County, N. Y.; and, last, Aroostook County, Maine.

(The chart referred to was marked "Exhibit No. 2653" and appears on p. 16947.)

Dr. JOHNSON. In Aroostook County, Maine, there has been a net reduction of 14 hours per acre, and in that county the yields were increased nearly 90 bushels per acre between 1909 to 1936, so that the time used to produce and market 100 bushels of potatoes—and here we put it in the other terms—in 1936 was only 16 percent of that required in 1909.

EXHIBIT No. 2652

[Submitted by the Bureau of Agricultural Economics, Department of Agriculture]



In Clay County the yields per acre were down during the period; consequently the man-hours per hundred bushels actually went up.

I am going to read a short statement here on mechanization in other lines.

Some of the most striking examples of labor saving equipment are those used on relatively minor crops. Although these types of equipment—the cane stripper, the pick-up baler, the field ensilage cutter, the mechanical beet blocker, etc.—have not been used on large acreages, they do have an actual or a potential influence on labor requirements in particular sections of the United States. A good example is the combination of mechanical pea harvester and huller in use with newly developed processes of quick-freezing and packaging in the preparations of peas for market.

(The chart referred to was marked "Exhibit No. 2654" and appears on p. 16948.)

Dr. JOHNSTON. I turn now to the second part of the testimony, some evidences of mechanization. The next chart is on tractors.

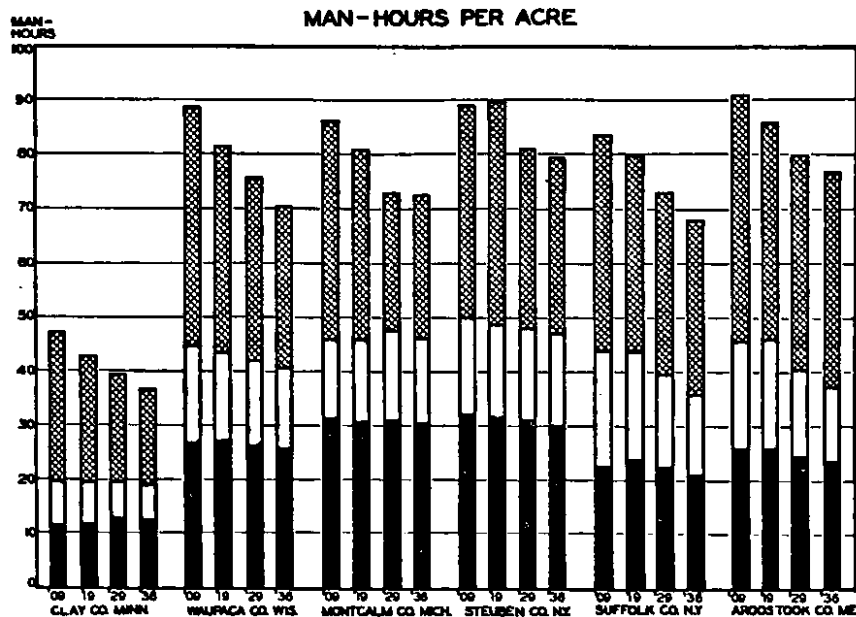
(The chart referred to was marked "Exhibit No. 2655" and appears on p. 16948.)

Dr. JOHNSON. This shows the number of tractors of all types on farms January 1, 1915, to January 1, 1939. Starting from an almost insignificant number in 1915 we see a spurt during the World War period which extended up to 1921, a slowing down during the depression of the early 1920's, and then again a spurt in the latter 20's, a slowing down again in the early 30's, and again a later spurt after 1935.

EXHIBIT No. 2653

[Submitted by the Bureau of Agricultural Economics, Department of Agriculture]

Labor Used in Potato Production in Selected Areas 1909-38



WPA - National Research Project
A-10

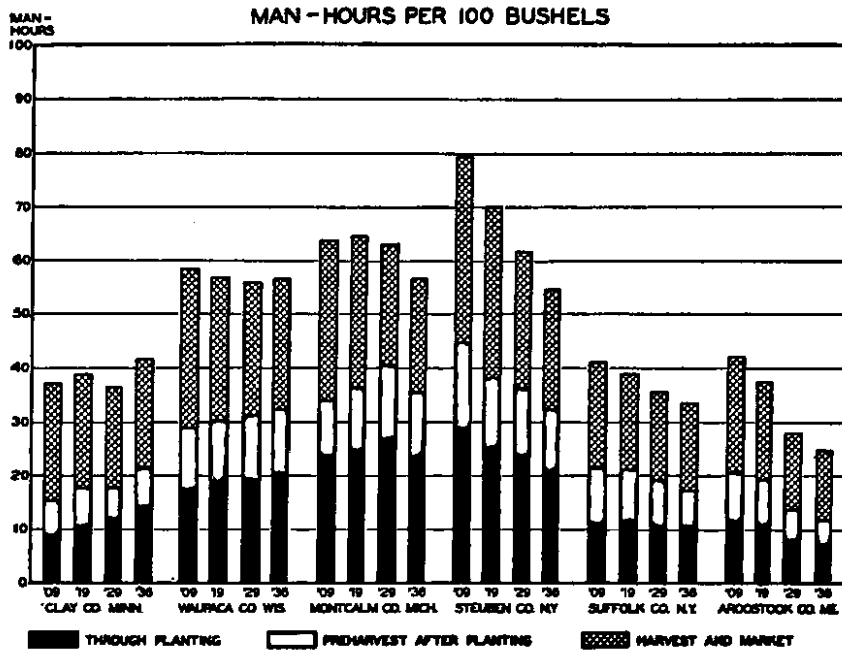
In 1930 there were 900,000 tractors on farms. These were mostly either the standard type or the crawler tractors. Some standard tractors were used in the Corn Belt, particularly on the large farms, but with the development of the general purpose tractor, and particularly with the addition of pneumatic tires to tractors, the use of tractors and mechanical equipment increased rapidly in the Corn Belt and in the Eastern States, so that we have estimated for 1939 1,600,000 tractors. With further improvement in tractor design and especially with the recent introductions of the small tractors, we can expect mechanization to take place in some of the eastern areas and the Southeastern States where tractor use has not made the advances that it has in the Midwest and the small grain regions.

CONCENTRATION OF ECONOMIC POWER

EXHIBIT No. 2654

[Submitted by the Bureau of Agricultural Economics, Department of Agriculture]

Labor Used in Potato Production in Selected Areas, 1899-36

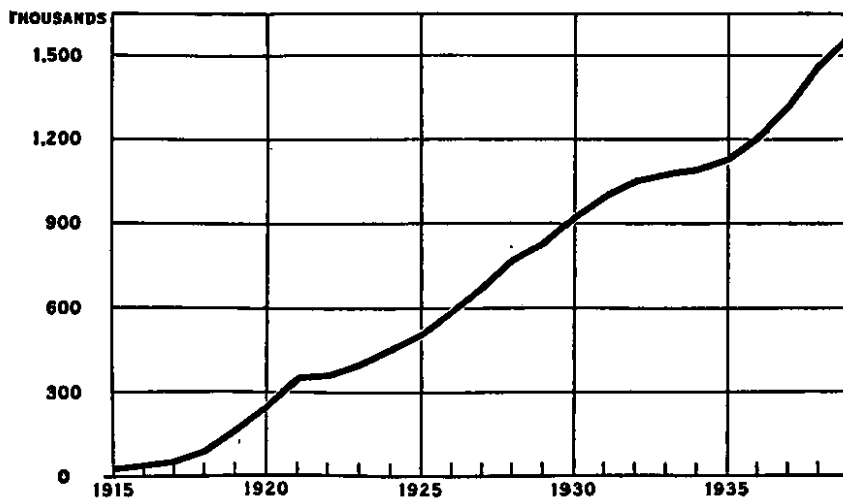


WPA - National Research Project
A-20

EXHIBIT No. 2655

[Submitted by the Bureau of Agricultural Economics, Department of Agriculture]

TRACTORS (ALL TYPES); NUMBER ON FARMS, JAN. 1, 1915 - JAN. 1, 1939



U. S. DEPARTMENT OF AGRICULTURE

BUREAU OF AGRICULTURAL ECONOMICS

Acting Chairman WILLIAMS. Has there been a tendency toward the use of smaller tractors in recent years than larger ones?

Dr. JOHNSON. Oh, yes; there has been a very decided shift to the smaller, general-purpose tractor with pneumatic tires.

Acting Chairman WILLIAMS. That is perhaps due partly at least to using them on smaller farms than they did formerly.

Dr. JOHNSON. Right, and, of course, the general-purpose tractor is more adapted; it is adapted for a good many different operations, and with the power take-off the usefulness of the tractor has been vastly modified.

Mr. PIKE. That has been a development of the last few years.

Dr. JOHNSON. That has been a development in, you might say, the 30's, although, of course, the general-purpose tractor came in the middle 1920's.

Mr. PIKE. There has been a great change, though, in the last decade.

Dr. JOHNSON. Oh, yes, there has been a great change in the last 2 or 3 years, especially in the development of the small tractor suitable for a small family farm.

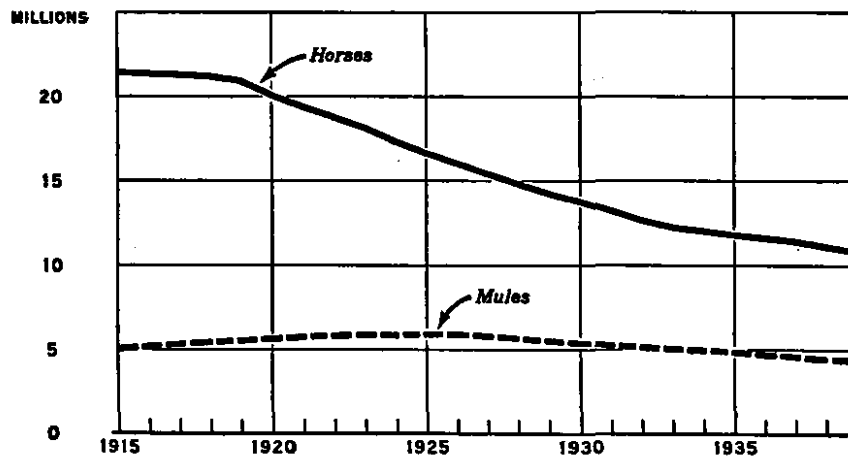
The other side of the story of tractor increase is shown on the next chart.

(The chart referred to was market "Exhibit No. 2656" and appears below.)

EXHIBIT No. 2656

[Submitted by the Bureau of Agricultural Economics, Department of Agriculture]

HORSES AND MULES; NUMBER ON FARMS, JAN. 1, 1915 - JAN. 1, 1939



U. S. DEPARTMENT OF AGRICULTURE

BUREAU OF AGRICULTURAL ECONOMICS

Dr. JOHNSON. As the number of tractors has increased on the farms we have had a corresponding decrease of horses and mules. The chart of horses and mules shows the trend in numbers for the same period as was shown for the trend in numbers of tractors. The number of mules has decreased more slowly than horses, largely because mules are used in the South, where mechanization has proceeded more slowly, and also because they are serviceable to a longer age. We find this downward trend in horse numbers is pretty closely

related to lack of replacement of horses, that is young colts, and the horses that are on farms today average much older.

Acting Chairman WILLIAMS. I would think there would be another very important reason in there. It strikes me that the mule is an animal that is used almost exclusively on the farm, while the horse formerly was used as a means of transportation which has been supplanted almost entirely by the automobile.

Dr. JOHNSON. Yes; that is true. The horses were used, of course, for hauling and for going to town.

Acting Chairman WILLIAMS. And for riding horseback.

Dr. JOHNSON. Yes; but, of course, the horse numbers that are shown here are horses on farms.

Acting Chairman WILLIAMS. Well, of course, they would be on the farm. You don't mean the horses and mules that are simply worked on the farm as work animals.

Dr. JOHNSON. Oh, no; I mean kept on farms.

The decrease of about 10,000,000 head of horses and mules during this period releases approximately 50,000,000 acres of land for other purposes; that represents the amount of land that was needed to produce horses' feed, hay, grain, and pasture, horse and mule feed.

Colonel CHANTLAND. Five acres?

Dr. JOHNSON. Approximately five acres per animal, so that that becomes available for cash crops, for pasture and feed crops, for other livestock, for market, and it represents, of course, a part of our surplus crop situation.

The total number of horses and mules is now, roughly, 15,000,000, and it is probable that the number might be stabilized at about 12,500,000 head. However, the recent introduction of the small 1-plow tractor may reduce the horses and mules still further.

The next chart is Percentage of Wheat Acreage Harvested With the Combine.

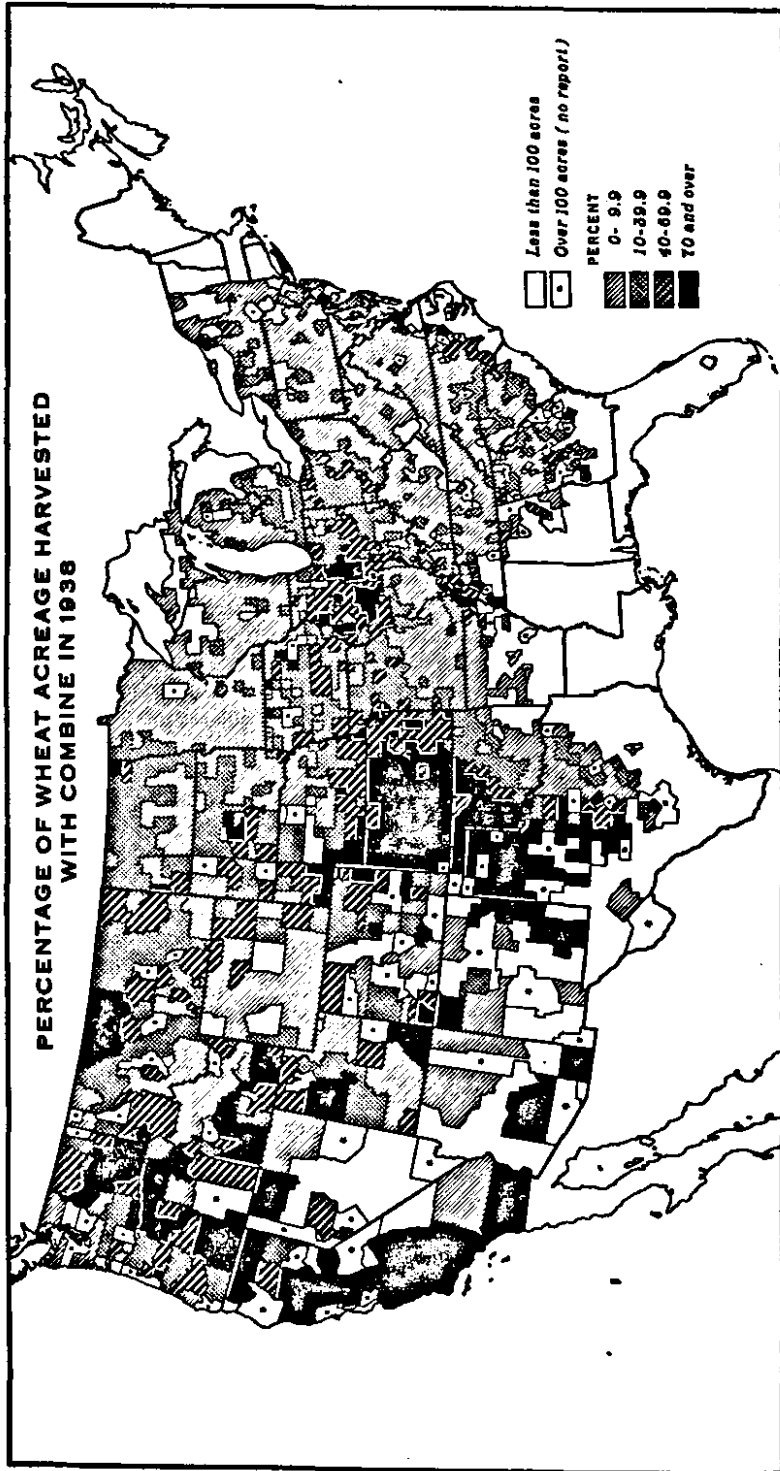
(The chart referred to was marked "Exhibit No. 2657" and appears on p. 16951.)

MECHANIZATION OF FARMING

Dr. JOHNSON. This chart shows the percentage of wheat acreage that was harvested with the combine in 1938. It indicates that the combine is almost universally used in the hard winter-wheat region, in Kansas, Oklahoma, Texas, and southwestern Nebraska. If the crops had been better in previous years, I would expect a much larger number of combines to have gone into the Red River Valley and a part of the important spring-wheat area. Of course, in the Pacific Northwest and in California the combine has been in use for a long time.

The combine is making a very strong bid for the wheat harvest in the soft winter-wheat country of Illinois, Indiana, parts of Iowa, and Minnesota, and Ohio as well. As a result of the use of the combine a crew of 3 men can now perform the same work that was performed by a crew of 8 to 10 men, and can do the work in less time. Probably 110,000 combines are now in use. It has been estimated that somewhere between 100,000 and 200,000 casual migrant laborers found employment in wheat areas in 1920. This opportunity for employ-

EXHIBIT No. 2857



ment has practically disappeared and the extra labor required at harvest is for the most part supplied from local sources.

The next chart is Percentage of Acreage of Corn for Grain Harvested With Mechanical Field Picker, 1938.

(The chart referred to was marked "Exhibit No. 2658" and appears on p. 16953.)

Dr. JOHNSON. I want to call attention to a difference between this chart and the one preceding on combines. The percentages are lower; that is even the areas of greatest concentration here start with 35 percent of the corn harvested with the picker rather than 70 percent in the preceding chart. You will notice, of course, the field pickers have made the greatest inroads in the heart of the Corn Belt, although it is interesting to see that it goes up pretty far into southwestern Minnesota and the eastern Dakotas.

Mr. PIKE. How recent a development is that?

Dr. JOHNSON. The corn picker has been on the market for, I should say, about 15 years, but there have been some very decided improvements in recent years.

Mr. PIKE. They probably have got the cost down to where they have on the combines.

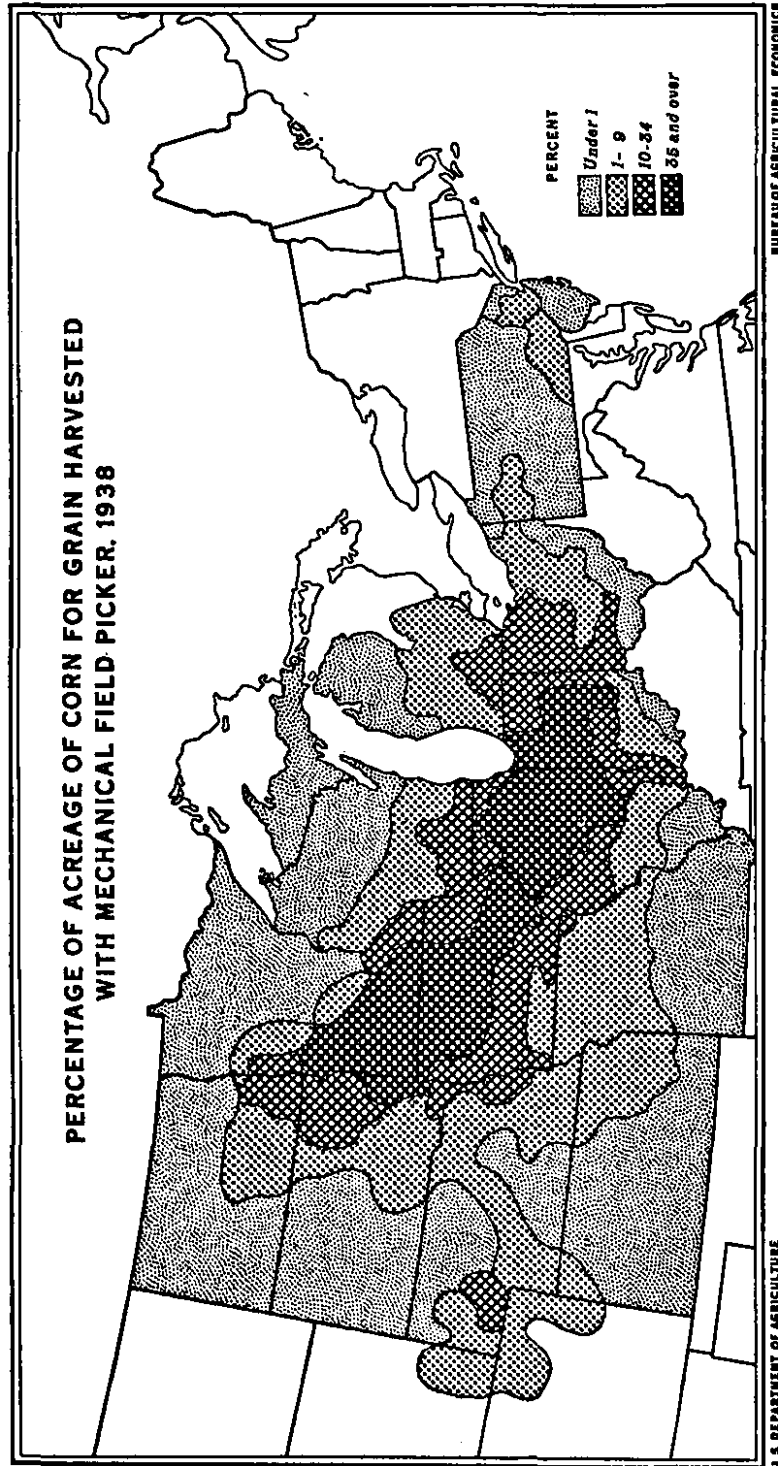
Dr. JOHNSON. They have got the cost down and it is a much more manageable machine. With a 2-row picker and facilities for hauling and cribbing corn yields of 60 to 70 bushels per acre can be harvested with only $1\frac{1}{2}$ to 2 man-hours per acre. Hand picking and scooping would require about 9 man-hours per acre to harvest a 70-bushel yield. Thus it cuts down the labor of harvesting about one-fourth and probably where the picker is used the work will be done largely with family labor.

The next chart is Labor on a 320-Acre Central Kansas Farm.

(The chart referred to was marked "Exhibit No. 2659" and appears on p. 16954.)

Dr. JOHNSON. This chart portrays the changes in the seasonal use of labor, the seasonal distribution of labor, on a half-section central Kansas wheat farm before and after the purchase of tractors. The solid perpendicular bars show the man labor actually used, by weeks, on this farm when it was operated as a horse farm, that is, with horses for power and horse equipment. The cross-hatched bars represent an estimate of the amount of man labor required by weeks when the same farm is operated with tractors and tractor equipment. You will find a broken horizontal line running across the chart which shows the available family labor, available for work on the farm. It represents a man and boy who goes to school part of the year but is available for work in the summertime. You will note, by comparing the solid and the cross-hatched bars, the very important reduction in the amount of labor needed in excess of the family labor, especially during the peak periods which are largely represented there by harvest, first of all, and alfalfa cutters. They have different seasons for the summer months. On this farm when it was operated with horse equipment a hired man was used on the farm for approximately 90 days, or 3 months. With a shift to tractor equipment only about 10 days in extra labor would be required, and this could probably be furnished by exchanging labor with the neighbors. Thus 3 months of hard labor has been eliminated.

EXHIBIT No. 2658



Dr. ANDERSON. Eliminated by the purchase and use of one tractor?

Dr. JOHNSON. By the purchase and use of one tractor and complementary equipment, combine and tillage equipment to go with the tractor.

Dr. ANDERSON. Is this a typical example of what would occur on that size farm generally?

Dr. JOHNSON. It is a typical example of what would occur on that size and type of farm.

Mr. PIKE. That is a mixed farm?

Dr. JOHNSON. No.

Mr. PIKE. It is mostly wheat?

Dr. JOHNSON. Mostly wheat, with some alfalfa and some livestock, but the major income comes from wheat.

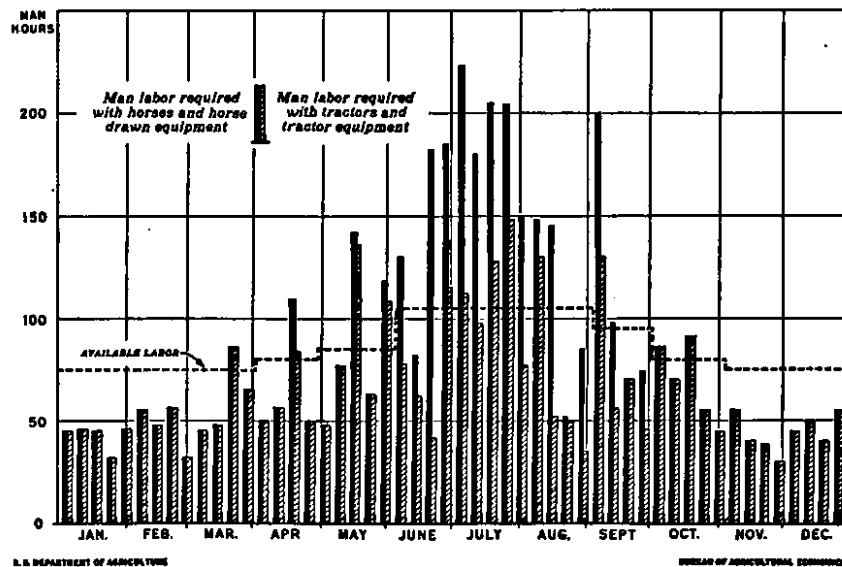
Mr. PIKE. And the major work involved, peaks of work, is wheat.

Dr. JOHNSON. Peaks of work represented largely by wheat.

EXHIBIT No. 2659

[Submitted by the Bureau of Agricultural Economics, Department of Agriculture]

LABOR ON A 320-ACRE CENTRAL KANSAS FARM, BY WEEKS



Mr. PIKE. It is winter wheat. *

Dr. JOHNSON. Winter wheat. You do the seeding in September.

We turn now to the third part of the testimony which indicates the effect of these mechanization changes on physical efficiency in agriculture as a whole.

(The chart referred to was marked "Exhibit No. 2660" and appears on p. 16955.)

INCREASED EFFICIENCY IN AGRICULTURE

Dr. JOHNSON. The solid line represents the employment figures from column 3 of "Exhibit No. 2648," the number employed in agriculture the first of each month, averaged for the year. The line is an index line, with the 1924-29 average considered 100, and the changes are

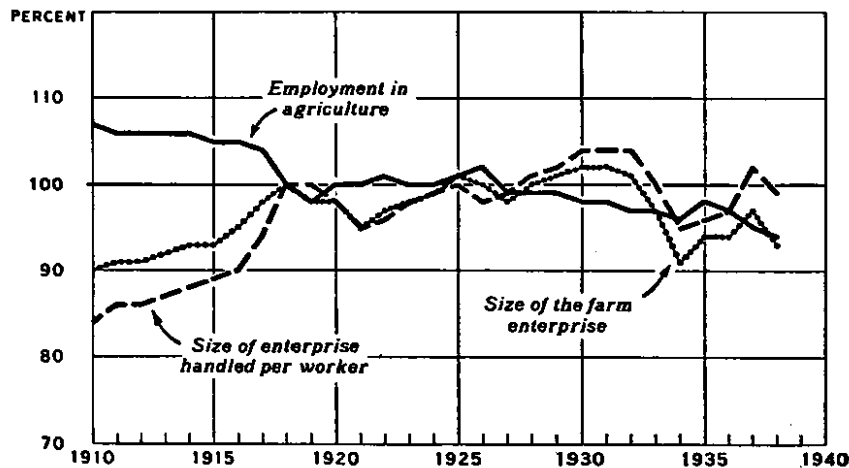
percentage changes from that base. The circled line represents the size of the total farm business in this country in terms of acres of crops and numbers of livestock, weighted on a 1924-29 base, and combined according to the amount of labor that was used during that period. The third line, the broken line, shows the change in size, that is, in acres of crops and numbers of livestock handled per worker, from 1910 to 1938. In the period from 1910 to '16, '17, or up to 1920, we had a rather constant increase in the size of the farm plant, the total size of the farm business. We had a constant decrease in employment in agriculture because of the city-ward movement which has already been portrayed by Dr. Taylor, but, because of the increased efficiency of production, that expansion of agriculture took place with a constant decrease in employment and with a constant increase in the acres of crops and numbers of livestock handled per worker.

EXHIBIT No. 2660

[Submitted by the Bureau of Agricultural Economics, Department of Agriculture]

RELATION OF EMPLOYMENT IN AGRICULTURE TO THE SIZE OF AGRICULTURAL ENTERPRISE

INDEX NUMBERS (1924-29=100)



U S DEPARTMENT OF AGRICULTURE

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Mr. PIKE. The type of expansion we were having is mostly extensive farming of new wheat lands on the western edge of the plains?

Dr. JOHNSON. Yes, at that time; but also a considerable extension in farming; you find increase of dairy farming during that period, which is fairly intensive.

Mr. PIKE. I was thinking about western Kansas and the Panhandle, and so on.

Dr. JOHNSON. Yes; I think that is the most important development. The later part of the period, of course, 1934 to 1938, is very much influenced by the very serious drought years of 1934 and 1936, with not very much of a recovery in 1935. Still this index shows a larger enterprise handled per worker in that last period than in 1910.

Dr. LUBIN. It is rather significant, is it not, that the really great increase in productivity in the agricultural industry occurred between

1910 and 1918, and nothing since then, despite the tractor and all the new equipment, has caused an increase of productivity anywhere near approaching it in an equal length of time?

Dr. JOHNSON. Well, I think that that question will be answered a little bit better by the next chart.

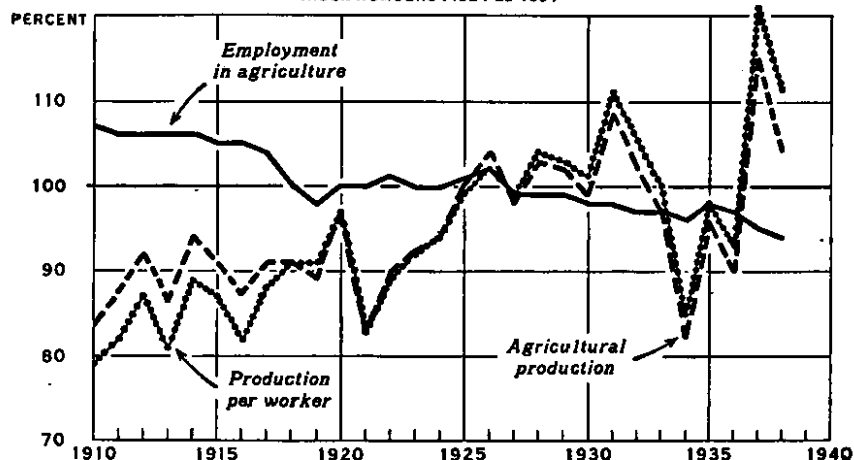
(The chart referred to was marked "Exhibit No. 2661" and appears below.)

EXHIBIT No. 2661

[Submitted by the Bureau of Agricultural Economics, Department of Agriculture]

RELATION OF EMPLOYMENT IN AGRICULTURE
TO AGRICULTURAL PRODUCTION

INDEX NUMBERS (1924-29=100)



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Dr. JOHNSON. This chart shows the same employment in agricultural index as the previous chart did, but the other two lines, the total agricultural production and production per worker, are made up in terms of the output from acres in crops and the output in numbers of livestock; in other words, the total physical crop. That goes up rather constantly throughout the period with the exception of the severe drought years which are outstanding here, 1934 and 1936. You will note also that total output is the highest, and production per worker in terms of output is also higher, in the latter period than at any other time.

Dr. LUBIN. What is the difference between the two charts? When you talk about size of farm enterprise are you talking in acreage or values?

Dr. JOHNSON. In acreage and numbers, in terms of acreage in crops and numbers of livestock. In the last chart we are talking in terms of bushels of wheat, pounds of cotton, pounds of butter, and so on.

Dr. LUBIN. In other words, you are getting a larger yield per acre?

Dr. JOHNSON. We are getting a larger yield per acre, especially in recent years. The corn crops have been very high in yield per acre, the cotton crop has been high in yield per acre.

Dr. LUBIN. Which then would be the better measure of productivity? I noticed in your earning charts you talked in terms of the number of hours per acre. I take it that would cover the preceding chart, namely the relation of employment in agriculture to the size of the agricultural enterprise. Wouldn't the former chart be the better index of what has actually happened to productivity?

Dr. JOHNSON. The acreage chart?

Dr. LUBIN. Yes, the acreage and numbers.

Dr. JOHNSON. Of course, production varies more from year to year—that is especially true of crops—than does acreage, and therefore the acreage measure is a more stable measure. I should say that we need both in order to get the picture.

Dr. LUBIN. I mean, in one case, you are dealing with a fortuitous element. If you haven't got a rain and good weather conditions, you get a big crop and get more off that acre than you otherwise would, but in the preceding chart, you are dealing with the actual size of the enterprise, the number of acres taken care of and number of livestock taken care of.

Isn't that really the best measure of what the productivity of labor is? If, by the use of better fertilizer, you get more of that production, that isn't attributable to the workers or—

Dr. JOHNSON. My reply would be that it is a more stable measure, but that we do need to look at this other measure, too, because there has been an increase in yields per acre and output per man-hour.

Dr. LUBIN. Isn't it rather significant, however, and your preceding chart shows an actual decline in the efficiency of labor on farms, and as a matter of fact, for the year, the last year on your chart, which I think is 1939, we are way below—

Dr. JOHNSON (interposing). It is 1938.

Dr. LUBIN. We are way below any point since 1914.

Dr. JOHNSON. Yes, because of the drought influence, and in small part because of acreage adjustment programs.

Dr. LUBIN. But if you take that whole period, however, let's take the peak of 1930 and 1931, you were slightly above where you were in 1918—hardly any above.

Dr. JOHNSON. Yes.

Dr. LUBIN. So that in terms of the amount of territory covered, as it were, and livestock taken care of, there has been relatively little increase since the war years in the efficiency of labor on farms, as measured by the size of the enterprise handled per worker.

Dr. BEAN. I think you need to take into account the size of enterprise as it would have been if you had not had adjustment programs in effect, do you not?

Dr. JOHNSON. Yes; and also the drought.

Dr. LUBIN. That would apply to any economic activity, the production policy of a given industry—in other words, the policy of some industries of cutting down on production when prices fall.

Dr. BEAN. If you put it on production per factory and if you defined the industrial plant in terms of the number of factories involved, and you put two out of use because of a depression, I think you might have the same sort of showing you have here.

Dr. ANDERSON. If in the previous charts you used a bushel, or production, basis, instead of an acre basis, you got an accentuated pic-

ture, didn't you? You got an increased productivity which corresponded to the last presentation you have made.

Dr. JOHNSON. That is correct. In any area where the yield per acre grows during the period that will be true.

Dr. ANDERSON. Is it possible to distinguish between the effects upon productivity of these natural factors of climate and weather conditions, man's increased productivity due to mechanization?

Dr. JOHNSON. Well, it is very difficult to isolate the effect of the two.

Dr. ANDERSON. In other words, both are included in this chart.

Dr. JOHNSON. That is correct, because even the acreage harvested was reduced on account of the drought.

PROSPECTS FOR INCREASED EMPLOYMENT

Dr. ANDERSON. Granted this increased productivity per worker employed, and the absorptive powers of the market which I presume will be discussed, do you expect an increased or decreased number of workers on the farm?

Dr. JOHNSON. I think the evidence points toward a decrease.

Dr. ANDERSON. Do you attribute much of that to the technological change which has occurred?

Dr. JOHNSON. Yes; I would say quite a little. The evidence as we have had it presented by types of farms, on the wheat farms, and the amount of labor used in wheat production in the different areas—

Dr. ANDERSON (interposing). In other words, a summary chart such as Exhibit No. 2660 conceals very important and vital information concerning productivity increases?

Dr. JOHNSON. Well, I wouldn't say that it conceals—

Dr. ANDERSON (interposing). Fails to reveal, let's put it.

Dr. JOHNSON (continuing). Productivity increases. I would say that it fails to differentiate between increases in productivity per worker due to technological developments, and increases due to other causes.

Dr. ANDERSON. And it fails, of course, to distinguish vital movements and changes that might be occurring in such a crop, for example, as corn or cotton, or has occurred in wheat?

Dr. JOHNSON. Yes.

Dr. ANDERSON. And it would also fail to distinguish such differences by geographical areas, and the impact of such changes on particular localities?

Dr. JOHNSON. Right.

Dr. ANDERSON. It won't tell us the story of the depressed condition of the Dakotas, for example?

Dr. JOHNSON. No.

Table I, the next exhibit here, has already been discussed by Mr. Holcomb, so we will pass over it.

Dr. ANDERSON. Is that already in the record?

Dr. JOHNSON. It is already in the record in Mr. Holcomb's testimony, for a longer period.

The next chart begins the last phase of the testimony and percentage.

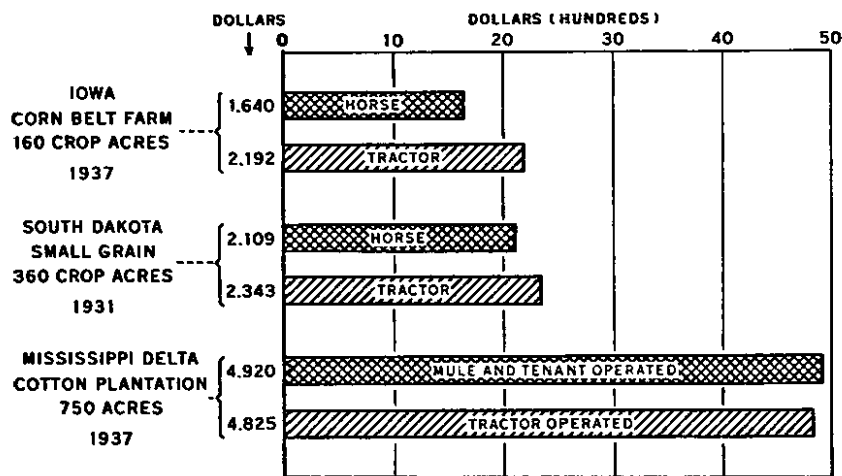
Dr. ANDERSON. Combined investment in work stock, machinery, and mechanical power on farms operated with horses and tractors.

(The chart referred to was marked "Exhibit No. 2662" and appears below.)

EXHIBIT No. 2662

[Submitted by the Bureau of Agricultural Economics, Department of Agriculture]

COMBINED INVESTMENT IN WORK STOCK, MACHINERY AND MECHANICAL POWER ON FARMS OPERATED WITH HORSES AND TRACTORS



U. S. DEPARTMENT OF AGRICULTURE

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EFFECT OF MECHANIZATION ON INVESTMENT

Dr. JOHNSON. This phase of the testimony is concerned with the effect of mechanization on investment in the farm business, largely, of course, in the part of investment represented by machinery and mechanical power, and different both in the amount and the nature of the operating expenses that result. We have taken here again some typical situations.

The first is an Iowa Corn Belt farm of 160 crop acres, on April 19, 1937. The equipment investment on farms using horses for power and horse equipment (which includes work stock) is less than for the Corn Belt farms of the same size that used tractor power and tractor equipment. It should be said, however, that those farms actually had more equipment. In other words, when they bought a tractor, they bought a combine, perhaps, to go with it, or a corn picker, so that they actually had more equipment, and part of the increased investment in equipment made it possible for them to reduce the amount of the contract work or hired labor on that farm, such, for instance, as threshing.

Acting Chairman WILLIAMS. Does your term "traitor" there include the investment of all the equipment that goes with it, or just confined to the tractor alone?

Dr. JOHNSON. No, no.

Acting Chairman WILLIAMS. It includes all the equipment to go with it?

Dr. JOHNSON. It includes all the equipment to go with it, with its present value of work stock, machinery, and mechanical power on those farms.

Acting Chairman WILLIAMS. It is contrasting horsepower formerly used on the farm with the mechanized farming of the present.

Dr. JOHNSON. It is contrasting the farms of that same size that used horses in 1937, and had horse equipment, with the farms that used tractors and had tractor equipment, as of the same date, the same sized farm.

Acting Chairman WILLIAMS. Do you mean, now, that is the investment in the animals, in the one case, and in machines in the other?

Dr. JOHNSON. It is the total value on both kinds of farms. It is the total present value of horses, if they had them, and most of them do, you see, even though they have tractors—horses, tractors, and other machinery.

Mr. PIKE. There would be different types of plows say, if you had horses, and if you had tractors?

Dr. JOHNSON. That is right; yes.

The next situation, then, is on small grain farms. We had to go back to 1931 for a comparable situation; that is, where we could compare horses with tractors in a small-grain area, because mechanization is just about complete in the wheat-producing areas. We took there a comparison for South Dakota, 360 crop acres, and again you will notice that the tractor-operated farms had a larger present value of investment in their work stock, machinery, and mechanical power than did the horse-operated farms.

You will find a little different situation on a Mississippi Delta cotton plantation. This represents a fairly large business, of course—750 acres—and the data are for 1937. When you take the present value of work stock, machinery, and mechanical power on such a plantation, you will find that the mules represent a very important part of the investment and that therefore the actual present value of that part of the plantation investment represented by those items is larger on mule-operated farms than it is on the tractor-operated farms.

Mr. PIKE. Would it be fair to guess that in general the differential in investment against this mechanized farm increases as the size of the farm decreases? In other words, with the small farm, your added acre, let's say, would be rather larger than if you could split it—

Dr. JOHNSON. I didn't have any evidence readily available, but my own judgment is that on a smaller cotton farm you would have a larger investment resulting from the use of tractor power.

Mr. PIKE. You probably won't be able to make as full use of your mechanization on a small farm.

Dr. JOHNSON. That is correct. I might add another statement to that, and that is that on a good many farms and in a good many types of farming areas, and on a good many different kinds of farms, when you add a tractor, and when you substitute a tractor for horsepower and the complementary equipment that goes with the tractor, you have capacity for operating a larger acreage than you had before. Consequently, there is a constant pressure because of unused capacity for attempting to increase the number of acres operated per farm.

Dr. ANDERSON. These displays are made up on the basis of actual farms that were in operation on the dates mentioned?

Dr. JOHNSON. Oh, yes.

Dr. ANDERSON. In the same area, and covering how many farms, say, in the Iowa Corn Belt farm under review here?

Dr. JOHNSON. I cannot answer that. Can you, Mr. Kifer—how many farms are covered?

Mr. KIFER. I can't tell you exactly how many farms there were of this particular size, but I think it was something like 56 or 60.

Dr. ANDERSON. So that you take it to be typical of what occurred?

Mr. KIFER. I think the sample was large enough so that the average was reasonably stable. The group of South Dakota farms included a few more than 100.

Dr. ANDERSON. Do you comment on the substantially larger margin of difference there between tractor-operated farms and horse-operated farms in the Corn Belt as compared with the other two, the difference in cost being, say, five-hundred-odd dollars?

Dr. JOHNSON. Yes.

Well, I would expect that the relationship would be in that direction. I would not make a great point of any wide disparity.

The next exhibit is a table showing comparative costs in operating a 320-acre wheat farm with horses and with tractors.

(The table referred to was marked "Exhibit No. 2663" and is included in the appendix on p. 17444.)

Dr. JOHNSON. This shows the operating expenses in terms of cash outlay, broken down by direct crop expense and other expense, machinery, replacement, the total charges, and receipts, and the difference between the cash farm receipts and expenses, including machinery replacement.

Hired labor expense is reduced materially. The threshing expense disappears, but there is an increased expense for machinery, repairs, fuel, and oil. Total cash expense increased somewhat; machinery replacement, depreciation charge on machinery considerably increased.

There is an increase of income from wheat because more wheat is produced.

The difference between cash receipts and the expense is indicated as approximately the same, so that one offsets the other. A higher investment in equipment is shown.

That doesn't quite tell the full story, because the significant difference to the wheat farmer is that the expense for operating and replacing equipment is no longer a variable cost, varying directly with his production, and consequently with his income. The necessity for meeting these payments in years when incomes are low, because of low prices or drought, has added to the agricultural distress in drought areas. I mentioned a moment ago that, of course, when this change takes place on a half section farm of this size, there is some unused capacity, so that in good years this farmer will have that inducement for renting or purchasing additional land, and increasing the size of his business, which in good crop and price years would be profitable for him.

COMPARATIVE COSTS OF OPERATION

Dr. JOHNSON. The next table shows the comparative cost of operating a 200-acre Corn Belt farm with horses and horse equipment as compared with tractor and tractor equipment.

(The table referred to was marked "Exhibit No. 2664" and is included in the appendix on p. 17445.)

Dr. JOHNSON. We find here approximately the same changes in expenses; a decrease in direct crop expense, a decrease in hired labor, an increase in expense for operating equipment, an increase in machinery replacement expense, and some increase in receipts, so that there is a slight increase in the difference between receipts and expenses, and a small increase in investment in equipment and horses.

The next table shows the comparative expenses of operating plantations in the Mississippi Delta situation, with croppers and mules, with wage hands and mules, and with wage hands and tractors.

(The table referred to was marked "Exhibit No. 2665" and is included in the appendix on p. 17445.)

Dr. JOHNSON. The first column shows the cash outlay and the depreciation for work stock and equipment, and the net income to the plantation for the investment in the business as well as for labor and management. The first column shows figures for operation with cropper labor and mules, the second column with hired labor rather than cropper labor, but operating with mule equipment, and the third column with hired labor and tractor power.

Now, for the situation that prevailed in 1938, with the prices that prevailed at that time, a very considerably higher net income to the plantation would result from operating with hired labor and tractor power. More cotton could be produced, by the way. There would be a reduced number of families on the plantation. That comparison is for a situation with a picking charge at 90 cents per 100 pounds of seed cotton, and other labor at \$1 a day.

The last table compares the net plantation income under two different systems with different prices of cotton and different wage rates. The first comparison, with cotton lint selling for 12 cents a pound, labor \$1 a day, and the yields as above, 350 pounds of lint per acre, shows a very considerable advantage of operating with wage hands and tractors. When labor is raised to \$1.50 a day, with the price of cotton remaining the same, that advantage of operating with wage hands and tractors is very much reduced. With cotton down to 6 cents a pound and labor \$1 a day, a plantation operator would lose less money by operating with cropper labor and mule power than he would by operating with wage hands and tractor power. If labor were 50 cents a day, the situation would be reversed, and it would pay him to shift to wage hands and tractors.

(The table referred to was marked "Exhibit No. 2666" and is included in the appendix on p. 17446.)

Dr. ANDERSON. Mr. Chairman, might we break for lunch and come back?

Acting Chairman WILLIAMS. I suppose you have concluded with Dr. Johnson. We appreciate your statement.

The committee will be in recess until 2:30.

(Whereupon, at 12:50 p. m., a recess was taken until 2:30 p. m. of the same day.)

AFTERNOON SESSION

The hearing was resumed at 2:45 o'clock, upon the expiration of the recess, Senator O'Mahoney, the chairman, presiding.

The CHAIRMAN. The committee will please come to order.

Dr. ANDERSON. Mr. Chairman, we are proceeding with the remainder of the testimony from the Department of Agriculture experts.

We have composed them into a panel for this purpose, each giving his testimony with as few interruptions as possible, and they are going to remain thereafter for questioning on the entire day's testimony.

There are two witnesses this afternoon, Mr. Louis Bean and Mr. Norman J. Wall. Mr. Wall will proceed next. He is head of the Division of Agricultural Finance of the Bureau of Agricultural Economics of the Department.

The CHAIRMAN. Mr. Wall has appeared before us before. You may proceed.

TESTIMONY OF NORMAN J. WALL, DIVISION OF AGRICULTURAL FINANCE, BUREAU OF AGRICULTURAL ECONOMICS, DEPARTMENT OF AGRICULTURE, WASHINGTON, D. C.

Mr. WALL. During the forenoon you listened to the exposition which showed the great increase in productivity in agriculture. During this same time there was also a very rapid rise in farm-land values, which was the basis for a large increase in farm-mortgage indebtedness.

The CHAIRMAN. Would you mind summarizing for me, because I was absent attending the Committee on Appropriations this morning, the story of the increased productivity of agriculture?

Mr. WALL. I am sorry, Senator, but I was also absent.

The CHAIRMAN. Well, then I will read the record.

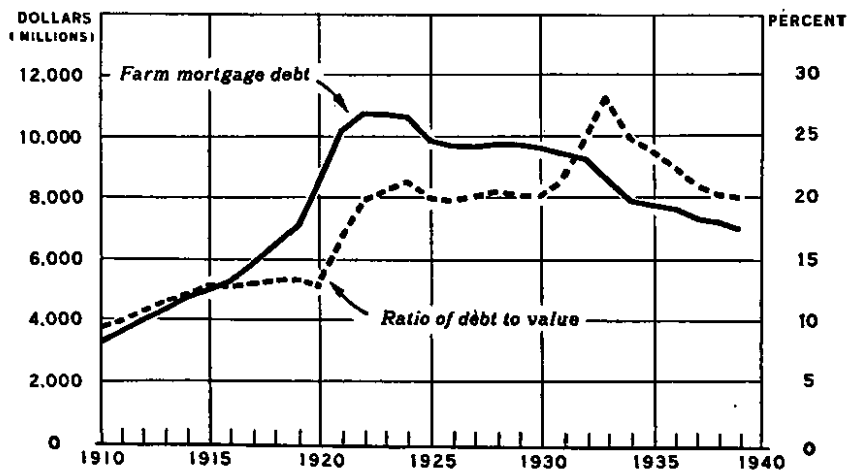
Mr. WALL. This chart shows that there has been a very substantial increase in farm-mortgage indebtedness from 1910 to about 1934.

(The chart referred to was marked "Exhibit No. 2667" and appears below.)

EXHIBIT No. 2667

[Submitted by the Bureau of Agricultural Economics, Department of Agriculture]

TOTAL FARM MORTGAGE DEBT AND RATIO OF DEBT TO VALUE OF FARM REAL ESTATE, UNITED STATES, 1910-39



Mr. WALL. Farm-land values, however, rose more rapidly, and as consequence the ratio of debt to value did not show as large an increase in the total farm-mortgage debt in the 1920's. However, the situation was reversed; as you will note that total farm-mortgage debt continued to decline, but the ratio of debt values stayed at practically a constant value during the period. Farm-land values also declined.

You will note the high peak in the ratio of debt to value in 1933, at which point it amounted to 28 percent of the total value of farms, and since that time, it has been reduced to about the level of the twenties.

Representative WILLIAMS. You are talking now about the entire farm values, as compared with the entire farm-mortgage indebtedness; is that true?

Mr. WALL. That is right.

Representative WILLIAMS. Are you going to show later on, or have you the figures there, to show the relation of the farm debt to the farms upon which the debt is placed?

Mr. WALL. We do have some information on that, showing the ratio of debt to value, which I can supply for the record, if you wish. Of course, it is much higher on the mortgaged farms. About 34 percent of all farms are mortgaged, so you can see that the ratio of debt to value on the mortgaged farm would be substantially higher.

Representative WILLIAMS. Oh, yes, undoubtedly. I was just wondering about what that was, whether it was 65 or 80 percent?

Mr. WALL. Well, I would judge, just offhand, that it might run around 50 percent.

The CHAIRMAN. Now, to explain this chart, which I understand you want to admit to the record?

Mr. WALL. Yes, sir.

FARM INDEBTEDNESS AND FARM VALUES

The CHAIRMAN. It represents, in a solid line, the curve of the farm-mortgage debt of the United States from 1910 to the present time, in terms of dollars.

Mr. WALL. That is correct.

The CHAIRMAN. And in the dotted line, it represents the ratio of debt to the value of the farm property mortgaged, in terms of percentage.

Mr. WALL. The value of all farms, including those not mortgaged.

The CHAIRMAN. All right. The chart represents the ratio of the entire mortgage debt to all of the farms in the United States.

Mr. WALL. That is correct, Senator.

The CHAIRMAN. In terms of percentages?

Mr. WALL. That is correct.

The CHAIRMAN. The dollar scale appearing at the left-hand side and the percentage on the right-hand side.

Mr. WALL. That is correct.

The CHAIRMAN. So that it would appear that in 1915, when the farm mortgage debt amounted to about \$5,000,000,000, that debt was approximately 12½ percent of the value of all the farms in the United States; is that correct?

Mr. WALL. That is true.

The CHAIRMAN. In 1930 the farm debt amounted to almost \$10,000,000,000, and the percentage had risen to 20 percent?

Mr. WALL. That is correct.

The CHAIRMAN. Then there was a very sharp rise between 1930 and 1934 of the ratio of debt to value?

Mr. WALL. From 1930 to 1933.

The CHAIRMAN. In 1931 or 1932, the ratio for the first time went above 21 or 22 percent.

Mr. WALL. Yes.

The CHAIRMAN. And it is now back to about 20 percent?

Mr. WALL. That is correct.

The CHAIRMAN. That shows a trend of reduction of the farm mortgage debt at the present time, and likewise of the ratio.

Mr. WALL. And a lower level of land values as compared to the twenties.

The CHAIRMAN. There is nothing on this chart to indicate any lower level of land values, is there?

Mr. WALL. "Exhibit No. 2668" is a short table showing the mortgage debt, the value of farm real estate, and ratio of debt to value. In 1935 the value of all farm real estate was about \$35,000,000,000, which is lower than at any time during the twenties.

(The table referred to was marked "Exhibit No. 2668" and is included in the appendix on p. 17446.)

The CHAIRMAN. Yes; but in 1933 the value of farm real estate was only \$30,724,000,000.

Mr. WALL. That is correct.

The CHAIRMAN. Which was far lower than it was in 1910.

Mr. WALL. Yes, sir.

The CHAIRMAN. And it has been increasing since that time?

Mr. WALL. That is right.

The CHAIRMAN. Now, what have you to say about the future as indicated by these trends?

Mr. WALL. It is probable that the total farm mortgage debt will not decline much further, assuming that we have a reasonable prosperity in agriculture. In other words, we would rather look for an increase in farm mortgage debt as the acquired farms of leading lending agencies are sold back to farm operators.

The CHAIRMAN. You think we can make that assumption?

Mr. WALL. Well—

The CHAIRMAN. Of a reasonable prosperity in agriculture?

Mr. WALL. That is up to Congress. [Laughter.]

The CHAIRMAN. Oh, I wish it were. [Laughter.] It would be settled tomorrow. Don't you agree with me on that, Congressman?

Representative WILLIAMS. Yes; but I won't say what I think. I would like to say it off the record. [Laughter.]

Let me ask you a question in connection with this. There has been an actual reduction in the farm indebtedness from about \$11,000,000,000 to \$7,000,000,000.

Mr. WALL. That is right.

Representative WILLIAMS. Along what line has that been? Has that been the result of foreclosures, scaling down of the indebtedness between the mortgagor and mortgagee or simply the paying off of the indebtedness?

Mr. WALL. I think it represents a combination of all those factors.

Representative WILLIAMS. What has been the main factor?

Mr. WALL. In the period from 1930 to about 1934, I think perhaps the major factor was the liquidation of debt through foreclosure and assignment, yet we find from our studies that in certain areas where income has been fairly favorable there is a fairly sizeable amount of loans liquidated through payments. There is another factor of increased debt put on for one cause or another, so that you have a combination of several factors there. Of course, debt adjustment was another factor, particularly during the period of commercial financing of the Farm Credit Administration, but I would judge that if you were going to single out any one single factor, it probably would have been foreclosure.

Representative WILLIAMS. Have you those separate figures, the figures which would indicate the extent which each of these factors played in that farm-mortgage reduction?

Mr. WALL. It would be difficult to give you exact figures because there are so many outstanding factors. We could put into the record some indications of the different factors, such as foreclosures and new loans closed, which would tend to give you a fair picture of the situation. We do come to some material later on in the exhibit that does have some bearing upon that.

The next table shows a break-down of the total farm-mortgage indebtedness by geographic divisions.

(The table referred to was marked "Exhibit No. 2669" and is included in the appendix on p. 17447.)

Mr. WALL. I think the most significant thing the table brings out is the change in the importance of the West and the South during the 30-year period. The North Atlantic States accounted for roughly 11 percent of the entire farm-mortgage debt in 1910, as compared with 8 percent in 1939. On the other hand, the Southern States, which accounted for only 16 percent of the total in 1910, now account for about 22 percent of the total. The Western States now account for about 17 percent, as compared with 8 percent in 1910.

The CHAIRMAN. This is the table representing the estimated amount of farm-mortgage loans outstanding by geographic divisions.

Mr. WALL. It is merely a break-down of the heavy black line which you see on the chart before you.¹

The CHAIRMAN. How were these figures obtained?

Mr. WALL. The estimates of farm-mortgage indebtedness are based upon the data for the known sources, that is for the Federal land banks, life-insurance companies, commercial banks, and State credit agencies, and in addition to that a W. P. A. study was conducted in which data were obtained on farm mortgages filed and recorded in the several hundred agricultural counties, and these were used to estimate the loans other than those of the known agencies. Then in each census period, the Census Bureau obtained a figure on the total amount of debt on owner-operated farms, and on the basis of this information and special surveys we develop estimates for debt on part-owned farms and on tenant farms, so that the other data are linked to the census dates as bench marks.

¹ See "Exhibit No. 2667," supra, p. 16963.

The CHAIRMAN. What is the significance of this division into regions? Is there very much significance in the table without figures to accompany this table indicating the value of farm lands in those same areas?

Mr. WALL. I think that is a very good point, Senator. I have right before me a chart which we do not include in the exhibit which shows that the rise in land values in the five divisions, Mountain States, Pacific States, South Atlantic, East South Central, and West South Central States, has been much more rapid than in other sections of the country or for the United States as a whole, and that in part explains why there has been a more rapid increase in mortgage debt in these geographic divisions. These are the sections of the country which have been developed very rapidly during the last three decades, and as a consequence have provided a greater amount of security for obtaining loans.

The CHAIRMAN. So that increasing debt in a particular region might only be an indication of increasing values.

Mr. WALL. Increasing development of that particular area.

FARM OWNERSHIP AND OPERATION

Mr. WALL. The next chart deals with the percentage of the value of farm real estate belonging to the farm operator, United States, for census years 1890-1935, and by States, 1930 and 1935.

(The chart referred to was marked "Exhibit No. 2670" and appears on p. 16968. The statistical data on which this chart is based are included in the appendix on p. —.)

Mr. WALL. You will note at the top of this chart several black bars, which indicate the percentage of the value of farm real estate belonging to the farm operator, and there has been a very significant trend in this series from 1890 to 1935. In the earlier period, the equity of the farm operators in their real estate was 59 percent of the total value of that farm real estate, while in 1935 it represented only 39 percent. In the two maps you will note the differences by individual States from 1930 to 1935, and during this period there was also a decrease in the equity from about 41 to 39 percent. This decrease occurred in practically every State. Only about six States showed slight increases. The decrease in equities during the 5-year period were particularly marked in some of the Mid-West States, where there had been a high ratio of debt to value, and a sharp drop in farm income caused a very large number of farms to come under foreclosure.

Mr. O'CONNELL. When you refer to the equity of this group, do you mean the percentage of the total of farm property that is at present owned by the farm operators, or do you mean the equity of individual farmers as against the value of the property?

Mr. WALL. This refers to the total value of farm real estate, and refers only to the equity of owners. In other words, it excludes the mortgage debt. It is the equity of owners, compared to the total value of farm real estate.

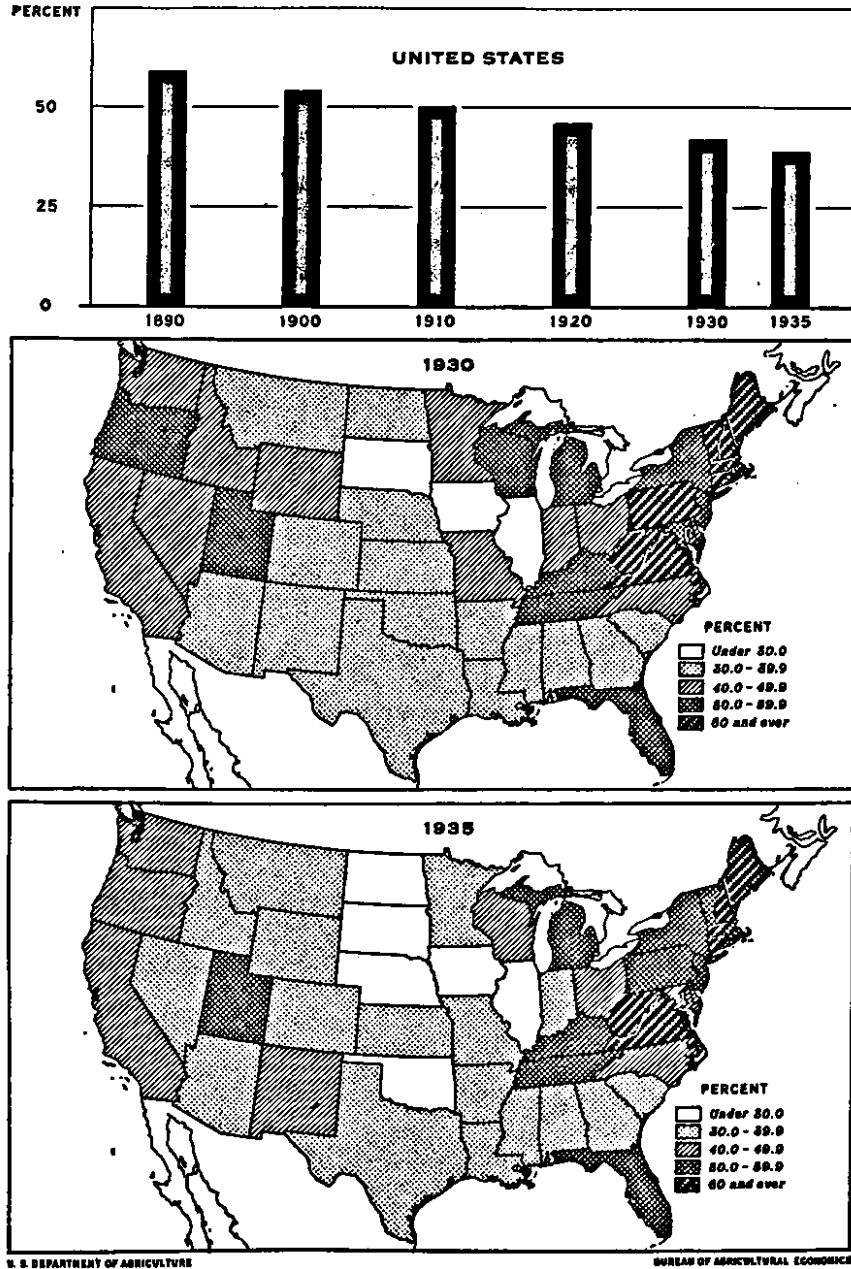
The next table shows a breakdown.

(The table referred to was marked "Exhibit No. 2671" and is included in the appendix on p. 17448.)

EXHIBIT No. 2670

[Submitted by the Bureau of Agricultural Economics, Department of Agriculture]

PERCENTAGE OF THE VALUE OF FARM REAL ESTATE BELONGING TO THE FARM OPERATOR, UNITED STATES, FOR CENSUS YEARS 1890-1935, AND BY STATES, 1930 AND 1935



Dr. LUBIN. Do you mean the figures for 1930 and '35 refer to the value existing in those years of all farm real estate that is owned, or do you use a fixed base for both periods?

Mr. WALL. It refers to the value of farms in each of those periods.

Dr. LUBIN. So despite the fact that the values in these farms went down, the equities went down as well.

Mr. WALL. More rapidly.

If there are no further questions on that particular chart, we will turn to the table entitled "Total farm mortgage debt and amounts held by principal lender groups, January 1, 1910-39.

(The table referred to was marked "Exhibit No. 2672" and is included in the appendix on p. 17449.)

Mr. WALL. I think the chief significance of this table is to indicate that there has been a rapid shift of the mortgage indebtedness into the hands of the centralized lending agencies and out of the hands of individual investors.

(Representative Williams assumed the chair.)

Mr. WALL. For instance, on January 1, 1939, the land banks and the Land Bank Commissioner, life insurance companies, and commercial banks held about 60 percent of the entire farm mortgage debt. Individuals and others held about 40 percent of the total, as compared with 75 percent in 1910. A large part of this shift to the centralized lending agencies, of course, represents the substantial increase in the holdings of the Federal land banks and Land Bank Commissioner as a result of the emergency refinancing program following 1933 and 1934. Life insurance companies have reduced their outstanding loans by more than one-half in the past 10 years; commercial banks have shown a very substantial reduction, and the joint stock land banks, which are now in liquidation, of course, have shown the greatest decrease of any of these groups.

The picture of the indebtedness situation of the American farmer, however, is incomplete if we consider solely the farm mortgage indebtedness, as in addition to such debts he also borrows various amounts from commercial banks, government sponsored agencies, individuals, and others.

The next chart which you see before you, "Short-Term Loans to Farmers Held by Commercial Banks and Federal Agencies, Compared with Index of Prices Received by Farmers," will give you a picture of the changes that have occurred in non-real estate debt of farmers.

(The chart referred to was marked "Exhibit No. 2673" and appears on p. 16970.)

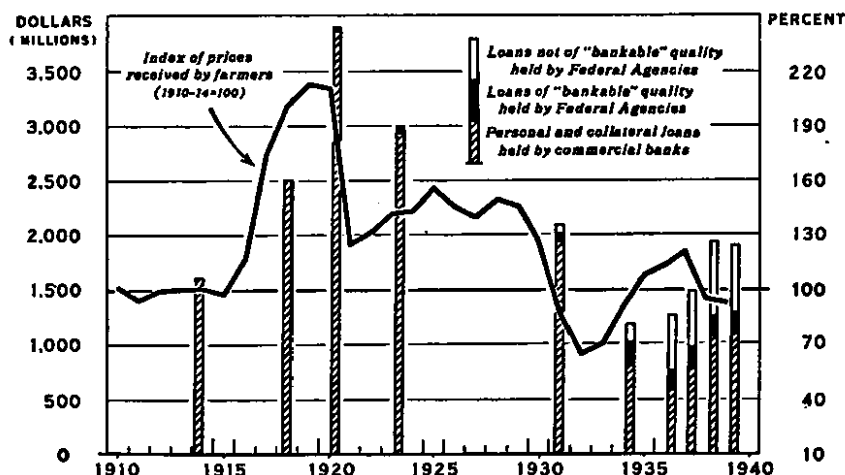
Mr. WALL. There has been an even more drastic reduction in personal and collateral loans to farmers held by commercial banks than there has been in the farm mortgage indebtedness. On December 31, 1920, commercial banks held commercial and collateral loans to farmers in the amount of about \$3,870,000,000. By the end of 1936 this had been reduced to about \$593,000,000, and since that time there has been an increase of about 100 percent, but this has represented largely commodity loans under the Commodity Credit Corporation loan program. The loans from federally sponsored agencies of the character similar to those made by commercial banks, which are indicated in the chart as of bankable quality, now amount to about \$195,000,000,

or roughly about one-fifth of the loans held by commercial banks. This type of loan has not increased materially since 1934. The biggest increase was in 1931-32, when the regional Agricultural Credit Corporations were established to cope with the emergency that existed in agricultural areas at that time. There has been, however, a very substantial increase in another type of loan made by Federal agencies, and that is represented primarily by emergency crop and feed loans, rehabilitation loans, and loans made to stabilize the prices of agricultural commodities, the latter under the Commodity Credit Corporation loan program.

EXHIBIT No. 2873

[Submitted by the Bureau of Agricultural Economics, Department of Agriculture]

**SHORT-TERM LOANS TO FARMERS HELD BY COMMERCIAL BANKS
AND FEDERAL AGENCIES, COMPARED WITH INDEX OF
PRICES RECEIVED BY FARMERS**



U. S. DEPARTMENT OF AGRICULTURE

BUREAU OF AGRICULTURAL ECONOMICS

We might make a rough estimate of the total indebtedness of American agriculture, which would be roughly about \$10,000,000,000, representing about \$7,000,000,000 of farm mortgage indebtedness, about \$2,000,000,000 of short-term loans obtained from commercial banks and Federally-sponsored agencies, and the balance of roughly 1,000,000,000 representing loans obtained from individuals, amounts owed to merchants and dealers, and so forth.

You will note that we have charted the index of prices received by farmers along with the data for the short-term loans, and it will be noted that as prices rise there is a general tendency for the volume of agricultural loans of this character to expand, and conversely, when prices decline, there is a consequent reduction in the volume of that type of loan.

Changes in farm income naturally result in a change of the value of the collateral that the farmer has to offer in obtaining credit, and also influence his ability to repay advances already obtained.

Dr. LUBIN. Mr. Wall, do these figures include short-term loans in the sense that they represent debts of farmers for purchases of equipment, in other words, if the financing is done by the selling agency rather than the bank?

Mr. WALL. No; they would not, these are direct loans to farmers. If the advance were financed through, say, an implement manufacturer who, in turn, obtained credit from a commercial bank, that would not be in these figures, but would be in this rough catchall figure of \$1,000,000,000, that I mentioned a moment ago.

Acting Chairman WILLIAMS. What, taking the entire farm indebtedness, is the indebtedness of the farmers at the present time, compared with what it was at the peak, its highest point?

Mr. WALL. Well, I would say about \$15,000,000,000, compared with \$10,000,000,000. It was up around \$15,000,000,000 in the very early twenties. Then, as the mortgage indebtedness increased following 1920, there was some refinancing of short-term loans which didn't represent an increase in the total debt but merely resulted in a shift from the short-term category to the long-term category.

That likewise occurred to some extent following 1933; the increase in loans, we will say, of the Farm Credit Administration represented a refinancing of a considerable amount of short-term indebtedness.

Acting Chairman WILLIAMS. There has been, roughly, then, a decrease of \$5,000,000,000 in farm indebtedness.

Mr. WALL. Yes; as a rough figure.

Acting Chairman WILLIAMS. What about the rate of interest during that same period of time? How does the entire interest load which he carries now compare with what it did at that time?

Mr. WALL. Well, I have with me material on the total farm mortgage interest payments. I do not have immediately available the interest payments on the short-term indebtedness. In 1922 total interest charges on the farm mortgage indebtedness amounted to about \$680,000,000, and in 1938 that had been reduced to about \$357,000,000. That represents, of course, a substantial reduction in the mortgage debt, but also some decrease in the rate of interest.

FARM INTEREST RATES

Mr. WALL. For instance, the average rate of interest paid on outstanding farm mortgages in 1923 was 6.35 percent, and in 1939 that had decreased to 4.99, or about 5 percent. There has also been a reduction in interest rates and short-term indebtedness to the increasing proportion of short-term indebtedness held by Federal agencies, of course, reduces the average rate in all outstanding short-term indebtedness, and we know from fragmentary data that commercial banks have also reduced quite sharply, particularly in some areas, the interest rates that they charge farmers on personal collateral security.

Acting Chairman WILLIAMS. It would appear from that that the interest load today was perhaps not over half what it was in the early twenties.

Mr. WALL. Well, the relation of farm mortgage interest payments to farm income is about the same now as it was in the pre-war period, 1909 to 1914. The next table shows total farm real-estate taxes and farm-mortgage interest payable, and the percentage they form of cash

farm income. In 1938 the total of both taxes and interest charges represented about 9.5 percent as compared with 6.4 percent in 1910, but that increase in percentage is accounted for largely by an increase in farm taxes in relation to farm income.

(The table referred to was marked "Exhibit No. 2674" and is included in the appendix on p. 17450.)

Dr. LUBIN. Mr. Wall, in your previous charts you have an item called "Loans of bankable quality held by Federal agencies." You mentioned emergency legislation in the early thirties. Are there any Government sources to which a farmer can go for a so-called commercial loan of a bankable quality that will make loans today?

Mr. WALL. Yes, indeed. There are something over 500 production credit associations located throughout the United States, in which farmers can obtain credit on good collateral at interest rates around $4\frac{1}{2}$ percent per annum. These production credit associations cover the entire United States.

Dr. LUBIN. Evidently the number of loans they have been making since the value of loans has not been increasing, judging by these borrowers, but has held more or less the same since 1936?

Mr. WALL. That is just about right. I have before me some figures here for December 1936, \$172,000,000; and in 1938, \$181,000,000; in December 1939, \$194,000,000. Of course, these are year-end figures, at which time such loans are lower than they are in the middle of the year, which is the peak season for short-term advances.

Dr. LUBIN. Does this mean that commercial banks are meeting their needs, so they don't have to have recourse to these commercial credit agencies?

Mr. WALL. Well, there are a number of factors involved there. In some areas the commercial banks are giving very active competition in obtaining loans of this sort, so that these production credit associations have not shown as large an increase as they did in earlier years. On the other hand, there are certain areas, like the livestock areas, where the local institutions are not able to handle all the loan business, and in those areas the production credit associations have shown a very satisfactory business.

Dr. LUBIN. Are they incorporated?

Mr. WALL. Yes; each borrower must take stock in the amount of 5 percent of his loan.

Acting Chairman WILLIAMS. In that respect they parallel exactly the Federal land-bank system?

Mr. WALL. That is correct.

Acting Chairman WILLIAMS. And what about the rural rehabilitation program?

Mr. WALL. Those are direct loans made by the Farm Security Administration to farmers who cannot qualify for credit from other agencies.

Acting Chairman WILLIAMS. That is an additional agency to make these nonbankable loans?

Mr. WALL. That is right.

The next table, which is entitled "Number of Farms Changing Ownership by Voluntary and Forced Sales, Per 1,000 of All Farms, by Geographic Divisions, 1926-39," will have some bearing on the question which you raised earlier in connection with the factors that accounted

for the sharp reduction in mortgage indebtedness. The amount of forced sales rose rapidly after March 1931 and reached a peak during the year ended in March 1933, at which time they were about two and a half times the average prevailing during the 5-year period 1926 to 1930. The portion of that that is just sales has been quite large in the West and North Central States, and this is accounted for by the larger percentage of farms mortgaged, together with the relatively high rates on the mortgage debts to land values in these particular areas before the depression set in.

(The table referred to was marked "Exhibit No. 2675" and is included in the appendix on p. 17451.)

Mr. WALL. Now, if you want to see the result of all these developments, you might turn to the following table, which shows farm real estate held by leading lending agencies.

(The table referred to was marked "Exhibit No. 2676" and is included in the appendix on p. 17451.)

Mr. WALL. As a result of the depression and the large volume of forced sales, there has been a considerable shift in the ownership of farms from owners to the large lending agencies.

At the beginning of 1939 a group of five of the most important lending agencies held acquired farms in an estimated investment of slightly over \$1,000,000,000. This represents roughly around 28,000,000 acres. These holdings are largely concentrated in the Midwest States, where land values were relatively higher in other sections of the country, and with, as I mentioned a moment ago, the ratio of debt to value and percentage of farms mortgaged were both quite high before the depression set in.

Acting Chairman WILLIAMS. Are there any further questions? I think that is all; thank you.

Dr. ANDERSON. The next witness of the panel is Dr. Louis Bean. He has been previously sworn.

TESTIMONY OF DR. LOUIS BEAN, ECONOMIST, BUREAU OF AGRICULTURAL ECONOMICS, DEPARTMENT OF AGRICULTURE, WASHINGTON, D. C.—Resumed

Dr. BEAN. I should like to begin, Mr. Chairman, with the very last tabulation in that small document that was brought together.

Acting Chairman WILLIAMS. What is the title of it?

Dr. BEAN. The title of that tabulation is "Gross income from farm production, expenditures for labor, and value of farm implements and machinery on farms, by types of farms, 1899 and 1929."

(The table referred to was marked "Exhibit No. 2677" and is included in the appendix on p. 17452.)

Dr. BEAN. The purpose of this table is to give a very general impression as to the relation between expenditures for labor and the expanded use of farm machinery during the period of 30 years, 1899 to 1929, with the assumption that there will be a great deal more detailed information presented for the most recent decade.

Another reason for presenting this table is that it gives information which has not been presented so far, on the relation of expenditures for labor and machinery, by types of farms.

The contrast is presented here in terms of the expenditures for labor as estimated or tabulated by the censuses in these 2 years, as percentages of gross value of production, sometimes called the gross income from agricultural production.

Similarly, I have used the value of machinery on farms as reported by the Census, as a ratio to gross income, merely to get some indication of the changes in these two items as between types of farms and over this 30-year period, not purporting to say that this represents the situation of 1939 but merely to supply the committee with material for that 30-year period as a background for more recent data. As indicated by the testimony of this morning, much more striking changes have taken place in the past few years than took place during the earlier 20 or 30 years.

The gist of this tabulation, then, is that between 1899 and 1929, expenditures for farm labor as a percentage of gross income declined from 9.7 percent to 8.7 percent.

Dr. LUBIN. Does the series in the 1929 figure include the same things as the 1899 figure? They are labeled differently, but taken as a whole, are they the same?

Dr. BEAN. That is right. They are essentially the products of agriculture, exclusive of products fed to livestock, sometimes defined as the value of sales plus the value of products consumed in the farm home.

In that same interval, the ratio of farm machinery inventory to income increased from 20.2 percent to 30 percent.

Dr. ANDERSON. Your ratio for farm machinery is based on inventory and total gross income?

Dr. BEAN. That is right.

Dr. ANDERSON. Let me ask you, first, what does farm machinery include?

Dr. BEAN. It includes all of the farm implements plus the motor equipment that farmers have bought during the past generation or so. In other words, you had, in 1899, farm implements and machinery exclusive of the motor equipment which is now typical of farming.

Dr. ANDERSON. In other words, it would include automobiles?

Dr. BEAN. Automobiles and tractors.

Dr. ANDERSON. And trucks?

Dr. BEAN. That is right.

Dr. ANDERSON. And would it include household machinery, sewing machines, and so on?

Dr. BEAN. No; this is only machinery on farms, for productive purposes.

Dr. ANDERSON. The ratio in 1899 was 20 and in 1929 it was 30. Do you have any break-down to indicate what would make the difference?

Dr. BEAN. I will come to that a little later. We have some information on the relative increase in the purchases and costs of motor equipment.

Dr. ANDERSON. But this is an inventory figure, and would not be taken to mean in any sense the proportion of an income that would be spent for machinery—

Dr. BEAN. Not directly, only as indicative of the, say, incidence of costs for machinery in relation to gross income. Insofar as a

change in the value of inventories is representative of a change in depreciation costs.

Dr. ANDERSON. And we will discuss the detail of it later?

Dr. BEAN. I will have a little more detail on that in another tabulation.

If you will take the cash grain farms for that interval, we find that in 1899 the inventory figure increased from 21.8 percent to 46.7 percent. That is the largest increase of any of the types of farms shown here. The proportion of income paid out for labor in this group of farms declined from 10 percent in 1899 to 8.3 percent in 1929. In the case of cotton, the proportion going for wages was the same in 1929 as in 1899, namely, 5.9 percent; while the farm machinery inventory figure rose from 10.4 to 16.4 percent. Similar changes took place on dairy farms. There, wages took 13.3 percent in 1899, and 8.6 percent in 1929. Farm machinery inventories increased from 25.6 percent to 34.4 percent.

On livestock farms the shift in the wage proportion was from 8.2 to 6.2, and the machinery item increased from 19.1 to 29.5. The smallest change occurred on fruit farms. There wages took 20.1 percent of income in 1899 and 23.7 in 1929, the machinery item rose from 19.1 to 24.7.

EFFECT OF MECHANIZATION ON LABOR COSTS

Dr. LUBIN. Is it fair to conclude from these figures that in some instances the large increase in the use of machinery had little or no effect upon percentage of income that went to labor whereas in other instances the relatively small increase through this machinery affected labor costs rather markedly?

Dr. BEAN. Well, I present this material for such inferences as any of you may make, and I think you are in about as good a position to draw inferences from this as I am. I thought that you were interested in such quantitative expressions of that question as we can bring to you.

Dr. LUBIN. Evidently the table shows that a 50-percent increase in machinery inventory resulted in about a 9-percent decline in the amount of farm income that went to labor.

Dr. BEAN. That is the over-all evidence, that you could have a substantial increase in machinery costs and not have a similar offset in the reduction in the wage bill.

Dr. LUBIN. In many instances no offset at all, in fact an actual increase.

Dr. BEAN. That is possible.

Mr. PIKE. You probably had a much higher rate of wages in 1929 than in 1899.

Dr. BEAN. All values were different.

Mr. PIKE. But the man-hour reduction doesn't show.

Dr. ANDERSON. Dr. Bean, the question I raised earlier was to fix the point you have just brought up about an increase in machinery costs. Do I take it that we can consider inventory figures as machinery-cost figures?

Dr. BEAN. Sometimes, lacking better information, it is possible to take an inventory item and allow, say, 10 percent of inventory as cost of depreciation, or some such formula; it doesn't have to be 10 percent.

It is for that purpose that I have used this over-all impressionistic ratio of inventory to gross income. I think it represents fairly well a shift or change in the relative importance of this item as a cost, not an absolute, but a relative change. I think we come a little closer in answer to your question in the next exhibit, which is called "Cash Farm Income From Marketings and Cost of Operating Farm Machinery, Depreciation, and Wages Paid for Labor as Percent of Farm Cash Income, 1910-39."

(The table referred to was marked "Exhibit No. 2678" and is included in the appendix on p. 17453.)

Dr. BEAN. The Bureau of Agricultural Economics is in the process of making estimates of items in the cost of producing the annual farm production, and I have utilized that material, which has not yet been fully published, in the form of ratios to cash income from the marketings of farm products.

The estimates of depreciation allowance on all farm machinery and farm equipment as a percentage of cash income appear in the second column, and you will notice that in the pre-war years that figure represented close to 6 percent of the annual receipts. In the post-war years of the 1920's, that percentage is something over 6 percent, between 6 and 7 percent. In 1931-32, naturally that proportion rises sharply as it did in 1921 because of the sharp shrinkage in income. In the more recent years, 1938 and '39, that depreciation ratio stands at about 9 percent.

Mr. PIKE. It is a pretty high depreciation there, better than 20 percent. The only year where it is comparable, in 1929, you had 30 percent inventory and 6.8 depreciation.

Dr. BEAN. That would be a fifth.

Mr. PIKE. Yes; you were amortizing there in less than 5 years on your farm machinery.

Dr. BEAN. These are the facts and if you would like to argue about them I will get you the reasons for them. For the moment I think all that I want you to use these figures for is to get an impression of relative change. The 5 or 6 percent before the war isn't absolutely significant, but the change from 5 or 6 before the war to 8 and 9 now I think is.

The next column represents the net cost of operating farm machinery, which is essentially automobiles, trucks, and tractors, including gasoline, tires, oil, things of that sort. And you will notice that in the pre-war years that cost was insignificant because this type of farm equipment didn't exist. In the 1920's, it had risen to over 7 percent of annual receipts, and in the last 2 years, it was slightly under 12 percent, or 11.7.

Mr. PIKE. For a man operating equipment with his own horse, you wouldn't charge that—

Dr. BEAN (interposing). No; it is cash outlay.

Dr. LUBIN. What would the percentage be now if the level of farm prices were equal to what they were in 1929?

Dr. BEAN. Farm prices now are approximately 100; in 1929 they were 50 percent higher. I suppose this ratio would drop to perhaps 8.

Dr. LUBIN. You would be close to where you were in the '20's.

Dr. BEAN. That's right. The wage proportion is shown in the next column, and here it appears that in the pre-war years farmers paid out

annually a little over 9 percent as cash wages. In the 1920's it was something under 9 percent, but not a great deal. In 1929, it was 8.5, compared with 9.1 in 1910; since then it has fallen off to 7.1 in 1939, having gone lower in 1934.

Dr. LUBIN. Do these wages include all wages on the farm or only those wages for the cost of operating machines?

Dr. BEAN. This is all wages, cash wages for hired labor. The sum of these three cost items in relation to income is in the last column, and we find here that nearly 16 percent of receipts in the pre-war years went for these three costs. By 1929, the figure amounted to 23 percent, and in the last 2 years, it has averaged 28 percent. As you study the make-up of this aggregate figure, it is clear that there has been some offset as between the increase in the depreciation column and the decrease in the cash wage column, so that the net increase in the relative importance of these three cost items is almost entirely accounted for by the increased importance in the cost of operating automobiles, trucks, and tractors.

Dr. LUBIN. Has there been an increase in the cost of operation, or an increase in proportion of income that has been devoted to it?

Dr. BEAN. All this information shows is that there has been an increase in the proportion of income going for this type of expenditure.

Dr. LUBIN. The costs may have gone down.

Dr. BEAN. Whether or not other costs have gone down to offset this is another question, and I think on that I can tell you that there have been some reductions naturally in the past few years, taxes and interest—

Dr. LUBIN (interposing). Even in operation, I mean if you had the same cash income in 1939 that you had in '29, your actual percentage of income that goes to operation of these machines would have been lower.

Dr. BEAN. Oh, naturally.

Dr. LUBIN. In other words, it isn't cost of operation that has gone up, that may have gone down for all we know, but as a ratio to total cash income—

Dr. BEAN (interposing). That is right; and I thought it was important to give you the relation of costs to income and not merely the absolute figures which you already have.

Colonel CHANTLAND. Wasn't there a figure given this morning that indicated that the farm help without the payment of wages did go up during this time at the same time that these other costs went down?

Dr. BEAN. "Exhibit No. 2648" gave the annual average of persons employed, divided into three groups, total employment, family workers, and hired workers. I have just been studying this tabulation, because I wanted to see what relation it bore to the course of the number of tractors on farms,¹ and if you wish I will give you the relation of those two.

Colonel CHANTLAND. In other words, if they did pay less wages, but had more of their own family on without paying the wages, the cost still was there, if the boy is entitled to anything.

Dr. BEAN. If you will hold that "if" for a moment, we will see if it is really pertinent.

¹ See "Exhibit No. 2655," appendix, p. 17445.

I would like to give you the figures for three separate periods. You may recall from "Exhibit No. 2655" that the number of tractors on farms rose fairly persistently from 1913 to 1939. It was pointed out that there were three periods when the expansion in the use of tractors was more marked than in other periods. We had a rapid expansion which culminated in about 1920, then you had another expansion which was more rapid than in other years, which culminated shortly after 1930, and then you had another expansion in the last few years.

CHANGES IN FARM LABOR FORCE

Dr. BEAN. I want to present the figures for your question for these three periods. Family workers, during that first period of expansion in farm machinery of this type, dropped from an index of 107 to 101, the years being 1915 to 1920. In other words, you had a 7-percent decline in family workers. During that same period you had a decline of 2 percent in hired workers.

Colonel CHANLAND. But that is family wages. Supposing they don't pay family wages, or do you figure it at any rate?

Dr. BEAN. May I first present the physical aspect of the question, numbers of people, because it underlies the problem of evaluation. That family workers declined 7 percent, hired workers 2 percent during that first period when farmers went into motor equipment fairly heavily. During the second period of expansion, which I mark off as between 1925 and 1932, over that period of 7 to 8 years there was no change in the number of family workers, the index being 102 in each of those 2 years, but during that interval family workers declined from 102 in 1925 to 99 in 1929, which is a decline of 3 percent prior to the onset of the depression, so that the subsequent increase in family workers from 99 in 1929 to 102 in 1932 is apparently a function or a result of the low prices and the depression.

During that same period, from 1925 to 1932, we have a decline in the number of hired workers from an index of 97 to 85; in other words, 12 points, or approximately 12 or 13 percent.

Now we come to the final, the most recent, period of expansion, and there, taking the period from 1935 to 1939, we find a reduction in the number of family workers of 6 points, from 103 to 97, or, roughly, 6 percent, but no change in the number of hired workers, the index being 84 in 1935 and 84 in 1939, with some increase in that interval, and a subsequent decrease. The net change over that 5-year period is zero.

So that over this period you have a reduction in the number of people producing as one of the factors in this wage bill, and at the same time I think you see the relation between the change in the number of workers to possibly one of the factors which is at least logically associated with that change.

Dr. ANDERSON. Dr. Bean, why do you select the particular periods of time that you do?

Dr. BEAN. They are selected for me by the data.

Dr. ANDERSON. Let's see that clearly, sir.

Dr. BEAN. Is it possible to get "Exhibit No. 2655" back on the easel?

Dr. ANDERSON. In other words, you are basing it upon that distribution of time? We would like to see the connection between the two sets of data.

Dr. BEAN. While the predominant record here is of a sharp increase in the inventory of tractors on farms, it is clear that the changes in that rate of expansion are an indication of the more or less rapid rate of accumulation or purchases. This curve peaks up at January 1920, indicating that there was a rapid increase in purchases or expansion in purchases of tractors. In 1922 the inventory figure was about the same, indicating that there was practically no additional purchase of tractors in that year, or at least a very small one. To put it another way, it was only enough to offset depreciation.

The next period of rapid accumulation occurred during the late 1920's, culminating with 1932, and the final, or the most recent period, occurred during the last 5 or 6 years, so I select these three periods merely because the record suggests that those are the periods when, if this has any relation to employment of farm labor, you would expect to find it in the record.

Dr. ANDERSON. Would it be possible to take, instead of the inventory of farm tractors, actual increased sales?

Dr. BEAN. I think, if you can visualize numbers of tractors around this line, you will have essentially annual purchases, assuming that you have a constant purchase for replacement, but these variations in the rate of increase of this line represent variations in annual purchases.

Dr. LUBIN. Dr. Bean, I am sorry I wasn't here this morning when the question of farm population was discussed, but evidently, judging by the tables which were submitted, and the charts, there has been a very marked increase in agricultural population in the last 15 or 20 years.

Dr. BEAN. No.

Dr. TAYLOR. Since 1932 there has been, Mr. Lubin; up to 1932 there was a gradual decline.

Dr. LUBIN. The chart here—

Dr. BEAN (interposing). That is certain groups in the farm population. That is not the total farm population. May I give you the total farm population? In 1909 it is estimated at 32,000,000; in 1920 at 30,200,000, in 1939 at 32,000,000. In other words, between 1909 and 1939 there has been no real change in the farm population. The change that you have there represents the changes in the age groups.

Dr. LUBIN. That was a 6-percent increase, roughly.

Dr. BEAN. Between 1929 and 1939 you have an increase of about 1,800,000; yes; about 6 percent.

Dr. LUBIN. The increase in your family workers, however, at the maximum, was 4 percent, is that right?

Dr. BEAN. The increase in family workers? There has been no increase in family workers.

Dr. LUBIN. Between 1929 and 1935 there was an increase of about 4 percent.

Dr. BEAN. Yes; for that period there has been.

Dr. LUBIN. Well, now, what do these people do? You have increased your population by 6 percent on farms. Do you assume that most of these people are doing nothing on the farm, that they don't help at all?

Dr. BEAN. I personally assume that they are doing very little, if anything; that some of them are on relief work and some of them perhaps are doing nothing. We have no—

Dr. LUBIN (interposing). Although you have 6 percent more people on the farm, about 2 percent less of them are working, which means they are either on relief or do nothing at all. They are not helping on the farm.

Dr. BEAN. All I can say is that we have a general impression that there is a surplus population on the land, both total and working.

Dr. LUBIN. There may be a surplus in terms that they are not necessary, but the question is, are they doing anything?

Dr. BEAN. Well, what do you think they are doing?

Dr. LUBIN. I get the impression that they have been doing odds and ends and, consequently I can't reconcile your decline in the number of family workers since 1929 with the increase of farm population since 1929. It assumes not only that everybody who went back to the farm is doing nothing, but all new additions are doing nothing, plus some others who formerly were doing something who are now doing nothing.

Dr. BEAN. Unfortunately, I don't have any qualitative impression of this thing, and I doubt if anybody has, so that whatever I say is hardly worth the saying. You might, however, assume that since a larger proportion of your population is in the higher-age groups, over 60 or above 65, perhaps they are not working as much as they used to, if they can rely on some of the folks who have come back from the cities onto the land. But that is all speculation.

Dr. LUBIN. That assumes that everybody who came back from the city, plus 2 percent more who formerly were working, are not working today.

Dr. BEAN. I don't know that it is worth while pursuing this. I don't have any information, and I don't think anybody else has, as to what this excess of population is. If they are working, then it is clear that they are not working economically.

Dr. LUBIN. I will agree with that. That we can all agree on. But I am just wondering; it seems unreal to assume that the net difference, the increase in farm population, both through migration and birth, is not doing anything—let's not use the word "employed" because that has an economic significance—plus 2 percent more who formerly were working who aren't doing anything at all.

Dr. BEAN. It is your privilege to make that assumption. I might assume something different, but I don't think either of us knows.

Dr. ANDERSON. The designation "family worker" has never been precise, and any small percentage of change would mean nothing significantly in a series of data. As a matter of fact, we are getting more improved data as we go along, but nobody would stake his life on the precise meaning of "family worker" in 1 year of collection of data as compared with another. I think that would have something to do with the interpretation to be made of the changes that have occurred.

Dr. BEAN. Your remarks lead me to add that between 1929 and 1935 there was an increase in the number of farms, and therefore presumably an increase of something like 600,000 or 700,000 persons who are engaged on these farms as part of this farm family labor group.

Dr. LUBIN. But they seem to have disappeared since '35, because you are down below where you were in 1929.

INCREASE IN FARM PRODUCTIVITY

Dr. BEAN. I think we will be a little clearer on that point as soon as we have the next census data. But this happens to be the best information we have, and roughly, the data indicate that your total farm population is the same as it was 25 years ago; there has been some increase, of uncertain magnitude, in the past few years and that all the evidence we have indicates that there are more people on the land than are now required for production.

Colonel CHANTLAND. Omitting all idea of exports, how many more people in the United States have they had to take care of during these same periods?

Dr. BEAN. You might say, very roughly, that 32,000,000 people on the land are now feeding or taking care of 99,000,000 people.

Colonel CHANTLAND. Besides themselves.

Dr. BEAN. Besides themselves; whereas in 1909 they took care of nearly 58,000,000. In other words, the same number of people on the land now feed roughly 70 percent more people. If you make one further assumption, which is not unrealistic, that over this period of years there has been no material change in the per capita consumption of food products for the Nation as a whole, the annual intake of agricultural products tends to be a pretty constant figure per person.

If that is so, then you might say that 32,000,000 people on the land today are 70 percent more productive than 32,000,000 people on the land in '99.

Colonel CHANTLAND. That is assuming that your export remains at a sort of constant factor. If it changed it would throw it out of kilter.

Dr. BEAN. We know within what period that change may take place. Before the war—I am giving you a figure from memory now—something like 18 percent of our total output went out as exports. In the past few years it has been only 7 or 8 percent.

Colonel CHANTLAND. That makes quite a difference.

Dr. BEAN. It makes a difference of 10 percent.

Dr. ANDERSON. But let's put in the import picture and see what happens. What were our imports before the war as compared with what we import now?

Dr. BEAN. I don't have that here.

Dr. ANDERSON. As I remember it, it cuts it down materially, so that 10 percent doesn't look quite like that.

Dr. BEAN. Let's put it this way: in 1909 you had 100 units of domestic consumption plus 18 units of exports; today you have 100 units of domestic production and 8 units of exports, giving you a total of 118 in one case and 108 in the other. That is a difference of 9 percent in the 70 percent figure I gave you.

Colonel CHANTLAND. But Dr. Anderson says that 108 is to be reduced by certain imports.

Dr. BEAN. Let's leave it this way.

Colonel CHANTLAND. I think we had better not pursue it because we haven't the figures.

Dr. BEAN. I would like to leave an impression as to where that figure might lie. If it isn't 70 it might be 60 or it might be 50, but

it isn't less than 50 percent increase in productivity in terms of people engaged on the land.

Colonel CHANTLAND. That is really all we can say.

Dr. BEAN. And that is, I think, the long-time history of agriculture in this country, that a fairly constant number on the land is decade by decade able to produce for an increasing industrial population, without increasing the number of people on the land.

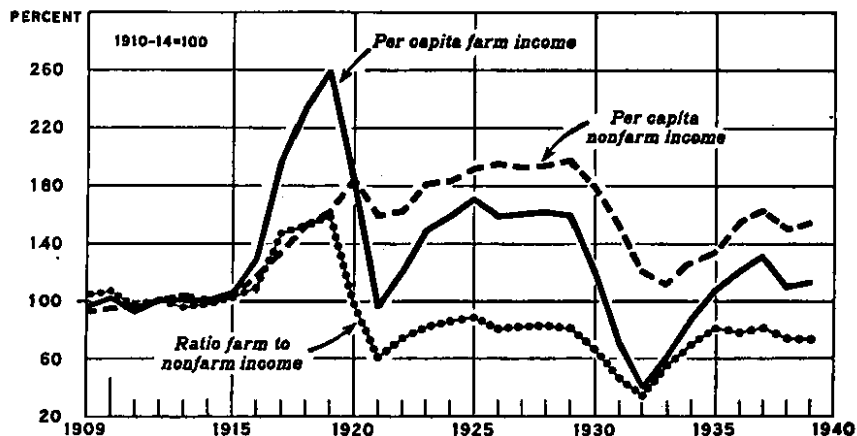
I have two items that I would like to call to your attention. One is in connection with the chart labeled "Per Capita Farm and Non-agricultural Income Available for Living."

(The chart referred to was marked "Exhibit No. 2679" and appears below.)

EXHIBIT No. 2679

[Submitted by the Bureau of Agricultural Economics, Department of Agriculture]

PER CAPITA FARM AND NONAGRICULTURAL
INCOME AVAILABLE FOR LIVING, 1909-39



U.S. DEPARTMENT OF AGRICULTURE

Dr. BEAN. I want to use this material in relation to the cost items that we discussed earlier.

FARM INCOME

Dr. BEAN. There are two sets of data in this illustration. One represents the per capita income received by individuals not on farms. It is the income per person of the nonfarm population. If you will, it is the national income, exclusive of agricultural income, on a per capita basis. That is the dotted line which reaches the high point in 1929 above the other lines that you see there. The second set of data is income available to persons on the land derived from agricultural production. It is obtained by deducting from the gross income from farm output a selected list of business expenditures, including these machinery cost items that we have here before us—costs of feeds and fertilizer and building materials and various other things—so that we have here the amount of money available per person living on farms for living purposes, as contrasted with income available for business purposes.

Acting Chairman WILLIAMS. Are you talking about cash income?

Dr. BEAN. I am now talking about cash plus the value of things consumed, goods consumed in the home, derived from farming.

In 1939, the last point on the chart, income per person not on farms was roughly 156 percent of the pre-war level. Agricultural income available to people living on the land—that is, income from farm production—was approximately 120 percent of the pre-war figure, and the difference between those two is represented by a ratio of 80. In other words, had farm income been higher by the equivalent of \$1,500,000,000, the farm-income line would have been up where the non-agricultural income line is in 1929. The nonagricultural income line, incidentally, is what the Department of Agriculture calls parity income; it is the level of income of nonfarm people to which farm income would need to rise if parity income for agriculture were attained, and that difference in 1929, in addition to the Government payments made to farmers, approximates \$1,500,000,000.

Dr. LUBIN. Where would that be if you would change your base from 1915 to 1920?

Dr. BEAN. It would have to turn back and make some mental computations.

Dr. LUBIN. The farm income would be greater than nonfarm income average per capita.

Dr. BEAN. Naturally that relationship depends upon the base period selected. If you want to go into why that period is selected I will do that, but I don't think that is what you need this afternoon.

Dr. LUBIN. I am trying to find out what significance this is. If you change to a different base you find the farm income higher than that.

Dr. BEAN. If you took 1919 as a base, then, of course, farm income would be much lower in relation to other income than it is; if you took it at 1929 it might not be quite as low. Perhaps that disparity would be completely wiped out.

Acting Chairman WILLIAMS. I had the impression that when we were talking about parity we were talking about that period between 1909 and 1914 or '15. The purchasing power of the farm products as compared with the value of manufactured products would be that period on which that line seems to run about parallel from 1909 to 1915. I have always understood that when legislators talk about parity of agriculture to industry it meant that period of time.

Dr. BEAN. There are two things. This represents parity income. You are referring to parity price. In concept, they are essentially the same except that one is a price comparison and this is an income comparison. It is true that in both cases the pre-war years are taken as a point of departure, and the relationship of the pre-war years constitutes the parity relationship. The parity relationship, these two lines, may come together at any point. They may come together at 156, in which case you have restored parity. That is, one would have the same relation to the other at this higher level of 156 as they had in the pre-war years, when they were equated at a lower level.

The main point is that equation; that is, the two series of data have the same numerical value. They have been given a value of 100 before the war, and if they both should have the value of 156 in 1939, then they would have parity of income.

Similarly with prices. Industrial prices are now, speaking from memory, about 125 or 128 percent of the pre-war level; farm prices are

at about the pre-war level, so you have a discrepancy there indicated by a ratio of 80 or 82. I think 80 is the most recent figure, so that both in terms of price ratio and income ratio, we come to practically the same point in terms of the parity level.

Acting Chairman WILLIAMS. What in figures was the farm income for 1939, if you have that?

Dr. BEAN. The cash income figure was about \$8,500,000,000. A gross income figure, including the value of things consumed from farm production, would bring it close to \$10,000,000,000. In 1929, it was around \$12,000,000,000. That is gross income.

For the purposes of this comparison, it is necessary to deduct business expenditures from that gross-income figure to obtain income available to farm families for living purposes, and to make it comparable with the income of the nonfarming population, because no business expenditures or income are included in the non-farm-income line.

May I make one other observation about this discrepancy of \$1,500,000,000? In one of the previous tables, I indicated that there has been a net increase in the cost of operating farm machinery from 0.2 percent of income in 1910 to 11.7 percent in 1939. Part of that increase represents the use of automobiles for home or pleasure use as against production use so that not all of this increase of nearly 12 percent is to be associated with the increased costs of running the farms. If we assume that only about 8 percent of this increase is to be so associated, then that net increase of 8 percent is the equivalent of something like \$500,000,000 to \$600,000,000 in an annual cash income of nearly \$8,000,000,000. Six billion dollars of income represented in this column of expenditures associated with machinery is approximately 40 percent of this discrepancy between actual farm income in 1939 and parity income.

Now, I would like to turn to a table entitled "Distribution of gross farm income in each of 10 equal groups of farms arranged according to the size of income," for the years 1899 and 1929.

(The table referred to was marked "Exhibit No. 2680" and is included in the appendix on p. 17454.)

Dr. BEAN. This material has been gotten together hastily. It was done last night, so that many questions about it I may have to stall on, or ask you to give some additional time. There are additional comparisons that we need and want to make and hope that we can either present at a later occasion or for the record. As it stands, this material gives some impression as to what is happening to farm income in relation to the number of farms in the different income brackets.

You will notice that in the column marked "All farms," the number of farms up to the first 10 percent in the lowest income group there, we find less than 1 percent of the value of farm products in 1899 and a little more than 1 percent in 1929.

If you go to the other extreme and examine the income which falls in the last 10 percent of the farms associated with the higher-income brackets, namely, in a group I have marked 90 to 100 percent, we find nearly 40 percent of all farm income in that group of 10 percent of the farms in 1899 and 41 percent in 1929—in other words, a shift of 1.5 points.

As you look down the third column of that tabulation marked "Difference," it is clear that there has been some shift in income into the

lowest-income groups, and some shift into the very highest income groups. There is an additional comparison given so that you may see whether that increase in the highest income brackets took place evenly as between the last 5 percent and the next to the last 5 percent.

When you take all farms you find that the increase in the highest income bracket occurred for that bracket which I have marked 95 to 100 percent; in other words, the 5 percent of the farms getting the highest income in 1929 got a little bit more than similar farms got in 1899.

The next column is labeled "Cotton farms." Here we also find that there has been some increase, not a great deal, but some increase in the proportion of income associated with the farms in the lowest-income brackets and some decrease in the farms associated with the highest-income brackets. It is particularly in connection with this column that we want to do some more work to examine this type of data with respect to the owner-operated farms, the tenant farms, and the share-cropper farms.

Mr. PIKE. The present census will affect that.

Dr. BEAN. We are really waiting eagerly for the 1939 results. It is really in anticipation of that that we are preparing this background material.

In the case of the grain farms, the same situation appears, with a somewhat lower concentration in the grain farms, with a somewhat higher concentration in the last 5 percent of the high-income farms.

In the case of livestock, the thing which differentiates that column from the others is the increase of 7.5 points in the group of 90 to 100 percent of the farms, and there, too, the increase occurs chiefly in the last 5 percent. The most striking of these groups is the fruit-farm group. Here we have a decrease in the proportion of income for each of the income brackets except the lowest 10 percent, and a very marked increase in the last income bracket, an increase of 16.7 points in the 95- to 100-percent bracket. In the final column, labeled "Crop specialty farms," which is a catch-all, including vegetable farms, truck crops, tobacco, and sugar, we have the same general showing, that there has been an increase in the proportionate income in the low-income brackets, and only a very slight increase in the highest-income brackets.

With respect to that last column, I think it would be worth while to show that in its detail because the groups that are included here represent a great diversity. In general, then, I would say that the low income brackets have received somewhat more than the former share and that the middle income brackets have received somewhat less, but that the very high income brackets are receiving, or in 1929 received, relatively more. That fact checks also with the usual data supplied by the census on the size of farms, and just to give you a brief comparison in these terms, if you take the number of farms with 20 acres or less, we find that in 1920 there were 12.4 percent of all farms in that low acreage group.

Mr. PIKE. That is just number of farms?

Dr. BEAN. That is number of farms. In 1930, it is 14.6, an increase of 2.2. In all other size groups, there is a relative reduction similar to what I have just discussed in terms of income. When we get to the group of 500 to 1,000 acres, we find a slight increase, from 2.3 percent of all farms in 1920 to 2.5, about an 8-percent increase

relative to numbers; and in the size of farms over 1,000 acres, the proportion goes from 1 percent in 1920 to 1.3 in 1930. Also, contrasting this size of farm with the relative importance of farm implements and machinery, we find something of the same general characteristic, that in the lowest size group, under 20 acres, the value of implements and machinery rises from 3.2 percent of the total in 1920 to 4 percent of the total.

In the next size groups up to above the average, we find relative reductions, but in the group of 175 to 500 acres, the value of farm implements and machinery rises from 31.7 percent of the total in 1920 to 32.2 percent in 1930, and in the next two groups, or all the rest, above 500, the increase is from 11.3 in 1920 to 15.1 in 1930, so that you have three sets of data here, the distribution of your farm machinery by size group, the distribution of the number of farms by size, and the distribution of the number of farms by income group, which seem to present three patterns of the same general characteristics.

Mr. PIKE. You would infer some increase in corporate farming, what is happening in the larger farms, wouldn't you?

Dr. BEAN. That would be an inference but I don't know whether that is a fact.

Mr. PIKE. It isn't necessarily so but it sounds very much that way.

Dr. BEAN. It would lead one to investigate that question.

Acting Chairman WILLIAMS. What is your definition of "farm"? What do you consider "farm"?

Dr. BEAN. I have adopted the census definition, whatever it is. I think it is generally 3 acres or more, producing something like \$250 worth of goods. That figure has changed over the years, but I think between 1900 and 1929 the definition hasn't been much different.

Acting Chairman WILLIAMS. I notice you spoke of an average. Do you mean an average-size farm?

Dr. BEAN. The groups that I have here run under 20 acres, 20 to 49, 50 to 99, and 100 to 174, and the average-size farm falls within that bracket of 100 to 174 acres to a farm. It is beyond that bracket of 100 to 174 that we find a relative concentration of farm implements and machinery.

Acting Chairman WILLIAMS. Have you figured actually how many farms there are in the country?

Dr. BEAN. For 1900 the number of farms is given as 5,700,000; for 1929 it is given as 6,200,000 in rough figures, and for 1935, 6,800,000.

Acting Chairman WILLIAMS. Something was said a while ago by someone about the number of farms that were mortgaged. Have you that figure?

Dr. BEAN. Mr. Wall, who I hope is still here, had that.

Acting Chairman WILLIAMS. I don't know whether he gave the number.

Mr. WALL. It is 34½ percent of all farms.

Dr. BEAN. Which would be a third of the 6,800,000, which is 2,200,000, for a quick calculation.

Dr. LUBIN. I wonder whether you would repeat for the record the percentage of gross farm income that goes to the upper 10 percent in each of these groups.

Dr. BEAN. Do you want the contrast for each group?

Dr. LUBIN. No; just for the year 1929.

Dr. BEAN. Just the 1929 figure?

Dr. LUBIN. Yes.

Dr. BEAN. For all farms, 41 percent of the value of products, or gross income, went to the highest 10 percent in 1929, 32 percent in the case of cotton farms, 31.5 percent in the case of cash grain farms, 41.3 percent in the case of livestock farms—that livestock includes what the census called animal specialty, poultry, and stock ranches—48.3 percent in the case of fruit farms, and 42.8 percent in the case of crop specialty farms.

May I say that this proportion would probably be a little larger if it were put on a cash-income basis.

Dr. ANDERSON. Mr. Bean, I wish some of the other members of the staff would come up to the "mikes" so we could talk a little better.

PROSPECT OF GREAT TECHNOLOGICAL CHANGE

Dr. ANDERSON. Several questions occurred as we were going along, some of which were not cleared up during the morning session. There was one point raised just in passing, I think by Mr. Taylor, concerning impending technology on the farm. Your testimony this morning indicated major changes that have occurred and suggested that should one or another thing happen, there would be drastic results. You mentioned the Rust cotton picker. As experts in the field, have you come to any conclusion about impending technology which would drastically alter the material that we have been discussing today?

Do you anticipate any such drastic changes in the immediate or near future, and if so what do you think the trend would be?

Dr. JOHNSON. It is awfully difficult to anticipate something like that, and you have this kind of situation. A good many of these machines are on the horizon for a good many years before they are finally perfected, and also priced low enough in relation to the price of the product and of hand labor so that they will be widely adopted. I confess that I do not know at what stage the various kinds of pickers that are being experimented with will be adapted. We know that they are not ready for adoption today. How long it will be before they are generally adopted is a real question. For instance, the combine harvester was being experimented with, I think, as early as 1850, just quoting the date from memory, and, of course, it was used in the Pacific Northwest for a good many years before it got into the Great Plains country. Finally now in the last 4 or 5 years it is coming into wide use in the Corn Belt. If the cotton picker does become perfected so it can be widely adopted it will create a revolution in cotton which will be at least as important, perhaps much more important, than the revolution in wheat machinery—the combine and the associated tillage machinery in the small-grain areas.

Mr. PIKE. Just one question occurs to me. From what I have heard about the cotton pickers, my memory is that the trouble is not with the picker but with the cotton plant. I wonder what your idea would be in agriculture toward giving the country a cotton plant, if you thought you could.

Mr. JOHNSON. Well, I am not a plant breeder, but I do know that plant breeders are working on that at the present time. Of course, the unevenness of the ripening period varies in different sections of

the cotton South. You have much more uniform ripening periods and the cotton is left so that it can be picked much more at the same time in the western cotton area than in the Delta.

Mr. PIKE. Say, the Texas Panhandle area? They do use some mechanical means now and have for some years.

Mr. JOHNSON. Yes, but the Texas station especially is working with cotton plants more adapted to machine picking.

Dr. BEAN. The changes are slow. Perhaps it is easier for Mohammed to come to the mountain than it is for the plants to accommodate themselves to the picker.

Mr. PIKE. Well, you have done some very funny things with plants in the last several years.

Dr. BEAN. Or shall I say the time involved is too long?

Dr. LUBIN. That raises a very significant question, and I wonder whether we can get an opinion for the committee from this group, on the relative importance of machine technique and the other scientific information which has become available in the last generation. Now, Dr. Bean stated that the same number of people today are producing food for a much larger population than, say, 25 years ago, which means in turn an increased productivity of the farm population as a whole, of something between 50 and 70 percent.

Now, how much of that increased productivity is the result of better fertilizer, better breeding, the use of better seed, more efficient operation of farms, better use of land in the sense that it is selected and the more efficient acreage being used, and how much of it is attributable to machines as such?

In industry, several witnesses have stated that the big improvements of productivity have not come necessarily from machines in their particular cases, but from better organization, better knowledge of their products, and things of that sort.

One gets the impression, by looking at these figures that were submitted here today, that if you are going to explain that 50 to 70 percent increase in productivity, you must explain it in terms of scientific information, of the sort I mentioned, rather than in terms of the machine as such, although the machine must have played an awfully important part.

Now, is there any way of measuring the relative importance of the machine as opposed to these other things in measuring this increased productivity? Would it be 50-50 or 75-25 or what?

Dr. JOHNSON. I wouldn't have any quantitative basis for judging. I can give one illustration. Hybrid corn, for instance, has been tremendously important already because it has been widely adapted in the Corn Belt. Now, as it spreads out from the Corn Belt, it will, perhaps, be again as important in increasing the yield of corn as it has been today. So that you would have there an increase of about 200 bushels of corn as against an average corn crop of—speaking from memory—2,500,000,000 bushels.

Now, there is one significant increase in productivity of agriculture, coming from a scientific discovery. It is just an illustration.

Dr. LUBIN. Your land utilization problem would come into the picture there, wouldn't it? I mean, you select the better acreage?

Dr. JOHNSON. That has been done in recent years; yes. You have some increase in production per cow; you mentioned the question of commercial fertilizer. The sales of fertilizer are very closely asso-

ciated with the prices and income of the previous year in the fertilizer-using areas.

Dr. LUBIN. Have there been improvements in fertilizer?

Dr. JOHNSON. Oh, yes.

Dr. LUBIN. So that it is advantageous?

Dr. JOHNSON. Yes.

Dr. BEAN. May I supplement that comment? Insofar as fertilizer has been used chiefly in the South, you would expect to find some evidence of that increased use of fertilizer in terms of increased acreage, increased yield per acre in the South. My impression is that there has been no change in the level of acreage, or yield per acre, in the cotton South, up to recent years, say, the early 1930's. There has been a marked change in the level of yield per acre, in the average yield per acre, in the past 3 or 4 years, which apparently is associated with neither weather nor—I was going to say, with the fertilizer use, but I want to qualify that because I don't have those fertilizer figures per acre well enough in mind.

The fact that the change came rather abruptly in the years 1935 and 1937 would suggest that it may have been associated with the adjustment programs, where the emphasis, after 1935, was on improving yield per acre.

Mr. PIKE. Of course, in a great many cases, fertilizer is used more to check a decline—or as much to check a decline as it is to increase yield. I think that perhaps has been true in the South, that it became absolutely necessary to use fertilizer to get any reasonable return at all, and perhaps it dampened or checked the decline in that area that otherwise would definitely have occurred.

Dr. BEAN. I wonder, Dr. Lubin, if the answer to your question might not be put tentatively in this form, that insofar as you have an increase in productivity as the result of a reduction in the number of persons engaged in farming, that proportion of it may be associated with the increased use of machinery, and the excess or the balance of that increase of productivity might be associated with the scientific advances of hybrid seeds, more efficient use of feed, and the various other things?

Dr. LUBIN. In other words, the ratio would be about 4 to 1? In other words, 80 percent of the increased productivity of the agricultural plant country is attributable to science and the application of—

Dr. BEAN (interposing). No, I would put it more nearly 50-50, because you have had something like a 25 percent increase in productivity per person—no, you have had a reduction in the number of people engaged, which would account for what? About 20 percent increase in productivity?

Dr. LUBIN. No, in the past 25 years, you say there has been no change in the number of people who are feeding the country.

Dr. BEAN. But that is not exactly talking about workers in agriculture. I meant to check you on that earlier. The fact that we have 30,000,000 people on the land today and had 32,000,000 in 1910 doesn't mean that the same number of people are engaged in production; in fact, I am inclined to think that you have fewer people engaged in production, but the same number of people, the total number of persons, on the land.

Dr. LUBIN. Well, there has been a decline since 1915 of 1,300,000 people, which is approximately a 10-percent decline, in the total employment on the farm?

Dr. BEAN. Yes.

Dr. LUBIN. During that period of time, however, that 25 years, the population has increased by what? About 30 percent? So the ratio is 3 to 1. In other words, science has contributed 3 times as much to the increased efficiency as machinery.

Dr. BEAN. Well, you have come down from 8 to 1 to 3 to 1, and you might come down to 2 to 1.

Dr. LUBIN. So then it is 2 to 1? Is it 66-33?

Dr. BEAN. Well, I would like to—

Dr. ANDERSON (interposing). May I ask it in this way, Dr. Bean: aren't we dealing with things that are so vague and difficult to get at, that it is impossible, at this stage of our knowledge, to make even a rough estimate of the proportionate weights of these influences?

Dr. BEAN. That is why I would suggest that if the committee must have a figure, 50-50 is about as good a one as it can take. [Laughter.]

Dr. ANDERSON. I was going to put it a little bit differently, but isn't it possible to be much more precise by making your analysis in terms of particular crops for particular areas? In other words, just a moment ago you talked about the cotton in a certain area. This morning we saw some relationship to corn in a certain area. Isn't it possible, when you go into a specific crop and area, that you can get very much closer to the answer to Mr. Lubin's question?

Dr. BEAN. Yes; but you should not be too hopeful, because even on this question of hybrid corn, which has been talked about a great deal, there is no exact estimate as yet as to how much that scientific development has increased productivity. A figure of about 20 percent has been bandied about, but I happen to know the origin of that figure, so that I am inclined to say that we still don't know exactly what the truth is.

Dr. ANDERSON. Well, it would be true, would it not, that some areas in the country show a much higher rate of productivity, in volume of products and workers employed, than other areas?

Dr. BEAN. You mean a greater change in productivity?

Dr. ANDERSON. That is right.

Dr. BEAN. Yes.

Dr. ANDERSON. Are any scientific studies now in progress or recently completed which would attempt to measure these factors and their relative weights?

Dr. BEAN. I think, Dr. Johnson, that is yours.

Dr. JOHNSON. There are studies in progress that have not reached conclusion by any means, but the attempt is being made to measure it by commodities and by types of farms in the way that you have indicated.

Dr. ANDERSON. What is the purpose of making such a study? Why do we want to know precisely the weights of the relative influences?

Dr. JOHNSON. Well, I would say that that is the first requisite to understanding the situation. I think that it gives a much better background if we understand the forces that make up the total change.

Dr. BEAN. May I say something on that, too? Another reason for trying to discover the answer is to see whether we can anticipate the

number of people that will be required on the land to supply the food that the Nation is going to need over the next 5 or 10 years.

(Senator O'Mahoney resumed the chair.)

FUTURE MOVEMENT OF FARM POPULATION

Dr. ANDERSON. That leads to a question we have been asking almost every witness we have had before us, and we would like to put it here now. You indicated this morning a surplus labor supply on the farm available for migration, and you also indicated that, with conditions as they are in urban communities, this migration might not take place. Will that farm population, then, continue to grow; will there be more people on the farm in the immediate future, and possibly more unemployed on the farm also in the immediate future?

Dr. BEAN. Do you want to answer that, Mr. Taeuber?

Mr. TAEUBER. I see no escape from that conclusion, if there is no resumption of the migration sufficient to offset the excess of births over deaths on farms, which is now between 300,000 and 400,000 per year.

Dr. ANDERSON. So that the farm, in your opinion, does not offer the opportunity to these unemployed city workers that it did in the past?

Mr. TAEUBER. No.

Dr. ANDERSON. Well, in that connection, what happens to the whole program of so-called public subsistence farming, the maintaining of people on the land even though they are not able to compete on commercial terms?

Dr. BEAN. You mean what is the significance of it?

Dr. ANDERSON. That is right, and its future.

Dr. BEAN. Well, in my mind, if we have a subsistence farming program, we would be altering our notions as to the kind of life that certain groups in the country should lead.

The CHAIRMAN. It would be a complete alteration of the American idea of what constitutes society, wouldn't it?

Dr. BEAN. Yes. So far we have accepted the notion that if you can't make a living on the land you move into town and try your hand there. A subsistence kind of existence would mean that, since you can't find a place in the cities and since by remaining on the land you are just producing more and lowering the general standard of living for those commercially engaged, you'd better find yourself another kind of life which would be neither commercial farming nor industrial activity. What that intermediate is is something that we will probably have to do some tall thinking about.

Representative WILLIAMS. After all, that might be better than to be in the congested cities and in the slums without anything to do, and dependent entirely upon charity relief.

Dr. BEAN. There is a great deal behind that word "better," and it is there where you begin to deal with different notions of standard of living.

Representative WILLIAMS. I have been interested in one thing I wanted to ask, and that is, the effect that our agricultural adjustment program has had on production. It seems that from 1934 to 1937 this production rose from a percentage of 82 in 1934 to 104, according to the plat I have here in front of me. During that same period there was considerable acreage taken out of cultivation, wasn't there?

Dr. BEAN. I think you can bring those two together by studying not only the index of production but the size of the farm enterprise.

Representative WILLIAMS. That is the fact, though, is it—the production was very much greater in 1937 than it was in 1934?

Dr. BEAN. Well, you have there the extreme difference between a drought of 1934 and the most abundant year of 1937.

Representative WILLIAMS. All right; you take 1937 and it is above all time.

Dr. BEAN. Yes; you have record production of cotton and substantial production of grains.

Representative WILLIAMS. And in 1938 it had come down; 1938 is the last one shown there, but it is still far above the average. That has taken place notwithstanding the fact, as I understood this program, that it was to at least try to adjust production to consumption and maintain a higher standard for the farmers of the country, and to that end the Government itself has spent many, many million dollars. It doesn't seem to be working, and that is what I would like to know; if we are not doing any good along that line, I feel like we ought to quit the program, maybe.

Mr. HOLCOMB. I believe in 1937 the volunteer program was on, and quite a few of them did overplant in cotton acreage.

Dr. BEAN. The Secretary of Agriculture commented with respect to the production changes after 1936, that prior to the Supreme Court decision, the programs were more exact, more specific, in that they dealt with specific crops. After that decision the agricultural programs became general. They became soil-conservation programs, where you didn't have exact control of acreage, because you were dealing with a general program instead of commodity programs. The combination of an expansion in acreage under that system, and good weather, produced, say, the bumper crop of 1937, part of which we still have on hand.

Representative WILLIAMS. The fact is, isn't it, that there has been a very substantial reduction in acreage? Is that a fact or not?

Mr. HOLCOMB. Of certain crops.

Dr. BEAN. That is indicated in this measure labeled "Site of the farm enterprise," which is really nothing more than the aggregate acreage harvested.

Dr. JOHNSON. Plus numbers of livestock.

Dr. BEAN. Which went down from an index of 102 or 103 in 1931 or 1932, to about 93 in 1938, so that you had approximately a 10-percent reduction in aggregate acreage and livestock.

Representative WILLIAMS. That was the very deliberate purpose of the program, wasn't it?

Dr. BEAN. Yes. There was an attempt to reduce production for export.

Representative WILLIAMS. In order to adjust production to domestic consumption and, therefore, give the farmers a better price. Now, that was the very fundamental of the program, as I understood it. Is that correct?

Dr. BEAN. Yes; farmers have better prices, have higher incomes, but I am not sure that this is where you want a dissertation in defense of A. A. A. programs.

Representative WILLIAMS. I was just wondering and asking you men who have made a study of it what effect it has had on production

and prices. It is sometimes claimed by some who are not in favor of the program that it has been disastrous to the farmers, and not effective. I have not been one of those, but I was wondering how the men who have made a particular study of the situation think of it.

Dr. BEAN. In general, I find myself in your company on that question.

Representative WILLIAMS. But on the other hand, it does seem that there has been a very substantial increase of production there, and the piling up of an inordinate surplus in some products, especially cotton.

Dr. BEAN. There is no denying that acreage control by itself doesn't effectively control production, where you have variations in the weather to contend with, and for that reason Congress has written into the law certain controls of marketing as well as control of acreage, to deal with the weather factor as well as with acreage.

The CHAIRMAN. I like this euphemism, "Congress has written into the law." We pass the law that you fellows write.

Dr. JOHNSON. You flatter us.

The CHAIRMAN. I was very much interested in some of the charts that were presented here earlier in the afternoon, which illustrate the fact which is well known to all students of the agricultural problem, that the percentage of farm ownership is steadily decreasing in the United States, the number of farmer-owner operators has been steadily decreasing year by year for more than 50 years. That is a fact, isn't it?

Mr. WALL. That is true.

INCREASE OF CORPORATE FARM OWNERSHIP

The CHAIRMAN. Corporate farming, institutional farming, has been increasing during this time; isn't that true?

Mr. WALL. Particularly during the last decade.

The CHAIRMAN. Exactly.

Dr. JOHNSON. Corporate ownership, wouldn't you say, more than corporate farming?

Mr. WALL. Corporate ownership.

The CHAIRMAN. Tenant farming has been increasing and corporate ownership has been increasing, but all of these farm programs are based not upon any concept of the effect upon the operator or the tenant as an individual, but in terms of production. Am I right?

Dr. BEAN. I think that statement would cover pretty well the agricultural adjustment philosophy of 1933, where the problem was prices, volume, and income for the Nation as a whole, the creation of a new flow of purchasing power.

The CHAIRMAN. Isn't that a correct statement of the present philosophy? Soil conservation is carried on and the payments are made regardless of the type of ownership.

Dr. BEAN. Well, I think you have additional things that have been created since 1933. The farm-security program, I think, is not quite the way you describe it.

The CHAIRMAN. No; of course, the farm-security program, I think, is separate and distinct policy, and that has to do with an attempt to preserve families upon the land; that is true.

Dr. BEAN. You have the tenant program in the same category. True, it is very small, but at least the philosophy has been developed, and here and there accepted.

The CHAIRMAN. Yes; but neither of those is geared to production, and soil conservation is geared to production.

Dr. BEAN. That's right.

The CHAIRMAN. That's correct, isn't it?

Dr. BEAN. Yes.

The CHAIRMAN. So that in whatever benefits or subsidies we extend to the farmer, we make no differentiation between the corporate farmer and the flesh-and-blood farmer. Is that right?

Dr. BEAN. That is right.

Dr. JOHNSON. We limit the size of the benefits.

Representative WILLIAMS. We limit the size of the benefits we pay to them.

The CHAIRMAN. That is one concession that has been granted to them.

Dr. BEAN. That may also affect the noncorporate farmer of large size as well.

Mr. PIKE. How does this control tie in—well, I just went back to the country last year and found a barn half full of superphosphates that the Government had given me to improve what was left of the acreage, so that I could raise, perhaps, as much on, I should think, about one-third of the acreage as I did on the whole of it before. I couldn't tie that in, lying for 2 or 3 years. It would make good farmers cramp themselves, I am afraid, by holding down, taking out of production here, and then all this refertilization. I couldn't rationalize it. We had to take it and put it on the land. It was sort of contradictory.

Dr. BEAN. In general, I would say that the philosophy probably is that if we are going to produce, we might as well produce as efficiently whatever the country requires, and if you are going to produce a certain amount of bales of cotton, say 12,000,000 or 13,000,000 bales, you want to produce it as efficiently as possible.

Mr. PIKE. That still isn't quite clear.

Dr. BEAN. Also, if you want to produce 5,000,000 automobiles, you produce those as efficiently as possible in terms of manpower and other costs. That is what I take it is society's frame of mind at the present time.

The CHAIRMAN. Have you, in these discussions, indicated the trend of agricultural development in relation to employment?

Dr. ANDERSON. Yes.

The CHAIRMAN. You have. And what is that trend?

Dr. BEAN. In general, it is that over the years we can expect to produce either more agricultural products with the same number of people that are now on the land, or the same volume of production with fewer people on the land, and unless there is an opening up of an entirely new channel of consumption, it would be difficult to see any opportunities on the land for people who are not now there. In fact, there is difficulty to see opportunities for all the people that are now living on the land.

The CHAIRMAN. Well, what opportunities do you see for new uses of agricultural products?

Dr. BEAN. There are a thousand and one uses of agricultural products, new uses, that are being experimented with but, for some reason or other, these uses just don't occur rapidly enough for the immediate situation within the next 2 or 3 or 4 years.

Dr. JOHNSON. For the future, but not for the immediate time.

Dr. BEAN. We have an exhibit in the Department of Agriculture now of the many uses of cotton that have been developed—gears and handles and what-not, all sorts of things it is difficult to imagine that you can use cotton for, but in the aggregate those things at present don't consume a great deal of cotton. They may in time, but that is in the lap of genius of the scientists.

The CHAIRMAN. What can be done to stimulate the development of new uses?

Dr. BEAN. The Department of Agriculture, I believe, has quite an extensive program of effort in that direction.

The CHAIRMAN. The opportunity is there, is it not, and it is recognized.

Dr. BEAN. I would say the hope is there. Whether opportunity is, I don't know. For example, a good deal—

The CHAIRMAN (interposing). I didn't mean opportunity in the commercialized sense. You speak of all these possible uses of cotton but for some reason or another they don't develop. Is that because they have not been made commercially profitable as yet?

Dr. BEAN. That is probably a factor.

The CHAIRMAN. Is it true, for example, that the use of alcohol as a fuel has long been recognized but it cannot yet be produced at a price to make it competitive with oil or gasoline? Is that correct?

Dr. BEAN. Yes, sir.

The CHAIRMAN. So science, chemistry, already can point out to us innumerable new uses for agricultural products which are not being taken advantage of because they are not yet in a competitive stage.

Dr. BEAN. Yes; but that same science needs to make one more remark, namely, that we scientists need to discover how to use agricultural products in these new ways on a commercial basis, but it isn't up to the farmer or to any of us who are not scientists to develop the new uses, after scientists merely tell us that here is a place; it is still the scientists' job to discover the next trick, which is to bring that process down onto a commercial level.

The CHAIRMAN. Well, could we bring it to a commercial level by using the same device that we used to bring so-called infant industries to a commercial level?

Dr. BEAN. I am not sure I have in mind—

The CHAIRMAN. Tariff as an exclusion policy, an isolation policy.

Dr. BEAN. That is a question of many, many colors.

The CHAIRMAN. It presents itself to any student of this problem because the alternative seems to be the subsistence homestead and the reduction of a large proportion of our people to a peasant class.

Dr. BEAN. Not necessarily.

The CHAIRMAN. What is the alternative if that isn't it? We have the Farm Security Administration, which is an effort to keep farm families on the land, whereas we know that your testimony here is absolutely correct, namely, that production per man is increasing, and the market is not increasing.

Dr. BEAN. If you will allow me to make a statement without spelling it out in detail, because I don't have the detail, I would say this: We ought to be able to look forward to opportunities of employment which are not in the industrial centers and not in commercial agriculture, but somewhere in between where we utilize our resources more effectively than we now do. Some people call that a rural works program, or some kind of a set of opportunities for work which doesn't necessarily have to be a subsistence type of living.

EFFECT OF INCREASED EMPLOYMENT ON FARM PRODUCTION

Dr. LUBIN. Mr. Bean, let's assume the per capita consumption of all goods in America were equal today to what they were in 1929, which means in turn, let's say, that we would be employing in industry and in service trades and transportation, just for the sake of argument—I don't know what the figures would be—6,000,000 or 7,000,000 more people than we are employing in those forms of activity today. What would that mean in terms of consumption of farm products? Or put it this way, wouldn't an increase in employment by 7,000,000 or 8,000,000 in other types of economic activities so increase the demand for farm products that this problem you are talking about would disappear?

Dr. BEAN. It all depends on how much time you are going to take to get that increase in employment. If you can do it immediately, overnight, then, of course, you have a stepping-up of agricultural consumption. The extent of that stepping-up will depend on the extent to which consumption by the unemployed is now below standard, and it probably isn't as much below standard as the overall impression would suggest. It would still leave us, incidentally, with an unemployment problem on the land, because when you merely absorb 6,000,000 people in your industry, you are not even doing a good job of employing the number that are variously estimated to be unemployed in the cities. In the testimony this morning, you had various figures which, while the figures were of wide range, nevertheless indicated a substantial unemployment problem in the rural and farm areas, somewhere perhaps around 2,000,000 people.

The CHAIRMAN. Are you indicating to us that if all of the unemployed were capable of purchasing food and agricultural commodities as though they were receiving \$1,200 a year, there would still not be an appreciable increase of the market for agricultural products?

Dr. BEAN. Yes; I think there would be an increase, but I think it would be an increase which the farmers on the land now can supply and still leave us with a block of people on the land who ought to be working more effectively in other pursuits.

The CHAIRMAN. On what do you base that conclusion? Is that an impression that you get from your readings and your studies, or is it a well-developed conclusion? I ask you that question because the Surplus Commodities Corporation seems to feel that there would be a very substantial increase of consumption.

Dr. BEAN. Provided you channelize that increased purchasing power into food or farm products. Do I make myself clear? The Surplus Commodities Corporation adds purchasing power to the family with the proviso that that increased purchasing power be spent for food.

Whether or not you would get the same increase, the same use of purchasing power, if it were created without any strings tied to it, I don't know. The fact that so-called size of farm income, the average of acreage harvested in the past few years, has been roughly 10 percent less than in 1930, with from 8,000,000 to 10,000,000 people employed in agriculture today as against 11,300,000 in 1929—which suggests to me that there are additional people around there somewhere that are not working—all that suggests to me that the people now on the land can produce more than we are now producing to supply this increased consumption that you might expect from an increase in purchasing power.

The CHAIRMAN. Of course, what is true of our economy, of our agricultural economy, is necessarily true of every other agricultural economy, too, in varying degrees. The capacity of the land to produce is not altered by the flag that flies over the land, is it?

Dr. BEAN. Well, if you have in mind such technological advances as we make, they are easily and quickly transferred to other countries, in expansion of agricultural output, just as in the United States.

The CHAIRMAN. So that leads us to the question whether we should be content to see our future in the marketing of surpluses in other countries which eventually, if not immediately, will be producing their own surpluses.

Dr. BEAN. That, of course, opens up the area where statesmanship has its task for the next few years, dealing with the international flow of surplus raw materials.

Dr. ANDERSON. Dr. Bean, the National Resources Committee's study of consumer expenditures indicates that it would take an expenditure of about \$2,000,000,000 for food to move the lowest third up to the level of the middle third. Would that size expenditure, in your opinion, alter the employment situation in agriculture?

Mr. BEAN. You assume that an increase in expenditures for food must be effected in the form of an increase in the volume of intake, which I think isn't a necessary assumption.

Dr. ANDERSON. It would take an additional expenditure of \$2,000,000,000 on food to move these people into the level of consumption expenditure with the middle third of the Nation.

Dr. BEAN. I say that that increase in expenditures doesn't necessarily mean a comparable increase in volume.

Dr. ANDERSON. That is quite likely.

Dr. BEAN. We have the whole question of change of diet and quality.

Mr. WALL. If we were to increase consumer income by the proportions that you have indicated, the increase in farm income would give rise to additional employment in the service occupations and in perhaps farm construction, because with a higher level of farm income you would open up, I think, a certain amount of additional employment in agricultural areas, in rural areas.

Dr. ANDERSON. In the over-all.

Mr. WALL. In the over-all.

Dr. BEAN. That is right. Let's see if we can get a little closer to the implication of that figure. You have \$1,900,000,000 increase in consumer expenditures. Farmers would get roughly half of that, close to \$1,000,000,000. Then the question is, will consumers buy 10 percent more in volume, or will they merely be changing their type of intake without increasing their volume, merely paying for another

set of services? If half of that increase in purchasing power means increased volume, that would mean what, roughly, a 10-percent increase in the aggregate volume of farm products?

Dr. ANDERSON. Possibly.

Dr. BEAN. But you have the underlying fact that over the years the aggregate volume of consumption of farm products doesn't vary with the rise and fall of the national income, and this computation is based partly on that concept, so that it is difficult to conclude that that much increase in income would actually give you that much more employment in agriculture for additional production.

Dr. ANDERSON. There is one other problem that has bothered me all day long during the discussion. Having something of a farm background, I have been led to regard farming and independent ownership as somehow linked with the concept of Americanism, that as landed people we have the right to own a farm and operate it. In your discussion this morning you showed that apparently the rungs are being taken out of the agricultural ladder and we can't move so readily from the bottom to the top. Is that a continuing trend which will foredoom an increasingly large number of people to tenancy, and keep them from ever becoming independent owners on the farm?

Mr. HOLCOMB. I don't know about the doom, but I think that there is reason to believe it will become increasingly difficult to rise from the lower rungs of the ladder to the higher ones, as we increase the amount of capital necessary to become owners or tenants. If the machinery is made available to them at lower and lower prices, that may facilitate the rise in the ladder. However, the increased productivity of individuals may tend to shunt out an increasing number of workers in the field.

The CHAIRMAN. Have any of these farm experts testified as to any relationship between the machine and the amount of food consumed by the individual who uses the machine? In other words, did a hand worker in the old days eat more than a machine worker today?

Dr. BEAN. Have we had that kind of testimony for the rest of the economy?

The CHAIRMAN. No.

Dr. BEAN. None was brought here this morning.

I have a feeling that that is a real question.

The CHAIRMAN. I would naturally assume that a person who worked with his hands laboriously would consume a great deal more food than one who didn't work so laboriously. I would assume, for example, that an outdoor worker, a laborer, would eat more than an office worker because of the increased demand upon the body for effort, and naturally an increased consumption of body forces. I wondered if the statisticians and philosophers of the Department of Agriculture had ever studied that possibility.

Dr. BEAN. Like yourself we have thought about it and have come to about the same conclusion, that it must be so.

Mr. LUBIN. I think in many types of industrial activity the amount of energy a man uses is much greater, concentrated for a shorter period of time, of course, than work by hand; I should assume that running a caterpillar tractor 8 hours a day probably takes more energy out of you than if you were digging a hole.

The CHAIRMAN. Undoubtedly that would be true in many instances, but I think it is also probably true that the use of the machine by and large has reduced the amount of physical effort which all workers must exert.

Dr. BEAN. I think that a complementary question to yours has to do with the increase in the service industry, and that probably is related to the reduction in the per capita consumption of such things as wheat.

The CHAIRMAN. Of course we do know that there has been a very marked change in the diet, the change from meat to salads has been marked. Some of your experts in domestic economy have testified from time to time with respect to that.

Dr. BEAN. We have had a net reduction in the per capita consumption of pork and cereals in the past generation.

The CHAIRMAN. And it seems to me that I have a very distinct recollection of an intensive drive that was made several years ago against some of the publications of the Department of Agriculture, because it was alleged that they were tending to impair the consumption of wheat and flour.

Well, are there any other questions? If not, what is your program?

(Off-the-record statement by Dr. Anderson.)

The CHAIRMAN. Then we will stand adjourned until 10:30 o'clock tomorrow morning, in room 357.

(Whereupon, at 5:20 o'clock, a recess was taken until Wednesday, April 24, 1940, at 10:30 a. m.)

INVESTIGATION OF CONCENTRATION OF ECONOMIC POWER

WEDNESDAY, APRIL 24, 1940

UNITED STATES SENATE,
TEMPORARY NATIONAL ECONOMIC COMMITTEE,
Washington, D. C.

The committee met at 10:40 a. m., pursuant to adjournment on Tuesday, April 23, 1940, in room 357, Senate Office Building, the chairman, Senator Joseph C. O'Mahoney, presiding.

Present: Senators O'Mahoney (chairman), and King; Representative Sumners (vice chairman); Messrs. Kades, Lubin, O'Connell, Pike, Kreps, and Brackett.

Present also: S. Abbot Maginnis, Department of Justice, William T. Chantland, Federal Trade Commission, and Dewey Anderson, economic consultant to the committee.

(The committee meeting was preceded by the showing of moving picture films of mechanization in farming operations.)

The CHAIRMAN. The committee will please come to order. Your first witness this morning.

Dr. ANDERSON. The first witness this morning is Mr. Fowler McCormick, vice president of the International Harvester Co., of Chicago, Ill. Mr. McCormick has prepared a statement which he wants to read and offer certain exhibits.

The CHAIRMAN. If Mr. McCormick will come forward, we will begin.

Do you solemnly swear that the testimony you are about to give in this proceeding shall be the truth, the whole truth, and nothing but the truth, so help you God?

Mr. McCORMICK. I do.

TESTIMONY OF FOWLER McCORMICK, VICE PRESIDENT, INTERNATIONAL HARVESTER CO., CHICAGO, ILL.

The CHAIRMAN. Won't you please give your name to the reporter, for the record.

Mr. McCORMICK. My name is Fowler McCormick.

The CHAIRMAN. And your position.

Mr. McCORMICK. I am vice president of the International Harvester Co.

The CHAIRMAN. How long have you occupied that position?

Mr. McCORMICK. I have been vice president since 1934.

The CHAIRMAN. And are you not a descendant of the original McCormick who was the inventor of the first harvester?

Mr. McCORMICK. I am a grandson, Senator.

The CHAIRMAN. You are his grandson?

Mr. McCORMICK. Yes, sir.

The CHAIRMAN. Are there any other questions that you wanted to ask?

Dr. ANDERSON. Mr. McCormick, how long have you been engaged in the business of farm implements?

Mr. McCORMICK. Well, I have been in the business for 41 years, in a sense, in another sense, 15.

Dr. ANDERSON. In other words, you grew up in the business.

Mr. McCORMICK. Just about.

Dr. ANDERSON. And you observed its effect and growth and development.

Mr. McCORMICK. For a considerable period I have been directly connected with it; yes.

The CHAIRMAN. Mr. McCormick, the committee is indebted to you and to your associates for the presentation of the motion picture which we have just seen exhibited in another room in this building. It certainly leaves no doubt that farming is much less a back-breaking job in 1940 than at any other time in the long history of upward progress of the human race. There can be no question about that. I suppose, however, that there still remains unanswered the problem of markets for increased production. All the testimony which we have had presented to us to date in this committee, from every angle, whether from the point of view of the manufacture of machines or from the point of view of the representatives of labor, has been to the effect that by reason of technological advance we are now having much greater production per man than ever before. The machine is unquestionably a labor-saving device, and there is some testimony to the effect, a good deal of testimony, I may say, that it is also a job-displacing device, and, of course, it is obvious that the use of machines and the purchase of the product of the machines depends upon the ability of people to buy the machine and to buy the product, so finally we come down to the question of how we are going to promote markets for the products of the farm and of the factory.

Mr. McCORMICK. That is very true.

The CHAIRMAN. You may proceed.

The VICE CHAIRMAN. Mr. Chairman, just before Mr. McCormick proceeds, may I make a little observation, a very short one?

The CHAIRMAN. We will be very, very happy to have you do so. Your observations are always interesting and constructive.

The VICE CHAIRMAN. This observation I suggest for the consideration of the country as a whole in connection with this record. It was stated in connection with this magnificent exhibition to this effect. The question was asked, "Where are the people who could or would do the work now done by machine?"

That query would indicate a great progress in the strength and efficiency of the machine, probably a corresponding deterioration in the strength and courage and determination and capacity of the human being. I don't make that observation in any criticism of what we call progress, but it seems to me that society should give some consideration in connection with its progress as to whether or not it is developing, whether or not it is making strong machines and weak people, whether or not the capacity to do things and the responsibility of doing things is being shifted from people to machines.

One of the interesting observations that was made in connection with this exhibition—and I want to repeat that certainly what I am saying is no criticism of anything that is being done—was that it wasn't any strain on the fellow's suspenders to operate those machines. There is not much strain on his muscles, and muscles grow stronger with us. There is not awfully much strain on his head. It doesn't tend to strengthen the thinking machine. Of course, it is a little more difficult to operate a complex machine, but, after all, there was a good deal of individual resourcefulness required when a fellow was plowing on a hillside with a bull-tongue plow in the days of long ago.

Something was said about putting hay up on the wagon by the Armstrong method. It musn't be forgotten that when you changed from putting it up on the wagon by the Armstrong method, the tendency was for the arms to cease to be strong, because nature is not disposed to let strength remain where it is not used.

Now, I hope I make myself clear. I am not at all criticizing. I do have a good deal of the fogie in me; I admit that, but I am reasonable. I am not criticizing this progress. I know that machinery has done a great thing in progress. But in connection with this appreciation of what machinery is doing, it seems to me, as indicated by our chairman, we are going to probably have to be cautious that we don't develop a sort of warfare between machinery and human beings. He has indicated that. That is one of the big problems that you are not here to talk about, but I think you will probably have to think about it. When I was looking at the work that was being done by the magnificent machine, I was thinking of the picture I see when I go home, of these tenant farmers sitting around on the streets, living off direct or indirect contributions from other people. It presents a serious question.

I want to continue to repeat, because I don't want to be misunderstood about it, I am not saying this in any criticism of what you gentlemen have done who are making this wonderful progress, but I think society is well able to realize it charges them with some additional responsibility, and we have to meet that.

That is the line of talk that I thought might impress my people. I have got to come up for reelection pretty soon.

The CHAIRMAN. Well, the vice chairman's talk to his constituents prompts the chairman to add a few remarks to what has already been said in this record. I think there can be no doubt that the machinery has done a great deal to improve the living standards of the human race. No one, I think, would have the hardihood to deny that. The trouble, as I see it, is that it hasn't done enough. Our problem is to find a way by which it can do the remaining job, which is, of course, to provide full employment for all who want and need jobs. The machine has certainly been very successful in contributing to the creation of abundance, abundance of farm products and abundance of all types of natural resources, abundance of all types of commodities that the human race needs or desires. There can be no doubt that the machine has also created a great deal of leisure. We saw the leisure in the farm home on the picture that you presented this morning, Mr. McCormick. The long, long day of the farmer has been made unnecessary by farm machinery, and the long day in the shop has been made unnecessary. There is no question about that.

The machine has created leisure. The trouble is that it has also created a certain amount of unpaid leisure. That is the forced leisure of the workman who, though he wants a job, can't find a job, and because he can't find a job, if he is a farmer or a farm tenant he can't get the land upon which to buy the tractors that the International Harvester and Allis Chalmers and the others make.

I'm sorry.

Dr. ANDERSON. May we proceed?

The CHAIRMAN. That was also a speech to my constituents. [Laughter.]

Senator KING. May I make an observation, but not in the way of explanation? I am listening, and after the testimony is all in, than I may submit a statement for the record.

Dr. ANDERSON. Very good.

Mr. McCORMICK. Mr. Chairman, if I might defer any comment on the Congressman's remark, I think they are very pertinent indeed, and perhaps we can go into them more fully a little bit later. I want to express at the beginning our appreciation of the time that you gentlemen have taken to see those pictures given by Allis Chalmers, the Deere Co., and ourselves. We had a feeling that they might be illustrative of some of the modern practices in the industry, and we very much appreciate the time you have taken.

Mr. Chairman, if I may ask your permission, we have prepared a statement on behalf of our company which I will ask your permission to insert in the record because there are two exhibits in the back of the statement, and than I should like to read the greater proportion of the statement, if I may.

The CHAIRMAN. To avoid duplication, this statement now presented will appear in the record as the statement which you are making.

Mr. McCORMICK. If that is permissible.

The CHAIRMAN. Without objection that will be the rule.

(The charts referred to were marked "Exhibits Nos. 2681 and 2682" and appear facing p. 17604 and on p. 17005.)

Mr. McCORMICK. I am glad to come here to give any assistance I can to your study of the progress of technology. No such inquiry, naturally, could be complete without a careful examination of the technology of farming, for the farm is the basis of our civilization. If there had been no developing farm technology, there could be no industrial America as we know it today.

That is true, I believe, because the farm has furnished two of the absolute essentials of an industrial society—adequate food and available manpower. Today we take those things for granted. This could not have come about unless farm technology had removed the fear of famine and set men free to work in industry, at manufacturing, selling, and transporting goods of all kinds.

In addition to these general benefits, the progress of farm mechanization has made the farmer's life more attractive and enabled him to raise his income by reducing his costs of production.

There are many questions touching on farming which I am not competent to discuss. I do not come before you today as an agricultural economist or a sociologist. I am able to suggest no panacea for unemployment, on or off the farm. I think it is obvious that advancing technology, whether in farms or in industrial regions,

PRICE COMPARISONS FARM MACHINES AND OTHER PRODUCTS

This chart shows how the 1937 wholesale prices of typical farm machines and other manufactured products used by farmers compare with the pre-war (1913) prices of these same products. The chart also compares 1913 and 1937 prices of materials and 1936 wage rates (1937 rates not available). The figure before each item shows the percentage which the 1937 price is of the 1913 price.

HOW TO READ THIS CHART

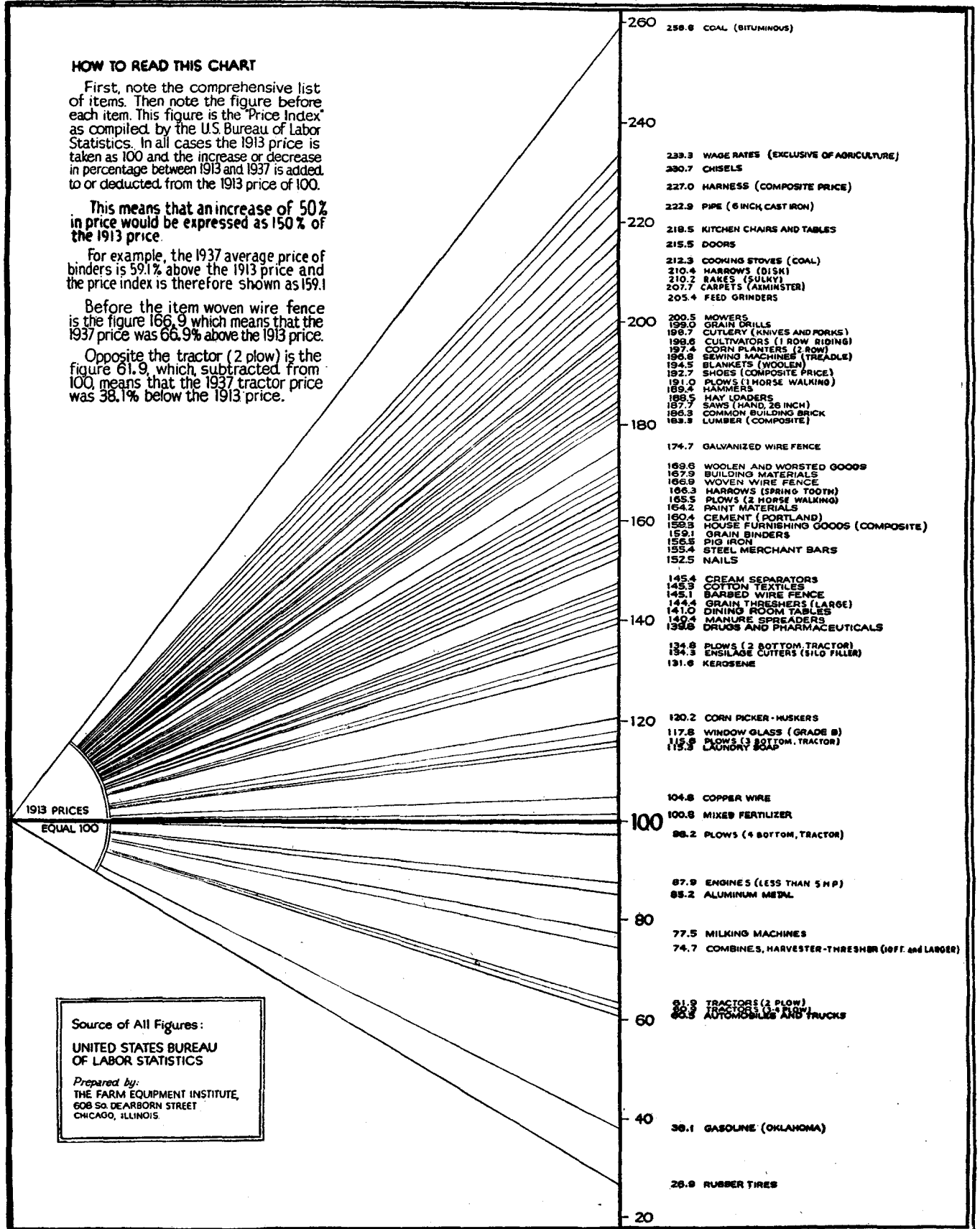
First, note the comprehensive list of items. Then note the figure before each item. This figure is the "Price Index" as compiled by the U.S. Bureau of Labor Statistics. In all cases the 1913 price is taken as 100 and the increase or decrease in percentage between 1913 and 1937 is added to or deducted from the 1913 price of 100.

This means that an increase of 50% in price would be expressed as 150% of the 1913 price.

For example, the 1937 average price of binders is 59.1% above the 1913 price and the price index is therefore shown as 159.1.

Before the item woven wire fence is the figure 166.9 which means that the 1937 price was 66.9% above the 1913 price.

Opposite the tractor (2 plow) is the figure 61.9, which, subtracted from 100, means that the 1937 tractor price was 38.1% below the 1913 price.

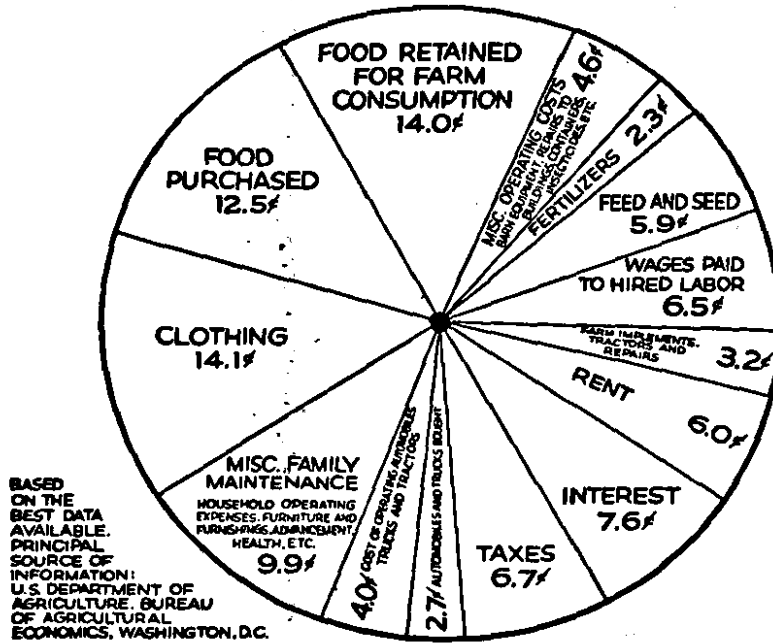


Source of All Figures:
UNITED STATES BUREAU
OF LABOR STATISTICS

Prepared by:
THE FARM EQUIPMENT INSTITUTE,
608 SO. DEARBORN STREET
CHICAGO, ILLINOIS

EXHIBIT No. 2682

THE FARM DOLLAR DISTRIBUTION OF U.S. FARMER'S 1931 EXPENSES



YEAR	GROSS FARM INCOME (1)	EXPENDITURES FOR FARM IMPLEMENTS, TRACTORS AND REPAIRS (1)	% OF FARM MACHINERY EXPENDITURES TO GROSS FARM INCOME
1932	\$ 5,562	\$ 95	1.7 %
1933	6,404	96	1.5
1934	7,629	194	2.5
1935	8,688	343	3.9
1936	9,672	464	4.8
1937	10,425	585	5.6
1938	9,290	475	5.1
1939	9,100	422	4.9

(1) IN MILLIONS OF DOLLARS

sometimes results in displacements of labor. Although the distress caused in this way is generally temporary and local, it is nevertheless acute to those affected and is important to society in general. Obviously, solutions of these problems are of vital importance.

MECHANIZATION IN AGRICULTURE

Mr. McCORMICK. I think I must limit myself to the contributions to farm technology which have been made by the industry with which I am connected, and I say that in the sense, Mr. Chairman, that I think technology can rightly include other fields in which we are

not expert or engaged, such as the improvement of seed, improvement of plants and fertilizers and farm buildings, and so forth, and I don't intend to touch on them today.

These contributions of our industry lie chiefly in two areas—the mechanization of farm production methods and the development of farm transportation through the use of the motor truck.

The problem of the farmer under any economic system is to produce as efficiently, as unfailingly, and as easily as possible. The business of our industry is to improve the farmer's ability to do that. I want to talk a little, if I may, about what machines have achieved, what they have failed to achieve, what the sources of farm mechanization are, what some of the present tendencies and future possibilities are, and what some of the results and contributions have been as I see them.

Most of you are generally familiar, I believe, with the evolution of farm machinery. But since my later remarks will be based on the course which that evolution has followed, it might be well to review briefly some of the high spots in the history of farm mechanization.

Prior to 1831 agriculture had been for many centuries an industry which utilized human labor as its source of power. Animal power had been brought into the picture only partially. The most notable uses of animal power were in plowing with wooden or cast-iron plows, and in hauling. The other processes, planting, cultivation, harvesting, were carried on almost entirely by hand.

The two decades between 1830 and 1850 witnessed a remarkable revolution in agricultural methods. The reaper was invented in 1831. The machine that was to become the basic mower appeared 3 years later. The steel plow, which made it possible to plow the rich, sticky soil of the prairies was invented in 1837. The threshing machine came in 1834; the earliest combine in 1836. Grain drills, permitting more accurate planting of seed than was possible with hand sowing, appeared in the forties.

The effect of these inventions was almost immediately apparent. The time required to harvest an acre of wheat, for instance, was reduced approximately 65 percent between 1830 and 1840, from an estimated 37 hours in 1830 to an estimated 11½ hours in 1840.

These new machines all utilized animal power, usually in the form of horses or mules.

The next half century between 1850 and 1900 witnessed the development of many other machines, including the corn planter, improved types of harrows and cultivators, the grain binder which was evolved from the reaper, and, on the Pacific coast, the big combine powered by from 18 to 50 horses.

Throughout the period, farm machinery underwent a continuing process of improvement in design, production methods, materials, and utility, and new machines and accessories continued to be developed for special purposes according to the needs and demands of a changing agriculture.

This period was notable for the first effort to substitute mechanical power for animal power. This was the steam engine, which appeared in the middle of the century and was useful chiefly as a mobile source of power for threshing machines. Occasionally these steam engines were used in plowing, in regions where the terrain permitted.

In the last decade of the nineteenth century many experimenters began work with the internal-combustion engine, looking toward the development of the tractor.

(Representative Sumners assumed the chair.)

Mr. McCORMICK. Commercial production of tractors powered by gasoline engines may be said to have begun in the first decade of this present century. Before the World War their use was widespread and during the war it greatly increased.

The basic tractor from 1910 to 1924 was a four-wheel machine useful mainly in preparing the seedbed and in harvesting operations. These tractors were intended to pull machines which were essentially of a horse-drawn type, although the construction of many such machines was strengthened to stand up under tractor use. In field work these tractors applied their power principally through the drawbar.

Two devices enabled the power of the tractor engine to be applied to related machines. The belt pulley made it possible to use the tractor to run stationary threshers, hammer mills, ensilage cutters and blowers, small sawmills, and other such machinery. The power take-off, through a drive shaft, operated grain binders, corn binders, corn pickers, potato diggers, and other machines with moving parts, thus making these machines independent of power from ground traction for the first time. In other words, before this time the mechanism of an implement pulled before by a horse was motivated by power derived from the wheel.

From this time forward the wheel became something simply to carry the implement, and the power necessary to move the mechanism of a binder or mower was derived by a shaft running from the rear end of the tractor to the front end of the implement. That made quite a revolution in machinery design.

Side by side with the growth of the tractor came another application of the gasoline engine to farm technology. This was the rise of the automobile and motortruck.

The importance of the automobile and the motortruck led a number of farm equipment manufacturers to enter that field during this period. No company in the farm equipment industry is now engaged in making passenger automobiles. Our company is the only one in the industry which manufactures motortrucks. I consider our motortruck business a contribution to technological advance on the farm in the same sense as our other products. Although our motortruck sales eventually became greater in urban areas than in farm areas, we entered the business originally with the needs of farm transportation foremost in view.

In this period, too, a third type of tractor was introduced, the crawler or tracklaying type. It appeared about 1905, and soon became available in several sizes. Its chief advantages are its great tractive power in hilly or loose soil conditions, and its relatively low height.

Small crawlers are used extensively in orchard work while larger ones have been adopted in many regions where great power on the drawbar is the principal need.

During these same years the large Pacific-type combine was adapted in a greatly reduced size to the smaller farms of the prairies. These prairie-type combines, having cutting widths of from 12 to 16 feet, became available about 1914.

Such developments as the power take-off, the belt pulley and the prairie-type combine added greatly to the utility of the tractor but it still could not perform one of the essential farm operations, the cultivation of growing crops. This did not become possible until the Farmall tractor was introduced in 1924.

The great contribution of the Farmall tractor was its ability to do everything the earlier tractors had done, and in addition, to cultivate row crops without injury to the growing crops. It made possible for the first time the application of tractor power to all field operations. It took the tractor out of the class of a partial substitute for animal power and made it unnecessary to keep horses at all.

The Farmall differs from standard tractors in that it is a 3-wheeled machine with a higher axle clearance.

It derives its traction from two large drive wheels at the rear, its steering from the small wheel centered at the front of the machine. Its rear wheels are adjustable to different row spacings and its design enables the operator to see the work he is doing better than with a four-wheeled machine. The popularity of this type of tractor has influenced all subsequent tractor design and has made all-purpose tractors standard in the industry.

I don't mean by that that the four-wheeled tractor is an extinct type of tractor, but it means that all manufacturers manufacture an all-purpose type of tractor at the present time. There is a use for four-wheeled tractors in certain sections of the country where row crops are not the all-important feature.

Under the influence of the all-purpose tractor the principal farm machines underwent a radical revision in design. An important phase of this change was the construction of machines not to be pulled by the tractor but to be mounted directly on it as quick-attachable tools.

The all-purpose tractors had their greatest usefulness in farming areas where row crops predominate, particularly in the Corn Belt and the Cotton Belt, where the previous four-wheel models had been of limited utility.

During this period between 1924 and 1932 the prairie combine underwent still further changes which tended to reduce its size and the width of its cut. Ten-foot machines and 8-foot machines were introduced.

The census of 1930 showed 900,000 motortrucks on farms. By 1935 manufacturers' estimates place the figure at nearly 1,000,000. I believe the 1940 census will show more than 1,000,000. The figure does not in itself reflect the importance of the motortruck in farm transportation, since much farm produce moves to market in common-carrier trucks. I know of no statistics covering the number of such trucks.

Before the present development of the motortruck, the farm viewpoint was bounded by the number of miles a horse could cover in a day. The farmer's market was the nearest market, unless he enjoyed an unusually favorable location on a railroad. There were costly delays in shipping. Stock lost weight, which meant dollars to the farmer, on the way to market.

By 1932, 40 percent of livestock went to market on the highways. By last year that proportion had increased greatly. Department of

Agriculture studies in October 1939 of 67 major markets showed that 58.8 percent of the cattle, 66.9 percent of the hogs, 58.4 percent of the calves, 40.5 percent of the horses and mules, and 25.7 percent of the sheep and lambs went to market by motortruck.

Aside from livestock marketing, I think it is probably not necessary to do more than refer to the obvious boon the motortruck has been to dairymen, fruit and vegetable growers in increased speed of delivery, widening of markets and lessening of spoilage losses.

Turning again to the field of farm machineery, the year 1933 was notable for the introduction of an all-purpose tractor substantially smaller and cheaper than any other theretofore built. This was the Farmall 12. While designed primarily for use with one plow for which it proved popular, it also developed that in many soils it had enough power for two-plow operations. Competitive developments in the one-plow tractor field immediately followed with the result that still smaller and cheaper one-plow tractors were introduced and a substantial demand from farmers for this small type of tractor has been clearly demonstrated. At the present time 4 or 5 of the tractor manufacturers of the country have one-plow tractors and those who have not will presumably have tractors of this type within a short time. Last year the Harvester Co. introduced two new one-plow tractors, smaller and substantially cheaper than its original one-plow tractor of 1933.

The year 1933 was also notable for the first introduction of a tractor with rubber tires as regular equipment. And you gentlemen, I am sure, noticed the large number of implements and tractors you saw with rubber tires in those pictures.

Since that date the increase in demand for rubber tires has been remarkably rapid until today the overwhelming majority of all tractors of all sizes made by all manufacturers go out on rubber.

Although rubber tires increase the first cost of a tractor their advantages more than offset their disadvantages. Their rolling resistance is much less than that of the steel wheel with lugs. Under most conditions, therefore, the use of rubber tires permits either higher speed of operation, or the use of larger implements, or a reduction in fuel costs while using the old implements at the old speeds.

By their cushioning action rubber tires save wear and tear on the tractor and, even more important, add greatly to the comfort of the operator. Furthermore, the rubber tire admits the tractor to the paved highway, either to move implements from field to field or for road hauling with a rubber-tired wagon. The utility of the rubber-tired tractor for road work is causing manufacturers to build greater speeds into tractors, and road speeds of 8 to 15 miles an hour are commonplace on current models.

In addition to the use of tires on tractors, an increasing number of wheeled implements, such as plows and combines, are being mounted on tires.

You will be interested to know that an effort is being made by our company, and I believe by other implement companies generally, to standardize the wheel sizes of implements on which rubber tires are desirable, in order that the farmer may equip his machine with second-hand automobile tires. Tires with worn-down treads no longer safe for automobile use can still give long and cheap service

on implements which are not required to furnish their own traction, but are drawn or powered by tractors or horses.

I might say at that point that one of the resistances to the introduction of rubber tires some years ago was just that fact of the first cost. There was a natural skepticism and doubt about whether the farmer was really warranted in adding that additional cost to his tractor or to his implement. There was a further question about the durability of tires on the farm. You men know that around a farm and out on country roads there are any number of nails and sharp things loose, and it was thought that the life of a tire might be short. That has not proven to be true.

Another thing that caused a resistance to the introduction of the rubber tire was the thought that it would not have sufficient traction under a large number of conditions. That hasn't been proved true either. It is true that under certain limited conditions, for instance frozen soil on which there is a little thawing on top, the rubber tire has not had the desired traction, but in other conditions you have either equal or better traction than another tire, and it looks as if it were here to stay.

The VICE CHAIRMAN. Does the rubber tire help to prolong the life of the machine?

Mr. McCORMICK. Yes, sir; it does very definitely, and it has another definite effect: When you take away by the use of rubber tires the sharp shocks, the shock of a steel lug on a hard surface, a frozen surface, for example, or a steel wheel hitting a stone, you are able to design your whole machine less heavily, less strongly, and therefore more inexpensively. The rubber tire has had a distinct influence on our being able to lessen and lower the cost of the tractor, and I believe that that will maintain to a degree in implements, although not to as great a degree.

Another notable development since 1932 has been the small combine. Prior to that date, the smallest combine had an 8-foot cut, and there had been sufficient sales of these machines east of the Mississippi to indicate that combine harvesting was not limited to the dry areas. The development of the small one-plow tractor naturally led to experimentation with small combines which could be pulled with the one plow tractor, operated with a power take-off and handled successfully by the operator of the tractor without other assistance. The Allis-Chalmers Co. was the first in the field with a successful small combine having a cut of 5 feet. Other manufacturers, including the Harvester Co., were soon in the field with small combines of their own designs having various cutting widths. At the present time the farmer has a wide range of choice of combines, with cutting widths varying from 3½ to 6 feet, all of which can be operated with small tractors.

One of the reasons for the popularity of the small combine is that it will harvest many other crops besides the grain crops which the larger combines were designed to handle. The small combines have harvested successfully almost 100 different kinds of crops. Some of the most important, in addition to the grain crops, are soybeans, clover, edible beans, lespedeza, buckwheat, flax, peas, and sorghum.

Time will not be taken to list other newly designed implements for use with the one-plow tractor other than to say that many spe-

cial machines have been recently designed and are now available. The result is that with the old implements formerly available and all of the new machines specially designed for use with the one-plow tractor, the purchaser of such a tractor can use it for practically all farm operations; that is, a complete line of implements is available and each purchaser may choose those needed in his operations.

Reviewing the technological changes in farm machinery since 1932 as listed above, your attention is called to the fact that in the main they relate to equipment for small farming, and that a remarkable number of new machines have been designed, put out and proved popular, within a short time. When the history of this period is reviewed at a later date, it may well be that it will stand out like the period of 100 years ago as a time of concentrated invention having a marked effect on the future of agriculture.

The inventions of 1831 to 1850, with their subsequent refinements, made possible the rapid development of our prairie States and the building of our industrial civilization. The recent technological advances in farm machinery from which the family-size farm will greatly benefit, may well become a bulwark to preserve this important part of our social structure.

There are in the States about 6,800,000 farms of which the great majority are family-size farms operated without hired help. The United States census figures indicate that only about 1 farm out of 7 has hired help. In the 1920 decade most of the tractors were used on the larger farms with the exception of the specialized small fruit and vegetable farms. This was largely because one-plow tractors were not available and many farmers who would like to have farmed with tractors did not feel justified in making the investment required for a two-plow tractor and its tools.

Because of the situation some dire prophecies were made that farm mechanization would lead to corporate farming and the elimination of the family farm. The development and production of the one-plow tractor and all of the small-tool equipment to go with it, reflects the determination of the family-size farmer to remain in business and his desire to share in the benefits of mechanization. Only in response to such a demand could the many small tractor and the many tools to go with them have been designed, produced, and marketed. The small farmer wanted an automobile and in many cases had one, purchased perhaps in the second-hand market. Not needing his horses on the road, he wanted to do away with the care and expense of horses on the farm and enjoy the savings in time and shorter hours made possible by the use of improved farm machinery.

With the mechanized equipment now available for small and medium-sized farms it seems reasonable to believe that the family farm which has often been called the backbone of our Nation will still stand and perhaps be in a stronger position than ever.

(Dr. LUBIN assumed the chair.)

Mr. McCORMICK. The foregoing is a very condensed outline of the technological progress in labor-saving farm machinery during the last century, with an indication of the pronounced present-day trends.

FARMERS' DEMAND FOR MECHANIZATION

Mr. McCORMICK. One conclusion seems fairly clear. It has not been the implement manufacturers who have directed the efforts of the

farmers, but rather the farmers who have directed and inspired the efforts of investors, engineers, and manufacturers to solve their problems and supply their needs.

The early implements were in many cases invented or designed by farmers themselves. Highly trained engineers now design farm machinery, but their efforts are naturally directed to the solution of the problems actually presented by farmers. These problems of demands for different kinds of equipment find constant expression in contacts with farmers and are transmitted to manufacturers through their sales and research organizations.

Now, Dr. Anderson, with your permission, if I could skip over to page 12, in the interest of saving time, the material covered there I would be very glad to discuss any questions which you might care to cover at a later date. We will go to the bottom of page 12, then.¹

(The material omitted appears below) :

Refrigeration has only recently become an important part of farm equipment, and is one more example of the industry's response to the farmers' demands. The demand began when health authorities required the cooling of milk on the farm before delivery to the cities, and it has been stimulated by the farmers' desire for household refrigeration.

Ordinarily not very many types of implements are required to handle the operations of a single family-sized farm, but most people would probably be astounded at the immense variety of implements and tools required for the many varied farm operations throughout the country, and also for similar operations under varying weather or soil conditions.

Progress in developing better implements, and by better I mean more efficient, more durable and less expensive, has been continuous and is still going on; but it is a gradual process, requiring field experimentals, including waiting periods between seasons for further experimentals.

MAJOR EFFECTS OF THE USE OF FARM MACHINERY

Mr. McCORMICK. As already noted, all the principal labor-saving devices for the preparation of the soil, planting, cultivating, harvesting, and handling of farm crops have been developed or invented within the last century, and during that time a continuous process of development and improvement has been going on. It is worthy of note that all this happened in our country and also that American manufacturers, unprotected by any tariff, have led the world in the manufacture of farm machinery, and that the American farmers have always been the greatest users of farm machinery.

It would seem, therefore, that the history of the last century should reveal in long-range perspective the effect of the use of farm machinery and the contribution it has made toward the progress of our country to its outstanding position in the world. The four major effects may be stated briefly as follows:

(1) Farm machinery has brought about an assured food supply and freedom from famine.

(2) Farm machinery, through enabling a much smaller proportion of the total population to produce food for the whole, has released from the soil the manpower which has made possible our great industrial progress.

(3) Farm machinery has done much to relieve the drudgery and shorten the hours of labor for that portion of the population remaining on the farms.

¹ Referring to prepared statement.

(4) Farm machinery has brought more profit to the farmers. (And not alone or mainly through labor displacement, but also in the many ways by which better yields and better quality of crops are obtained and assured through improved methods of soil preparation, planting, cultivating, and harvesting. The weather always will be one of the greatest farm hazards. The speed and timeliness of cultivation can do much to conserve moisture and effect weed control, and the speed of mechanized harvesting has greatly reduced the risk of losing matured crops through rain, hail, wind, heat, or other adverse weather conditions.)

(Senator O'Mahoney resumed the chair.)

Mr. McCORMICK. These four statements are self-explanatory, but I want to add a few comments on some of them, and in this connection discuss the subject of present-day labor displacement by farm machinery.

An assured food supply is a condition which never existed anywhere at any time in the world's history until it became a reality here within comparatively recent times. The change is so great that we no longer think of crop failure in terms of hunger and starvation, but rather in terms of the effect of a short crop on farm prices and farm income. We regard our food supply as so certain that we do not worry about the matter at all. Credit for this change belongs, of course, in part to the governmental and private agencies which have contributed to the control of pests and diseases, produced new and better varieties of plants, and improved the quality of livestock breeding and handling. But I believe the mechanization of farming between 1831 and the present day has been a foremost factor.

We can all remember the World War slogan, "Food will win the war." We can also remember that the machines available made it possible to bring about a vast increase in food production to meet the unparalleled demand of that period. I believe our unequalled capacity to produce food is the foundation of our strength from the standpoint of national defense. The present uncertain state of the world certainly brings home the vital importance of this productive capacity.

At present there are surpluses of some farm products, but in the main these are surpluses in the sense that they are not currently salable rather than in the sense that our people do not need or could not use the products. Regarding these surpluses, I am in substantial agreement with the views expressed by Dr. Mordecai Ezekiel, of the Department of Agriculture, before the National Industrial Conference Board meeting in New York last January.

Dr. Ezekiel gave it as his opinion that a level of industrial employment comparable to what existed in the 1920's would cause a substantially larger demand for farm products, and might even require an increase in acreage of some crops. He suggested that the more fundamental problem is how to put back to work the city people who are not working and are ready to work, and ready to buy more food for their families. When that problem is solved he believes the remaining farm problems will be comparatively simple of solution. I think that is probably true. And I have faith enough in the future of the United States to believe that these problems will be solved.

Next in importance to our assured food supply, and conditioned upon it, is the fact that without agricultural mechanization our industrial society would be impossible. Only when men were released from physical toil in the fields could they apply their strength and intelligence to the development of industry.

From the beginning of history until very recently the necessity of producing food by crude hand methods chained the vast majority of people everywhere to a life of hard labor on the land. Secretary Wallace has clearly stated the dramatic change that has taken place:

One hundred fifty years ago it required 19 people living on the land to support themselves and one person in town. Today, under greatly commercialized and industrialized conditions, one person on the land supports himself, 3 people in town, and contributes to the support of another person overseas.

The mechanization of agriculture, including farm transportation, made the farm population a great reservoir from which almost constantly man power has been drawn for the expanding industries that have made the United States the foremost nation of the world. For more than 100 years, right down to the depression of 1929, the pressure for release of men from farms to join the ranks of industry has never ceased.

This movement halted with the depression, and now the persisting industrial unemployment has made socially undesirable, for the present at least, this very process of release of men from the soil which for so many years was of social and economic benefit.

This brings us to consideration of the present situation. Naturally the question arises as to whether the continuing sale of farm machinery is aggravating the unemployment problem of the Nation.

First let us agree that farm machinery is labor-saving without question. No machines have ever been demanded or salable unless they enabled farmers to perform farm operations in less time and in a more efficient manner. That is their very purpose.

The CHAIRMAN. May I interrupt you there? Going back 1 or 2 paragraphs to your statement that for more than 100 years, right down to the depression of 1929, the pressure for release of men from farms to join the ranks of industry never ceased, do you mean to imply by that that industry is something new, or do you agree with me that it is merely a transfer of the situs of industry, so to speak?

Mr. McCORMICK. That is correct, Mr. Chairman.

The CHAIRMAN. Before the invention of the modern machine, industry was carried on on the farm.

Mr. McCORMICK. Going way back, before even city industry, yes.

The CHAIRMAN. Yes, and the story of our industrial development, the development of the factory system and the machine age, has been the story of the gradual transfer of industrial activities from the farm to the city as well as the story of the substitution of machine labor for hand labor.

Mr. McCORMICK. The substitution of machine labor for hand labor on the farm?

The CHAIRMAN. In the industries.

Mr. McCORMICK. Yes, I think of course that statement is true, with perhaps the addition that new industries were created in the cities which never did exist perhaps on the farm.

The CHAIRMAN. Yes; that is perfectly true.

Mr. McCORMICK. This only means to imply I think just what you mean, that there has been a demand as industry moved into and grew in the city, for this labor which now is freed from agricultural use to go into the industry. Of course that is a broad statement, and undoubtedly there were periods in the past where that process was held up, just as it is held up at the present time.

The CHAIRMAN. In other words, by reason of the inventions of thoughtful and skillful men and the discoveries of science, we are able as a race to produce many things which were impossible to produce 100 years ago, 50 years ago, even 10 years ago.

Mr. McCORMICK. Exactly.

The CHAIRMAN. In earlier days mankind had to be satisfied with what he could produce in the circumstances that then existed.

Mr. McCORMICK. That is right.

The CHAIRMAN. So industry is changing both its form and its locale, so to speak.

Mr. McCORMICK. Naturally, yes.

The CHAIRMAN. And our problem is, as you stated here, to provide for the absorption of those who may be thrown out of employment.

Mr. McCORMICK. That is true.

FARM MACHINERY AS LABOR SAVER

Mr. McCORMICK. But in appraising the effects of farm machinery, an important distinction must be made between labor saving and labor displacing. The labor hours saved by machines may be reflected in shorter hours for those working on the farm or in someone leaving the farm to seek other work. I believe both effects have occurred in varying degrees at different times and places.

There have been long periods when the attraction of city jobs led many farm workers, both hired hands and farmers' children, to leave the farm. During these periods the benefits of labor-saving machinery were mainly applied to replacing those leaving the farms, and in less degree to shortening the labor day of those remaining on the farm.

At the present time, however, and looking ahead, I believe it can be said with some assurance that the tendency is to shorten the hours of the workers on the farm rather than to decrease their number. The working hours of industrial labor have been substantially shortened by law, agreement, or custom. The farmers' working hours have been much longer than the hours of factory labor, and it is only natural that they should desire shorter hours and also relief from the most back-breaking farm operations.

In addition, there is the important fact already mentioned that the great majority of farms are family farms without hired help where no labor displacement takes place, as farmers do not fire themselves or their children when the time required for farm operations is shortened. These farmers earnestly desire the help of machinery. They constitute the great market for which the newer and smaller tractors and implements are being made and on which the farm-equipment industry is pinning its hopes.

When farmers think of labor-saving machinery, they are thinking primarily in terms of shorter hours and release from physical labor of the most wearing kind, and secondarily of the cost reduction which

in many cases results from and can be obtained by the improved methods of production and handling of crops made possible by machinery. Any farmer who has ever walked 15 miles a day in the furrow, wrestling every foot of the way to keep the plow in a true course, knows what the tractor and the tractor plow really mean.

Anyone who has ever plodded through a cornfield in freezing fall weather, husking by hand, knows what a blessing the mechanical corn picker is in terms of labor saving.

This kind of labor saving has small effect on employment. Its main effect is in shortening the working day for the family group, father, mother, and children, and making the group work more efficient, more pleasant, and more profitable. Farming, as has been said many times, should be a way of life as well as a way of earning a living. Labor-saving machinery has contributed much to a more attractive way of living for the farm family, and it will contribute more.

We know there has been an improvement in rural educational facilities. We can see it in the new consolidated schools and in the growth of the agricultural colleges. That growth could not have taken place unless young people had been released from work by machines.

We know there has been an increase in the social opportunities of the farmer and his family. We need only consider as one example the really wonderful work which has been done and is being done through the 4-H Clubs to train farm children for better living. We know that before mechanization, such a program could not have been carried out.

We observe that the Federal Government through the Rural Electrification Administration is itself concerned to extend mechanization on the farm by making available a new source of power.

In short, farm life can be made more attractive than it ever was, and is being made so, and the farmers want it that way. There is no longer the vast gap between farm living and customs and city living and customs which once existed and there should not be.

In this connection I should like to quote from a radio address by S. H. McCrory, Chief of the Bureau of Agricultural Engineering, delivered July 22, 1938. Speaking of the effect of machinery on the farmer's way of living, Mr. McCrory said:

He must still keep close to his work, but he has been given such able assistants he can lift his nose from the grindstone of the past and give more attention to the business of farming and living.

While stressing the major effects of farm machinery and shortening hours, I do not mean to imply that farm machinery has brought about no recent labor displacements. No doubt it has brought about such displacements, but not, I think, to any such extent or to the degree which has occurred in industry. In addition to the family size farms there are, of course, larger farm operations in various parts of the country employing hired labor which have had and are having difficult times on account of the low prices of their products. Such farms, if they are to survive, must be operated in the most efficient way to achieve the lowest costs and this in some cases has brought about the use of machinery to reduce the amount of hired labor.

These situations parallel to a certain extent industrial operations. I firmly believe that the best interests of our society as a whole are served by encouraging technological advances tending to bring about the production of cheaper, better, and more goods for general use. But no intelligent person, and no one of good will, would ignore the fact that the benefits of such progress are sometimes achieved at the cost of temporary labor displacements involving hardships and readjustments. The answer, I believe, lies in recognizing these situations as social problems to be handled with sympathy and with policies calculated to alleviate the hardships of the necessary readjustments.

The extent of labor displacement by farm machinery is sometimes exaggerated by confusion with other causes. Nature smiled during the 20's on the settlement of the semi-arid areas of the Midwest plains. Then followed many successive years of cruel drought, want, and poverty. Naturally this led to migration, and the lure of an Eldorado where a certain amount of migrant labor was needed led to the concentration of this migration and its dramatization.

Straight thinking on the problem may be easier if we consider what would be a sound national policy for the resettlement of these unfortunate people. Surely they should not be returned to the dust bowl now that we know how severe and prolonged the drought periods can be. The human hazard of concentrating populations in such areas is too great. To the extent that a sound national-conservation policy would include the use of these lands for farming operations, it would seem advisable that they be conducted with a minimum amount of population and maximum efficiency of mechanization. Only in this way can the human and economic hazards of drought be minimized.

Bearing on the effects of farm machinery on the farmer's income, the National Resources Committee in its study of technological trends and national policy says:

That the income of the agricultural worker tends strongly to increase with increase in power and machinery available for his use is indicated in comparing by states the average gross annual income, available power, and value of farm mechanical equipment. * * * Fragmentary data from foreign countries seem to indicate that throughout the world increase in the amount of power available, within the limits observed, tends to increase the income of the agricultural worker.

This increase in the income of the agricultural population, through mechanization of the farm has also been of importance to urban industry in maintaining a market for its products, since the ability of the farmer to buy industry's product depends upon his income. I do not believe that the American type of high-volume, low-cost industry could have developed in connection with a backward, underpowered agriculture.

The extended use of labor-saving machinery on the farms of the Nation is indispensable if any fair balance is to be maintained between the farm worker and the industrial worker with respect to their ability to produce and exchange their products.

FUTURE TREND TOWARD SMALL MACHINES

Mr. McCORMICK. No one, of course, can predict what the future may hold. But some things about the future may be said, I believe,

on the basis of what has happened in the past. On that basis, I believe the future will witness continued progress in the application of mechanical power to farming. I believe the changes will be gradual, as all changes in agriculture are. I believe that they will come in response to the changing needs of the farm population. I believe that they will have the same objectives as before—to increase the farmer's income and improve his way of living. I am convinced that the pronounced trend toward smaller machines will continue and that the end result will be to improve the position of the family-sized farm which has always been held as the ideal basis for American farming.

(Appendix A to Mr. McCormick's testimony, which was not read, follows:)

At the request of Mr. H. Dewey Anderson of the committee, the following brief sketch of the organization of the farm-equipment industry has been prepared.

Prior to the Civil War the manufacture of farm machinery was carried on in small factories, each of which usually produced only one type of implement, and many of which were owned by local mechanics or blacksmiths.

As the industry grew, individual manufacturers tended to make more than one implement, but they generally confined themselves to one classification of implements. A plow maker, for instance, might add to his list of products such other tillage tools as harrows and cultivators, but was not likely to engage in the thresher business.

In this way the industry by the end of the last century had developed several fairly well defined branches. These might be enumerated as plows and tillage tools, drills and planters, threshers, wagons, spreaders, engines, harvesting machines and cream separators.

The turn of the century saw a trend toward consolidations of companies in this industry, as in several others, which resulted in larger units, and which also resulted in a tendency to broaden the range of implements supplied by the individual company.

The impetus toward broadening the line of products came from the system of distribution of implements. Most manufacturers had found it necessary to maintain wholesale branch sales houses in various parts of the country to handle their sales, since unaffiliated wholesale houses often lacked either the knowledge or the energy required to promote the sale of new or little known implements. Maintenance of these branch houses, however, was expensive when only a single line of implements was sold, because of the seasonal nature of the business. The tendency toward broadening a company's line resulted from the desire to have something to sell at each season of the year.

This tendency has led to the growth of 8 companies which are known as long line companies. They are Deere & Company; J. I. Case Company; Allis-Chalmers Manufacturing Company; Oliver Farm Equipment Company; Minneapolis-Moline Power Implement Company; Massey-Harris Company, Incorporated; B. F. Avery & Sons Company; and International Harvester Company.

In addition to these "long line" companies, there are many smaller concerns engaged in manufacturing lines which range from a single machine, such as a cream separator, to a line of implements and machines of considerable length. Among the more important "short line" companies are New Idea, Inc.; Avery Farm Machinery Co.; Gleaner Harvester Corp.; Dempster Mill Manufacturing Co.; Stover Manufacturing & Engine Co.; A. B. Farquhar Co., Ltd.; Lynchburg Foundry Co.; Papec Machine Co.; Wood Bros. Threshing Co.; Ann Arbor Machine Co.; DeLaval Separator Co.; Anker-Holth Manufacturing Co., Inc.; Ohio Cultivator Co., and Farm Tools, Inc.

In all, the "long line" and "short line" companies engaged in the farm equipment industry total approximately 200. To these should be added 2 of the large mail order houses, Sears, Roebuck & Co. and Montgomery, Ward & Co., both of which engage in the selling of farm machinery on a large scale, and the Ford Motor Company, which has recently reentered the farm equipment field and is now marketing a tractor with some implements.

The majority of agricultural implement factories are located in the Midwest, especially in the state of Illinois, Indiana, Ohio, Wisconsin, Minnesota, and Iowa, although factories are to be found also in such other States as New York, Penn-

sylvania, Kentucky, Nebraska, Tennessee, and Michigan. A number of specialty implement factories are on the Pacific coast because of the special requirements of West Coast agriculture. The Midwest has been favored as a manufacturing area because of its central location, its transportation facilities, and its position in the heart of a rich farming area suitable for mechanized cultivation.

Probably the two most important districts in manufacturing are the Chicago-Milwaukee district and the Rock Island-Moline-East Moline-Davenport district.

Individual factories tend to specialize on certain related groups of machines and implements rather than to make many products. A factory may thus make only tractors, tillage tools, or harvesting machinery. There are, however, numerous exceptions.

The distribution system of the larger and many of the smaller companies is usually national in scope. The sales unit of the manufacturer is the company-owned branch house, whose territory usually embraces a number of counties and may even, in sparsely settled regions, take an entire state or parts of several states. The branch houses sell to dealers in the local communities who in turn sell the goods to the users.

The blockman, or wholesale salesman, is the principal contact of the manufacturer between the manufacturer's branch house and the local dealer. It is his responsibility to secure dealers, to assist them in merchandising, to advise them on stocking machines and repairs, and to help, when needed, in closing sales. Ordinarily there are 8 to 10 blockmen to each sales branch.

The branch houses at all times carry large stocks of new machines and of factory-made repair parts which are available both to dealers and users of the machines. The maintenance of adequate repair stocks is vital, since any long loss of time due to the breakdown of a machine means a considerable monetary loss to the farmer.)

The CHAIRMAN. I note with much interest, Mr. McCormick, the statement that the answer lies in recognizing these situations which you have described as "social problems which are to be handled with sympathy and with policies calculated to alleviate the hardships of the necessary readjustments." I assume from what you have said that you regard this policy as one of national responsibility.

Mr. McCORMICK. Yes, sir; I do.

The CHAIRMAN. Policies to be undertaken by the Government.

Mr. McCORMICK. Where the localities are unable to handle them, the national Government certainly must take care of them.

The CHAIRMAN. Have you given any thought to the particular policies that might be adopted?

Mr. McCORMICK. No, sir; I haven't. Naturally we all think about those things, but I am unable to give anything of a definite nature in that way.

The CHAIRMAN. Of course, there are certain national policies, for example, reclamation, which is of great interest to those of us who come from the so-called arid-land States. The Reclamation Service was first established in 1902, and many large reclamation projects were undertaken. Later the feeling grew up that we had too much farm production and for many years the Federal contribution by way of appropriation to the building of new reclamation projects was delayed. Practically one might almost say it was abandoned. In my own State, in Wyoming, though that State contributed by way of oil royalties to the public domain, millions of dollars to the reclamation fund, more than \$25,000,000, for example, came out of a single county in my State into the reclamation fund, there was no attempt at all to expand the reclamation projects in the State or to develop new ones. During the last 7 years new reclamation projects have been constructed and are now under construction in various of the States, and some of these Dust Bowl families to whom you have alluded are being settled on these new lands. You

don't regard that as an undesirable policy, do you, from what you stated here?

Mr. McCORMICK. I think, Senator, that my opinion on individual matters isn't worth very much. I think, in general, we have to take care of temporary situations, that is all there is to it. In other words, when distress arises in a given section of the population, it must be taken care of. Aside from that, the only position I could take would be that whatever is for the permanent good of the farmer in each individual case is what we want.

The CHAIRMAN. Your use of the word "permanent" points again to the real significance, we need a permanent policy.

Mr. McCORMICK. That is right, not a flash in the pan or a thing that isn't fundamentally sound, but something which year by year we can build on as a permanent thing.

The CHAIRMAN. You have no suggestion to make on that?

Mr. McCORMICK. I have no suggestion.

The CHAIRMAN. Who buys the farm machinery you manufacture?

Mr. McCORMICK. On the whole, speaking generally, we, the manufacturing company, sell to dealers and the dealers are those who sell to the farmers.

The CHAIRMAN. Do the dealers in farm machinery, like the dealers in automobiles, absorb the difficulties that are inherent in the used tractor, the used machine?

Mr. McCORMICK. The situation is very similar. In many instances they take a trade-in, in some cases recondition it and resell it.

The CHAIRMAN. When you dispose of your product to the dealer, your story is told.

Mr. McCORMICK. That is right, Senator, in general.

EFFECT OF TENANT FARMING ON MECHANIZATION

The CHAIRMAN. So that you don't have any figures, certainly no experience, with respect to the relative importance of the tenant as a purchaser of these machines?

Mr. McCORMICK. No; I wouldn't have any—do you mean as a purchaser of a second-hand machine?

The CHAIRMAN. Of any machine. You see, the testimony is here, and it is clear from the census returns that the number of tenant farmers is steadily increasing.

Mr. McCORMICK. Yes. I am sorry I wouldn't have any concrete information that would be of any use as to what proportion of our sales went to tenant farmers and what went to owners.

The CHAIRMAN. Do you think it would be a reasonable assumption that the tenant farmer is unlikely to be as good a purchaser as the owner?

Mr. McCORMICK. I would rather have the feeling that it would depend a great deal on the individual and his capacity, ability, and financial worthiness rather than whether he was a tenant or owner. That is just an offhand statement.

The CHAIRMAN. Well, the figures presented to us indicate not only an increase of the tenant farmer, but also an increase of what might be called institutional farming, that is, corporate farming, the ownership of farms by corporations. Insurance companies, for example, have been compelled, through no choice of their own, but by reason of the depression, to take over many farms.

Mr. McCORMICK. Yes, and if that is the case, and farming can come back to a more profitable position, wouldn't we consider that part of it a temporary phase, that wouldn't be an underlying trend toward larger farms in that particular connection. In other words, insurance companies, as you say, are not taking those farms because they like to do it, they have to, and I understand they are trying to put them in good condition and then sell them. So, after the end of that cycle, you might say of transfer of ownership, those farms I should think would revert to individual owners.

The CHAIRMAN. That may be true to some extent, but the steady increase of the proportion of tenants seems to be independent of the depression.

Mr. McCORMICK. Oh, yes; that is a quite different thing.

Dr. ANDERSON. I wonder if you could discuss the used farm machinery market, and tell us whether the used farm machinery market offers a possibility to farmers in lower circumstances to mechanize their operations and compete successfully with other farmers who buy original and new equipment.

Mr. McCORMICK. Dr. Anderson, I think there is no question about that. It is entirely parallel to the automobile situation. The used tractor or the used implement does go toward supplying the farmer with the lower income so that he can have the benefit of mechanization without the cost of the original equipment.

With your permission I should like to read that section of my printed statement, if I may.

An effective factor in extending the benefits of farm machinery to a larger proportion of the farmers has been the development of resale markets in which serviceable used equipment of many kinds is being purchased at prices substantially below the cost of new equipment. This development has been greatly accelerated since 1935. Most of the tractors in use during the depression were manufactured in the late '20's. The improvement in farm income which took place after the worst of the depression, together with the improved machines offered by the industry, resulted in extensive buying of new tractors and implements and the trading in of the old machines and these old machines after reconditioning were in turn sold to other farmers.

We estimate that currently about 80 percent of the sales of new tractors involve the trading in of an older tractor. Naturally, the percentage on these very small tractors that are now being introduced to some farms which have been exclusively horse or mule farms before won't have as high a percentage of trade-in as that.

This makes tractor power in the form of a used tractor available at low cost to farmers who might not otherwise obtain it.

You gentlemen are probably familiar with the somewhat similar situation in the automobile industry, where a very large proportion of all automobile owners have never owned anything but a used car.

In the case of farm equipment, the potential usefulness of a machine purchased at resale is even greater than usual as the industry has an outstanding record of good repair service on old models which are no longer in production.

The result is that the purchaser of a used tractor is able to get parts and service and need put no arbitrary limit on the length of time he will use the machine. As a matter of fact, no one knows what the life of a tractor is. The first Farmall tractor ever sold, which was manufactured in 1925, is still in daily use on an Iowa farm.

The history of the motor truck on the farm parallels that of the tractor. Here again the resale market and the practice of reconditioning machines for resale has made the motor truck available at very low cost.

Dr. ANDERSON. Mr. McCormick, yesterday when we were examining this question with the experts in the Department of Agricul-

ture we were given some depreciation figures that would not be in line with the statement you have just made. The indication was then that depreciation was relatively high and replacement necessary within a rather brief period of time. Carrying out the statement you have just made, that this first Farmall tractor ever sold is still in operation, is it your judgment from your observation of the industry that the depreciation period is relatively high or not?

Mr. McCORMICK. I would say that any time that we sold a tractor that you couldn't use for more than 5 years we would be cheating the man out of his money.

Dr. ANDERSON. In other words, a person buying farm machinery and installing it on his farm has a prospect of a life of, what would you guess for the tractor?

Mr. McCORMICK. I would put the lowest figure at 8 years, the very lowest. I would say that 10 years should be a fair average. Just as I say here in this paper, the first Farmall is being used on an Iowa farm and that is 16 years. That isn't the only one. We have got thousands and hundreds of thousands of them still out, and I am quoting just from memory now and I can't back it up, but it seems to me that I have seen figures which indicated there were some hundred thousand Fordson tractors still in use. The Fordson tractor was last produced in 1927, which would make those tractors at least 13 years old.

Dr. ANDERSON. What is this process of mechanization? How does the farmer go about becoming mechanized, changing over from the horse to the tractor?

Mr. McCORMICK. Well, that is a pretty broad question to answer, and I should like to know if you mean that in a rather historical sense, or if a man who had been just a horse farmer up to today were to change today.

Dr. ANDERSON. What does he do today?

Mr. McCORMICK. What kind, an Iowa corn farmer?

Dr. ANDERSON. Take an Iowa corn farmer, to make it specific.

Mr. McCORMICK. If he were a horse farmer up to today he would naturally be preparing the soil with horses. He would have presumably a horse plow, probably a 2-bottom gang plow; he would have a horse disk; he would have a horse peg-tooth harrow, or smoothing harrow. Suppose he was going to start in at the beginning of the year to prepare his soil, he would have to buy his tractor; some of those things it would be difficult to do with the plow; he could do it to a lesser extent, not quite successfully, with a harrow; he might cut his tongue off and try to make a tractor hitch out of his horse hitch. He might use that for the first year, and maybe the second year, I don't know, but he wouldn't be satisfied with it very long. Let's say that he wasn't satisfied with it when he first tried it out in the field, and he went to the dealer, and said, "That doesn't work very well, I think I'll just have to buy a tractor disk," then he would buy a tractor disk harrow which would cover the ground faster than the horse disk; he would buy his peg sections that he could use behind the tractor; he could put on new chains behind the tractor.

COST OF MECHANIZING A SMALL FARM

The CHAIRMAN. What would be the capital investment, let's say, for a 50-acre farm?

Mr. McCORMICK. Well, Senator, that is a very difficult question to answer, because we have to decide whether we are going to talk about new price, or, what most farmers do, buy some new and some old.

The CHAIRMAN. Well, of course, there would be a change of capital invested. He would dispose of his horses.

Mr. McCORMICK. Yes.

The CHAIRMAN. And buy the machinery.

Mr. McCORMICK. Yes.

The CHAIRMAN. Comparatively speaking, by and large what is the relation of those two items?

Mr. McCORMICK. Well, that is a difficult figure to arrive at. We had yesterday, I think it was in Dr. Johnson's testimony, if I can find it, some figures given here that I will just cite for reference, speaking of an Iowa farm. Dr. Johnson gave \$2,445.

Mr. PIKE. That is for a 160-acre farm?

Mr. McCORMICK. That is for a 200-acre Corn Belt farm.

Colonel CHANTLAND. That didn't include a wheat combine, then.

Mr. McCORMICK. I don't believe he had a wheat combine included. I don't know just what was included. They don't give the list.

Colonel CHANTLAND. What is the retail price of your small combine, ordinarily?

Mr. McCORMICK. The smallest we are manufacturing this year is \$405, retail price, a 4-foot machine. The next size is a 6-foot machine that retails for \$665.

Colonel CHANTLAND. And the retail price of this Farmall 12 tractor?

Mr. McCORMICK. The new one, Colonel?

Colonel CHANTLAND. Yes.

Mr. McCORMICK. In one-row size that lists at \$515. In the two-row, which is a little change-over of that same machine, it lists for \$535.

Colonel CHANTLAND. And you figure the average life of that is 10 years?

Mr. McCORMICK. We would be ashamed of it if it didn't last 10 years.

Colonel CHANTLAND. What about the life of a combine? I suppose that is a matter of housing?

Mr. McCORMICK. That is a great deal a matter of how the farmer takes care of his machine. There are many combines being operated in Kansas and Nebraska and other wheat sections that I venture to say were bought in at least the late twenties. I don't know why with good use a combine should not last 12 to 15 years.

Colonel CHANTLAND. Suppose we take what we would call a reasonably diversified Iowa farm, including, then, a combine. Would you feel that that \$2,400 figure or a \$3,000 figure as an initial investment would be reasonable?

Mr. McCORMICK. I am just giving it to you off-hand.

Colonel CHANTLAND. For all the implements needed? I think you ought to include in the implements needed the grinding and storing of it, ought you not?

Mr. McCORMICK. I should say that it would come to some place in that neighborhood, although I would have to sit down and add up this thing. Let's say some place between \$2,000 and \$2,500. I am just giving an off-hand figure. Let's say between \$2,000 and \$3,000. I think that might be a little more accurate.

Colonel CHANTLAND. Your exhibit 2682 shows that the average per year for '39 has gone up to 442. I don't quite know what that means. I suppose that is maintenance and replacement. That is the last of your exhibits.

Mr. McCORMICK. Will you say that again? I am sorry I missed that.

Colonel CHANTLAND. Well, it shows down at the bottom, there, 422 as the 1939 figure. I take it—

Mr. McCORMICK (interposing). That is millions of dollars of expenditures for farm implements, tractors, and repairs. That won't give you anything comparable there.

Colonel CHANTLAND. I see up above there in your 100-percent circle, you have the machinery down to 3.2 of the farmer's dollar.

Mr. McCORMICK. That is a question of the proportion of the farmer's cash outlay or dollar used in different ways. That item of 3.2 represents the purchase; in other words, that is his cash outlay for his farm implements, his tractors, and his repairs.

Colonel CHANTLAND. I was just wondering whether that is his initial expense.

Mr. McCORMICK. It is initial. It is, in other words, whether he buys a machine for the first time or if he replaces it when he gets his second machine. It is whatever he spends for equipment. That is not the cost of operating. Down here at the bottom you have another operating figure.

Colonel CHANTLAND. I understand that.

The CHAIRMAN. How does that capital investment in machinery compare with capital investment in animals?

Mr. McCORMICK. Well, we have the figure given here by the gentlemen yesterday, the figure they gave on this Corn Belt farmer, "Investment in equipment and horses, \$2,265. Investment in tractor and equipment, \$2,445," or a difference of \$180.

The CHAIRMAN. Do you accept that as being reasonably accurate?

Mr. McCORMICK. I would say so, in general. I wouldn't want to be committed to it, because I haven't studied it, Mr. Chairman.

The CHAIRMAN. Do you care to make any comments upon this other phase of the transfer, from horse power to motor power, that when horses were used for motor power on the farm, the farmer raised his own fuel, so to speak?

Mr. McCORMICK. That is true.

The CHAIRMAN. Because he raised the feed. Today the farmer buys the fuel.

Mr. McCORMICK. That is true.

The CHAIRMAN. Now, what is the effect of that change?

Mr. McCORMICK. The effect of that, naturally, was to take a certain amount of crops on a certain number of acres that were used for feeding horses and the crops from those acres then were transferred to other uses, such as increased livestock on the farm, increased dairy cattle, and other livestock, which are consuming a great proportion of that.

Another thing that happened, strikingly in my home State of Illinois, a new crop, the soybean crop, has grown in the last 10 years to absorb millions of acres. I won't say just the number; that may be an exaggeration, but a great number in Illinois, which forms, probably, some of the feed.

The CHAIRMAN. Did it contribute to the farm surplus of which we talk so much?

Mr. McCORMICK. Not in this particular way. The soybeans weren't a surplus; they are a growing size crop in this country.

The CHAIRMAN. Of course, it has increased our own self-sufficiency.

Mr. McCORMICK. That is right. Instead of importing these we grow them ourselves.

The CHAIRMAN. I noticed with interest that you spoke of the need of new farm machinery in the raising of sugar beets.

Mr. McCORMICK. Yes.

The CHAIRMAN. Experimentation with the development of such machinery, of course, is going on.

Mr. McCORMICK. It is important in your State.

The CHAIRMAN. Very important in my State, and, of course, the development of such machinery would do away completely with the problem of child labor on the beet farm, if it weren't already done away with substantially by the Sugar Act, and it would tend to reduce the problem of hired labor.

Mr. McCORMICK. Yes. There are certain cases like that, Senator, that you have mentioned.

We had a case the other day. I read in the newspaper of a group of people, I think in one of the Carolinas, who were clamoring for some machine to help them with their peanuts. They had a certain labor situation which was bothering them there, and they didn't come to us. We just saw in the paper that somebody was trying to work that problem out. The present farm mechanization is just a series of such instances, one after the other.

The CHAIRMAN. And as we continue technological advance with information from the farm, does it follow that we become increasingly independent of the foreign sources of supply?

Mr. McCORMICK. Well, I don't think mechanization—

The CHAIRMAN (interposing). Because machines make us capable of developing our own?

Mr. McCORMICK. I don't think mechanization can claim the sole credit for that. I think many other agencies, such as governmental agencies experimenting with new crops, various agricultural agencies and research people, are all doing that, but to the extent a new machine would be needed, it would be our job to see if we could develop a machine for the new crop.

The CHAIRMAN. And does it make it necessary for us, if we are to take full advantage of technological gains, to make ourselves independent of the supplies of given commodities, agricultural commodities which may be secured from areas not as advanced, technologically, as we are?

Mr. McCORMICK. That is a pretty deep question, Senator.

The CHAIRMAN. You don't want to go into it? Very well, I will pass that.

Mr. McCORMICK. We are getting into pretty wide fields.

CREDIT POLICY OF INTERNATIONAL HARVESTER

Dr. ANDERSON. Getting back to this question which I think is of fundamental importance, how the farmer becomes mechanized. Your thesis is that mechanization, and particularly the all-purpose tractor, has now made it possible—as a matter of fact you went on to say pointedly that this perhaps means the saving of independent farm ownership on the small farm. How available is mechanization to the average farmer? You pointed out that he turns in part of his old equipment, he turns in his horses. He doesn't make any such cash outlay, does he, as \$2,445 right on the spot?

Is it important for him to become mechanized without any considerable cash outlay?

Mr. McCORMICK. That would depend a great deal on the locality in which he is. In other words, our credit terms in one part of the country are more stringent than they are in others, naturally. If he had—of course I am speaking again second-handed, because as the Senator has brought out, it is the dealer who does this and we don't have any part in it except in a few minor instances—if he had, for example, horses and maybe some horse equipment to trade in, it is very likely that a good dealer could arrange to take the horses and horse equipment in as a down payment and perhaps more. In other words, that equipment, depending on the amount of equipment he was going to buy, might be sufficient to handle his down payment so he could go into farm powering.

Dr. LUBLIN. What is the maximum period of credit extended for these purposes?

Mr. McCORMICK. The maximum period we extend is 30 months. One may say, "Why 30 months?" The general thing is that we endeavor to give the farmer 2 crop periods in order to enable him to pay for his equipment.

Colonel CHANTLAND. He can raise a 2-year-old steer in that time, too.

Mr. McCORMICK. Yes; he could do that.

Dr. ANDERSON. In other words, Mr. McCormick—

Mr. McCORMICK (interposing). That is the longest. The average is far below that, very far below that.

Dr. ANDERSON. He has approximately two growing seasons in which to move into mechanization on a growing scale?

Mr. McCORMICK. That has been the custom of the farm equipment industry practically since its inception.

Dr. ANDERSON. Does the farm equipment industry itself underwrite these credits?

Mr. McCORMICK. We do. There are some companies which to a greater or less degree have finance companies finance some of their paper. Local banks do quite a bit of farm equipment financing, and we do the balance.

Dr. ANDERSON. And, in your judgment, then, the benefits of mechanization to the small independent farmer are not in any serious way impeded or denied by reason of a credit structure that is not suitable, or by his failure to have access to the machines themselves?

Mr. McCORMICK. No, sir. We endeavor, and we have been doing it increasingly as the years have gone on and our experience has grown, to suit our credit policy to the individual and to get away

from broad classifications which might be unfair or bad business. We have been endeavoring to fit these credit policies to the individual. In any size of farm, I would say, and almost in any category, there would be men who could buy equipment. There is no question about it.

The CHAIRMAN. The committee will stand in recess until 2:30.

(Whereupon, at 12:45 o'clock, a recess was taken until 2:30 p. m. of the same day.)

AFTERNOON SESSION

The hearing resumed at 2:30 o'clock, upon the expiration of the recess, Representative Hatton W. Sumners, the vice chairman, presiding.

The VICE CHAIRMAN. The committee will please come to order.

Colonel CHANTLAND. I think, Mr. McCormick, we left one open before the lunch period. What I was trying to find out was whether you had or whether the figures given yesterday indicated at the present time how many tractors were out and actually in use on these 6,800,000 farms that you gave as a figure for the United States.

Mr. McCORMICK. Colonel, we have an exhibit here that was submitted yesterday by Dr. Johnson,¹ giving the trend in numbers of tractors on farms from 1915 to 1939, which would indicate that at the end of 1938 there were something over 1,500,000 tractors on farms.

Colonel CHANTLAND. Were they on farms or is that the number that had been sold? Did they take into account any obsolescence?

Mr. CORMICK. I would assume, without knowing exactly the date on which this is based, that would represent an actual census on farms. I might be mistaken.

Colonel CHANTLAND. Just one other question on this last exhibit²—let's get that out of the way.

I was trying to make something out of that last figure. That is total expenditures per annum for all farm implements, isn't it?

Mr. McCORMICK. All purchases.

Colonel CHANTLAND. Not mechanized or anything else.

Mr. McCORMICK. What distinction—do you mean not necessarily power-driven?

Colonel CHANTLAND. That is what I mean.

Mr. McCORMICK. All farm equipment, tractors, and repairs.

Colonel CHANTLAND. And we can't tell how much of that is new, replacement or maintenance.

Mr. McCORMICK. That is correct.

Colonel CHANTLAND. So there is no use of trying to do anything with that figure as applied to what you are talking about here.

Mr. McCORMICK. Except that one could say from the chart that that was the total outlay of a farmer for his equipment.

Colonel CHANTLAND. But we don't—

Mr. McCORMICK (interposing). We can't correlate it.

Colonel CHANTLAND. As to your problem.

Mr. McCORMICK. No; as to the cost of equipping the individual farm, for example.

Dr. ANDERSON. But we do know that the percentage of farm machinery expenditure to gross farm income rose from 1931 to 1937, dropped slightly in '38, and again in '39.

¹ See "Exhibit No. 2655," supra, p. 16948.

² See "Exhibit No. 2682," supra, p. 17005.

Mr. McCORMICK. That is correct.

Dr. ANDERSON. In other words, there was a gradual increase, a rather gradual increase, in the percentage of farm machinery expenditures as compared with the gross income.

Mr. McCORMICK. That is a cyclical feature, of course. The farmer, of course, purchases in proportion to his estimation of his ability to buy, and when his prices are reasonable and his income is expected to be good, he invests more in equipment than he would otherwise.

Dr. ANDERSON. And if we took the high point of 1937 with over \$10,000,000,000 of farm income, we have the highest percentage expenditure as well for farm machinery.

Mr. McCORMICK. That is correct.

Dr. ANDERSON. In other words, in an especially good year he buys more machinery and becomes mechanized faster in good years than in bad.

Mr. McCORMICK. That is characteristic of the industry at all times.

Colonel CHANTLAND. And, of course, on any gross at the top is where the net comes from, so that the small addition to the expenditure might mean considerable increase in the net.

In other words, you have to go up to a certain percent before you make cost, don't you, in your gross—on anything?

Mr. McCORMICK. Yes.

Colonel CHANTLAND. So that the top part is the net; so that a small percent of increase in expenditures here might be a very good thing—

Mr. McCORMICK (interposing). Toward stimulating the top part—

Colonel CHANTLAND (interposing). Which is the net.

Dr. ANDERSON. Mr. McCormick, before lunch the chairman asked about the cost of mechanizing a given sized farm. I understand that you have a compilation on that point.

Mr. McCORMICK. Yes, Dr. Anderson. Some of my associates furnished me here with roughly retail prices on typical implements to equip a family farm in the 50-70 acre plats. We assume that on that farm a man would use a small tractor, a 14-inch tractor plow, a 1-row cultivator, a 2-row planter, 1 of the small combines, and a disk harrow. The total cost of that equipment, retail, f. o. b. factory, would be \$1,207.

Now, on the assumption, which is justified in most cases, that that man was a horse farmer previously, he naturally had a team or two of horses and some horse equipment. It is impossible to estimate what the value of that equipment would be in a trade-in at the dealer, but assuming that it ran, to be conservative, \$250, which I believe would be low—I think, if he had a good team of horses, he would probably get better than that—but just for the sake of argument suppose it was \$250, he would have a net balance to pay of \$957.

The VICE CHAIRMAN. I don't believe I followed you there. What are his horses worth? Would you assume he would retain his same team of horses?

Mr. McCORMICK. I was assuming that by buying the tractor he would be able to sell at least a team of horses.

The VICE CHAIRMAN. This farm that you have in mind—is that a 2-horse farm?

Mr. McCORMICK. It might be a 4-horse farm, but if he bought a tractor he might say, "Well, I will keep a team of those horses, and I will trade in a team." Just assuming for the sake of argument (this is purely hypothetical) that he did trade in a team, and some other equipment; for instance, a horse cultivator and a horse plow—

The VICE CHAIRMAN (interposing). You have started in with new machinery?

Mr. McCORMICK. That is correct.

The VICE CHAIRMAN. Wouldn't it be better if you had figured on the cost of installing it? But I won't disturb your figures, though.

Mr. McCORMICK. It is just on the assumption, you see—that he was an entirely new farmer who had no equipment. Then he would have to pay, naturally, \$1,207. But let's just suppose that he had been a horse farmer. He could spare at least a team of horses if he bought this small tractor, and he wouldn't need his horse plow, he wouldn't need his horse cultivator, and he wouldn't need his disk harrow. So he would say, "I will see what I can get for that in a trade-in." I am just making an assumption, Mr. Chairman, that the dealer would be able to allow him \$250 for that. It might be considerably more; in some instances it might be less. But suppose the dealer did allow him \$250. He would then have a net balance to pay of \$957, and that balance, then, could be paid for in accordance with the usual credit terms over a period of two harvests.

Dr. ANDERSON. In other words, Mr. McCormick, his annual payments would be around \$400 to \$500.

Mr. McCORMICK. About \$475.

Dr. ANDERSON. And I take it from your testimony this morning that it is possible for an up and coming ambitious farmer who seeks to compete with mechanized farms in his neighborhood and in his crops to get access to the \$400 or \$500 and the equipment in the first year.

Mr. McCORMICK. Without any question in my mind, Mr. Anderson. In fact, a great deal of our equipment is sold and works out on the basis that the investment in that equipment will be returned in increased yield and increased income to him, and we must assume that that has been the case in hundreds of thousands of instances on the farm.

The VICE CHAIRMAN. Now, how do you know that his yield is greater? Have you statistics showing that the yield average is greater on a farm cultivated with machinery as distinct from horses?

Mr. McCORMICK. There are figures, Mr. Chairman, some of which were submitted yesterday by the Department of Agriculture, indicating that in the case of the fully equipped farm, the mechanized farm or the tractor farm, the yields are increased over the horse farm. That won't maintain, naturally, in every case, but there is considerable evidence that there is an increased production on those farms in which machinery is used.

The VICE CHAIRMAN. Were those figures based on statistics gathered from a given farm cultivated by animals, and that same farm cultivated by machinery, or do you know?

Mr. McCORMICK. I don't know that. I don't know the basis on which these department figures were arrived at, but Mr. Johnson yesterday submitted figures showing an increase, I think in one case of 7 percent, and in another case of 15 percent in the case of a mechanized farm or the horse farm. You see, with tractor power you can make

operations more timely than you can with horsepower. You know the importance of that in planting and seeding and harvesting, and those things do tend toward an increased production.

EFFECT OF MECHANIZATION ON LABOR COSTS

The VICE CHAIRMAN. What effect upon labor costs on this 50- to 70-acre farm will result from the change to mechanized farming?

Mr. McCORMICK. Well, the assumption that we must make in that case—it is only an assumption, but I am making it because I believe it would be the typical case rather than the exception—is that a 50- to 70-acre farm was a family farm. In other words, a farm of that size, unless it was a very specialized truck farm or something of that nature, could most easily be handled by one family. In that case you would have an instance where the advantage to the farmer was a lessening of his hours of work and the arduousness of his labor, and an increase, or rather, let me say a decrease in the cost of his production along with an increase in his production of crop. In other words, in that case I would assume that you wouldn't have a displacement of labor. That is only an assumption, and I wouldn't say that there might not be some farms of that size which had a hired man who perhaps then wouldn't be necessary if you had this mechanized equipment.

The VICE CHAIRMAN. What is the difference between the element of obsolescence or wear-out in the two sorts of farming equipment?

Mr. McCORMICK. Well, we have to consider two things there. We have to consider, in the first place, machinery versus machinery—in other words, a horse tool versus a tractor tool. I don't believe there would be any difference in the obsolescence or depreciation there. In other words, a horse cultivator probably, I would think, would last as long as a tractor cultivator, although, due to the bearings, and wheels, and so forth, it might not. Then we have to consider the obsolescence, or the depreciation, if you choose to call it that, of the horse versus the tractor. That is a figure that I am not prepared to give you. That is a question I am not prepared to give you exact figures on, but I should say that the depreciation, the period of depreciation, of a tractor would be somewhat longer than what you have to figure on a horse. In other words, the expected life of a tractor would be longer than the working life of a horse.

Dr. ANDERSON. Mr. McCormick, that covers substantially the story with respect to the family-sized farm. You have been putting out, however, combines which have gone into the harvest fields, particularly into the prairie harvest fields, for a number of years. There undoubtedly, as these combines have met man competition, a number of harvest hands have been affected. What, in your judgment, has been the net effect of the introduction of harvest combines in the prairie areas?

Mr. McCORMICK. I should think that one might characterize the net effect, briefly, to sum it up, as one of stabilization of employment. If you remember, back in the days when the binder and the threshing rake were used you had the situation in which a large number of men were needed to shock the grain that came from the binder, and then you had the situation of the threshing crew wandering around the country, either in a ring among farmers, or a traveling commercial

crew, and that kind of operation was characterized especially in the western plains by a very distinct type of migratory labor. There was a large number of men who traveled from the Mexican—well, not quite from the Mexican border, but from Texas, through Oklahoma and Nebraska, and up to the Dakotas and Montana, and even Canada. Now, if anything has happened, I would say that in the first place the living conditions for the farm wife have been enormously improved, because she doesn't have to take care of this gang of men who crowded in on her and dirtied the kitchen up and bothered the life out of her, and, secondly, that the work of the harvest now is stabilized within the individual farm, or a very small group of neighbors, one of whom may rent the machine from his other neighbor, or borrow it in exchange for other work. So I think we could characterize it by the increase of stability.

The VICE CHAIRMAN. Wasn't the question as to what effect it had on labor?

Mr. McCORMICK. The general stabilizing of labor, I would say, Mr. Chairman, and that is borne out by the peak figures as shown in Dr. Johnson's chart of labor on a 320-acre central Kansas farm, in which is it very obvious that the harvest peaks involve a great number of men who just have that amount of work, and then have to drift on.

The VICE CHAIRMAN. Yes, but the effect, isn't it, is to eliminate the jobs of these migratory laborers and make it possible for each community to take care of its own harvest?

Mr. McCORMICK. That is it exactly, and, of course—

Dr. ANDERSON (interposing). What happens to these migrants or transient laborers who found their sustenance in the harvest fields, and were able in some way to eke out a year-round existence as a result of what they got there, and what they could pick up elsewhere?

Mr. McCORMICK. I am not able to answer that question in detail, Dr. Anderson. I imagine those—it is not only imagination—men have had to find more regular employment in some locality rather than wandering; but aren't we safe in making it—or taking the position that if any form of labor has to be obviated, the floating or migratory form is possibly socially the best one?

Dr. ANDERSON. In other words, you are assuming that if labor is to be displaced, it had better be the floater than the person who has a tie in the land?

Mr. McCORMICK. That is it exactly.

Dr. KREPS. Is that stability or stabilization of employment taking place in other than wheat farming? Is the effect, for example, in fruit and vegetable growing in California of the introduction of the machine, of the same order?

Mr. McCORMICK. Well, I am not really prepared to answer that question with a great deal of confidence. However, I think it is true that in any situation in which you have peak demands for labor, the use of a machine on the individual farm would tend to stabilize labor, at the same time displaces that migratory laborer.

Dr. KREPS. Now, mechanization is used, say, for plowing operations and cultivating operations, and your peak laborer is engaged in picking, such as is frequently the case in fruit farming. Then would it not be true that you would use fewer laborers in the seasons

in which you would do plowing and cultivating, seasons which are slack, in which labor is slack anyhow, and that on the whole, the peak labor which is used for picking would not be eliminated.

Mr. McCORMICK. That is true. In other words, in certain operations, there are bottlenecks, and until there is something that can be done about those, they still remain.

Dr. KREPS. That is what I was trying to bring out. You are quite right. In the Kansas wheat area, the mechanization has served to get at the peak of the harvesting demand.

Mr. McCORMICK. Yes, and level it off.

Dr. KREPS. Yes, it leveled it off. But there are an array of other products in which that may not be true.

Mr. McCORMICK. No, because you have not been able to eliminate that particular operation.

The VICE CHAIRMAN. Well, you just cut the top off, don't you? You just eliminate these people who travel around getting employment?

Mr. McCORMICK. That is right, Mr. Chairman.

The VICE CHAIRMAN. And what became of them we just don't know.

Mr. McCORMICK. Well, that is the question which Dr. Anderson raised, and that is one of the social questions we all have to find some answer to.

PROSPECT OF FURTHER TECHNOLOGICAL CHANGE

Dr. ANDERSON. I have one more question I want to ask. We have asked it successively in these hearings of witnesses on the topic of technology and its impact.

Mr. McCormick, in the field of agriculture, do you know of any impeding major technological changes, such as, for example, the cotton picker and others that might occur to you, in your laboratories or in the process of development in the area, that will have an effect, and what effect will they have, on agricultural labor and the development of American agriculture?

Mr. McCORMICK. Well, Dr. Anderson, if I may have your permission, I could best cover that, I believe, by reading a portion that I omitted this morning, if I have the chairman's consent to that?

The VICE CHAIRMAN. Yes, sir.

Mr. McCORMICK. At the present time, machinery is available for handling all processes in the production of hay, small grain and some row crops. On the other hand, the production of cotton, tobacco, and vegetables can only be handled in part by machinery. It might be of interest to enumerate some of the major farm operations for which so far no satisfactory commercial machines have been developed.

A crop which badly needs mechanical assistance at present is the sugar beet crop. What is required is a machine that will pull the beet out of the ground, cut off the green top without removing a wasteful amount of the beet itself, and load the beet into a truck. Fairly successful machines can be built, but none now exists which can justify itself on a medium or small-sized farm from an investment standpoint.

Secondly, there is now a demand for a corn combine, a machine to do for corn harvesting what the combine does for wheat; that is,

to pick, husk, and shell the corn in one continuous operation. The problem is not yet solved. It is not a mechanical problem, but one of the moisture content of the corn. The corn must in some way be dehydrated after shelling so that it may be safely stored in bins.

Thirdly, similarly, there is a large demand for a sugarcane harvester. Cane presents a problem because it varies greatly in size and requires three operations by a commercially successful machine. The cane stalk must be cut as close as possible to the ground, the leaves must be stripped from it, and the two upper joints of the stalk, which have no sugar content, must be cut off. There is a great demand for this machine, but you might be interested to know that the problem has defied satisfactory solution so far as we are concerned for more than 35 years.

Now, it is a fact that several machines have been built for these purposes, but they are very large and bulky and expensive machines, and we have never come anywhere near finding a solution to that problem mechanically and what we think is a commercial product.

The VICE CHAIRMAN. Mr. McCormick, right on that point, we have now an arrangement under which we can cut the stalk close to the ground.

Mr. McCORMICK. In the sugarcane?

The VICE CHAIRMAN. Yes; by human beings.

Mr. McCORMICK. Yes; you mean with a knife?

The VICE CHAIRMAN. Yes. I mean, it is possible now to cut the stalk close to the ground.

Mr. McCORMICK. Correct.

The VICE CHAIRMAN. It is possible now to strip the leaves from the stalk. It is possible now to cut those two upper joints off.

Mr. McCORMICK. All by hand, you mean?

The VICE CHAIRMAN. Yes. But I say it is possible to do that thing.

Mr. McCORMICK. Yes.

The VICE CHAIRMAN. Now, being done by human beings with their hands—then we get a machine that does it. There is no job that we know of for those people to engage in who used to do stripping, cutting, that sort of thing. As I said this morning, I appreciate that we have got to go ahead with this business. There is no way to turn back that I can see. We cannot let those people starve, it is against the law to kill them, and if you killed them, why, it would shut down the use of the sugar and you would put the sugar fellow out of business. [Laughter.] This whole business is not a one-sided business, is it? I mean, it really has two sides to it.

Mr. McCORMICK. Of course it does.

The VICE CHAIRMAN. How much real progress is there in a trend that is displacing a human being with a machine and putting him out on the road? I hope you will understand that I am not criticizing this trend, but I am not unmindful that it obtains.

Mr. McCORMICK. I do. What you are saying is that any advance in any technology creates new problems that didn't exist before, it solves some and creates others.

The VICE CHAIRMAN. When we have accumulated such a surplus of unemployed people, I have had a serious question as to whether or not the government ought to continue to offer a premium in the nature of a patent.

Mr. McCORMICK. In the nature of what?

The VICE CHAIRMAN. A patent. I have had a question in my mind, when you accumulate this surplus of unemployed people and with such an inefficiency on the part of the generation of which I am a part to deal with these big problems which we are creating by our unusual or rapid advancement in the supplanting of human beings by machines, whether or not it is a sound policy to continue to offer a premium, a bid, for more inventions or more machines and put more people out of business. This is something we have got to face. Of course, a patent is not a natural right; it is a thing given by government, and the government is now bidding 17 years of the right of monopolistic use to anybody who will invent a machine that will add some more idle people to what we have already got. I know that is not the whole picture. I am just stating one side of it. The other side we all understand. But it is there, and I wish these gentlemen who are digging up testimony would bring us 2 or 3 people who are smart enough to handle it.

Mr. McCORMICK. I would like to find them.

The VICE CHAIRMAN. Yes; I would, too. You are making an interesting and helpful witness.

Dr. ANDERSON. There is one other feature of the new technology that has come to our attention. I wonder if you would comment on such a thing as this rotary tillage that we have been seeing so much about in the papers in recent days. Does it offer something for the future which will increasingly displace the use of man-power on the farm?

Mr. McCORMICK. By rotary tillage, do you mean that type of plow which may have a share but up above you have a revolving member which breaks up the soil?

Dr. ANDERSON. That is right.

Mr. McCORMICK. I haven't see the recent press notices on that or the stories on it, but that is not a new idea, as you know. That has been experimented with for a great many years. We have made some tests of it. I think there were quite extensive tests made in Iowa on that kind of implement. The point of it I think probably would be that in certain soils it would do a very good job of pulverization of the soil, we might not have to do any disking after such a plow; on the other hand, in some soils it probably would do too good a job of pulverizing. I wouldn't care to comment on it because I haven't read just what you are referring to, but if I may say so, I am doubtful that it would be a thing in the nature of a great revolution. It might be a moderate change in farm methods.

Dr. ANDERSON. And it is your contention that new technologies or impending ones have an introductory phase sufficiently long for adjustments to be made to meet them as they arise, as they become widespread?

Mr. McCORMICK. I believe that to be true in almost every case. You take this case of the cotton picker. I was going to refer to that in a moment. That is a similar thing, and the development of these machines is a very long process, as you know. It takes years of experiment. We have been working on the cotton picker for a great many years, and the sugarcane harvester, and many other things that we haven't found the solution to. Then, furthermore, the introduction and use of those machines is not just over night, on the whole. I remember when we came out in 1924 with the Farmall

type of tractor, a thing that has been as revolutionary in its effect on farm mechanization as almost anything, the farmers were slow to take hold of it. It was a funny looking thing to them, it wasn't like the conventional tractor. I believe that is the general case, as you mentioned.

Dr. ANDERSON. When Rust was planning the introduction of the cotton picker, scientific journals and popular journals mentioned that Rust had developed a contract which he proposed to enter into with purchasers or users of the cotton picker, in which he took account of this very problem. He realized the probability of the displacement on a large scale of workers, and therefore would attempt to ameliorate this in his contract which introduced the Rust cotton picker by certain things that would be to the advantage of the labor there displaced. Do you know of any practical attempts on the part of either implement makers or others to meet this problem in some fashion?

Mr. McCORMICK. I do not. I do not know of any such action as you speak of.

The VICE CHAIRMAN. Well, you couldn't get a contract that would stand up through any long period of time under which somebody would agree just to hand over part of his property to take care of somebody who was sitting on the fence.

Dr. ANDERSON. That is perhaps a weakness of the Rust contract.

Mr. McCORMICK. If I might read this section, it might bring out that point.

For many years there has been a demand for a mechanical cotton picker. This was especially true during the 1920 decade when labor was fully employed and foreign migrant labor was frequently imported to pick cotton. Several machines now exist which will get the cotton off the plants in a fairly satisfactory manner provided the conditions are favorable.

Our company's experimental work on cotton pickers has extended over approximately 30 years, but we are not yet really satisfied with the results and have never offered a machine for sale. The necessity of leaving the cotton plant uninjured for further growth and subsequent pickings, and the great irregularities in the size of the cotton plants present difficult problems. Cotton picked with present experimental machines is usually graded down because of the presence of leaf stains and more or less trash, and the grading down means a lower price and less possibility of saving.

A special study of mechanical cotton pickers was made in 1937 by R. L. Horne and E. G. McKibben under the direction of the Works Progress Administration. The authors state, page 18:

"Even though a mechanically successful and economically feasible cotton picker may be near at hand, its spread will probably be gradual rather than sudden. This view is strengthened by the history of the introduction of other agricultural machines. Rapid mechanization has occurred only where the financial rewards have been high or labor shortage acute. Therefore, as long as there is an abundance of cotton pickers willing to pick cotton for 75 cents to \$1 per 100 pounds, and as long as other prices maintain their present alignment, the mechanical picker cannot be expected to take the Cotton Belt by storm."

I concur in this view that if and when the cotton picker comes into commercial production, its use and spread will probably be gradual.

PROSPECT FOR INCREASED FARM EMPLOYMENT

Mr. O'CONNELL. Mr. McCormick, referring generally to the unemployment problems of the country, would it be fair to conclude from your statement that in your judgment the agricultural industry or that line of endeavor affords little hope for absorbing any substan-

tial number of the unemployed in the country today, at even assuming a much higher level of income?

Mr. McCORMICK. When you say the agricultural industry you mean the farm?

Mr. O'CONNELL. I mean the farm, of course.

Mr. McCORMICK. I am afraid I am not competent to give a judgment on that.

Mr. O'CONNELL. The thing that caused me to believe that was your general belief was that you quoted with approval that statement from Dr. Ezekiel in which he suggested that the more fundamental problem is how to put back to work the city people who are not now working and who are ready to work.

Mr. McCORMICK. Right.

Mr. O'CONNELL. It occurred to me that even assuming no more rapid technological advance is taking place at the present time, with the present people on the farm, the farmers would probably be able to produce enough of the products that they are presently engaged in producing to take care of those persons even assuming much more mass purchasing power than exists today. I thought that was the general tenor of your remarks. Maybe I am wrong.

Mr. McCORMICK. Yes; that is the point that we heard quite a little discussion on yesterday, whether a pick-up in industrial centers will mean a large or a small or a negative pick-up in farm employment. Now, I am not prepared, I am not expert enough, to give a really valid opinion on that, but my feeling is along the lines stated there, that industrial pickup, increased employment in the cities, should mean some improvement in the farm situation, and to my mind that, plus the other thing that was talked about yesterday, namely, the introduction of new farm products as time goes on, are two of the most hopeful possibilities for reemployment on the farm, or increasing employment.

Mr. O'CONNELL. That rather interested me because we have had witnesses here who in other fields took something of the same position. For instance, the representative of the white-collar workers is of the belief that that particular line of endeavor is already very overcrowded and that there will be little or no opportunity to absorb any of the unemployed in that area. The farmers take the same view. Other groups seem, on the one hand, to feel confident that something is going to happen to take up the slack of the unemployed, but insofar as their particular line of endeavor is concerned their position is, "Let George do it because we can't." If that becomes general it leaves us rather hanging in midair as far as any place, any specific place, to absorb the people who are unemployed. It isn't very helpful to the unemployed to have someone say that technological advance ultimately increases productivity and therefore more work and all that sort of thing, when you have accompanying that fact what is assumed to be a fact, that there are 10,000,000 people out of work.

Mr. McCORMICK. Well, those, of course, are very difficult problems to talk about, and one cannot safely make predictions. On the other hand, I have the feeling that it is just as unsafe to take a given set of conditions and say that that set of conditions is going to continue forever. In other words, there might be the introduction of this thing new or that new thing which is quite unforeseen today. You know what I mean.

Mr. O'CONNELL. Oh, of course, but it is somewhat nebulous when the only alternative is to say that something about which we know nothing is going to happen.

Mr. McCORMICK. That is correct.

Mr. O'CONNELL. The most concrete thing about the condition is 10,000,000 or 12,000,000,000 people out of work.

Mr. McCORMICK. It is necessarily nebulous, as the same kind of thing in history has been nebulous many times. There have been times when the future looked just as dark as it may at the moment.

Mr. O'CONNELL. There may have been.

Mr. McCORMICK. I am saying that I can't, and I don't believe anybody can see clearly into the future, yet, on the other hand, I personally wouldn't dare take the position that something couldn't happen that we are not able to see at the moment. I do say that in the meantime we have to do temporary things to clear the situation.

Mr. O'CONNELL. It seems to me perfectly obvious that as between hoping for something to happen and trying to make something happen, the balance is in favor of the latter.

The VICE CHAIRMAN. I think this kind of business is a whole lot more important than about these machinery improvements you have made, because we all know about that. Anybody going down the road can see machinery has been improved, and it is interesting too, but we are trying to find out something about what we are going to do about it, not what you did about your job, but what we are going to do about it. That is what this gets down to. If we could get rid of about 90 percent of these words and get down to business—I think, though, we have some other kind of a doctor coming on who knows something about this.

Mr. PIKE. I have one before you go, Mr. McCormick, and I am afraid it is impractical, too, but we heard yesterday about the wages of farm hands. I was really pleased to know that somebody was hiring people at \$1 a day to work on the farm. They are not in my area. But it sounded pretty bad when you got to the all-yearly wages of a good deal less than \$1 a day all over the country. So you not only have the problem of the unemployed labor and the partially employed labor, but as nearly as I could read it the fully employed laborer had quite a little problem. He didn't have any leisure and he didn't have much income. The steel worker in 30 days could earn more than the farm worker in a year, according to the figures that were presented, and I just wondered if you approached, as part of the solution, the same thing that we have done in industrial lines, and if Congress, in its wisdom, passed a minimum wages-and-hours law for farm workers, giving them something like the same minimum wage that industrial workers have, it would, without question, have a great upsetting effect in tremendous areas. It would change some cost figures enormously.

Mr. McCORMICK. Yes.

Mr. PIKE. Well now, it wouldn't change the cost figures on a family farm much of anything. The thing I wanted to ask you was, if something like that did happen and there aren't enough solutions around so that you can afford to throw away anything that offers even the shadow of one, you probably would increase mechanization further on farms which had part-time labor, almost surely, if you

really had to pay a decent-day's wages. And you would probably have quite an effect on further mechanization in what we may call corporate farming, very large-scale farming if you, say, double the wage rate. The incentive to mechanization would be much greater, of course.

Mr. McCORMICK. Yes.

Mr. PIKE. You have a further displacement of substantial size of these partially employed, and I should think perhaps of some fully employed who still end up with \$126 a year in the Mississippi Delta, but it is a real question whether that would be a loss, whether that would end up in a loss or a gain. It is a sort of inchoate thing in my mind; I didn't mean to say I am for it. That is one of the things that has to be looked at. Farm wages, even for the fellow who is working all the time, are way out of line with industrial wages. I believe they are further out of line than the so-called parity prices that we saw yesterday between farm products and industrial products.

The VICE CHAIRMAN. But it doesn't seem to me, as a plain farmer, that there ought to be much difficulty about that. Whenever your labor cost gets higher than you can afford to pay, as against the job where the man was you get a machine. That is all there is to it, and you take these factories—they have organized labor, they sell their labor; but you take a producer of an exportable agricultural commodity and he sells to the highest bidder in the world market, and to him the domestic market is the lowest market, because he has to sell his commodity in the domestic market at prices much lower than the world market, with the cost of transportation from the domestic market over the world. You people can take your surplus up to Canada and sell it at a less price.

Mr. McCORMICK. We don't do that.

The VICE CHAIRMAN. I know you don't. I just said you could.

EMPLOYMENT IN FARM MACHINERY INDUSTRY

Dr. LUBIN. Mr. McCormick, this is a little bit aside from the subject of this testimony, but in view of the fact that you are here and we are interested not only in agricultural employment but in industrial employment, I wonder if we could get 2 or 3 minutes of your time to discuss some of the elements of employment in your own industry.

How many people do you employ, roughly?

Mr. McCORMICK. Well, that varies, of course, Mr. Commissioner. I should say, roughly, around 50,000 at the present time.

Dr. LUBIN. And has the trend over the past several years been upward or downward?

Mr. McCORMICK. In our plant it has been upward. In '37 we employed considerably more people than we did in 1929.

Dr. LUBIN. You people have the problem of technological displacement in your plant, I take it?

Mr. McCORMICK. Right.

Dr. LUBIN. Do you have any policy relative to installation of machinery to ease displacement?

Mr. McCORMICK. I think I would have to answer that question in two ways. If it were proportionately a small number of men

involved, the situation would be handled more or less in just the regular ways, having regard to seniority arrangements and agreements, and it is not a simple problem. I mean it isn't simply to analyze. It isn't just as if, let's say, a new machine was installed and one man was put out of work and then the question was, Would he be on the street or wouldn't he? It isn't as simple as that. That man who was displaced by the machine, let us say, has a given seniority standing in that plant. Therefore, if he had a long service, he would take the place of a man with a shorter service.

Now, then, that process would go on down the usual line until you came to the last man in that chain. Now, what happened to the last man would depend—and here is the complicating factor—on the nature of our employment at that time. If our employment was even slightly going up, and I should say under any even keel of employment, that man would not be thrown out of work. If employment was decreasing at the time, then he, along unfortunately with others, would be laid off for the time being. So in that sense it is not a simple problem to answer.

Now, suppose, to take a very extreme case, a very major thing should occur that I can't conceive of occurring, but should it, that a whole department, let's say, or a whole plant, due to some technological change, was affected in such a way that employment was greatly decreased. I could cite to you what we did in a similar case, not for that but because we were moving the manufacture of a given number of machines from one plant to another. In a case like that the men who were of pensionable age would be pensioned. We have had a pension plan for some 32 years.

The men who were nearly of pensionable age we would give a pension. The rest of the men we would try to employ in some neighboring plant of ours. And then, down to a service of perhaps 3 to 5 years, we would do something in the neighborhood of termination wage or something of that nature for them.

I am just speaking of a very extreme case, to illustrate the principle, and I have never seen that happen in our company.

Dr. LUBIN. I take it from what you say, then, that changes in technology in your industry are not radical or revolutionary in the sense that something comes along and displaces a whole series of men.

Mr. McCORMICK. That is correct.

Dr. LUBIN. A gradual change is taking place from day to day or when you change a model or something of that sort.

Mr. McCORMICK. That is correct.

Dr. LUBIN. And consequently this technological shift is taking place every day in the work.

Mr. McCORMICK. That is correct.

Dr. LUBIN. And it is your policy to provide for these people, either through normal turn-over or through expansion periods, or when you come to an acute crisis, through giving a man a pension before he is entitled to it, or a dismissal wage.

Dr. ANDERSON. Mr. Chairman, we have another witness this afternoon that I would like to interject here.

The VICE CHAIRMAN. Bring him on.

(The witness, Mr. McCormick, was excused.)

Dr. ANDERSON. Mr. Chairman, the final witness in this series on the discussion of technology and its impact on agriculture is Dr. Paul Taylor, professor of economics, University of California, Berkeley, Calif. Dr. Taylor hasn't been before the committee and should be sworn.

The VICE CHAIRMAN. Do you solemnly swear the testimony you are about to give shall be the truth, the whole truth, and nothing but the truth, so help you God?

Dr. TAYLOR. I do.

**TESTIMONY OF DR. PAUL TAYLOR, PROFESSOR OF ECONOMICS,
UNIVERSITY OF CALIFORNIA, BERKELEY, CALIF.**

Colonel CHANTLAND. Dr. Taylor, before you start, may I ask a question?

Dr. ANDERSON. May I qualify him first?

Dr. Taylor, how long have you been engaged in the study of agricultural economics?

Dr. TAYLOR. Something over 12 years, Dr. Anderson, under various auspices—my own institution, the University of California; the Social Science Research Council of New York; and with the California Emergency Relief Administration, as field director of the Division of Rural Rehabilitation; regional labor adviser of the Resettlement Administration; and consultant to the Social Security Board. I am professor of economics at the University of California.

Dr. ANDERSON. Have you published in this field that you are going to give testimony on?

Dr. TAYLOR. I have published numerous materials, Government reports, articles, and several books.

Colonel CHANTLAND. Before you start with your paper, may I ask a question? I see you are from California where the trek ended, and I notice by the papers this morning that this committee was presumed to have gotten into a discussion of Steinbeck's book yesterday. I wonder if you could give us your judgment as to the truth of the picture of the conditions there discussed?

The VICE CHAIRMAN. Oh, now wait a minute! Do you want him to jump on the book as a competitor?

Colonel CHANTLAND. Oh, I don't think they are competitors.

The VICE CHAIRMAN. But I mean, would you have any embarrassment in doing that?

Dr. TAYLOR. It would be very nice if I could be a competitor. His sales have been very fine.

The VICE CHAIRMAN. But I mean, seriously now, do you want to discuss the book or do you just want to give your testimony?

Dr. TAYLOR. Well, Congressman, perhaps I can put it this way: It is in a sense embarrassing to ask a social scientist to venture into the fields of literary criticism, and in that sense I am not at all competent to answer. But if, on the other hand—

The VICE CHAIRMAN. We might have some criticism of the social scientist.

Dr. TAYLOR. The purport of the question is this: Have you a serious, even critical, problem among migratory agricultural workers in California? I can answer that question unhesitatingly. Yes; we have.

I brought with me a photograph furnished by the Bureau of Agricultural Economics, which your committee may wish to examine.

Dr. ANDERSON. What is the photograph?

Dr. TAYLOR. That photograph was taken only a month ago and shows migratory agricultural laborers, mostly families, encamped behind the levees at Sacramento, our State capital. I think you can see from that photograph the conditions of these laborers in our State.

Before leaving the question, however, I should like to say this: That many people believe we have a problem in California which is peculiar to our State. I think it quite true that we have the problem in its most acute and most dramatic aspects. I hope before my testimony is completed, however, that I will have brought you to a realization of the fact that in varying forms and degrees, similar problems are developing in a number of parts of our country and that we have the problem only in its most acute form.

The VICE CHAIRMAN. I think the entire committee has recognized that fact, Doctor. I believe you wouldn't have to take much time to convince us of that fact. You say it is most prevalent, but wherever there are any migratory laborers, they follow along these seasonal activities, you have similar situations to that?

Dr. TAYLOR. Yes.

The VICE CHAIRMAN. I think the committee is convinced of that fact.

Dr. TAYLOR. I am glad.

Dr. ANDERSON. Do you want to proceed with your testimony?

Dr. TAYLOR. Shall I proceed with my formal statement?

Dr. ANDERSON. Yes.

EFFECTS OF FARM MECHANIZATION

Dr. TAYLOR. The effects of machinery on agriculture which are beneficial are well known. The saving of arduous labor, the cheapening of costs of production, and, for many, the elevation of living standards on the land are so important that no reason exists to attack men or corporations simply because they manufacture or use agricultural machines. At the same time, the advance of machinery on the land is causing human and socio-economic problems which grow increasingly acute. Even in times of industrial prosperity these effects would be serious, for they permeate and alter in important respects the social and political structure of our Nation. In times of unemployment like the present, they are critical. Distress, severance of families from the land, reduction in status, and complete dislocation of farm people are appearing with striking similarities in widely separated areas. These effects and their import are the aspects I wish to discuss of those problems in agriculture which technological progress creates.

Ample statistics and other data on the increasing use of agricultural machinery, and the prospect that this will continue rapidly to spread already have been presented to your committee. I should like, as my contribution to your deliberations, to describe the social patterns which result, directing your attention, first, to the Cotton Belt, then, successively, to the Wheat Belt, the Corn Belt, and to the fruit and vegetable industry.

The landscape and towns of the western Cotton Belt today show clearly the effects of spreading displacement. We had believed that these would not appear until the manufacture of mechanical cotton pickers in commercial quantities. However, displacement is occurring now over large areas because of introduction of all-purpose tractors and auxiliary machinery. In west Texas, the Black Wax Prairie, the Panhandle, and the southwest quarter of Oklahoma, consolidation of cotton farms and displacement of substantial tenant farmers is proceeding rapidly. Landlords replace their tenants with tractors and hired laborers—sometimes 1, sometimes 6 or 8 or 10 laborers, when their holdings are large. Tenants with foresight and sufficient resources buy tractors, rent a second farm, operate them both—and another white American farm family has been cut from the land. Farmers not protected by ownership or strong family ties to the land are starkly fearful that their turn to go may be next.

Towns are crowded with the displaced. The local W. P. A. and relief rolls are loaded with them, a stream of distressed humanity forms and hopefully seeks outlet to the West, in Arizona and California. Empty houses of families who used to make their living from the land strew the landscape, windows are boarded, and cultivated fields close.

Letters from rural folk deeply troubled by what they see occurring appear in the Dallas Farm News, especially around the turn of the year when old leases expire and new arrangements for the coming year are made. The following are recent examples:

From Henderson County, Tex., December 1939:

I ask the editor kindly to publish the following copy of a petition. I ask every county in the state to send similar petitions to their Congressmen before Congress meets in January. It is for the purpose of asking some protection for the one-team and two-team farmers of Texas.

Do you love your neighbor? Something must be done. We, the undersigned, are opposed to a few men renting the whole country in order to get the government checks and the full cotton acreage the little farmer had and rerent the same house back to him. The little farmer has to then sign up for WPA work or relief. One man told me he was renting over 400 acres and nearly 500 acres of land, which deprive 15 one-team renters.

From Tishomingo, Okla., March 1940:

. . . the land hog is all-powerful. He may buy a tractor and get possession of all the land in a community and, with a little hired help, farm all the land and thereby drive all his neighbors off the land to starve—just for his own private gains.

From Crockett, Tex., February 1940:

The big landowner does wrong in discharging his tenants and working his land with hired labor, but since that is the only way he can get a fair compensation he can't be blamed. This situation is causing more people to be without work than anything else.

The ground for these popular fears is confirmed by experts. Professors Bonnen and Magee state in the Journal of Farm Economics for August 1938, that within little more than a decade, by introduction of tractors and four-row tillage equipment on cotton farms on the high plains, "the amount of cropland that can be handled by a farm family has increased * * * from approximately 100 to approximately 450 acres."

This process has some advantage for the one in four who may survive as a farm operator, but the other three face alternatives,

"none of which," say those Texas authorities, "are particularly promising."

In the first place, they may migrate to less productive land in lower rainfall zones on the western fringe of the area or in older areas to the east. Secondly, they may find their way into other occupations, in most cases as laborers. Thirdly, they may remain in the area as agricultural laborers with small chance for employment except during the hoeing and harvesting seasons, and perhaps be forced to depend upon relief during a large part of the year. The latter alternative has been the one most frequently resorted to during the past 3 or 4 years.

What this opportunity to become an agricultural laborer means to those who have been farmers is told by Dr. C. H. Hamilton of the Texas Agricultural Experiment Station in a 1938 report.

The typical farm tenant in the High Plains or in the Blackland (Prairie) may be expected to earn a net farm income of from \$800 to \$1,000 annually, even with cotton prices as they are today. As either a common or an agricultural laborer the same tenant cannot expect to earn more than from \$250 to \$300.

A fourth alternative of the displaced—farmers, laborers, and small townfolk alike—is to take to the highways leading west.

The process which I am describing so briefly has contributing causes more complex than time permits me to explain, such as drought, depression, and phases of the agricultural and relief program. But the displacing effects of machinery on the cotton land are final, and they are not limited to areas of drought.

May I call your attention at this point to the first chart, which shows the origins of migrants to California.

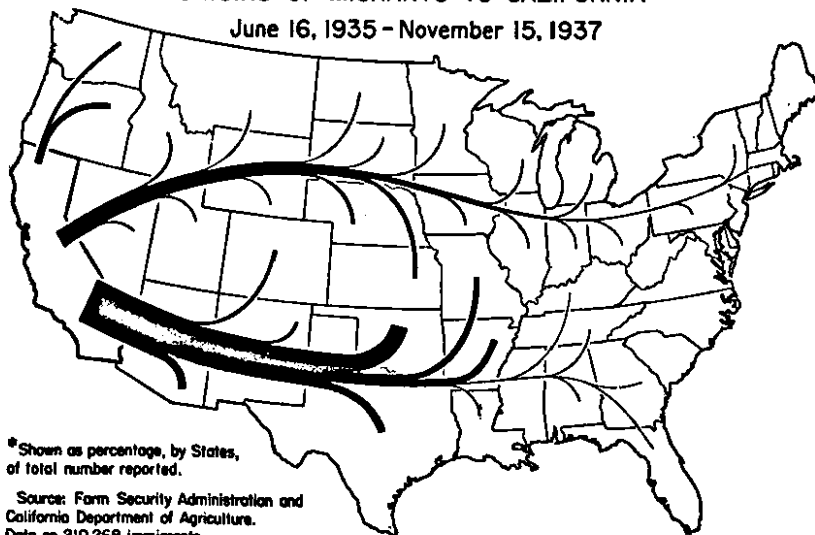
(The chart referred to was marked "Exhibit No. 2683" and appears below.)

EXHIBIT No. 2683

[Submitted by Dr. Paul Taylor]

ORIGINS OF MIGRANTS TO CALIFORNIA*

June 16, 1935 - November 15, 1937



*Shown as percentage, by States, of total number reported.

Source: Farm Security Administration and California Department of Agriculture. Data on 210,268 immigrants.

ORIGIN OF MIGRANTS TO THE WEST COAST

Dr. TAYLOR. This chart is, of course, not a measure of persons displaced by mechanization, for no such classification is possible in obtaining the data. However, it does show the origins of the people who have come to us in California seeking employment over about a 2-year period. The width of the line is proportioned to the percentage of the total influx to California that came from each particular State.

The VICE CHAIRMAN. Does that line bend back into the country from whence they came?

Dr. TAYLOR. It does, and by looking at the width of the line, you can approximate the proportion of the whole migration that came from that particular State.

The VICE CHAIRMAN. What I was asking is, you have three lines that bring these people into California?

Dr. TAYLOR. Yes.

The VICE CHAIRMAN. Do they move out of California?

Dr. TAYLOR. Out of California? No statistics are now available of the migration out of California.

The VICE CHAIRMAN. How do you accumulate these facts?

Dr. TAYLOR. These statistics are obtained by a count at the California border maintained by the California State Department of Agriculture.

The VICE CHAIRMAN. They do not maintain any count as they go out of California?

Dr. TAYLOR. The Bureau of Agricultural Economics a few months ago completed arrangements with the Arizona Department of Agriculture which will give us that back movement concerning which you inquire, Congressman, but at the present time that is not available. We know that there is a sizeable return migration. We know also the net deposit in California is heavy.

The VICE CHAIRMAN. These are what you call migratory workers, largely, these people.

Dr. TAYLOR. These people may very well find themselves in the kind of camp shown in the photograph at Sacramento. They are likely to be working in the southern San Joaquin Valley, migrating about, or seeking to settle themselves in one way or another.

The VICE CHAIRMAN. Those camps represent places where people who come into California, maybe who have been in California, who have no better place than those places in which to stay. That is all there is about it.

Dr. TAYLOR. The kind of camp that is exhibited in the photograph?

The VICE CHAIRMAN. Yes.

Dr. TAYLOR. There is no other facility available. The Farm Security Administration, you understand, Congressman, has placed a chain of camps through California to which many of these people come, and those camps have been very effective in eliminating the kind of condition that still prevails in Sacramento.

The VICE CHAIRMAN. To give the same person who is here a better place to live.

Dr. TAYLOR. To give the same kind of person who is shown in those tents and trailers a better place to live as he follows the crops.

There are other projects of the Farm Security Administration which endeavor to provide a better place. There are some of those projects in California and Arizona.

The VICE CHAIRMAN. What is the type of those?

Dr. TAYLOR. The project is of two types. Both are based upon decent housing. One type provides a small plot of ground around the house on which a garden may be cultivated. The other type provides what is called a cooperative part-time farm, in which approximately, it is believed, the rental paid for a decent house can be earned. The remainder of the income of the migratory labor family living in such a project is expected to be derived from seasonal employment in crops in California.

The VICE CHAIRMAN. In the meantime the difference is being taken care of in some way from the treasury of some governmental agency.

Dr. TAYLOR. That is very likely to be true among those in the lower income groups. There are of course some who will keep off relief.

The VICE CHAIRMAN. But do these houses that are put up bring a rental that will take care of the cost of production and construction and maintenance?

Dr. TAYLOR. I think, Congressman, that the Farm Security Administration could furnish you figures on that. I am sure that that is the intention, that the costs shall be kept low by extensive construction, and that the rental shall be such as can be paid by these people.

The VICE CHAIRMAN. Yes. I beg your pardon for leading you into that field, because it is a little aside from what you are discussing.

Dr. TAYLOR. Not at all, Congressman. I don't mind the questions in any way.

Colonel CHANTLAND. May I ask if there is any other project that tends to more permanency?

Dr. TAYLOR. Yes, Colonel; I planned to discuss that a little later, if that is agreeable, but I hope that question will recur. I don't know whether time is going to permit. I should like very much to answer that question. I would prefer to do so a little later.

May I invite your attention to the next chart, which shows origins of migrants to Oregon.

(The chart referred to was marked "Exhibit No. 2684" and appears on p. 17046.)

Dr. TAYLOR. This chart is constructed in similar fashion. The base of the data is somewhat different. It is based upon something over 5,000 rural immigrant families studied by the Oregon State Agricultural College. You may again compare the breadth of these lines showing origins from the different States. You cannot compare the breadth of these lines with the breadth of those on the preceding chart. In other words, the volume of migration to California is very much larger than the migration to Oregon. This shows the relative importance of different sources of origin of immigrants to Oregon.

The VICE CHAIRMAN. Doctor, what is the point about that? What lesson do we draw from the fact that people who are close by move in more numerous than people who are far away?

Dr. TAYLOR. My purpose in introducing the chart is twofold: First, to show that the problem is broad in respect to the destinations of those who are cut loose from the land; second, that the area of dis-

placement is broad. You will notice that the California migrants come mainly from Oklahoma, Texas, Arkansas, and Missouri. You will notice from the chart which I am now exhibiting that the Northern Great Plains States show up in much more important fashion. There is a whole belt of emigration which is not apparent as you look at the single chart.

The VICE CHAIRMAN. Do you think it is because there are better opportunities, relatively better opportunities, in that belt to which they are going, than would have been afforded if they had stopped closer to the point where they started moving from?

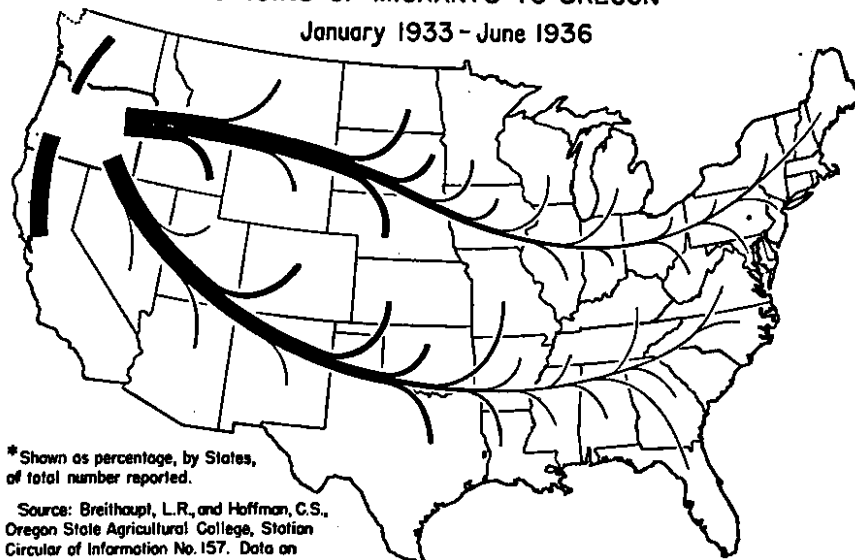
Dr. TAYLOR. I don't think that the reason they came to the west coast is primarily that opportunities are so good for them. I think the expelling forces are their principal reasons for leaving. I shall describe those in a moment.

EXHIBIT No. 2684

[Submitted by Dr. Paul Taylor]

ORIGINS OF MIGRANTS TO OREGON*

January 1933 - June 1936



* Shown as percentage, by States, of total number reported.

Source: Breithaupt, L.R., and Hoffman, C.S., Oregon State Agricultural College, Station Circular of Information No. 157. Data on 5,022 rural immigrant families.

CHART NO. 4

The third chart shows origins of migrants to Washington. You notice the source of emigrants lies still farther northward.

Dr. ANDERSON. That will be "Exhibit No. 2685."

(The chart referred to was marked "Exhibit No. 2685" and appears on p. 17047.)

SHARECROPPING ON COTTON PLANTATIONS

Dr. TAYLOR. Displacement of cotton farmers in the rich lands of Mississippi and Arkansas is beginning to be heavy. Sharecroppers, supplanted by machinery and wage laborers, are being swept from the plantations. They crowd the towns of the Delta and choke the slums of Memphis, Tenn. During cotton chopping in spring and picking season in the fall they are hauled daily in great trucks to work on plantations as far as 43 miles distant. The rest of the year

they remain largely unemployed, and a heavy burden on relief. They constitute a mobile labor reserve, supported at public expense in the winter, and by this fact make possible further mechanization and further displacement of sharecroppers.

It is the impact of these changes on the plantation system that produced the highway demonstrations in the Arkansas Delta and boot heel of Missouri in January 1939, and the eviction crisis in January of this year. From this area where both Negroes and whites are victims of technological progress, the displaced whites already have appeared in numbers as migratory workers in the cotton fields of Arizona and the pea fields of California.

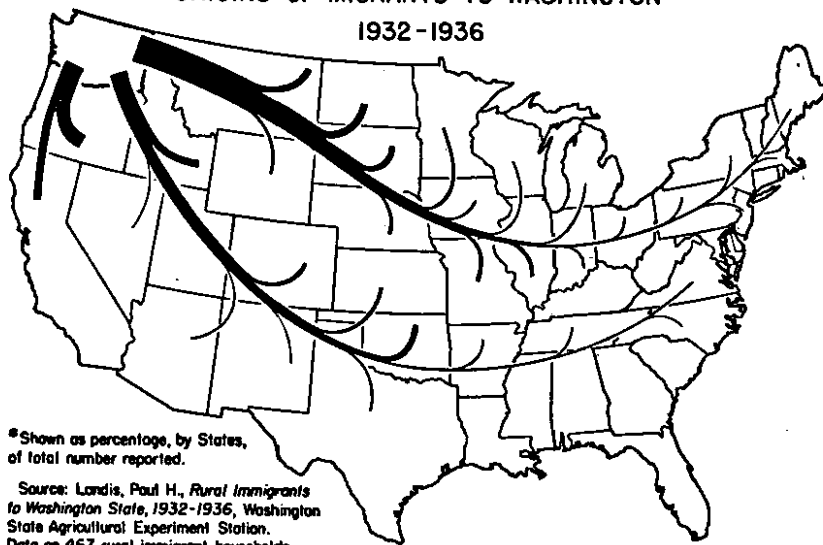
The displaced plantation Negroes who are not left on the land as wage laborers flock to towns. Some are seeking outlet in the industrial cities of the North. No tide of Negroes has yet started west. The advance of machinery in the Cotton Belt is irregular. It

EXHIBIT No. 2685

[Submitted by Dr. Paul Taylor]

ORIGINS OF MIGRANTS TO WASHINGTON*

1932-1936



spreads over delta and river bottom lands, and appears in spots where topography and other conditions are favorable, in Alabama, Georgia, and North Carolina. Behind this dislocation on the plantations is the economic pressure cited by a report of the Mississippi Delta Experiment Station which forecast in 1932 that "from 30 to 50 percent of present Delta farm labor must ultimately be replaced by machinery * * *." When plantations follow this program they are transformed into large industrialized farms. The starkest example of this change which I have personally encountered was told me by a planter who purchased 22 tractors and 13 four-row cultivators, let go 130 of his 160 sharecropper families, and retained only 30 for day labor.

In the Journal of Rural Sociology of September 1939, Prof. B. O. Williams, of Clemson Agricultural College, South Carolina, formally advances the proposition that—

The mechanization of agriculture in the South has already gone forward much further than is generally recognized * * * (It) will result in a disruption of the family-farm institution * * * It is probable that the owner-manager type of organization will come to prevail, changing the system of social organization from the family-farm type to the manager-labor type * * * The mechanization of Southern agriculture would result in either (1) a lowering of material living standards of large numbers of the farm population; or (2) the migration of large numbers of surplus and displaced laborers to other areas.

Mr. MAGINNIS. Mr. Chairman, may I ask a question at this time? Isn't the situation so far as the Cotton Belt is concerned due primarily to the low price of cotton as a result of the loss of the world markets in the last several years?

Dr. TAYLOR. Of course that is a very serious factor in cotton production. I don't think that is the major factor in the changes in the structure of production which I am describing.

Mr. MAGINNIS. You don't think that primarily that is the cause of most of the difficulty in the Cotton Belt in line with what has been written in the last several years about the necessity of changing production in the cotton States to other commodities?

Dr. TAYLOR. There is, of course, pressure for lowered costs and undoubtedly machinery is sought as one of the means of meeting that. I agree entirely with that. I think the use of the machinery, then, is the factor that cuts the pattern which I described.

Mr. MAGINNIS. In other words, the price of cotton in the last few years due to the loss of the world markets has forced to a large extent placement of machinery for more economical operation to avoid, if possible, the giving up of the raising of cotton.

Dr. TAYLOR. Possibly hastened it. I think there is always pressure for lower costs of production in a competitive market.

Dr. KREPS. Dr. Taylor, in that connection, if the price of cotton should rise appreciably, is it your feeling that the pace of mechanization would be retarded or is it likely to be accelerated in that farmers will have more funds in order to buy machinery?

Dr. TAYLOR. I think that a rise in the price would accelerate the process; as has been presented here by preceding witnesses, the purchases of machinery depend in part upon the income of the farmers.

The VICE CHAIRMAN. The reduction of the number of people to be found on the farm would seem due to the fact that we have lost a good deal of the world market regardless of how we lost it. It takes fewer people to raise 10,000,000 bales of cotton than 15,000,000.

Dr. TAYLOR. Certainly.

The VICE CHAIRMAN. Then you have this mechanization and that has something to do with it. I wonder if our governmental farm policy—are you going to discuss that—has anything to do with it.

Dr. TAYLOR. The agricultural adjustment program? I am going to make one recommendation with reference to it if I am permitted to at the conclusion of this statement.

The VICE CHAIRMAN. If you will be permitted to do it. [Laughter.]

Dr. ANDERSON. Dr. Taylor, I have before me the figures of the Department of Agriculture on the production of cotton, just to clear

this point under discussion. It is your contention that these major mechanical mechanization changes have taken place in the last few years?

Dr. TAYLOR. In the Cotton Belt that is true.

Dr. ANDERSON. If that is true, that it has occurred, say, since the depression, since 1932-33, except for the year '37, we have had a rather steady production of cotton, so that the production of cotton itself would not be a factor.

Dr. TAYLOR. I think there is no question that mechanization is an extremely important factor in displacing people in the Cotton Belt.

MECHANIZATION IN THE WHEAT BELT

Dr. TAYLOR. In the Wheat Belt the combine harvester and tractor have been displacing farmers, laborers, and many of the townfolk dependent upon them, during 15 years or more. In Oklahoma, so the State commissioner of labor reports, adoption of the combine harvester was already so general by 1932 that laborers furnished by State employment offices to wheat farmers dropped from 11,298 in 1921 to 165 in 1932, and that the machine had—

* * * completely reversed our harvest labor problems of finding and distributing an adequate supply of labor to that of preventing a surplus from coming into the state during the harvest season, as an oversupply of labor in any locality is almost as disastrous as a shortage and more so as far as the community in general is concerned.

A notable and significant, if extreme, instance of mechanization and labor displacement in Oklahoma wheat was drawn to my attention in 1937. In one of the northern wheat counties one man had purchased successively 100 quarter sections. He introduces machinery, leaves one tenant on each section, and displaces from one to three tenants.

The effects of the combine harvester on the inland empire wheat country of eastern Washington were described in 1932 by the United States Department of Commerce in a report of Edwin Bates. The report quotes first a leading wheat farmer:

We no longer raise wheat here in eastern Washington; we manufacture it. With large tractors, gang plows, seeders and combines for production and trucks for transportation to shipping points, we have virtually a factory system of production in which horses are rapidly passing out of the picture, and labor demands are decreasing. Under the new system this "wheat factory" can run 24 hours a day. Most of our operations can be carried on at night if necessary. In dispensing with work stock we reduce the number of men required. (*Commercial Survey of the Pacific Northwest*, p. 273.)

Bates, after traveling through the country, noting the abandoned farm homes and talking with townspeople, observed significantly that—

* * * there are two sides to this story. It is easy enough to reconcile the above statement of the wheat rancher with that of the implement dealer who estimates that every time he sells a tractor he drives at least 5 customers off the farms. The general merchant has frequently expressed it as follows: "This movement toward power farming is damaging every small town in this section of the State. Towns which had a good volume of business a few years ago are now very dull. There are fewer farms and less people on them. A few years ago we had a heavy seasonal labor movement into this section. The harvest hands would come in about the 15th of July and stay through the greater part of the summer. Now the harvesting season is much shorter, and there is a

smaller number of workers. Our sales of work shoes and work clothing of all kinds as well as foodstuffs have fallen off very heavily.

These divergent points of view, (continued the Department of Commerce report) "one from the wheat rancher with his eye fixed on lower costs of production, and the other from the retail merchant whose interest centers in an increasing population with an expanding volume of retail sales, are evidence of the changes which the technical revolution in grain production is working in the economic fabric of this area."

Between 1920 and 1930 in 7 counties of eastern Washington affected by this process of mechanization, the average size of farm increased 25 percent, the number of farms declined 19 percent, and the population fell 15 percent.

The effects of machinery on the wheat country of North Dakota today are described in the March 1940 issue of *Rural Sociology* by Professor J. M. Gillette of the University of North Dakota. In an article entitled "*Social-economic Submergence in a Plains State,*" he writes:

There has been and is thus being formed a self-perpetuating class of socio-economically submerged individuals in a wide region where it would least be expected.

* * * Rapid mechanization of farm production and farm processes and forced foreclosure of farm mortgages during recent years are the most important of the immediate and local factors. New types of rubber-tire tractors which propel new and larger plows, disks, harrows, seeders, harvesters and threshers, cultivators, sprayers, and so on, are rapidly transforming much farming into a highly sedentary mechanized and technically industrialized business. These machines are rapidly displacing agricultural labor of regular and seasonal kinds. I was repeatedly told that within 6 years the number of laborers required to harvest and thresh a crop of grain has been reduced from three or five to one. This means a displacement of 2 out of 3 or 4 out of 5 workers. It is also displacing many small farmers. Many men who operated a quarter or a half section a few years ago with horse power are now operating from twice to four or more times as much with tractor power, combines, and trucks. Two or three men in Bottineau County are operating 45 quarter sections of land, with a very few men as hired laborers * * *. This alone has caused the displacement of many small farmers and scores of laborers. It is a most serious situation for the young men and women on farms who are just coming to maturity. Farming no longer has power to absorb them; and after remaining idle parasites on the farmstead for a time, they float into towns and villages, marry, and join the Work Projects (sic) Administration forces. For them and the stranded agricultural laborers and farmers there is no longer a retreat in great cities to join the armies of manual and white collar workers; for those cities are filled with unemployed millions, and new recruits generally soon apply for relief and are then sent back to the Dakota counties from which they derived and where their legal residence is.

Professor Gillette estimates the probable future extent of this "submerged class" at from 5 percent in some counties to 15 or 20 percent in others.

The VICE CHAIRMAN. Doctor, I don't know how limited your time is. You are covering things that ought to go in the record, but they are matters with which the committee are very familiar. If you are not in a hurry and have plenty of time just go ahead and read, but if you are in a hurry just discuss the points you want to discuss with us.

Dr. TAYLOR. My time is at your disposal, Congressman.

The VICE CHAIRMAN. How much more have you?

Dr. TAYLOR. I have a half dozen pages.

The VICE CHAIRMAN. We want that all in the record for the permanent record, but the men who are sitting at this table are pretty familiar with that general picture. We are anxious that you get to

the point where you are going to make some suggestions. Pick out anything in there in particular that you would like to call attention to.

(The material omitted appears below):

CORN BELT MECHANIZATION

Dr. TAYLOR. The Corn Belt, like Wheat and Cotton Belts, is experiencing rapid mechanization, and with similar effects—displacement of laborers, expanding farms, displacement of farmers, replacement of tenants by wage laborers. As early as November 1937, Ray Murray, formerly Secretary of Agriculture of Iowa reported:

Despite the fact that we have this year in Iowa one of the biggest and best crops for a period of some 20 years, and despite the fact that these products have been selling for a price above the average for the past 5 years, and despite the known resumption of normal business conditions which are as favorable in Iowa as in any other part of the United States, we still find that thousands of Iowa people, farm-trained and farm-minded, are still without employment * * *. The greatest contributing factor in this distressing picture is the mechanization of Iowa farms with modern power machinery * * *. One man with a tractor behind which he can haul two disks and one harrow can thus do at less expense and less time the work that 3 men and 3 horse-drawn outfits would in an earlier day * * * many Iowa farms are now equipped with three- and four-row power-driven corn planters, and three- and four-row tractor-driven corn cultivators * * *. Other farm operations such as haying have been greatly simplified and hastened in their operations by such labor-saving equipment as side-delivery hay racks, mechanical hay stackers, sweep rakes, hay loaders, universal adoption of slings for unloading, and so forth. Modern manure spreaders, grain elevators, portable feed grinders and other such modern machinery have, also, contributed greatly to the ease and speed of farm operations, but have not been so successful in contributing toward the employment of men who make at least part of their living from such farm operation. We have seen the tractor-pulled binder shorten the harvest of our small grains by a considerable length of time and the introduction of small threshing machines have made a couple of weeks' job out of what used to be a month or two's work every year during the harvesting season * * *. The use of such machines eliminates the services of thousands of men who previously found work shocking the crop of oats, wheat, barley, and so forth * * * we could say roughly that the mechanical corn pickers in Iowa this year are replacing 15,000 to 20,000 men who formerly were employed at hand picking during this season of the year * * *. With the exception of Des Moines and Sioux City * * * in * * * our cities and villages, all the people who are not gainfully or continuously employed either as hired help or in their own establishments are men who depend to a greater or less degree on whole or part-time farm labor as their means of subsistence. With one single machine eliminating the jobs of over 15,000 of this class of people annually and with similar situations arising from the use of other power machinery, one can easily glimpse the position in which these people now find themselves.

From the Illinois Emergency Relief Administration come reports on April 29, 1938, that suddenly the spring farm-labor supply conferences held to help farmers needing laborers have turned into conferences to help laborers needing farm jobs which no longer exist. From county after county the reports came in—

From Calhoun County: As in other counties, power machinery is supplanting farm labor.

From Greene County: The supervisor of Kane Township gave us, before the meeting, some very interesting information as to what is occurring in his township. There are 10 farmers who are planning to plant 75 acres of corn each and intend to cultivate this crop without any help. There is one farmer who is tending 1,500 acres of land. He has 6 tractors and will hire only 6 or

7 men, when previously between 15 and 20 men were employed to tend this amount of land.

From Ogle County: One person who is a farmer on a large scale, stated that modern machinery has replaced to a large extent the need of farm hands and has tended to level off the cycle of farm work. He stated that in his own community of Polo there have been 70 tractors sold during this last year and that as a rough estimate each of these has displaced one farm worker.

From Vermillion County: The farm advisor and several members of the Farm Bureau pointed out that the displacement of the casual farm laborer was due in a large measure to the general use of power machinery and suggested that some program of public employment would have to be planned to absorb these permanently displaced agricultural workers.

From Peoria County: It is reported from the Jacksonville area that farmers are using their tractors day and night rather than hire additional labor.

Displacement by machinery in the Corn Belt is not limited to farm laborers. For farm operators, too, it is extinguishing the chance to make a living from the land. The chairman of the Iowa Farm Tenancy Committee stated in 1938:

A matter which received considerable discussion * * * is the operating of a number of farm units by one operator, thus displacing many farm homes. * * * Landlords naturally seek the greatest net income from their land regardless of possible destructive effects upon the social conditions of the country. Farmers with large sets of machinery bid up the rent to a point where a tenant family with little power equipment can no longer compete with large-scale operators.

In July 1939 Wallaces' Farmer and Iowa Homestead carried an article entitled, "Pushing Farm Families Off the Land." A State-wide questionnaire was sent out which asked, "How many farmers who were running farms in your school district 3 years ago have been squeezed out as a result of such expansion by big operators?" Drawing its conclusion, after eliminating the shiftless and incompetent from the count of the displaced, Wallaces' Farmer states:

If this sample is typical of the State it means that over 6 percent of Iowa's farm families have been pushed off their farms in the last 3 years.

On March 9, 1940, Wallaces' Farmer published a leading article called *Men Left Without Land*, which states after a field survey, "If those questioned are representative, there are around 2,000 new landless tenants this year." Displacement comes about under a number of circumstances, which are reflected in the attitudes of people toward them, says Arthur T. Thompson, author of the article:

I have listened to a lot of talk, trying to size up attitudes. Not much is said, I find, when a man goes back on his own place. This is still a free country; it's got to be expected. Nor is there much talk when a farm is sold to an enterprising chap who has been a good tenant, or when a father helps his son to buy a place. There is a little more stir when one man keeps increasing his string of tenant-operated farms, but this depends on how he treats the tenants. Sometimes, through his capital help, the multiple landlord actually helps the tenant to make more money.

It's when a landlord throws off a tenant and starts working the land with hired help, especially trailer-house migrants, that voices raise and you see anger on men's faces. Or when the farm is leased to a nearby owner-operator who, say the neighbors, already has "a God's plenty."

A friend of mine says this thing is going to end up in a farm-tenant's protective association or something of the sort, just like the share-croppers' union of the South. That seems a little extreme, yet I wouldn't be too sure if greedy owners and landlords keep reaching for more and more land. As I said at the beginning, I have been looking into the eyes of these landless men, and I see something there that is pretty sure to snap if they are pushed too far.

Dr. TAYLOR. I should like to call attention to the fact that displacement is moving rapidly into the Corn Belt, which has always

been regarded as one of the most stable sections of our American social and political life, that the same pattern of displacement of laborers and of small farmers which appears in the Cotton Belt is now occurring also in the Corn Belt. Tractors, smaller combines, a variety of machines, are accomplishing that. The farm laborers are hit with the utmost severity, and the smaller farmers are now feeling the pressure of displacement from machinery, and they are writing to Wallace's Farmer and Iowa Homestead the same kind of letters that the displaced tenants of Texas are writing to the Dallas Farm News.

The VICE CHAIRMAN. When you say the small farmer do you mean the tenant farmer or the owner of a small farm?

Dr. TAYLOR. I think mainly they are tenant farmers. They are the northern counterpart of what in Texas you call, I believe, the tenant farmers on thirds and fourths, substantial citizens with a substantial amount of property who find themselves deprived of an opportunity to make their living on the land.

Studies have been made by Wallace's Farmer and Iowa Homestead which indicate that for the last 3 or 4 years this has been progressing at the rate of something like 2,000 tenant farmers per annum.

Dr. ANDERSON. Dr. Taylor, is that a new phenomenon in the Corn Belt area?

Dr. TAYLOR. So far as I know, that has not appeared in the Corn Belt before. Certainly it has not been conspicuous, either to outside observers or to the people themselves in the Corn Belt.

The VICE CHAIRMAN. It has to follow, though, that wherever you have curtailment or reduction of acres, regardless of whether you have to do it or not, when you put in machines—I mean it just has to happen. Any field of production where you curtail your acres as a part of the program and then you put in machines, of course, you will have reduction of hours of work, but the tendency of those two things is bound to put somebody off the farm.

EXPANSION OF HOLDINGS AFTER MECHANIZATION

Dr. TAYLOR. When you put in the machinery, the tendency is to expand the size of your farm, in order to make use of the otherwise unused capacity of your machine.

The VICE CHAIRMAN. And when you have an agricultural program that requires a reduction in the number of acres that you used to have in a given crop, then that means a reduction, too. I don't mean to say that it isn't necessary to do it, but that is one of the consequences.

Dr. LUBIN. Mr. Taylor, just how does this happen—I was interested in your statement to the Judge just now, in other words, the farmer buys more land in order to make the machine pay its keep, or does he refuse to rent his land?

Dr. TAYLOR. In the Cotton Belt, it usually starts by a renting of more land. Take, for example, the tenant farmers in the plains of Texas. If they expand the size of the farm by placing machinery upon it, it throws 2 farmers together and 1 tenant leaves. Sometimes 2 tenants leave if the landlord moves in and operates directly

with hired labor. There is a loss of status of the tenant-farmers and replacement with someone of the hired-labor status.

Dr. LUBIN. And the same thing happens in Iowa? What form does it take?

Dr. TAYLOR. Well, I think the record will show that the pattern is strikingly similar in Iowa to what happens in Texas, that one man leases more land, or not infrequently, that a farmer with means buys another farm.

The VICE CHAIRMAN. I happen to come from Texas. If a man who owns maybe five or six hundred acres of land, who used to have 5 or 10 tenants there, he would get in 1 or 2 hired hands and a tractor and the tenant would have to get out.

Dr. TAYLOR. I have seen that in Ellis County, Tex., which I understand is in your district.

The VICE CHAIRMAN. Right in my neighborhood; yes.

Dr. TAYLOR. I have here, Dr. Lubin, a description from the Des Moines Register of March 3, 1940, under the title "Tractor brings trend toward fewer and larger farms in Iowa," which tells exactly what is happening. I don't know whether you wish to hear it.

The VICE CHAIRMAN. Let's hear it.

Mr. TAYLOR (reading):

Is it "good" or is it "bad"? Is it toward an agriculture based on a more stable family-sized farm or is it toward a different kind of farming community?

Apparently the movement is dual. In some instances it is toward a healthier farm community in terms of the past—the owner-operator farming with little or no hired help but with all members of the family pitching in, the individual farm and the community based on farming as a way of life as well as a business. But in other instances the change seems clearly to be toward something different. AND THE DIFFERENCE BETWEEN THESE TWO TENDENCIES IS LARGELY ONE OF DEGREE.

In some cases, multiple farm operation is undoubtedly better for the soil.

But what about the people? Is it better to have a large number of farm families barely above subsistence levels or a smaller number operating larger units and earning incomes in excess of their minimum requirement? Better, certainly, for those who survive, but is it better for those who lose their farms? THEY MUST BE TAKEN CARE OF—IS IT BETTER TO TAKE CARE OF THEM IN THE COUNTRY OR IN THE CITIES AND TOWNS?

These problems will press us more fiercely if multiple farm operation radically changes our Iowa economy in a direction in which the other phase of the trend seems headed. Larger farms means fewer farms; fewer farmers and more mechanization mean fewer farmers and their families. And this means keener competition among tenants for farms, with greater insecurity for those who get farms and many who do not get farms.

It means a larger transient population, moving from county to county, state to state, with hurt to themselves and damage to institutions like the school. It means, probably, a larger agricultural proletariat class * * *.

This problem, like all problems of its kind, will not be solved by blind passionate opposition. Its solution demands that we answer in our own mind the question, "What kind of an agriculture do we want?"

The VICE CHAIRMAN. What kind of a citizenship do you want, too.

Dr. TAYLOR. Certainly.

The VICE CHAIRMAN. That is involved.

Dr. LUBIN. Does this mean that it is harder for a man to rent a farm in that area now than before the tractor came up?

Dr. TAYLOR. Unquestionably; for many, impossible.

The VICE CHAIRMAN. I live in that country, and the year before last I was in a community where the sons of people whom I had known ever since I have been in Texas, friends of mine, young fellows, wanted to have a home and they were good people. They told

me that it is absolutely impossible for them to rent a place. They were young fellows who wanted to farm awhile and then buy a place after awhile, and they just couldn't rent a place anywhere.

Dr. TAYLOR. Traditionally, we have insisted upon maintaining the agricultural ladder as the opportunity by which men could rise. As the capital equipment on farms increases, it becomes increasingly difficult to ascend that ladder from laborer to owner, and for those who make the ascent it becomes increasingly a matter of inheritance. Those who are not favored in their parentage find increasing difficulties.

The people in the Corn Belt are becoming conscious of that, as I am sure they are in your country.

The fullest development of mechanization with which I am familiar in the field of agriculture is in the fruit and vegetable industry. There, mechanization has transformed market gardening into a highly mechanized industry within a generation, with factory methods of production on the land, factory methods of processing materials, and with hordes of laborers working in gangs at piece rates on the land, moving from harvest to harvest, hired and fired in the manner familiar among old-fashioned industrialists.

There should be called to the attention of this committee, it seems to me, the fact that when mechanization has moved as far as it has in the vegetable industry there is apt to take place an integration, the same sort of thing that occurs in, say, the manufacture of automobiles, a control of the industry spreading from a processor clear back to the land, or from the middleman back to the land.

The concentration of economic power with which you are so familiar in industry has its counterpart in the vegetable industry.

Dr. KREPS. Dr. Taylor, do you have any figures showing the extent to which you have concentration of production in agriculture in California—in various agricultural products?

Dr. TAYLOR. As you know, Dr. Kreps, a subcommittee of the Senate Committee on Education and Labor recently came to California in order to make investigations in agriculture. Their staff has furnished me with a table showing crop concentration. Perhaps the committee would like this introduced in the record?

Dr. ANDERSON. Yes. Mr. Chairman, the table should be admitted to the record.

(The table referred to was marked "Exhibit No. 2685-A" and is included in the appendix on p. 17455.)

Dr. TAYLOR. I think you have that before you. I might then read just three or four examples of the crop concentration.

In canning asparagus, for example, based upon 1939 data, 1½ percent of all producers produced 23.4 percent of the entire product in terms of deliveries to canneries. In cotton production, 3.5 percent of all producers produced 33.3 percent of cotton in terms of acreage.

In lemon production, less than 3 percent of all producers in 1940 produced 34.6 percent in terms of acreage.

There are other ways of measuring concentration. Under the A. A. A. program, for example, the sugar-beet concentration of the production shows 2.1 percent of all payees received 20.6 percent of the total of all payments under the program. For agricultural conservation, 2 percent received 43.6 percent of all payments.

There are other measures also. Ten percent of all farms in California received 53 percent of the 1939 gross farm income; 9.4 percent of all farms made 65 percent of all expenditures for wage labor in 1929.

The VICE CHAIRMAN. Doctor, will you kindly repeat those figures just before you gave us these figures? I would like to ask you to repeat the acreage there, if you have it. Will you repeat the figures just before the ones you have just given?

Dr. TAYLOR. The sugar beets?

The VICE CHAIRMAN. No; the income.

Dr. TAYLOR. Ten percent of all farms received 53.2 percent of the 1939 gross income. Is that it?

The VICE CHAIRMAN. Yes. Now, I wanted to know what acreage, what relative acreage, did that 10 percent in number make up?

Dr. TAYLOR. I am not able to answer that question, but I may say this, that with respect to California, acreage is the most misleading measure of concentration.

The VICE CHAIRMAN. Yes; that is so.

Dr. TAYLOR. Much more in my State, I think, than in yours, because we have everything from range land to irrigated acreage.

The VICE CHAIRMAN. That is right.

Dr. TAYLOR. And very often, on 20 acres, we have a tremendous product. So, I think the measures which are employed in these figures are more accurate than if I tried to give you an acreage figure.

The VICE CHAIRMAN. Yes; I know that is so, and I beg your pardon for asking the question.

AGRICULTURAL CONCENTRATION BY STATES

Dr. ANDERSON. One question before we leave this important exhibit. This, I take it, is a measure of the concentration in California agriculture. Dr. Taylor, are there any comparable figures available anywhere concerning agriculture concentration State by State?

Dr. TAYLOR. There are, Dr. Anderson; I have had prepared the next chart, which—

Dr. ANDERSON (interposing). I think I anticipated you.

Dr. TAYLOR. Shows the percentage distribution of number of farms and value of all products sold, traded, or used in the United States in 1939.

Dr. ANDERSON. That will be admitted to the record.

(The chart referred to was marked "Exhibit No. 2686" and appears on p. 17057.)

Dr. TAYLOR. You will observe there that 1.4 percent of all of the farms of the United States produced 15 percent of all products by value, or combining the lower two categories, that 3.9 percent of all farms produced 25.6 percent of all products by value. The chart which follows presents figures for the United States on another basis.

(The chart referred to was marked "Exhibit No. 2687" and appears on p. 17058.)

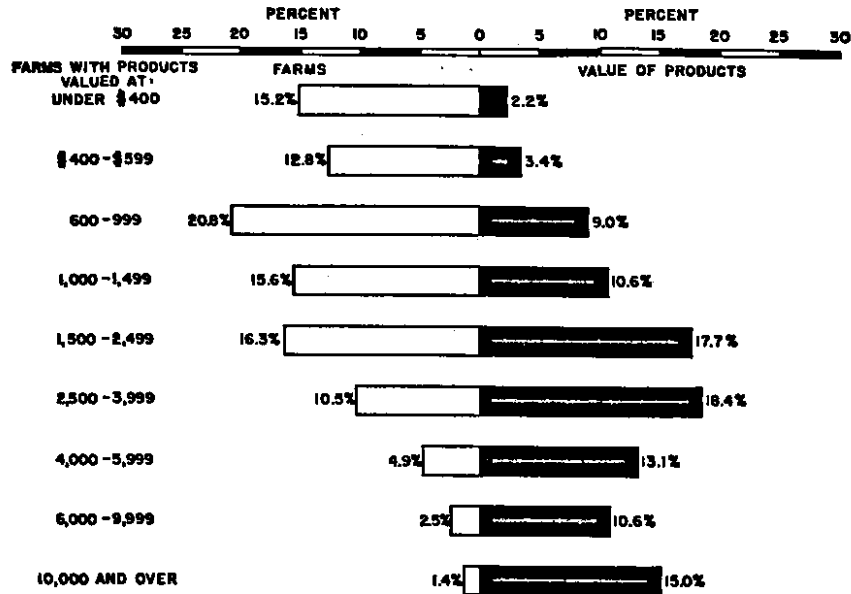
Dr. TAYLOR. This chart classifies farms of the United States in terms of the numbers of laborers employed per farm. In July of 1935, this was estimated by the Social Security Board from the census of 1935 and the seasonal indices of the Bureau of Agricultural Economics.

May I call your attention to the fact that some 78 percent of all farms in the United States, of the 6,800,000 farms, employed no laborers, no hired laborers at all.

Dr. KREPS. Do you mean to imply by that that taxes on labor, such as social security taxes and others, would leave such farms completely exempt?

EXHIBIT No. 2686

[Submitted by Dr. Paul Taylor]



UNITED STATES

PERCENTAGE DISTRIBUTION OF NUMBER OF FARMS AND VALUE OF ALL PRODUCTS SOLD, TRADED, OR USED. 1929

SOURCE: COMPILED FROM 1930 CENSUS

Dr. TAYLOR. Virtually that, Mr. Kreps. You realize that this figure is employment at a particular month in the year, so it is not identical with your question, but it comes fairly close to answering your question.

Dr. KREPS. Would you say that July was a period in which, on the whole, the amount of farm labor would tend to be as large as in any other month during the year?

Dr. TAYLOR. Something below the peak. It is a month of large employment, but below the peak.

Dr. KREPS. At any rate, better than average, possibly?

Dr. TAYLOR. It is average or a little better.

EXHIBIT No. 2687

[Submitted by Dr. Paul Taylor]



UNITED STATES

FARMS AND WAGE WORKERS, BY NUMBER OF WAGE WORKERS PER FARM

CUMULATIVE PERCENTAGE DISTRIBUTION ESTIMATE

JULY 1935

SOURCE - WENZEL, SOCIAL SECURITY BOARD

Dr. KREPS. That would mean then that, on the whole, we tend to subsidize, as I get it, large-scale agriculture in the United States and mechanization in large-scale agriculture?

Dr. TAYLOR. Well, it seems to me that there is another way of looking at the exemptions from social legislation which generally Congress has granted to agriculture. I think in general it has been felt that because of the peculiar importance of agriculture to our national life, and for some other reasons, it was appropriate that social legislation should exempt agriculture.

I think upon examination of "Exhibit No. 2687" it becomes plain that that is not exactly what we have been doing. On the contrary, you notice that most of the farmers employ very little or no labor. It has been proposed by the Social Security Board, for example, that old-age insurance should be extended to cover hired farm laborers with exemptions for the family farmer. So that an agricultural labor exemption which is complete in its coverage of agriculture, it seems to me, may well be looked at as a public subsidy, not to agriculture in general but to a particular manner of carrying on agriculture. In other words, it is industrialized agriculture which in a sense is in competition with the working farmer, that we are subsidizing by our so-called exemptions to agriculture, and insofar as mechanization plays its role in building up an industrialized form of agriculture we are thereby subsidizing further displacement from the land and reduction of working farmers in status.

Dr. KREPS. I believe you will recall that there was a reemployment commission recently, will you not?

Dr. TAYLOR. Yes.

Dr. KREPS. Do these farm laborers receive support from other groups, and particularly from governmental groups, in addition to the support which they receive during the time they are employed on the farm? Is there a seasonal problem there?

Dr. TAYLOR. In terms of relief?

Dr. KREPS. Yes.

Dr. TAYLOR. There is a very serious relief problem, and the curves of employment on the land and of relief show a very considerable dovetailing, which means, of course, that the taxpayers of California are supporting the unused labor supply of the agricultural enterprises during their slack seasons.

May I ask, with further reference to the suggestion that I have just made, that we look again at the effects of the agricultural exemptions which we have granted in the past. The President's Farm Tenancy Committee of 1937 recommended to Congress that it give very careful consideration to the extension of social-labor legislation to agricultural enterprises above the size operated by the working farmer.

Dr. LUBIN. Dr. Taylor, if the social security, that is, the unemployment compensation and old-age insurance, were made applicable to agriculture, as far as this industry itself is concerned, only about 20—what is it, 21 percent of the farmers!—would have to pay any taxes for social security; is that right?

Dr. TAYLOR. It depends on where the exemption is drawn.

Dr. LUBIN. I don't mean—

Dr. TAYLOR (interposing). If it covered all of the labor, the figure based upon the 1935 census is something like 22 percent.

Dr. LUBIN. In other words, 22 percent of the farmers would have to bear the burden?

Dr. TAYLOR. That is right.

Dr. LUBIN. That is, pay taxes. Now, if you put it at, let's say you exempted every farmer who had one employee?

Dr. TAYLOR. If you exempted every farmer who has 1 employee, only 6 percent of the entire 6,000,000 would be covered. You understand, I am giving you simplified figures that would need elaborating in a more careful discussion.

Dr. ANDERSON. Suppose you made it on a parity with present conditions of the Unemployment Compensation Act; how many farmers would be affected, how many employers? What would the proportion be?

Dr. TAYLOR. Well, the Unemployment Compensation acts vary from State to State, I believe. The Federal has an exemption of four.

Dr. ANDERSON. That is right.

Dr. TAYLOR. A good many States, I think, have no exemption.

Dr. ANDERSON. Suppose we took an exemption of four?

Dr. TAYLOR. Well, if you took four, it appears that 1.6 percent of our agricultural employers employ something over one-third of all the hired labor. May I point out a further aspect of this problem of coverage of agricultural employers and their employees by social and labor legislation? May I refer now, Dr. Anderson, to my next chart? It is the average cash expenditure for labor performed, reporting by tenure of operator.

Dr. ANDERSON. That will be admitted.

(The chart referred to was marked "Exhibit No. 2638" and appears on p. 17061.)

CASH PAYMENTS TO LABOR

Dr. TAYLOR. This chart is derived from the 1930 census. It shows the average expenditures in cash for farm labor per farmer reporting. In other words, all of the farms which spent no cash for labor are excluded, and we are dealing here only with that minority of farms which spent money to hire labor.

Please note, at the top, for the United States as a whole, the average cash expenditure for farm labor was \$356, by owners. The open bars refer to owners, the next bars refer to tenants, and the solid black bars refer to farms operated by managers. Please note that the average expenditures for owners are \$365 a year; for tenants, \$261 per year; and for managers, \$2,985.

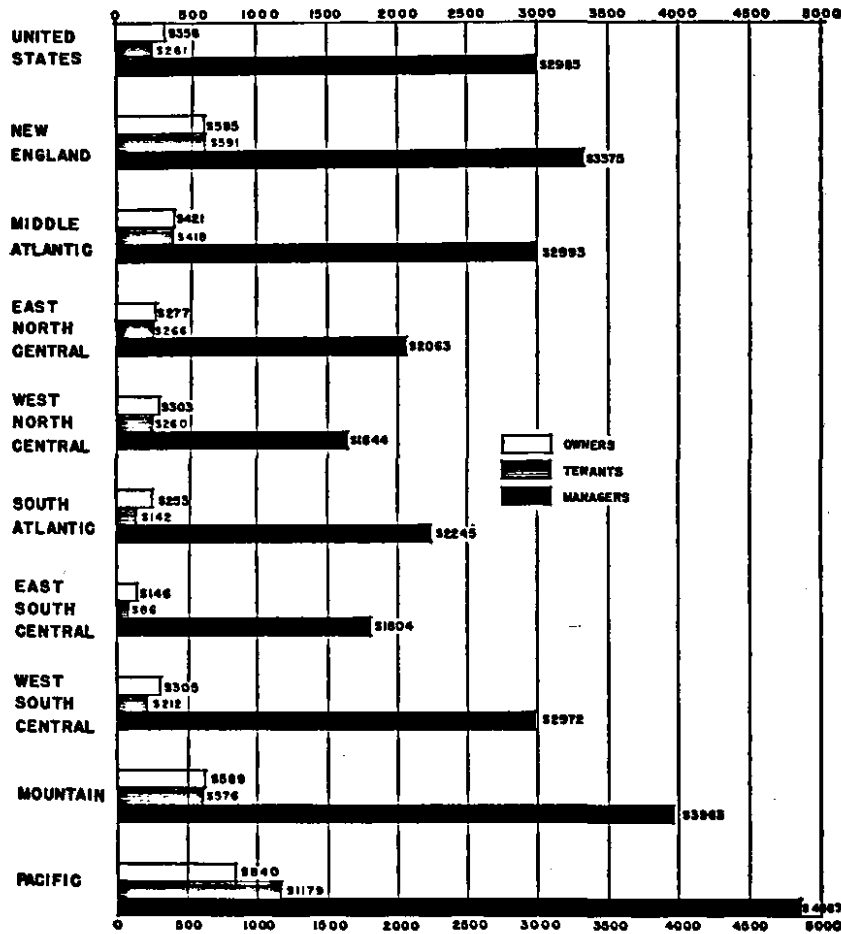
Dr. TAYLOR. The chart permits you to carry out comparisons of that kind through every division of the country. The point of the chart is this: That the manager-operated agricultural enterprise typically is the industrialized enterprise, and if these so-called agricultural exemptions were removed, retaining always an exemption for the man who is a bona fide working farmer, the enterprises which would be most surely covered, are those where the manager-hired labor type of industrialized agriculture has developed.

Dr. LUBIN. In summarizing your previous statement then, is it fair to say that insofar as your agricultural industry does not give steady employment and consequently, places upon the rest of the economy the burden of taking care of the people who are not unemployed during

periods of slack, that 78 percent of the farmers insofar as they are taxpayers, and consequently through their taxes, are helping to support the unemployed, are helping to bear the burden to provide a sufficient—

EXHIBIT No 2688

[Submitted by Dr. Paul Taylor]



AVERAGE CASH EXPENDITURE FOR LABOR,
PER FARM REPORTING, BY TENURE OF OPERATOR

SOURCE: 1950 CENSUS

FARMS NOT REPORTING EXPENDITURE FOR LABOR ARE EXCLUDED

Dr. TAYLOR (interposing). In connection with which they have now a problem.

Dr. LUBIN. To the other 21 percent, when they need a sufficient supply.

Dr. TAYLOR. The answer, Dr. Lubin, is yes. I would like to make just one additional remark at this point, so if anyone examines the

record, he will realize that these conclusions are based upon that single estimate. There should be compared with these estimates the expenditures for labor derived from the 1930 census, so that you cannot say, 21 and 78 percent. You must give other estimates which show a range.

In principle, your statement is correct, but I wouldn't want someone to read from the record and quote me as apparently ignorant of the fact that other estimates might be made which would vary somewhat from the answer I have given.

Dr. ANDERSON. Go ahead.

Dr. KREPS. Pursuing that question of integration, Dr. Taylor, just a bit further, as I understand this statement of yours, this isn't only a matter of concentration of production in agriculture as such, but an interrelationship between agriculture and variety of enterprises of industries, that is, concentration in agriculture as a part and parcel of concentration in variety of industries. Is that correct?

Dr. TAYLOR. I think that is essentially correct, Mr. Kreps. You are undoubtedly familiar with the reports of the subcommittee of the Senate Committee on Education and Labor, which have developed that, I think, very fully. They have pointed out, for example, the development of large-scale processing corporations which move back into control of the land through ownership, through financing, leasing arrangements, and so forth.¹

Again, my emphasis is that although in California we perhaps have the most extreme development of this industrialized and integrated agriculture, it is very conspicuous in quite a number of other parts of the country. For example, one of our largest corporations, the California Packing Corporation, to quote from some testimony which recently was introduced into the Senate committee record, "the California Packing Corporation owns and operates some 20,000 acres of farm land in California, valued at \$9,000,000. In Illinois, Hawaii, and the Philippine Islands, the corporation leases and operates 47,000 acres additional. The American Fruit Growers, Inc.," continuing the quotation, "is another Nation-wide shipping and brokerage firm which controls a considerable amount of farm property. It owns some 15,000 acres of farm land in 10 States, of which 2,500 were planted with citrus fruits, grapes, and vegetables in California. In 1936, this company handled 34,225 cars of fruit, of which about 9,000 cars originated in California and Arizona, where the company maintains 31 packing houses."

Mr. PIKE. They get the same exemptions from social security, wages and hours, as any farmer would get, do they?

Dr. TAYLOR. It would be difficult to answer your question yes or no, because each of the laws has its own definition, its own—

Mr. PIKE (interposing). The statute would vary?

Dr. TAYLOR. The statutes vary. I have been discussing in these charts the employment of workers for cash on the land. Now, I point out the fact that the processing industry has moved back on the land. The exemption of those who work in the processing plants, and those who work on the land for farmers are somewhat different in nature.

Mr. PIKE. Yes; but these people, when they are farming, get all the compensations that family farmers get? I mean in their farm operations.

Dr. TAYLOR. Not entirely, but to a large extent, that is true.

¹ See Hearings before the subcommittee of the United States Senate Committee on Education and Labor, Part 47, pp. 17353 ff.

Dr. LUBIN. Well, as far as they employ workers in agriculture on the land they are exempt from social security and the wage-and-hour law, those people.

Dr. TAYLOR. I believe that under the latest amendments, that is so.

Dr. LUBIN. But as I understand the law itself, in other words, the corporation happens to be running a farm and doesn't pay any social security taxes for the workers working on that farm directly, that is, on the land hoeing, plowing, and so forth.

Dr. TAYLOR. They did until the amendments of a year ago.

Dr. ANDERSON. Are we to understand, Mr. Taylor, that these corporate groups engaged in processing, moving back now onto the land, who come from California and ramify out into other States and other counties, are to be found not only in California, but elsewhere over the country, that is, developing to the extent that this begins to characterize an aspect of the agricultural change?

Dr. TAYLOR. It appears to be of growing importance. Certainly it characterizes portions of the country like Florida and south Texas and other important fruits and vegetable producing areas. I think it is a very significant development.

Dr. ANDERSON. Has it moved beyond the fruit and vegetable producing groups into any of the other agricultural groups that you know of?

Dr. TAYLOR. I do not.

Dr. ANDERSON. Milling houses, for example are not engaged, as you know them?

Dr. TAYLOR. I am not able to answer.

CITIZENS' ASSOCIATIONS AND FARM LABOR

Mr. KREPS. Again, referring back to this report by the Committee on Education and Labor, on violations of free speech and rights of labor, and particularly part 46, I notice throughout that subpoenas are issued to about the same groups. Is this an integrated group? Was this subpoena issued on the whole to the same group but with different interests? I'd like to read some of this group to you because the variety of interests involved is truly amazing. They start with the Associated Farmers of California. I presume that is the farm organization.

Dr. TAYLOR. That is the organization of the agricultural employers.

Mr. KREPS. Then I notice immediately Industrial—

Dr. TAYLOR (interposing). Processors.

Mr. KREPS. Yes. Then I notice Industrial Association of San Francisco. Is that affiliated with the farm group?

Dr. TAYLOR. It had relations with the Associated Farmers. I believe the committee reported or found that it had financed in part the Associated Farmers. The Industrial Association no longer is in existence.

Dr. KREPS. Well, then, I notice that they have the Growers-Shippers Vegetable Association, as you indicated a moment ago, a citizens' association of various areas. Then the California Processors and Growers, and then the chambers of commerce, I take it, in California, find kindred interests in the agricultural groups.

Dr. TAYLOR. I believe, Dr. Kreps, that the committee was concerned with these various organizations because it was endeavoring to ascertain the facts concerning interrelationships which developed concen-

tration of economic power. I am not in a position to speak in the fullest detail. I am sure they appear amply in the reports. I know that it is the purpose of the committee, in general, to discover those relationships, and I assume that that is why those subpoenas were issued. Its reports will show the facts in full concerning your question.

Dr. KREPS. That means, then, that on the whole the assumption is correct that these organizations are all interrelated and subject to a common control, for example, the Association of San Francisco Distributors, the San Francisco Retailers Council, the Water Front Employers Associations, and Southern Californians, Inc.?

Dr. TAYLOR. I am speaking now from newspaper reports written very largely at the time that the Senate committee held its sessions. I believe it is largely an employers' organization which has had very close relations with the agricultural employers.

Dr. KREPS. Organized to attract tourists?

Dr. TAYLOR. No, not at all; concerned to a considerable extent with labor relations on the farms in California.

Dr. KREPS. I notice other organizations, the Union of California Citizens, California Crusaders, Neutral Thousands, Women of the Pacific, Merchants and Manufacturers Association, East Bay Defense Association. Are those interrelated?

Dr. TAYLOR. They are a wide variety of organizations into which the committee made inquiries. No simple answer would cover, and in fact I can't give you a categorical answer with respect to them, but I am sure that the Senate committee report which is now in process of publication would carry a full answer to your questions. I was furnished today with a typewritten listing of expert testimony presented at hearings of the Subcommittee of the Senate Committee on Education and Labor with reference to the concentration of economic power in agriculture and allied industries in California.¹ It may be that you would wish to carry this in your record. I am sure it would answer your questions more completely and satisfactorily than I can.

Dr. ANDERSON. The exhibit is accepted for the record.

(The document referred to was marked "Exhibit No. 2689-A" and is included in the appendix on p. 17456.)

Dr. KREPS. I get the impression that this is a regional economic empire. Do you know whether it obtains on the Pacific Coast?

Dr. TAYLOR. Perhaps that is a good way of characterizing it. Certainly the interrelationships between the various elements of industry and agriculture are close and the controls are more or less centralized or at least coordinated, I think, to a rather surprising degree.

Dr. KREPS. So that the mechanization in agriculture is tied up with mechanization in industry and gives us a concentrated economic control both of agriculture and industry.

Dr. TAYLOR. I think the evidence shows a good deal of what you have just stated.

The course of mechanization and economic development has run so far in sections of the fruit and vegetable industry, that the patterns produced by its advanced stages of development, merit examination. As early as 1929 Wells A. Sherman, late chief marketing specialist of the Bureau of Agricultural Economics said:

¹ See hearings before the subcommittee of the United States Senate Committee on Education and Labor, pt. 46.

"Within a generation market gardening has largely changed from a hand and horse to a mechanized industry. The changes in the production and handling of most of our annual vegetable crops have been generally comparable to the changes in industries once conducted in homes or private shops but which are now centralized in immense factories. These changes begin with seed production and run through to the final delivery of the goods to the consumer. They comprehend all of the changes from their small beginnings to the present era of mass production.

"* * * squat labor is as essential to our mass production of some vegetables as is the tractor or power sprayer * * * In the harvesting of most truck crops and all fruit crops a large amount of hand labor is still necessary. To meet this need we have thousands of itinerant harvesting and packing crews in the fruit districts picking the fruit from the trees and performing every operation in the packing house; in the vegetable districts, selecting and picking cantaloupes or tomatoes, or * * * cabbage. Mass production has thus brought about what may be called the mechanization of the human element in the industry. The harvesting gangs are called in when wanted just as the tractor and the gang plow are brought out of the sheds when needed. These waves of itinerant labor ebb and flow with the seasons. Almost every district of important specialized commercial production counts upon them as it counts upon the succession of the seasons * * *.

This policy of "hire and fire," without responsibility for carrying the overhead cost of supporting their laborers between seasons is itself a contributory factor to that acute specialization which makes employment so highly seasonal and laborers so mobile. Under this system, which utilizes foremen, gang labor, piece rates, recruiting by labor contractors, the personal paternalism traditional between farmer and hired man is virtually absent, unemployment is intermittent and severe, milling about from crop to crop is necessary in order to obtain work, the average annual earnings are low despite wage rates which appear high, and opportunity to ascend the agricultural ladder from laborer to tenant is practically closed.

In some areas, particularly in the West, the vegetable industry has become highly integrated, not infrequently with a single corporation carrying on every phase from planting the seed to marketing the product in cities 3,000 miles away. Some corporations maintain extensive field and processing activities scattered all the way from Washington and Arizona to Florida. Ranch headquarters maintain direct wire services to sensitive eastern markets, and have the appurtenances of modern business offices.

FUTURE OF FAMILY-SIZED FARM

Dr. TAYLOR, May I, in conclusion, on the California situation, quote to you briefly from the official organ of the fruit and vegetable industry in our State, the Western Grower and Shipper of Los Angeles, which describes itself as "a monthly publication serving the West's great fresh-vegetable and melon-growing shipping industry." It says in October 1939 that the family-size farm cannot survive in California agricultural industry, particularly of its type:

It is true, of course, that a large sector of California agriculture is industrialized. * * * The incidents of husbandry, the family-sized farm with all of its pastoral glamor, is a lovely idyll—elsewhere than most sections of California. California is not unfriendly to husbandry and farming as a mode of life, but costly experience has shown that a large percentage of its acres, no matter how attractive to the inexperienced eye, are not suited to such purposes. The history of attempted development of many sections now successful under industrialized agriculture to small farming is a history of blasted hopes and broken hearts.

Mr. PIKE. Do you subscribe to that view?

Dr. TAYLOR. I think, on the whole, that is pretty close to the truth. You understand I am not generalizing for the United States as a whole.

Mr. PIKE. But where irrigation costs are high, and all that?

Dr. TAYLOR. Yes. The course of economic development very clearly is adverse to the family farm. We had them there. They were swept out by the process which I have been describing.

Dr. ANDERSON. Do you generalize from that? Would you care to even hint at such possible tendencies with respect to the rest of the country and other crops?

Dr. TAYLOR. I think that the testimony which I have prepared, not all of which I have read, but which I take it you are more or less familiar with, shows very clearly the appearance in widely separated areas of agricultural production on a pattern of industrialized agriculture—the Wheat Belt, the Corn Belt, the Cotton Belt, fruits and vegetables.

The VICE CHAIRMAN. Doctor, do you find any parallel between this tendency with regard to agriculture and the tendency of a good many years ago, which has greatly developed now, where the little manufacturer went out of business?

Dr. TAYLOR. I think that there are a great many parallels between the entry of machines on a large scale into agriculture and the entry of machines into industry. Certainly I think we are in the earlier stages of an important counterpart to what we call the industrial revolution.

The VICE CHAIRMAN. Isn't that perhaps one of the biggest things in this whole picture to be looked at?

Dr. TAYLOR. It seems to me that it is.

The VICE CHAIRMAN. You have something to go out and sit on the fence a good while and think about.

Dr. TAYLOR. May I, Congressman, read a couple of pages which will perhaps open up some other aspects of this problem? I want to speak for a moment on changes in status of farmers and the hired man.

Ninety years ago during the debates on the homestead bill, a Congressman from Indiana voiced the traditional American ideal of working farmers on the land in these words:

Instead of baronial possessions, let us facilitate the increase of independent homesteads. Let us keep the plow in the hands of the owner. Every new home that is established, the independent possessor of which cultivates his own freehold, is establishing a new republic within the old, and adding a new and strong pillar to the edifice of the state.

American land policy and pioneer conditions developed a common type of farm-operator known as "the farmer," distinguished alike from the European peasant and the landlord. "The farmer," says Dr. Joseph Schafer of the State Historical Society of Wisconsin, in a description of the type, "is one who operates a 'family-sized farm' for a 'living,' rather than for 'an actual or potential modern fortune'; a farm on which the owner and his son or sons can perform the actual work of tillage, the female members of the household smoothing the way by providing home comforts, assisting about chores, or in field or meadow as pressure of work may indicate. Hired men are rather the exception than the rule in this typical agriculture. So far as they are employed, it is usually with the instinctive purpose of raising the labor force to

the normal family plane rather than in hope of abnormally expanding the business beyond the family-farm size."

The progress of technology on the land not only displaces many of this type of farmer and his hired men; it also changes their status. The type of land operator which may result when change runs its full course can be illustrated from the citrus industry of southern California. The "farmer" is being displaced there not physically, but in a far subtler fashion which leaves him a resident on the land, but strips him of the traditional functions of a farmer who tills the soil. The packing of his fruit is usually performed in large packing plants cooperatively or privately owned, valued on the average at \$100,000, highly organized, and not located on the farm. But more than that, even the work in the grove of pruning, fumigating, spraying, picking, and so forth, commonly is performed by gangs of laborers under contract, or employed and directed by the manager of a citrus association. In an economic affidavit prepared for California citrus employers this has been stated by J. Eliot Coit very succinctly:

The term "farm" in the old or commonly accepted sense in the East, South, and Middle West is long since obsolete in respect to the highly specialized agricultural occupation of growing such products as citrus fruits, walnuts, avocados, and a large number of other specialty crops grown on the Pacific coast.

In some instances this removal of the farmer from work has become so complete that Mr. Coit declares:

In fact, there are some farmers who do no manual work on their farms.

To most Americans accustomed to thinking of farming as a family enterprise carried on by a "farmer" working beside his sons and an occasional hired man, these citrus growers clearly are no longer "farmers." Their functions, as such, have been progressively assumed by associations, corporations, and labor contractors.

Another subtle change away from the American farmer type results from replacement of "farmers" by managers, especially on large-scale and multiple farms. Such absentee operation of the land is perhaps more common than supposed. According to the census of 1930, one-eighth of all cash wages paid to farm laborers in the United States were paid by farm managers, and in Arizona and California one-quarter.

These changes which affect the status of the farmer have their counterpart in changes which affect the wage worker. It is a far cry from the migratory gang labor of industrialized cotton farms and the vegetable industry to the "hired man" described 20 years ago by Henry C. Taylor, now head of the Farm Foundation, in these words:

On the general farm in the northern part of the country the typical wage worker on the farm is a young man who is temporarily a member of the farmer's family as well as part of the farm crew. He eats at the family table, reads the paper in the family living room after supper, puts his soiled clothes into the family washing, and in general shares the life of the farm home. If he is a good hand he will soon become interested in the work of the farm and attached to the farm by many ties other than the wages he draws. This young man is a part of the farm family, and whether he is contented with the life and interested in the work depends largely upon the success of the farmer and his wife in developing sympathetic and happy relations. There are no class distinctions. The young man expects to become an independent farmer and feels that he is gaining skill, money, and credit which will enable him to establish a home of his own in a few years.

That is a picture of a scene which is passing in many parts of the country.

The VICE CHAIRMAN. Doctor, that was largely true, too, with the small cabinet maker, the small implement maker, just a few decades ago.

Dr. TAYLOR. Yes; the apprentice became the journeyman, married the daughter of the master, and became a master himself.

Dr. ANDERSON. I take it that is what you implied by "the ties that bind."

Dr. TAYLOR. If I may proceed, I have about 3 pages more which bring this together.

Perhaps I am wearing you out.

The VICE CHAIRMAN. No, sir, you are not. You are one doctor that seems to know what he is talking about.

Dr. TAYLOR. The course of mechanization in agriculture reveals a strong economic pressure to expand the scale of farm operations. Enlargement of the farm results in manifest benefits to those who are successful in thus obtaining fuller utilization of their machines, and some benefits may accrue also to laborers who are retained. But the effects of technology fall unequally upon our agricultural classes.

DISPLACEMENT OF FARM OWNERS AND LABORERS

Dr. TAYLOR. Many farm families—both farmers and laborers—are being displaced completely or driven into uneconomic subsistence agriculture. The result of combined forces—a narrowed outlet for farm youth in industrial employment, a high rural birth rate, and the introduction of machines—is a piling up of rural population on poorer lands. The Dallas Farm News, citing a study of the United States Department of Agriculture, stated on April 5:

Mechanization has driven many of the farmers from the better land and forced them to live on poorer land, subdividing the remaining small farms in poorer areas.

When mechanization achieves success in planting and cultivating, but not in harvesting a crop, agricultural employers must then depend for the harvest upon hordes of underemployed, mobile laborers. These conditions are conspicuous already in vegetable and fruit production and are spreading in cotton. This stratification upon the land is accompanied by bitter strife. It has appeared in the Arkansas delta and the Missouri boot-heel, in the onion fields of Hardin County, Ohio, where industrialized agriculture is conspicuous, in the potato fields of southern New Jersey, the pea fields of Idaho, the cotton fields of Arizona, the orchards of Yakima Valley, Wash. Its intensity in California and adjoining States moved the United States Senate last year to appoint a committee to investigate and report on violations of civil liberties in agriculture on the Pacific coast.

The socio-economic displacement pattern varies when mechanization of all processes from planting to harvest is completed. The seasonal laborers in wheat are virtually eliminated from all employment where the combine harvester is adopted. Farmers are completely displaced by enlarging farms, and merchants suffer. The success of sugar beet or onion harvesting machinery would strand the communities of beet and onion tenders now resident and necessary in Colorado and Ohio.

In the Corn Belt the effects seem to follow different directions. Expansion of the farms of middle-sized farmers eliminates other middle-sized farmers and smaller farmers. Carried far, this trend results

in industrialized farms, multiple farms, change in status from tenant to hired labor, displacement of both laborers and farmers, and commercialization of the relations between agricultural employers and those wage workers whom they retain.

On March 3, 1940, the Des Moines Register, in the heart of the Corn Belt, stated:

All in all, our Iowa agriculture may be on the road toward a sharp division into three kinds of farming: (1) large, highly industrialized, commercialized and mechanized crop farms; (2) specialized farms such as for dairy and hog operations, which are largely independent of the size of the farm and have been profitable in spite of ruinous grain prices; and (3) subsistence farms, growing as much as possible for home consumption.

A few of the implications are suggested: An emotional and political alignment of the farm-operator with the industrialist of the city and of the farm laborer with the urban laborer; a decreasing birth rate among the farm population, which is the principal source of repopulation of our cities today; a lower standard of education and culture for those who migrate to other parts of the Nation.

The story, in brief, could be the sacrifice of agriculture as a way of life for the many upon the altar of agriculture as a way of making a living for the few.

The trend hasn't gone far in this direction yet. And there are forces working against it. Tenants compete for farms. Attention is being focused upon their problems and they are being encouraged and helped to secure better tenure or to purchase their farms by Farm Security Administration and others.

The great mass of Iowa farmers strongly opposes the change toward fewer and larger farms. Greater value has recently been put upon the nonmaterial elements in rural life. There is a law of "diminishing returns" in operating large farms in Iowa, as elsewhere—the bigger the farm the higher the profits in good times under good management, but the bigger the loss in poor times or under inefficient management.

But economic factors are working toward larger and fewer units * * *

Sometimes it is well to look backward also as we strive to see ahead. About three generations ago Daniel Webster said:

Our New England ancestors brought thither no great capitals from Europe; and if they had, there was nothing productive in which they could have been invested. They left behind them the whole feudal policy of the other continent. * * * They came to a new country. There were as yet no lands yielding rent, and no tenants rendering service. The whole soil was unreclaimed from barbarism. They were themselves either from their original condition, or from the necessity of their common interest, nearly on a general level in respect to property. Their situation demanded a parceling out and division of the land, and it may fairly be said that this necessary act *fixed the future frame and form of their government.* [Webster's italics.] The character of their political institutions was determined by the fundamental laws respecting property * * * The consequence of all these causes has been a great subdivision of the soil and a great equality of condition; the true basis, most certainly, of popular government * * *

The freest government, if it could exist, would not be long acceptable, if the tendency of the laws were to create a rapid accumulation of property in a few hands and to render the great mass of population dependent and penniless. In such a case, the popular power must break in upon the rights of property, or else the influence of property must limit and control the exercise of popular power. Universal suffrage, for example, could not long exist in a community where there was great inequality of property. The holders of estates would be obliged in such case either in some way to restrain the right of suffrage, or else such right of suffrage would ere long divide the property.

Already we hear half articulate appeals from distressed and fearful farmers against "land monopoly," "land hogs," and "tractoring out." We see vague efforts to curb expansion of farms, or to distribute land more widely. Their aim is somehow to hold a broad popular base on the land. Also we hear talk of placing limits on the right of suffrage of those who are victims of mechanization in

agriculture. Native white American farmers displaced by power farming in Texas and Arkansas are virtually disfranchised by older poll-tax statutes.

The VICE CHAIRMAN. What was that statement?

Dr. TAYLOR. Native white American farmers displaced by power farming in Texas and Arkansas are virtually disfranchised by older poll-tax statutes.

The VICE CHAIRMAN. A poll tax disfranchises? Do you make that statement on your own responsibility?

Dr. TAYLOR. I have been informed by many who are so disfranchised—you understand the reason they are disfranchised is when they are stripped of their property, they don't feel able to pay the amount of money required in your State, and they are, many of them, many of your white tenant farmers whom I have seen, reduced to such estate that they don't feel able to pay the tax.

In California attempts are made to restrict the vote of migrant workers who serve our agriculture.

The issues which we face in the effort to distribute the benefits of machinery more broadly among our agricultural people are not alone economic. That they are also political in a fundamental sense is coming to be recognized. A week ago the chairman of the 1938 farm tenancy committee of Iowa said of this problem:

I am fearful that unless something is done about it within the next decade it will bring about and develop such unrest among our people that it will threaten our democracy.

MECHANIZATION AS A FORCE FOR EXPANDING ACREAGE

Dr. ANDERSON. Dr. Taylor, Mr. McCormick said this morning: "The recent technological advances in farm machinery from which the family-sized farm will greatly benefit may well become a bulwark to preserve this important part of our social structure." I take it the discussion this morning hinged largely on the fact that we are now changing from a kind of mechanization which benefited particularly the large scale corporation and manager farm that you have been discussing, to a kind which benefits particularly the family-sized farm. The implication is that this new type of mechanization may make it possible to equip a family-sized farm with the necessary machinery to enable them to compete successfully with larger units, and that mechanization now becomes a great benefit rather than a hazard to independent farmers.

What is your position with respect to that?

Dr. TAYLOR. In other words, the argument runs that the small farmer now has a security and independence on the land which he has not had in years recently past because of the rapid development of smaller machines which he is able easily to purchase. I cannot share the optimism of that position, and I agree with the statement which was made by an earlier witness before this committee, Mr. Sherman Johnson, of the Department of Agriculture, when he said that when the small farmer buys a tractor and machinery to go with it, he has capacity to operate more land. In other words, when the machinery is there, there is economic pressure to use it to the full. You can't simply put your tractor and all the auxiliary machinery in the shed with no expense to yourself. You can cut off the fuel expenses, to be

sure, but you can't cut off the overhead costs, the depreciation of that machinery. It is good farm management practice, I believe, to use your machinery to the full, to use your own labor to the full, and that pressure which exists, it seems to me, will continue to exist when the smaller farmer is able to buy machinery which now is not available to him.

It may well be that the small farmer would like to come in from the field earlier and read his paper in the evening in the parlor of the house, and leave his tractor in the shed, but it seems to me that the pressure of costs and the chance to earn wages for himself in operating the machine to maximum capacity will prevent many of them from doing what undoubtedly they would like to do. I don't say that none of them will do it, but I say there exists this continuous and strong economic pressure which prevents me from accepting that conclusion.

It seems to me, then, that while the smaller machinery may enable some small working farmers to resist displacement and hold their places on the land, it is more likely actually to spread the area of displacement into places where it was not taking place before.

May I illustrate that with perhaps two examples. The first is the combine harvester. I believe that the large combine harvesters operated first in the western wheat country. The Corn Belt was closed to them by their great size and cost. When smaller machines were developed, smaller combines with shorter cutting bars; it was possible to use combines in the Corn Belt, so the area of displacement spread from the great wheat country of the plains and California to the Corn Belt, where previously it had been absent.

And it is this same pressure to which I referred earlier, to use the machine to capacity, that makes the owner of the smaller machine wish to enlarge his farm when he gets his combine and other machinery.

Another illustration, it seems to me, can be derived from the history of the introduction of tractors. In my part of the country, on the west coast, we are pretty highly mechanized. We use to a considerable extent the caterpillar tractor or tracklaying type of tractor, many of them huge machines costing a good many thousands of dollars. These machines, which are so familiar in California and Arizona, occasioned no displacement at all in the western dry country of Texas, or in the black lands of Texas. It wasn't until much smaller machines were developed in the form of the all-purpose tractor that displacement by machinery entered into the high plains of Texas and the black lands of the Delta; so it was the smaller machine, costing perhaps a quarter or less of the cost of the large tractor, which spread displacement into an entirely new area.

In the western part of Texas and Oklahoma the all-purpose tractors for some years have been operated with 4-row cultivating equipment. As smaller tractors are developed they pull 2-row and 1-row outfits. It seems to me that the natural effect of those smaller machines will be to spread the displacement into areas of the cotton belt where, for reasons of topography or otherwise, the larger machines with 4-row cultivators couldn't operate.

May I repeat, I am not attacking the machines any more than the Congressman is attacking them. I am trying to answer the question, and to point out that I do not believe that continued mechanization in terms of the small machines offers a stable bulwark against displacement at certain points. It may assist the small working farmer

to maintain a balance for a time. For how long I don't know. But its additional effect will be to spread the area of displacement where it did not occur before. That, of course, refers to the farm operator. It is plain that the smaller machines are bound to displace hired workers, and indeed they are advertised to do exactly that.¹

Mr. PIKE. I would like to ask you, Doctor—it worries me a good deal—about these people who are required at harvest time only, in some of these highly mechanized farming operations that you have mentioned. Here the farms are going to need operators for a week to 2 weeks or 6 weeks, and here, scattered all over the State or over several States are relief camps operated by the Government, some of them perhaps of the sort you showed us in the photograph.

Dr. TAYLOR. Those camps which I showed in the photographs are not Government camps.

Mr. PIKE. I realize that. They are overflow. But here are these pools of unemployed workers and here are these jobs that are coming up. I think it would be a grand chance for the industrial people to get working with the people who are managing relief so that the unemployed laborer is in a warehouse just as truly as the unemployed machine, with the exception that the farmer doesn't have to pay his depreciation, even, or any of his support. He can pull him out of the relief camp or off the relief rolls almost the moment he needs him, but the worst of it is, he shoots him back there the moment he is through with him, so that the Government supports and—

Dr. TAYLOR (interposing). Someone else carries the overhead.

Mr. PIKE. And if it weren't done in a highly legitimate manner, requiring almost inhumanly perfect management, you would think there would be a chance for dovetailing and you would have the boys on the job for a few days and then back in the cooler. It is one of the greatest possibilities for the inhuman handling of labor that I ever saw. Have you seen some of that, or am I describing something that doesn't exist?

Dr. TAYLOR. I am not familiar with the industry-relief dovetailing.

Mr. PIKE. I mean the agricultural labor and the relief.

Dr. TAYLOR. Oh, yes; that is the constant procedure.

In other words, the relief administration in California stores a large percentage of the workers engaged in agriculture.

Mr. PIKE. You are subsidizing the big farm people again.

The VICE CHAIRMAN. I would like to know if anybody has an opinion as to whether or not these migratory peoples become accustomed to that way of living, and wouldn't like to change it.

Dr. TAYLOR. Congressman, I think I can answer for the people who have come from Texas and Oklahoma and adjacent States. They don't like the migratory labor life which we provide for them in California.

¹On June 20, 1940, Dr. Taylor submitted the following relevant quotation from "Economic Information for Wisconsin Farmers, prepared by members of the staff of the College of Agriculture" (December 1939):

"It has been estimated that the power and machinery on Wisconsin farms at the present time would be sufficient to handle satisfactorily two or three times the acreage now covered. . . . A farm of 40 to 60 crop acres usually has a rather complete set of farm machinery and in many cases these machines could successfully handle a much larger acreage. For example, a man with 15 acres of hay would probably have a 5-foot mower, a side-delivery rake, and a hay loader; a man with 45 acres would probably have the same machines; thus the investment per acre is only one-third as much on the larger area. . . . Many farmers are enlarging their farms by buying or renting neighboring farms in order to utilize their equipment to a greater extent. Even though there is a notable tendency to develop equipment suitable to small farms, further mechanization may tend to result in increased size of farms and reduced farm labor requirements."

The VICE CHAIRMAN. They would like to settle down somewhere?

Dr. TAYLOR. They would like it very much.

Dr. KREPS. Dr. Taylor, I had an uncomfortable feeling during part of this afternoon of rereading Gibbon's Decline and Fall of the Roman Empire, where he described the displacement of the independent farmers by formation of huge latifundia operated by slaves. I also agree with Mr. O'Connell that I hate to just sit around and hope for something to happen. I wonder whether you could not tell us what might be done. Do you have any recommendations that you could make to us that might serve a useful purpose in the problem?

RECOMMENDATIONS TO ELIMINATE DISPLACEMENT

Dr. TAYLOR. I have some rather specific suggestions which might be helpful. I have tried to suggest things that are practicable, that can be done and done fairly soon. I have suggested already that we stop subsidizing displacement by giving exemptions which are not exemptions to the working farmer. That I have already discussed and shan't repeat it.

Another way to stop subsidizing displacement is to remove the incentive for landlords to displace their tenants in order to get their A. A. A. checks. I understand that Congressman Snow has introduced an amendment to the act directed to this point.

Another suggestion is that the funds available for rural rehabilitation loans be increased. At the present time, I am informed, there are 120,000 eligible applicants who are rejected by the Farm Security Administration in the States of Oklahoma, Arkansas, Kansas, Missouri, and Texas, for lack of funds. About a like number were taken care of with the funds available.

The VICE CHAIRMAN. Doctor, do you know whether that is for lack of funds or because, to a considerable degree at least, the applicants did not provide, in themselves, a fair prospect in the judgment of those who are responsible.

Dr. TAYLOR. I am informed by the administrators, Congressman, that these 120,000 applicants who were rejected were in every respect eligible.

The VICE CHAIRMAN. They just didn't have the money?

Dr. TAYLOR. The agency did not have the money to take care of the situation.

I would suggest, further, with respect to rural rehabilitation, that the level at which loans for cooperative purchase of machinery are available be elevated in order to forestall and anticipate displacement.

At the present time, in general, the practice is to give loans for cooperative purchase of machinery, and thus cut the costs of operation for the small-work farmer on the land, to make those loans after he is already in distress, perhaps displaced by tractors on other farms. I suggest that the rural rehabilitation loans for the cooperative purchase of machinery be made available to small working farmers before they are displaced, in order to anticipate and forestall it.

The VICE CHAIRMAN. Doctor, it is all right to borrow money, but they would still be owing it, wouldn't they?

Dr. TAYLOR. Well, I can't give you offhand the record of repayment of the Rural Rehabilitation clients. I am sure the representative of

that agency could tell you exactly what percentage of repayment the Government gets from the funds it makes available for that program. I understand that it is a high percentage.

Mr. O'CONNELL. May I ask a question? On that question of making funds available to these people at reasonable rates of interest, that alone would do nothing more than delay the inevitable, would it? Wouldn't you have to tie that in with other things that you have referred to, which would tend to otherwise retard the progress of the integrated interests?

Dr. TAYLOR. I am suggesting these points as part of a pattern, a program, not with the intention of implying that any single one, or even all of them together, would entirely meet the situation. I am trying to make practicable suggestions to ameliorate the situation. I think, in some respects, those loans for cooperative purchase of machinery would be permanently stabilizing, for they would keep down the overhead costs of operation, and that is an important thing in holding working people on the land against those operators who, through lower costs, might displace them.

A third point involves consideration of the funds available for purchase of land. We have now what is called the tenant-purchase program which, in view of the magnitude and urgency of this situation, should, by all means, be continued and expanded in amount and in the flexibility with which the program can be administered. That, of course, involves direct appropriations for land purchased to take care of tenants.

I think, coupled with that, we might very advantageously provide for Government insurance of private loans for purchase of land to maintain working farmers on the land, as provided, I understand, in the Lee-Jones bill, S. 1836.

The VICE CHAIRMAN. Private loans which the Government would guarantee?

Dr. TAYLOR. That's right. If the Government would extend a guaranty, we might hope for a large volume of private loans which could go into the stabilization of our working farmers on the land, which would involve no heavy outlay by Congress.

It is essentially the procedure of the Federal Housing Agency.

The VICE CHAIRMAN. In that sort of situation, the Government would permit private money to take a chance on the profit, while the Government would be taking all the chances on the loss, wouldn't it?

Dr. TAYLOR. That, of course, is true. It is correct that the Government stands in the position of guarantor, and it is to be expected that there will be some losses. It seems to me, however, that the net cost to the Public Treasury may be a good deal less, and the chance of giving momentum to this program of holding people on the land may be so much more that it would be well worth enlisting private funds, even at the cost of the guaranty.

Dr. KREPS. Certainly, if the Government is going to lose money, it would much rather subsidize small farmers remaining on the farm than increase the subsidy to large-scale farming through its present relief payments. Isn't that correct?

Dr. TAYLOR. I think so.

Another recommendation is more reclamation projects.

The VICE CHAIRMAN. You mean put more land into cultivation?

Dr. TAYLOR. I mean put more land into cultivation.

The VICE CHAIRMAN. That is interesting. We have turned out a lot of land already.

Dr. TAYLOR. I realize that. I realize the inconsistency.

The VICE CHAIRMAN. I didn't say that is inconsistent. I said it was interesting.

Dr. TAYLOR. Perhaps both. Nevertheless, I recommend that in the circumstances there be some more reclamation projects. I think it would do a good deal to hold people in an economic position in areas of the country from which many of them now are in flight.

The VICE CHAIRMAN. Why don't they do some of this migrating and turn the tide back from California? Come back to the place where they didn't have to have an irrigation project?

Dr. TAYLOR. Why don't the people go back?

The VICE CHAIRMAN. Why put in an irrigation plant and put more land in cultivation? Why not let the tide of cultivation turn back?

Dr. TAYLOR. I am sorry. I perhaps don't understand.

The VICE CHAIRMAN. I don't wonder, because I don't think I understand the question myself.

Dr. TAYLOR. Thank you.

The VICE CHAIRMAN. My question is, Why not let the population move away from those sections where it is necessary to irrigate in order to cultivate, and let them go back to the country where such necessity does not obtain, and where the land is available for cultivation?

Dr. TAYLOR. Could you make any specific suggestions as to where they could go?

The VICE CHAIRMAN. Except for just what you have indicated, yes—Texas, anywhere.

Dr. TAYLOR. Where would your people farm in Texas, under present conditions?

The VICE CHAIRMAN. On farms. There are a lot of farms. But as you say, the tenants are being run off those farms. That is the difficulty, and we have been turning out a lot of land, you know, in order for the farmers to get the advantage of the three A's, putting out of cultivation.

Dr. TAYLOR. Perhaps the reason for my suggestion is that I don't think that the other program is likely, in practice, to be sufficiently and rapidly effective.

The VICE CHAIRMAN. You see, Doctor, what I mean to say is that we have had a general policy of reducing the utilization of land that is susceptible of cultivation, and to put in these crops. We have required people to reduce their acreage, in order to get the benefit of the Government's policy. Now, then, why put in some more land, and increase the burden on the Government, when you have the land already that could be cultivated?

Dr. TAYLOR. If you could reshape our social policies to deal with mechanization—

The VICE CHAIRMAN (interposing). In other words, if we are able to have a certain number of acres under cultivation under the general policy, the more land you put under cultivation, if the policy is sound, it seems you would have to make a corresponding reduction somewhere else, and make an additional burden on the Treasury, one, the burden of putting in the reclamation project, and two, the burden of taking

out this land. I don't want to go into that now. We can think that over after we have gone to it.

Dr. TAYLOR. I see your point, Congressman.

The VICE CHAIRMAN. Let's not bother with it any more. We will take it under advisement.

Dr. TAYLOR. I would like to raise for your consideration just one more point, which is rather long range in its implications. I will make it very brief, for the time is passing.

It seems to me that in our thought we should begin to give some consideration to one or two points that we have been a little reluctant to think about. Our land policy has been based upon such acts as the homestead law, giving land in fee simple absolute to the man who settled upon it. We have believed, through a large part of our history, that that meant security and independence for the working farmer on the land.

It seems to me that it is time to raise, in our thoughts, the question. In certain situations, particularly in irrigated lands, I think the record is rather clear that it has not meant security and independence.

The suggestion I am making grows out of a statement in the President's Farm Tenancy Committee in 1937, which said, "The land policy adopted by this country under which title to practically all of the agricultural land of the Nation passed to private owners in fee simple absolute has proved defective as a means of keeping the land in the ownership of those who work it."

We have seen how, in some areas, there is a concentration of control of the operation of the land which very commonly accompanies extensive mechanization. As I say, that has been particularly conspicuous in areas where there is irrigation.

To cite a conspicuous example, the San Carlos irrigation project in Arizona irrigates about 100,000 acres of land. Under the basic laws governing land policy, the Homestead Act, the Desert Entry Act, those lands initially could be taken up only in 160-acre blocks, and that was done. Virtually all of the land passed into private ownership in the early 1900's.

Then it was found that no sooner had the land passed to private ownership than concentration of ownership began, and larger land holdings developed. Then, in the early 1920's, Congress passed an enabling act to provide for construction of Coolidge Dam. As a condition it was provided that there should be no holdings of land larger than 160 acres, again following our traditional policy. That was done in conformity with law. The water was put on the land in the middle 1920's. In hardly more than a decade, the land was all concentrated again.

The Government, through the Farm Security Administration, purchased a block of about 3,600 acres of this land, and the concentration, the type of agriculture that is developed upon it is illuminating. It illustrates the futility, under some conditions, of protecting the working farmer on the land by a device so simple as fee simple absolute ownership. I am taking the facts of my illustration from expert testimony by W. E. Packard, placed in the record of the subcommittee of the Senate Committee on Education and Labor.

The VICE CHAIRMAN. You mean, Doctor, that the Government establishes a limitation insofar as the original occupant is concerned, and leaves to him the power, then, to sell it immediately?

Dr. TAYLOR. In a few years you have the enforcement of three acts, each of them endeavoring to do it, and the last time, within a decade since the water has gone on the land, there were only nine owners of this 3,600 acres.

The VICE CHAIRMAN. In those cases, a lot of people simply go on that property, in order to get possession, and sell out. I know that is true in the ranch country in my section and I am sure that is true there.

Dr. TAYLOR. I am quite sure, in 1936, when the land was bought by the Government, there were only nine owners of the entire property. Eight of the farms were operated by tenants using hired foremen and migratory laborers. That was only one of the nine owners who was operating, and he was operating 800 acres of irrigated land, which is a great deal of land. He was living 75 miles away, and operated with hired labor. In other words, there is a story of complete absenteeism, extreme mechanization, entire use of hired labor, most of which is migratory, without settled abode. There was only one decent house on the entire project.

There were only 7 families living on the project at the time of the purchase, though on one of the properties alone as many as 35 families lived during the cotton-picking season.

We see in this example, then, the development within 10 or 12 years of a rural slum of the worst type, of the most concentrated ownership, miserable housing, manager-hired labor or operation, and virtually everything that we have regarded as undesirable in our rural way of life.

Dr. LUBIN. Would you recommend a life lease or an option to the Government to repurchase, in the sense that the Government would have to pay for such improvements as were made by the original homesteader? In other words, if he wants to sell, all he can sell is his own improvements and give the property back to the Government if he does not want to keep it?

Dr. TAYLOR. I have not given close thought to the details of dealing with this, but I am sure it is a fertile suggestion and worth consideration.

I think there are many ways, ranging in this situation all the way from Government ownership and secure leases, to protected situations such as you have described, that would ameliorate this condition and prevent it from——

The VICE CHAIRMAN (interposing). You could put a condition forcibly in the deed to run with the land, that it was never to be owned by anybody who didn't occupy the land, or any condition you want to put in.

Dr. TAYLOR. It seems to me——

The VICE CHAIRMAN (interposing). And limit the ownership.

Dr. TAYLOR. It seems to me, Congressman, there are real possibilities in modifications which will protect the working farmer.

The VICE CHAIRMAN. In other words, your reasoning is, if there is any necessity in the first instance to have a 160-acre limit, it ought to run with the title?

Dr. TAYLOR. There is some reason for the continuance. I would avoid excessive rigidities because in the course of a generation somewhat different conditions may obtain. The development of machines

which we do not now foresee, or the development of different types of culture, different crops, and so forth, might alter it so that 160 acres might not always be correct. But the assurance of—

ECONOMY OF OPERATING LARGE UNITS

The VICE CHAIRMAN (interposing). You could put a maximum on it. Doctor, let me ask you one question: Does the fact that larger ownerships make it possible better to market the product of the soil cut any figure in the advantage of bigger ownerships over little ownerships?

Dr. TAYLOR. I think that an integration, which has gone far in California, and which I described earlier, is a factor in the economy of operation by large industrialized outfits.

The VICE CHAIRMAN. You would have to have a large acreage to maintain a big processing plant that would handle your own commodities?

Dr. TAYLOR. Yes.

The VICE CHAIRMAN. And then, having got a big processing plant and a big acreage, you could probably maintain a marketing organization to give you economical distribution.

Dr. TAYLOR. Yes, I think those things work together.

The VICE CHAIRMAN. Any further questions?

Dr. ANDERSON. Mr. Chairman, Mr. Elliott, counsel for the International Harvester Co., has asked permission to make a very brief statement in counter to Dr. Taylor's difference with Mr. McCormick's testimony this morning. If it is the pleasure of the committee that he make such a statement—

The VICE CHAIRMAN. Anything to stir up a row. This meeting is getting mighty tame.

Dr. ANDERSON. This witness has not been sworn.

The VICE CHAIRMAN. Do you solemnly swear that the testimony you are about to give shall be the truth, the whole truth and nothing but the truth, so help you God?

Mr. ELLIOTT. I do.

TESTIMONY OF WILLIAM S. ELLIOTT, VICE PRESIDENT, INTERNATIONAL HARVESTER CO., CHICAGO, ILL.

Dr. ANDERSON. Mr. Elliott, I presume you refer to my quotation of Mr. McCormick's statement that the recent technological advances in farm machinery, in which the family size farm will greatly benefit, may well become a bulwark to preserve this important part of our social culture. Mr. Taylor dissented from that opinion, giving his reasons.

I take it you want to dissent from his dissent.

Mr. ELLIOTT. That is the only reason I wanted to say anything. Mr. McCormick had to leave and asked that if there was anything I thought should be added, I should do so.

Dr. Taylor has expressed the directly opposite opinion that the new farm machinery, which is much cheaper and smaller than has ever been offered before, so far from helping to preserve the small farms, is going to aggravate the movement the other way. He gave only one reason for that opinion, which was that the statements put in the record by

the Department of Agriculture, or some of their statements tended to show that the investment in farm machinery was so high that larger acreage had to be acquired by the owner to make it pay. I wanted to call attention—

The VICE CHAIRMAN (interposing). Your statement—pardon me, Mr. Elliott—as I understood it, was that it would tend toward a disposition on the part of the owner of the machinery to use it to the full capacity of that machine to operate.

Mr. ELLIOTT. That is another way of stating my same point. I wanted to call attention to the fact that all the statements put in the record yesterday by representatives of the Department of Agriculture related to the larger machinery, to the 320-acre wheat farm, the 200-acre corn farm, both of which would use a two-plow tractor or larger, and that nobody has any figures as yet on this recent development under which a farmer would buy a small tractor and a combine for less than he could buy a tractor and a binder before, I realize Mr. McCormick is expressing an opinion on an undemonstrated thing, but I think Dr. Taylor will also agree that the fact that a man with a two-plow tractor will want to enlarge his operation in order to use it to the fullest capacity, may not be true of this smaller tractor which is for farms from 50 to 100 acres.

That is an undemonstrated fact as yet.

Now, we are not alone in developing that theory. There are several—I am no agricultural economist—but there are several for whom Dr. Taylor would have the highest respect who fully agree that this small machinery development which is very recent represents an effort on the part of the manufacturers to meet the desire of the family sized farmer, not to be put out of business, but to have shorter hours and an easier life. That machinery is produced in response to his demand.

It has not been demonstrated that this is going to lead to larger acreage and it should not, because the machinery itself is adjusted for use on the single small farm.

I just wanted to say that there is no data on that yet, Dr. Taylor. I am not disagreeing with you as to the effect of the larger machinery in some places.

I should like to ask, if I may, that we might have permission to put into the record some statements of our own as to our estimates of the relative cost of horse farming and power farming.¹ We find the industry in a curious position. Mr. Johnson of the Department of Agriculture put figures in here yesterday to show that the farmer made no more money out of tractor farming than he did out of horse farming, and today Dr. Taylor shows that it is so much more economical that it is sweeping the country and will go further.

Now, it is quite possible that technological progress may produce tendencies running in different directions. The larger farm machinery, the problems of marketing, and the association of farmers who farm in California may produce one tendency. The technological advance of this small machinery may be the very thing which persuades the family-size farmer to stay there and keep on rather than go some other place.

¹ See data submitted by Mr. Elliott under date of July 9, 1940, which appears in the appendix on p. 17597.

I do not think we are going to keep him there by depriving him of the benefits of technology and by telling him, "Your job is to work 16 hours a day, with a back-breaking job."

I think the whole tendency of making his hours shorter and giving him some of the benefits which other parts of our population are getting, is going to make it a more livable life which he will try to preserve.

The VICE CHAIRMAN. But anyway, it seems to be fairly reasonable that you probably wouldn't make the machine unless there was somebody who wanted to buy it? I mean, that is fairly reasonable.

Mr. ELLIOTT. We think the farmers know 50,000,000 Frenchmen can't be wrong. The farmers know perhaps more than some other people [laughter] about what they save by buying that machinery, and we are asking permission to put in tables here of actual farm operations.

The VICE CHAIRMAN. Do those tables show whether he is getting lazier or greedier?

Mr. ELLIOTT. Well, I don't know whether you would say that, Mr. Chairman. We don't call our laborers, our factory laborers, lazier because they now have a 40-hour week instead of a 50, and I don't believe anyone in this room would deny the right of the farmer to get his hours shortened, if it can possibly be done without bad social effects; and in itself, it is a good social effect.

The VICE CHAIRMAN. We understand, and I think the committee can appreciate the strength of the points. In other words, if you can make life on the farm easier, you have a greater tendency to hold the farm boy on the farm than to go to town and work in a job where it is more mechanized. There are many different aspects to the thing.

Now, Dr. Taylor—and this may be off the record.

(Off the record.)

Do you want to say anything further, Dr. Taylor?

Dr. TAYLOR. Well, Dr. Anderson invited me to return to the stand and I would like to say just one or two things.

The VICE CHAIRMAN. Well, go ahead.

Dr. TAYLOR. As a man who has husked corn and plowed corn with a walking plow behind a team of mules, I am fully appreciative of what the manufacturers of machinery are doing, to make labor less arduous.

I think the farmers sense their economic increase pretty well when they buy the machines. I think that that is the driving force behind the social and economic effects on others, of which I am so apprehensive. So I recognize the force and do not deny the fact that the farmers buy the tractors and other machines because it is good for them to do so.

The VICE CHAIRMAN. Well, now, that looks like a pretty good quitting point, doesn't it? Let's quit.

Dr. TAYLOR. May I add just one more thing? May I end on a note of harmony also?

There are ways of holding working farmers on the land, as we have discussed a few moments ago, a variety of ways, and one form of doing that, to which I think we should give more consideration than we have been disposed to give it in the past, is the cooperative farm.

There are a number of cooperative farms in the country and we are beginning to get records on them. I am going to cite only one, not to

generalize or say that the records of all of them are of that kind, but to indicate that they seem to be worthy of very serious consideration.

In San Joaquin Valley, where we recently had so much trouble that the Senate came out to look us over, the agricultural employers felt so aggrieved and so just in their cause that they felt, in their own words, it was necessary to take rubber hose and fan belts to drive striking cotton pickers out of the city park of Madera. (I am quoting now from the record of the Senate committee.)¹

Very close to that same area, we have a cooperative farm. The cotton strikers last fall were asking for more than 80 cents a hundred, which is what the agricultural employers felt was all, in justice, they could afford to pay and all that they should pay.

Two counties away was this cooperative farm, operated by the Government. The 15 families on that farm (this I draw from the records of the Senate committee also, the testimony of Mr. Packard),² these 15 families made their monthly wages as participants in the farm. Out of the profits of the year's operation, after meeting all of their obligations to the Government and to everyone else, they put aside \$500, approximately, in an educational fund, and \$2,500 in a reserve fund in order to finance their operations the next year independently of the banks. In addition to that, they allocated \$1,200 to pay the cotton pickers, who were employees and not members of the cooperative and whom they had already paid 90 cents, \$1, or even more, when the agricultural employers felt that they could not pay more than 90 cents.

Having paid them 90 cents, \$1 and even more, for 100 pounds of cotton picked, they allocated from their profits something like \$1,200 for distribution among 201 cotton pickers as a bonus. The amounts ranged from, I believe, 7 cents to \$55.

It seems to me evidence of that kind suggests that in our effort to hold working farmers securely on the land, we should give more attention to the possibilities of doing it through cooperation, than we have given in the past.

Dr. ANDERSON. The last three charts in Dr. Taylor's brief will be admitted to the record.

(The charts referred to were marked "Exhibits Nos. 2689 to 2691" and are included in the appendix on pp. 17456 and 17457-17458.)

The VICE CHAIRMAN. I am afraid we are going to have to adjourn. We are very much obliged to you.

We stand adjourned until 10:30 tomorrow morning.

(Whereupon, at 5:45 o'clock, the hearing adjourned until 10:30 in the morning of the following day, April 25, 1940.)

¹ See hearings before the subcommittee of the United States Senate Committee on Education and Labor, Part 51, p. 18685.

² Ibid, Part 50, p. 21823.

INVESTIGATION OF CONCENTRATION OF ECONOMIC POWER

THURSDAY, APRIL 25, 1940

UNITED STATES SENATE,
TEMPORARY NATIONAL ECONOMIC COMMITTEE,
Washington, D. C.

The committee met at 10:40 a. m., pursuant to adjournment on Wednesday, April 24, 1940, in the Caucus Room, Senate Office Building, Senator William H. King, of Utah, presiding.

Present: Senators King (acting chairman), and O'Mahoney (chairman); Representative Williams; Messrs. Kades, O'Connell, Berge, Pike, Lubin, Kreps, and Brackett.

Present also: William T. Chantland, Federal Trade Commission; S. Abbot Maginnis, Department of Justice; and Dewey Anderson, economic consultant to the committee.

Acting Chairman KING. The committee will be in order. Call your first witness.

Dr. ANDERSON. Some 3 weeks ago we started these hearings with an over-all view of the situation presented by Dr. Kreps and Mr. Watson Davis, who reviewed what was occurring in the field of industry and agriculture with respect to scientific and technological advance, and pointed out some of the problems which confront us, in an attempt to solve this unemployment situation. In the last 2 weeks we have presented a whole series of what amounted to case studies of the situation.

Today we propose to examine what can be done about this big problem of training and placing and retraining and replacing the labor force of the Nation. We have assembled a panel of witnesses, each expert in a particular field. They are educational men and applied educational or vocational-educational experts, whose business it is to deal realistically with the training and placement of the youth and the adult population of the Nation.

Each member of the panel will speak on a particular phase of the topic. The first witness will be Dr. John K. Norton, formerly head of the division of research of the National Education Association here in Washington for many years, and for several years now professor of education and an expert in the field of educational finance and school support at Teachers College, Columbia University.

Acting Chairman KING. That is not the City College that Bertrand Russell wanted to be connected with?

Dr. ANDERSON. No; it is not.

The second witness in the panel is Dr. Harold F. Clark, an economist who is now professor of economics at the same university. The third witness is Dr. J. C. Wright, Assistant Commissioner in charge of Vocational Education of the United States Office of Education. The fourth witness will be Dr. William G. Carr, executive secretary of the Educa-

tional Policies Commission and research director of the National Education Association. We hope to follow through with this panel today.

We do have, however, a witness who was not able to come at his scheduled time, Mr. William Green, who will appear this afternoon. It may be necessary, therefore, to carry some of today's witnesses over to tomorrow.

Acting Chairman KING. By that you mean that Mr. Green may not be called?

Dr. ANDERSON. Mr. Green will be called in any case as the first witness this afternoon, after lunch.

(Senator O'Mahoney assumed the Chair.)

Dr. ANDERSON. Our first witness, then, this morning, in this discussion of education and its influences in placing the labor force and raising the economy to a prosperity level, is Dr. John K. Norton, whom we will ask to come to the stand at this time.

Before Dr. Norton is sworn, Mr. Chairman, the Educational Policies Commission, a commission of professional and lay people brought together under the auspices of the National Education Association to study the problem of education in a democracy and the relationships of education to recovery, has prepared and presented to us a series of charts which are pertinent to the discussion of the day. I would ask that they be accepted as exhibits, as they are basic material for our study.

The CHAIRMAN. You want them entered in the record?

Dr. ANDERSON. That is right.

The CHAIRMAN. Without objection, it is so ordered.

(The charts referred to were marked "Exhibits Nos. 2692 to 2718" and are included in the appendix on pp. 17459-17485.)

Senator KING. May I make one inquiry before you start? Do you intend to discuss the question of education for—what shall I say?—farming and for irrigation and for land development, or is it merely an intellectual excursion we are going to enter upon this morning?

Dr. ANDERSON. I am glad you asked the question. I believe these men are something extraordinary in the field of educators, in that they will hew to the practical line all the way through. One of the witnesses will deal specifically with the matter of vocational education of an applied kind, the training of young and old so that they can do the work of the workaday world.

Mr. Chairman, Dr. John K. Norton, professor of education of Teachers College, the first witness, is ready to be sworn.

The CHAIRMAN. Do you solemnly swear the testimony you are about to give in this proceeding shall be the truth, the whole truth, and nothing but the truth, so help you God?

Dr. NORTON. I do.

**TESTIMONY OF DR. JOHN K. NORTON, PROFESSOR OF EDUCATION,
TEACHERS COLLEGE, COLUMBIA UNIVERSITY, NEW YORK,
N. Y.**

Dr. ANDERSON. Dr. Norton, you are professor of education of Teachers College at Columbia University?

Dr. NORTON. Yes.

Dr. ANDERSON. How long have you been professor of education?

Dr. NORTON. A little over 10 years.

Dr. ANDERSON. What is your specific field of study and teaching?

Dr. NORTON. Educational administration and educational finance.

Dr. ANDERSON. You have published books in the field of finance?

Dr. NORTON. Yes; such things as *Wealth, Children, and Education*.⁵ and other things.

Dr. ANDERSON. You are also a member of the Educational Policies Commission?

Dr. NORTON. Yes.

Dr. ANDERSON. And as such are responsible for the writing and publishing of this very recent work, *Education and Economic Well-Being in American Democracy*?²

Dr. NORTON. Yes; with the cooperation of other members of the Commission, economists, and other people.

Dr. ANDERSON. This is one of the basic studies being made by educators and economists?

Dr. NORTON. It is one of the 4 major reports issued by the Educational Policies Commission to date.

Dr. ANDERSON. I think the committee has been supplied with copies of this volume, and I hope they have had time to review it.

The CHAIRMAN. The members of the committee have not yet received copies of it, nor have they received copies of the charts. I think they are on the way up.

Dr. ANDERSON. The material you are presenting is on the subject of education and economic well-being, and I take it you are laying the groundwork for the discussion that will follow during the day?

Dr. NORTON. That is true, although I will particularly focus my remarks on the relationship of education to production and productivity.

Dr. ANDERSON. Would you proceed?

Dr. NORTON. Mr. Chairman, members of the committee, the Educational Policies Commission recently issued a report dealing with the interrelations of education and economic well-being. In preparing this document, the Commission sought the counsel of economists, educators, and other competent scholars. The technical literature of economics, education, and other fields pertinent to the investigation was carefully examined. As a result of this work, which extended for a period of several years, we are in a better position than ever before to attempt the difficult task of assessing the relationship of education and economic well-being.

POTENTIAL PRODUCTION OF THE UNITED STATES

Dr. NORTON. I will begin by pointing out that one of the striking features in the development of the United States has been the enormous increase in its production, both actual and potential. When the Nation was founded, it had an annual current income of some \$677,000,000; that is, total income, social income, of all the people, less than \$1,000,000,000. Now it receives a yearly income which, even in years of limited prosperity, runs somewhere between \$60,000,000,000 and \$70,000,000,000, and which in prosperous years is between \$80,000,-

¹ John K. and Mary A. Norton, *Wealth, Children, and Education*, New York, 1938.

² Educational Policies Commission, *Education and Economic Well-Being in American Democracy*, Washington, D. C., 1940.

000,000 and \$90,000,000,000. Furthermore, competent researches by the Brookings Institution group and others have demonstrated that without expanding existing plant and resources the national income could be increased more than \$15,000,000,000 above even the most prosperous years.

Now, I recognize clearly that the problem of realizing that potential productivity is an exceedingly difficult and complex one, and I have come here to offer no quick and easy panaceas for taking care of that problem.

I rather am interested in analyzing one element which doubtless will be, must be, in the picture when the problem is met. I refer to education.

Per capita production and per capita income increased several fold during the past century in nations like Great Britain and the United States. During the last 70 years population in the United States increased threefold, while the physical volume of goods produced and consumed increased more than ninefold.

The CHAIRMAN. What is the authority for that statement?

Dr. NORTON. Investigations of the Twentieth Century Fund in one of their recent publications, and other sources.

The CHAIRMAN. The Twentieth Century Fund staff made an analysis of authentic figures?

Dr. NORTON. A competent staff of economists and other experts.

The CHAIRMAN. So that this conclusion is drawn from those figures which are taken from authentic statistics?

Dr. NORTON. I believe that they are drawn from absolutely reliable statistics properly interpreted, yes.

A primary factor in this phenomenal expansion of productivity has been the application of science, invention, and the power-driven machine, and that whole complex of forces we sometimes call technology, to the processes of agricultural and industrial production. Education, and here is where we get down to our topic more directly, is also in the picture. The purpose of this statement is to examine the relation of education to increasing production and increasing productivity.

If you will examine economic literature you will find that economists generally recognize four basic factors in the productive process. These are labor, the human factor, natural resources, capital, and management. A properly planned and administered system of education makes one of its greatest contributions to economic well-being because of its effect on the first of these—namely, labor. In the United States this contribution has been exercised through various means, and I would like briefly to point out some of those in outline form as a basis for further discussion.

First, and I put this first one advisedly, the development of an open-door policy in education, we might say the American way in education, served as a driving influence throughout our history to encourage each individual to rise through his own efforts. As Thomas Nixon Carver, well known economist, has said:

The greatest stimulus that can be given to the human spirit is to serve notice upon it that its achievements are to be limited solely by its own native power, * * * that neither birth nor family prestige will count for much, and that humble birth and lack of prestige are no handicap to the person of ability and industry. This has made the typical American a model of energy. Our public school system has provided him a free chance to train whatever native ability he possesses.

We have done that in education at least to a degree. We need to do it more effectively in the future, but we have done it to a degree that has made education an important factor in developing individual initiative.

With the passing of each decade, graduation from high school and even more extended schooling are prerequisite to admission to a growing percentage of occupations. My point here is that actual formal schooling, the ability to answer "Yes" when an employer asks you whether you are a graduate from a high school, in the practical workaday world—and one could give many illustrations of this—is becoming a prerequisite to employment.

In some industries that one is surprised to hear about they are even calling for college graduation.

Energy and graduation from the "school of hard knocks" no longer promise success in most callings. Maybe in some the exceptional individual may get by with graduation from the "school of hard knocks," but not for the rank and file. Opportunity more and more lies along the route of extensive general education and specific vocational or professional training. The doors of educational opportunity must be wider than ever before if all Americans are to feel that no insuperable obstacles prevent the individual from realizing the best that is in him. Such a feeling must prevail if the dynamic economic effects of education are to be continued.

If you are interested in future evidence to support that whole general thesis, we would be glad to come back to it later.

Senator KING. May I interrupt you?

Dr. NORTON. Yes.

Senator KING. Have you elaborated upon the views expressed by Herbert Spencer in his great work in education and other classical writers of that period, one or two from Germany?

Dr. NORTON. You refer to such things as education's worth?

Senator KING. In part; yes. Of course, I wouldn't want to confine it to a materialistic education; there must always be the moral and spiritual, a factor which, after all, is basic in any proper education, but Herbert Spencer devoted some of his great ability to the elaboration of what education is——

Dr. NORTON. Yes.

Senator KING (continuing). What it must do, and he discusses the various spheres of activity in which the human being may operate. I was wondering if back of your thesis and the views of those with whom you are associated, the exposition made by Spencer has any recognition.

Dr. NORTON. I would say yes. In fact, almost any fundamental idea if you trace it to its roots often goes back a great many years or centuries, even. If you take material of the type that Spencer issued, and *The Wealth of Nations*, of Adam Smith, who a century or more ago pronounced in these areas, and add to that the experience of a century (they were hypotheses when they stated them), I think we have a right to say that many of those ideas now have to a considerable degree been proved in the practical laboratory of social development.

Second, education has increased productivity by directly or indirectly contributing to the occupational efficiency of the individual worker. As the number and proportion of unskilled laborers have de-

clined, the number and proportion of semiskilled, skilled, and technically trained workers has increased. In fact, the economic growth of the United States may be epitomized in the fact that a growing percentage of trained workers have used more and more effective methods of work. I would emphasize both of those, trained workers using more effective methods of work, as responsible for the tremendous increase in productivity that has occurred in the industrial revolution.

Mr. O'CONNELL. When you speak of trained workers you are using that phrase, I take it, as meaning skilled in doing a particular job?

Dr. NORTON. I am using it in a very broad sense, here meaning everything from professional workers to semiskilled workers.

Mr. O'CONNELL. Would it have the same significance as the old skilled worker, meaning a craftsman or master mechanic? I have in mind that we have had a substantial amount of testimony here by other witnesses to the effect that mechanization resulted in—the word used I think was “degrading” the quality of the worker in that the type of training that was required was something that could be acquired in a period of maybe 30 days, and while they were in a sense highly trained workers they were not comparable to the old skilled mechanic at all. I was curious to know on what basis you came to the conclusion that the number and proportion of semiskilled, skilled, and technically trained workers has increased. It seemed to me that it might be that you would construe all the people on a production line in an automobile factory as technically trained workers and yet not skilled in the old traditional sense.

Dr. NORTON. I am referring to evidence such as is presented on pages 84, 85, and 86 of this report, and I would say further that—

The CHAIRMAN (interposing). You are referring to the report of the Educational Policies Commission?

INCREASE IN OCCUPATIONAL TRAINING

Dr. NORTON. Yes; in which we cite a number of scientific investigations. In discussing the general trend of that evidence I would say that it is very important, as you have indicated, to define what area of occupations you are discussing. First, dealing with the area that we call manufacturing, in which the highest degree or percentage of the automatic machine has come into the picture, I tried to find every investigation on that subject that had been made, and after looking them all up and very carefully reviewing the evidence, I think it is fair to say that it is inconclusive. Some investigators say that even in manufacturing the total amount of training must be more, if you consider all workers, than it was a decade or 2 or 3 decades ago. Some say that it is not as much. Quite frankly, when you consider all investigations it is inconclusive if you think only of the field of manufacture. But please have in mind that workers in manufacturing constitute a minor fraction of all workers, and a declining proportion of all workers. Now, if you will direct your attention away from mechanized industry to occupations as a whole, the evidence there is quite clear and definite that the total amount of training per worker on the average is definitely increasing, and from all reasonable interpretation of present trends it is going to continue in the future. So it is very important to distinguish between one segment of occupational life, manufacturing,

and all occupational life involving everything from the professions down.

Mr. O'CONNELL. By training you mean training which is rather directly connected with the particular work that the man does as distinguished from general education?

Dr. NORTON. Yes; although you can leave general education out of the picture altogether. My emphasis here is on what we should call direct occupational training.

The most immediate and apparent economic outcome of education is where it provides specific training for a trade or profession, which you were just asking about. The objective here is to give each worker the general and the specific training which will permit him to work, in whatever occupation he may find himself, in an intelligent and efficient manner. Such training may be provided through a variety of agencies—trade schools, public or private, as well as industry itself, or labor may be in the picture. The important factor, however, is that the provision of such training has positive economic effects. There is complete agreement on this among economists. I quote one:

Without education one is likely to be limited to unskilled occupations. With education he is able to find more remunerative employment. The general effect of more widespread schooling is to increase the ranks of skilled workmen and to decrease the number of people capable only of cruder manual work.

A series of factors are now operating in American life which make carefully planned and effectively organized occupational training of first importance. The decline in immigration has largely cut off our supply of skilled workers from Europe, and it happens that many of them who came here 2, 3, and 4 decades ago are beginning to reach the age of retirement. The percentage of occupations in which definite training is either desirable or imperative is increasing. I am referring now to occupations as a whole. It seems probable that education can and should make increasing contributions to productivity in the future through expanding and perfecting its training of youths for occupational efficiency. I would emphasize that point of perfecting its training. I think in many respects, as in other areas of life, we have fallen considerably short of the ideal of doing what we should, so I am not arguing for just more of the same kind of education we have had in the past; I would rather urge that we need more of a different kind of education. In this publication that has already been brought to your attention, you will find two chapters right near the front of the book and two very important chapters dealing with the kind of general education for economic well-being. Dr. Carr, one of the later witnesses, is going to deal with that particularly, and Dr. Wright will be particularly concerned with another chapter, Kind of Occupational Education for Economic Well Being.

However, it is important that education to increase efficiency of labor should not be conceived in narrow terms. The effective operation of enormous aggregations of labor and capital, characteristic of contemporary economy, demands high types of vocational and economic intelligence. I am referring there both to occupational and general education. Improved organization and industrial techniques can be the outgrowth of suggestion and initiative on the part of the rank and file worker, as well as the product of research and managerial ingenuity.

The general pattern of organization in a business enterprise is likely to be different, as well as more efficient, when the manager is able to assume a degree of judgment and initiative on the part of the worker, as opposed to the ability merely to follow simple directions in a routine manner. That was brought very strikingly to my attention repeatedly on a little journey that took me through the Orient here 2 or 3 years ago, in which I visited mills in Indian and China and talked with managers and talked with them particularly as to the problem that is involved in the fact that the typical worker they have to deal with has little education. Even in mechanized plants such as cotton mills—they emphasize that what they can do even in that highly mechanized process is very much conditioned by the general economic and educational background of their workers. One gets a much clearer picture of some of these things that we take for granted in our country when one goes to countries in which the general level of education is not so high.

One industrial leader from a background of practical experience in directing a large business organization has stated :

* * * the effectiveness of individual capacity to produce, or to manage production, is determined by the degree of social cooperation, and that this cooperation depends primarily upon education * * *

I am quoting from Chester I. Barnard, as you notice.

High productive efficiency is impossible without widespread education. This is not simply a matter of securing leaders in science, invention, industrial organization, statecraft, etc., by an educational screening of the masses. No greater error could be made, it seems to me, than to adopt the notion too commonly held that either political or economic effectiveness is chiefly a matter of leadership. When generals can find no colonels, they must become mere captains. Captains are limited by the character, spirit, and ability of the men they command. The intensive training given to recruits is significant.

Now a third area. Education increases productivity by promoting occupational mobility. It is an accepted tenet of economics (and this idea occurs over and over again in standard economic literature) that the ability of labor to secure the training needed to transfer from crowded and low-paid occupations to those less crowded and better-paid tends to increase the national income. It is simply that if the individual worker on the average is working with greater skill and is producing more, by definition the national income is increased. When workers of energy and capacity must continue in low-paid common labor because of inability to secure training requisite to entering higher-paid callings, the national income tends to be decreased.

Occupational mobility is of increasing importance in a dynamic economy in which new discoveries are continually creating new vocations, many of which involve technical training. Education in the past has assisted in thinning out the overcrowded ranks of unskilled labor by increasing the proportion of workers in skilled and professional occupations. Its contribution in this area in the future should and can be made more effective. There is a whole series of ways in which that can be more effective. We give them in this publication, such matters as the collection of much more significant and definitive data as to what the occupational trends are, so that vocational advice which is pertinent can be given to high school youths, information as to the kind of training which is required, so that the kind of training

given in the school will be that which it can give best, leaving it to other agencies to give the training that can be given best by other agencies.

POSSIBILITY OF DISCRIMINATION IN VOCATIONAL TRAINING

The CHAIRMAN. The objection has been made in the past to vocational training, particularly for mechanical and industrial pursuits, that it would tend to limit the opportunities for advancement of those who take the vocational training rather than broader training in what in the old days used to be called the humanities.

Dr. NORTON. I don't believe you can speak in easy generalities in dealing with that problem. I begin by saying that every citizen, if you are going to assume a democratic order, needs a certain amount of general citizenship training, and he needs that particularly in the economic realm. We have just eliminated from the census the question about illiteracy because education has pretty well conquered the problem of what we call alphabetical illiteracy. I would say we still have the great problem of conquering what we call economic illiteracy. That applies to all workers. When you go beyond that and get into the more specific vocational or occupational training, I don't believe you can generalize too easily.

The CHAIRMAN. Well, does vocational training, vocational education, tend to differentiate youth into classes according to the economic standards of the parents?

Dr. NORTON. It should not if there is proper vocational guidance, because the area into which a youth goes should rest upon, first, knowledge of the various areas in which he might go, factual information, and, second, knowledge of his capacity and aptitudes and industry and all of those things.

The CHAIRMAN. You started out by quoting from Thomas Nixon Carver.

Dr. NORTON. Yes.

The CHAIRMAN (continuing):

That neither birth nor family prestige will count for much, and that humble birth and lack of prestige are no handicap to the person of ability and energy.

Now, I take it that you quoted that statement from Carver with entire approval.

Dr. NORTON. I did.

The CHAIRMAN. It still remains the general desire of all American educators—

Dr. NORTON (interposing). The ideal.

The CHAIRMAN. But do you not tend to divert from the ideal when you undertake to establish a different kind of education for different kinds of children?

Dr. NORTON. No; I don't believe—

The CHAIRMAN (interposing). And how are you going to determine the kind of children which should take this particular training of which you speak?

Dr. NORTON. I would say first generally that I do not believe that there is anything undemocratic in the principle of differentiation, that is having different kinds of education. Now it is true that in the field of general education up to a considerable level, up to a

relatively high level, limited only by capacity and such factors, we should have the same kind of education, the same general cultural background, but along about the end of high school, maybe before, certainly not very much after (it depends on the individual), there should be pretty careful assessment of the vocational opportunities of the country and the capacities and diligence and all that of the individual child, and out of that should come the best possible guess as to where he will achieve greatest success. Please don't misunderstand me. I do not mean I would have any board say, "You have to go this way." That is not what I am arguing for. I am rather saying that you should put in the possession of the parents of a child and of the youth himself by the time he has reached 17, 18, or 19 years of age, the information on which he can make an intelligent choice himself. Now we have done that to a very limited extent.

We should do it far more, and I would say that to the extent that you do that you encourage each person to rise through his own energy through the areas of work where he is most likely to rise.

The CHAIRMAN. Then your idea is that the preliminary education and high-school education should all be upon the highest cultural basis and for all children alike. That is, the public-school system should be so arranged that all children in the community should receive the same high cultural training, the very best that the community can afford.

Dr. NORTON. And I would go further and say also the very best occupational training for them.

The CHAIRMAN. Yes; but I was leading now to the point of the introduction of the vocational training. As I understand your statement now, it is that that vocational training should not be imposed upon youth, but should be opened as an opportunity to him after this cultural training for all has been completed.

Dr. NORTON. No; I wouldn't cut it off that way.

The CHAIRMAN. I didn't intend to imply that it was being cut off.

Dr. NORTON. They would run parallel. You would begin prevocational education, some thinking about what they were going to do in vocation, perhaps even as early as 13 or 14 or 15 years of age. You begin the actual vocational education at age 16, 17, 18, depending upon where the youth was going and his capacity, and certainly all would, by the time they were through high school, have some kind of an idea of the general route they were taking.

The CHAIRMAN. In any event, the choice would lie with the student and not with the school board or the school master or whatever.

Dr. NORTON. I would say in our society, in a democratic society, the final decision would rest with the student and his parents.

The CHAIRMAN. Now, that is a qualification. You say, "the final decision." What preliminary decision would not rest with them?

Dr. NORTON. I wouldn't say that things would be called preliminary decisions; I would say that the function of the school is to collect the most accurate, unbiased data bearing on the whole situation, both occupations and his capacity, honestly interpret them, and then try to show him exactly where the best opportunities are for him, with the hope that he will make the proper choice. In most cases where we have better developed programs they do take the proper choice. I suppose sometimes mistakes are made, human beings always make

some mistakes, but in the long run there will be far fewer than if we give them no information and have a situation such as exists in some places today.

The CHAIRMAN. In any event, you want to preserve complete freedom of choice on the part of every student.

Dr. NORTON. Yes.

The CHAIRMAN. So that there will be no measuring of the quality and kind of education by the economic level of the parents.

Dr. NORTON. Right, or putting it negatively, I would certainly not want to make any change in the school system that would be in the direction of making it a class-school system, the type that they have had in Europe, and still have in some places.

Senator KING. Dr. Norton, in your very interesting, instructive presentation thus far you have frequently used the word "cultural," cultural teaching, cultural education. What definition do you give to the word "cultural"?

Dr. NORTON. Well, perhaps a better term, one that is used more in education, would be general education. By general education I mean preparation for all of those responsibilities of citizenship, both individual and group, which lie out of the field of specific training for a vocation or occupation.

Senator KING. You would not exclude the preparation for farmers or blacksmiths or persons engaged in various manual pursuits?

Dr. NORTON. No; I would say that those parts of our population, just as all parts of our population, should have full opportunity for cultural or general education as well as for vocational education.

Senator KING. Do you think that the educational trend is toward—I don't use the term offensively, of course—the white-collar profession or the white-collar class, with a growing disposition to avoid manual labor, the manufacture of furniture, the manufacture of beautiful things with the hands, as our fathers and our forefathers did? I remember in my State we had some fine English cabinet workers who built a great organ, one of the finest in the world; they didn't have the machinery they have these days. We had men there who would make the finest violins, and their skill and technic was great, they had been taught that from youth—men who made the finest tables and furniture that would be an ornament a thousand years from now. I was wondering if we are not drifting away from the concept that labor by hand is honorable and involves cultural development and appreciation of the fine cultural things of life.

INCREASED EMPHASIS ON SKILLS

Dr. NORTON. If you put it on the basis of what is the trend, I do not think the trend is in that direction. I might admit that in the past, due to a series of factors which we won't review now, there has been that emphasis in many schools. I think the trend is away from that emphasis. For example, I spent a day in one of the well-developed vocational high schools of Pittsburgh recently. I happen to be associated with a general school survey that is going on there now. You can go into those high schools in Pittsburgh and you find them getting the foundation training that leads in the directions that you were specifying. They are gaining respect for skilled work of the manual type.

Now, if you had gone into Pittsburgh 30 or 40 years ago, or when I went to school, you wouldn't have found that type of thing. Those schools have all come in, or nearly all of them, within the last generation. I would say the trend is very much in the direction of giving respect for and training for what you would call highly skilled callings.

Professor Taussig deals with the whole thing that we have been discussing in a very beautiful sentence because it is so sweeping and yet I believe is so fundamental:

The removal of all artificial barriers to choice of occupation is the most important goal of society.

In addition to the quantity and quality of its labor supply, the natural resources of a nation constitute another basic factor affecting productivity. The lack of foresight in America's wasteful depletion of natural resources is an outcome of their plenitude. Other peoples have gained from experience the lesson which the United States is just beginning to learn.

Schools and colleges have already made substantial contributions to the conservation of natural resources. Schools and extension services are teaching farmers the importance of contour farming, crop rotation, soil fertilization, and protection of forests. Dr. Wright, when he comes on this afternoon, can give you many more details on this area. Colleges and universities are conducting research and imparting technical knowledge to agricultural and chemical engineers, business executives, and other experts.

Further contributions of education in conserving our heritage of physical resources should be made in directions already begun. There should be increased appreciation of the fortunate position of the United States with reference to resources. I don't believe many of us realize just how fortunate we are to have taken possession of a continent with none of its resources depleted as we did a few centuries ago. We have but 6.2 percent of the world's population, but we produce and consume some 50 percent of the world's mechanical energy. The United States ranks first among world powers as to national self-sufficiency in iron ore, coal, petroleum, copper, lead, sulphur, aluminum, zinc, phosphates, and other strategic resources.

We ought to understand the significance of that position. Education for conservation of the right kind emphasizes wise and economic use, not only conservation but wise and economic use of natural resources and develops vigorous public disapproval of flagrant waste whenever it exists. If you will go to the courses of study that are being developed in our high schools, you will find that this is coming in as a subject of specific and authoritative study, and I would say that there is no place where education can make a more fundamental contribution to preserving our economic foundations in the field of production than in this realm.

Capital is a third basic element in production. Here we are concerned with tools, machinery, plants, and technical processes employed in transforming materials into consumer goods. Science and technology are involved since they play a major role in discovering the tools and technical processes which give capital its peculiar modern characteristics.

Colleges and universities have conducted much of the significant research resulting in basic modifications in technics of production and

designs of machines and equipment. Research in the field of agriculture has perhaps been the most continuous and effective, going back, as you know, to the establishment of the land-grant colleges in 1862. Investigations concerning agricultural and biological chemistry, soils and soil fertility, field crops, horticulture, animal husbandry, and many other areas have been a major factor in remaking agriculture in the United States during the past two or three generations; and if you could compare the intelligence with which the farmer approaches agricultural problems with those used by the farmer in some of the other parts of the world, we would realize what a great asset we have here.

The research of scientific workers in universities has resulted in discoveries on which many new industries have been founded. This is but one of many illustrations of the important effect of university research in founding new industries.

Karl Compton says:

Eighteen of the new industries which have grown directly out of scientific research within the past 50 years provide one-fourth of all the employment in the United States. The majority of the products now manufactured by electrical companies were unknown 15 years ago. It is estimated that 95 percent of our chemical industry (which as you know in the last two or three decades has become a basic industry in this country) is based on fundamental discoveries made in university laboratories.

Nearly 200 college laboratories are used not only for the purpose of instruction but also to a considerable extent for industrial research work and commercial testing. The proved economic value of university research is one of the factors which has influenced industry to establish commercial research laboratories, involving expenditures of \$100,000,000 annually.

A fourth factor in this whole complex is management. The size and complexity of business concerns, the number of employees involved, the range of raw materials consumed, and the amount and types of capital equipment employed give a social significance to executive decisions and demand a grasp of technical knowledge and principles of organization which transcend those required of entrepreneurs in earlier economics.

Schools have long provided literacy and other elementary education which the self-made man has possessed. The tendency recently has been to emphasize the importance of formal training as a qualification for leadership in business enterprises. Colleges, technical schools, and universities train scientists, engineers, and technologists who provide expert knowledge for the business executive and who in some cases themselves assume managerial positions. Graduate schools of business are training growing numbers of young men, who first enter minor executive positions from which they are recruited to those involving more managerial responsibility.

Now we are coming to another subject—how does this theory that education affects productivity at these various vital points work out in practice? A number of studies have attempted statistical measurement of the relationship of productivity and provision for education among the 48 States of the Union. One of the most comprehensive and careful of these was made several years ago by Bowyer, and this is merely illustrative. It attempted to compare the percentage of its wealth which a State spends for schools with the rate of increase

in its wealth during the subsequent 25 years. This study found that "in those States in which the percentage of wealth expended for public schools in 1890, 1900, and 1912 was the greatest, the increase in the average per capita wealth during the following periods was larger than the corresponding increase in States which had provided adequately for their schools."

We can approach this problem also from the negative side, as Odum has done in some of his investigations. He shows that "the Southeast excels in the two primary resources—namely, natural wealth, natural resources—and human wealth, while it lags in the secondary resources of technology, artificial wealth, and institutional services," such as education. One of the outcomes of these lags is the wasted, as he calls it, "possibilities of youth undeveloped and untrained, born, living, and moving through life without ever gaining a knowledge of their power and possibilities." The outstanding fact in this whole situation, he says, seems to be that of "undeveloped possibilities and of human waste."

POTENTIALITIES OF DOMESTIC CONSUMPTION

Dr. NORTON. One calculation was made recently as to what the effect would be on our market for goods if the States in the lower half with reference to income per capita were lifted to the average for the country as a whole, and the conclusion was reached that the effect in terms of creating a new market would be far greater than our whole foreign trade. In other words, we have the possibility of developing within our own boundaries, by bringing areas that have not advanced as rapidly economically as others up to the average, a market for goods, opportunity for trade, which is far more important than we get from all of our foreign trade.

It appears, then, that logical analysis of economics, involving more than a century of study, the experience of the nations of the world, and the findings of technical statistical investigations, unite in supporting the hypothesis that high productivity and adequate education go together and that the latter does have important effects on the former.

The CHAIRMAN. May I interrupt? To return to what you were saying just a moment ago, by whom was this conclusion reached that a much larger market would be opened by raising the capacity or ability to consume of the lower income States?

Dr. NORTON. It is based on certain data that I took from certain economic sources.

The CHAIRMAN. I think it is a perfectly obvious conclusion.

Dr. NORTON. It is obvious, but it is very striking when you get the facts.

The CHAIRMAN. Your statement was that the conclusion was reached. I would like to get some additional authority.

Dr. NORTON. I can personally send you some of the data on that, if you would like to have it.

The CHAIRMAN. Can't you state for the record some additional authority on it? I think it is a perfectly clear statement that nobody could disagree with in the facts that are presented.

Dr. NORTON. Yes.

The CHAIRMAN. I have frequently thought that many of us pay too little attention to the open door at home, as I think Professor Beard once referred to it.

Dr. NORTON. Yes.

The CHAIRMAN. We are spending too much time thinking about potential markets that are not so easily reached. I was very much impressed about 2 years ago by seeing a 2-page colored map of the United States in the Saturday Evening Post prepared by the advertising division of the Saturday Evening Post. This map undertook to designate the comparative value as markets of every county in the United States. It illustrated that business was national in the first place.

Dr. NORTON. Right.

The CHAIRMAN. It was an appeal to national advertisers in the *Saturday Evening Post* to distribute their wares in counties which had the highest purchasing capacity, but it was perfectly obvious that if those counties which were represented in the color that told of the lowest purchasing capacity could be raised to the other level there would be a tremendously increased market for all of the *Saturday Evening Post* advertisers.

Dr. NORTON. And I would emphasize the importance of looking to that market and of using measures, of which education is one, of developing that market.

Colonel CHANTLAND. Didn't Dr. Lubin present figures or data along that line, of bringing the lower level up?¹

The CHAIRMAN. Yes; he has done some of that.

Dr. NORTON. It is important, however, that easy conclusions and naive assumptions should not be encouraged by this undoubtedly important fact that education is in the picture. Mere increases in amount of education, irrespective of its quality, character, and incidences, are not likely to have important economic effects. Furthermore, education is only one of several factors responsible for the remarkable increase in economic productivity, which some nations have achieved during the last century. It would be superficial to disregard this fact. On the other hand, it is not necessary to make extravagant claims as to the economic value of education. The annual cost of schools and colleges, both public and private, in the United States is only about \$3,000,000,000 even in the most prosperous years. This, after all, is a minor fraction of the \$80,000,000,000 income which the Nation enjoys in prosperous years. The assumption that even a small part of such an unprecedented level of productivity can be credited to the effects of education would more than amortize its cost.

The relation of education and productivity, we would say, is most clearly understood when one looks upon them as complementary, interacting forces. The existence of a high level of productivity makes possible the financing of an extensive system of schools and colleges. Adequate provision for education is essential to a high level of productivity. Each makes the other possible, and progress is made by this route rather than assuming something of that nature. Modern economic productivity and popular education have developed con-

¹ See hearings, Part 1.

currently and both are requisite to the maintenance and improvement of the Nation's economic well-being.

It is of the utmost importance that we do not permit ephemeral conditions or fallacious opinions to blind us to the fundamental relation between education and economic well-being.

Representative WILLIAMS. Right in that connection, does that not conclude there must be a consuming capacity or the ability to consume before they are produced?

Dr. NORTON. I would rather not be too specific as to the order. I would rather rest on the statement, otherwise we will get into a whole new realm, which I recognize is important. I would rather say that goods and services must be produced before they can be distributed and consumed.

Representative WILLIAMS. But it is perfectly evident that our productive capacity is increasing and it is unbounded for that matter, through education and technological advancement, but on the other hand, unless there is some means devised by which there can be a consumption of that production—

Dr. NORTON (interposing). Right.

Representative WILLIAMS. I don't see how we can increase, or continue to increase, production. The fundamental, the very underlying principle, to my mind, is the question of how we are going to increase consumptive capacity and provide the means by which the goods, when produced, can be bought and consumed.

Dr. NORTON. I recognize the importance of dealing with problems affecting distribution and consumption, and I say that is very important, as you have just been emphasizing, but should not obscure the thing that I am principally concerned with this morning, the crucial significance of conserving and upbuilding the factors essential to a high level of production. The two are not out of relationship.

Representative WILLIAMS. Of course, I don't want to be understood as intending to counteract that tendency in what I say.

Dr. NORTON. I realize that.

Representative WILLIAMS. I am heartily in accord with what you have said with reference to education's part in this advancement.

The CHAIRMAN. Well, isn't it an important thing to consider, even now—the answer to the question propounded by Congressman Williams, which comes first and which in the interest of society should be made to come first, the capacity, the ability to consume, or the production? Now, let me say this, before asking you to give us your opinion, that before the modern advance of technology, when industry was practically confined to the home and to the farm, those who lived on the farm and those who lived in the home produced what they wanted.

In other words, they geared their production to their own well-recognized capacity to consume, and they could fit one to the other because they were themselves both the producers and the consumers. But technology has caused another factor to intervene. We have broken down production into such specialized trades that the capacity to produce has outrun the ability to consume, has it not?

Dr. NORTON. If you give the proper definition to ability, yes; I will agree.

The CHAIRMAN. What is the proper definition of ability?

Dr. NORTON. Well, if you mean the willingness and readiness to consume if they can get hold of it, right.

CONSUMPTION LAGS BEHIND PRODUCTION

The CHAIRMAN. That's right, exactly what I mean. The desire to consume may be there, but the purchasing power has been lacking because the productive capacity of individuals has been cut off. The individual who formerly could produce upon the farm because it was his farm was in a much better position so far as stability of his living standard was concerned than the person whose capacity to produce is dependent upon his getting a job from some large industrial organization, a job which he cannot command. He could command it under the old economic system. Do you agree with that?

Dr. NORTON. You have undoubtedly outlined an area of extreme importance, and in my emphasis on the production side I don't want to give the impression that I failed to recognize the importance of that area.

The CHAIRMAN. Still you haven't given us your opinion of which does come first.

Dr. NORTON. I wouldn't think that my opinion was of great value in that area.

Dr. ANDERSON. Mr. Chairman, I might say that the second expert of the day, who is an economist in this particular field, is going to devote most of his time to trying to answer that one question.

Dr. NORTON. And I am anxious to give him the right of way in a few minutes.

The CHAIRMAN. Congressman Williams said that if we find the answer to that question we will have done our job.

Dr. NORTON. I was tempted to make a facetious remark, and here I am speaking as a layman. I will just say that that argument is about as difficult as deciding whether the egg or the hen comes first.

It is sometimes stated that less education should be provided since as a Nation we are already producing more than we can consume. The fallacy of this conclusion is readily demonstrated by referring to studies such as those of the Brookings Institution, which clearly demonstrate that even at the peak of production in 1929, we were producing less than enough to provide an acceptable standard of living for all Americans. There is every logical reason to continue the policy of expanding our productive capacity in an orderly and efficient manner. All agencies which contribute to this goal should be effectively maintained.

Some will point out that even well-trained workers now find it difficult to obtain employment, particularly during the depression. Accordingly, they would propose that fewer workers be trained and that the percentage of unskilled workers should be allowed to increase. I believe this is a counsel of despair. Followed to its logical conclusion, it would lead to economic retrogression or an uneconomic population of low-skilled, low-producing workers. We cannot afford to base our long-term educational policies upon our present temporary economic maladjustments. This would be equivalent to assuming that such problems as serious unemployment, production far below potential capacity, and similar depression maladjustments are permanent and incapable of solution. Much of what we have a right to hope for would be impossible if such an attitude were to become the basis of public policy. A far more intelligent approach, we would believe, is to assume that human intelligence will find solutions to present

economic problems and that most, if not all, workers possessing training and diligence will eventually find real opportunities for service. Certainly such workers—and by “such workers” I refer to trained workers—cannot be absorbed if they do not exist, and they will not exist unless they are trained.

It is important to note, also, that even in the depression trained workers found it far less difficult to obtain work than did those without training. A disproportionate percentage of the unemployed is made up of unskilled labor. Furthermore, there appears to be an actual shortage at present in the supply of some types of skilled labor.

Available evidence, therefore, suggests that both individual and general economic welfare require that we should develop every practical means for increasing, rather than decreasing, the percentage of trained workers.

Mr. O'CONNELL. On what do you base the statement that a disproportionate percentage of the unemployed is made up of unskilled labor?

Dr. NORTON. On certain factual studies that have been made. I would particularly cite you Census of Partial Employment, Unemployment, and Occupation, which was issued for 1937 by the Government Printing Office. There have been a number of studies on a factual basis that quite clearly demonstrate this to be the fact.

Some will contend that there will be no one to do unskilled labor if too many workers are trained. This attitude, again, is based upon short-term considerations. The whole advance of western society economically has consisted in discovering efficient means of performing labor of the type which in earlier times was done by unskilled workers. As the number of trained workers increases, mechanical ways are found to perform routine work. The training of unskilled workers should continue, subject only to the limitations of their capacity and willingness to take the training involved. The economic efficiency of a society increases as its proportion of unskilled workers of low productivity decreases.

There is serious danger that shortsightedness will prevent the development of long-term policies in education, essential to economic well-being. It is unfortunate that forces growing out of the depression have caused us to decrease expenditures for education, while those for relief have been enormously increased. Humanitarian considerations may have made this necessary, but it is a trend which should be reversed at the first opportunity. In the field of physical well-being, prevention of illness and the building of abundant health is recognized as sounder practice than emphasizing the curative side. The analogy has applicability to economic well-being.

Our economic health should be protected at all costs. Continuous education for replacement of economic knowledge and skill is of supreme importance in a technological society. The length of the period of training and the brief span of a man's working years testify to this fact. Education has an enormous job to perform in merely maintaining the accumulated capital of knowledge and skill. Every death of a professionally or technically trained worker reduces this capital unless it is currently replaced.

Willford King, well-known economist, has this to say on this important factor:

Some of the most expensive and important forms of savings are not tangible but consist of such things as accumulated scientific knowledge and the training of the human mind. Savings of the last-mentioned variety are extremely perishable, since they are constantly being lost through the death of the persons possessing the education.

Mr. O'CONNELL. I take it there is a certain volume of that so-called savings which is lost through technological change, too, that as a man might have been a skilled worker in a particular line for a period of years and would have accumulated that knowledge it might overnight, almost, have become worthless to him.

Dr. NORTON. It doesn't take death, if the industry you are working in so changes that it makes your training obsolete. Unless you are re-trained you become an unskilled worker. It is very important, perhaps as important as the factor of death, when industry is changing so rapidly.

An appraisal of the current situation clearly demonstrates that we have not provided facilities appropriate to the maintenance and expansion of economic capital. I want to emphasize that there are two chapters dealing with this point and giving extensive factual information in this report on Education and Economic Well-Being. I refer to the chapters, Existing and Desirable Amount of Education for Economic Well-Being, and Extension of Facilities and Selection of Students. It is a fact which you can document easily, that fortuitous factors to a large extent now determine whether children and youths shall have generous or little educational opportunity in the United States. Now, we are coming back to the point that Senator King was emphasizing, that although we have kept the door of educational opportunity open in this country, it has not been completely open. It has been open enough so that a considerable number of people could squeeze through, but it is also closed enough so that a great many people who happen to be born in a poor family or in a poor area or in some other restricted situation do not have a chance to go through that door.

"MORTALITY" IN HIGH-SCHOOL EDUCATION

Dr. NORTON. There have been a number of studies that justify this figure I am giving now: 30 percent, as a conservative estimate, of the youths in high school drop out for economic reasons. I would cite the studies on pages 135-142 of the Educational Policies book that document that statement. Some studies put it as high as 50 percent. Lack of money to meet college expenses not only keeps thousands of capable youths from entering college but is also one of the chief reasons for their withdrawal.

Mr. PIKE. Would you also say that too much money has put a great many people into colleges that perhaps clutter up the educational system?

Dr. NORTON. I think I know what you refer to—that we sometimes make rather poor use of the time of youths who go on for advanced education, but I would add further that if we offered the programs and the opportunities that they should have, and developed what you might call an ideal and practical educational opportunity, say, from the end of high school on, you would probably in toto increase rather than decrease the number of youths going on beyond high schools.

Mr. PIKE. But you wouldn't have them in those specific institutions where perhaps some of them don't belong.

Dr. NORTON. I think many of them are misplaced at the present time, misplaced as to the kind of training they are getting and various other factors. A youth's chance to prepare for high calling, or for any calling except unskilled labor, now in these free United States often rests upon such factors as the taxable capacity of his local school district, whether his father is a professional man or a laborer, which means whether he will be encouraged to go on or not; whether he happens to be born in the North or the South, in the city or in the country, or in an urban or even a suburban community. Large numbers of youths are prevented from continuing their education through high school and into college because of lack of ability to meet expenditures required. Many of these youths have superior ability, and I am not making that statement on the basis of generalities, I am making it on the basis of scientific investigations which have measured these youths as to intelligence and industry, and record in high school, and the facts show that about as many capable youths fail to go on to college as actually do go on.

Many of these youths have superior ability. When competent youths are given financial aid permitting them to continue their education they make outstanding records, and once again that is based on the studies connected with the N. Y. A. program and scholarship programs, that if you make a reasonable selection of youths from the very poorest families, families with less than \$1,000 a year of total income, and send them on to college, they make outstanding records. There are a number of studies that have demonstrated that beyond question.

The distribution of educational opportunity in the Nation today is such that the potential economic effects of education are far from being fully realized. Tens of thousands of youths each year are foolishly being thrown into the overcrowded ranks of casual and unskilled labor who could have qualified for callings which demand more and pay more. They have both the capacity and the ambition to so qualify. But we at the present time permit fortuitous factors beyond their control to sentence them to 30 or 40 years of low-grade and low-paid service. I would say that that is a thoroughly undemocratic situation. The youths thus condemned by an uneconomic social policy will earn less than they could have earned, and the Nation's income will be less than it might have been. Wise public policy urges that this undemocratic and uneconomic situation be corrected as rapidly as possible through the right kind of effectively free education.

Schooling must be made free enough so that its costs do not constitute an effective barrier to education. By effectively free schooling we mean schooling provided under such circumstances that persons who should have that schooling are not debarred from it by financial reasons, and literally tens of thousands of American youths who should have additional schooling and training today are being debarred because of financial reasons.

Because effectively free schooling is necessary to obtain maximum income, the economically wise society will continue making additional amounts of education effectively free, so long as the income which accrues from added productivity exceeds the cost of these additional educational expenditures. This will be done because there will be more left to buy other goods and services after such education is paid for than there would be if such education were not provided.

The development of a program for maximizing the economic effects of education should be initiated at once. Some educational funds now expended for less vital purposes should be directed to this end. Funds from this source should be supplemented by additional appropriations as rapidly as conditions permit.

This policy is justified on the grounds that the proposed educational program in the long run will yield substantial economic returns. It will pay for itself, since it promises to increase national income more than enough to cover the expenditure required. Education may not be self-liquidating in the immediate and narrow sense of a toll road or a harbor where tolls and wharfage fees meet original investment and maintenance costs, but education of the right kind is self-liquidating in a far more fundamental sense than material improvements can be. In contributing to increased productivity, it helps to create the economic basis in national wealth and income upon which taxation for education and other governmental activities, as well as our whole standard of living, depends.

Now, Mr. Chairman, are there questions you would like to ask?

The CHAIRMAN. There are many questions that I have no doubt that many of us would like to ask. Some of them, of course, have already been propounded to you.

Mr. O'CONNELL. I would like to ask one at the moment. Do you happen to know whether organized labor has any view with regard to what I understand to be a proposal to continuously extend the development of vocational training?

Dr. NORTON. I know of some of the opinions of the type that Mr. Phil Murray has, and doubtless of the type that you will get from Mr. Green, that have been issued by different labor groups. I have read about those; yes.

Mr. O'CONNELL. Are they, in general, sympathetic with your approach, or are they, in general, somewhat opposed?

Dr. NORTON. I think you have to say it depends somewhat upon the man you are talking with. I think Mr. Philip Murray appeared before this group earlier. You know his viewpoint and I don't need to emphasize it. And if you will go to the schools of Pittsburgh, where he happens to be a member of the board of education, you will find that their policy is to develop increasing amounts and increasingly effective vocational education, and so on that basis you could say that at least part of labor does emphasize the importance of increasing the amount of training.

Of course, I suppose anyone who is intelligent would emphasize the importance of just not increasing training in one particular realm or two or three trades. It should be a broad diffusion of training; it should be based upon occupational information as to where the outlets are, and most training should be given in those areas where the supply of trained labor is least. All of those qualifications have to be made, but I have a feeling that intelligent labor as a whole recognizes the importance of effective vocational training for the rank and file of workers.

Mr. O'CONNELL. You spoke of the fact that lack of sufficient facilities of free education was a barrier to be removed. It occurs to me there are other barriers with which a person who might have received adequate training would be apt to be confronted when he attempted to put his training into action. I would assume that in a highly skilled trade you would have to belong to or join in some

areas at least a union, and in some of the unions there would also be financial barriers, in the sense of initiation fees and things of that sort. You are discussing only one barrier.

Dr. NORTON. I am emphasizing that one barrier because the lack of education constitutes that barrier. There are many other barriers. If you happen to go to the right college and make the right contacts, you perhaps get other opportunities, and luck enters into the situation as well as skill and training. My emphasis would be, let's take down one barrier that should not exist in a democratic society, and that is the opportunity to obtain the requisite education. Certainly if you don't have the educational training you can't qualify, no matter how close your contacts may be, and therefore I would say that with proper guidance and advice, give every youth the amount and kind of training that his capacity and diligence says he should have.

Mr. O'CONNELL. I don't think we would quarrel with that.

Dr. ANDERSON. The next witness's testimony, which is directly connected with this, is discussional. We could perhaps finish before the lunch hour, as we have a terrifically heavy schedule this afternoon.

INCREASED PRODUCTIVITY OF LABOR

The CHAIRMAN. That would be quite agreeable to me if it is to the other members of the committee. I just wanted to ask Dr. Norton another question.

In your statement you said—

The economic growth of the United States may be epitomized in the fact that a growing percentage of trained workers has used more and more effective methods of work.

Dr. NORTON. Yes.

The CHAIRMAN. By that I take it that you are referring to the training which enables the worker to make the most effective use of all of the discoveries of science and invention, power-driven machinery, and the like.

Dr. NORTON. Right.

The CHAIRMAN. It is the application of trained skill to technology.

Dr. NORTON. Right.

The CHAIRMAN. That conjunction of trained skill and technology upon raw materials brings about the increased productivity of which you speak, and which you regard as necessary. Is that correct?

Dr. NORTON. That is right.

I would like to bring into the picture, though, the fact that a minority of our employed workers in this country, a minority of gainfully employed workers, are now in what you would call strictly manufacturing or mechanized industries. There is a whole series of occupations, for example, the distributive trades, which we are just now beginning to recognize on the basis of training, in which persons, by looking at their trade or calling as something that can be trained for, may become more efficient.

The CHAIRMAN. Well, even in the service industries mechanization is present in a degree that I think is sometimes overlooked.

Dr. NORTON. That is right.

The CHAIRMAN. The ordinary gasoline service station is just a marvel of mechanization.

Dr. NORTON. Right.

The CHAIRMAN. And yet, though many machines are used, there is also a great deal of personal, individual manual labor involved in running those machines.

Dr. NORTON. Right.

The CHAIRMAN. Even the beauty shop and barber shop of modern days use a lot of new devices.

Dr. NORTON. Right.

The CHAIRMAN. And yesterday we had a good deal of testimony with respect to mechanization upon the farm, so that even the agricultural industry has become mechanized. We see it almost wherever we turn.

Dr. NORTON. It is a very important factor in our lives.

The CHAIRMAN. But you were developing the application of training to natural resources, and so forth, to increase productivity, and then at the outset of your statement you were referring to the fact that at the time our country was first organized and the Constitution adopted, the national income was only \$677,000,000, and that this combination of training, skill, and technology has increased our national income, so I just wanted to lead up to this question: Is it your conclusion that the most effective way to increase the national income is to increase production?

Dr. NORTON. I would say, undoubtedly that is one of the important factors in the situation, because I would think that by definition you can't increase income and the general standard of living without actually increasing production.

The CHAIRMAN. Would you think that the national income could be increased by decreasing production?

Dr. NORTON. I would not.

The CHAIRMAN. That was the answer I hoped you would give.

Dr. NORTON. That is easy.

Thank you very much.

(The witness, Dr. Norton, was excused.)

Dr. ANDERSON. Mr. Chairman, the next witness is Dr. Harold F. Clark, an economist as well as an educator, and his procedure in presenting his testimony is a series of topical headings which he is perfectly willing to discuss as questions.

The CHAIRMAN. I would like to swear the witness.

Do you solemnly swear the testimony you are about to give in this proceeding shall be the truth, the whole truth, and nothing but the truth, so help you God?

Dr. CLARK. I do.

(Mr. O'Connell took the chair.)

**TESTIMONY OF DR. HAROLD F. CLARK, PROFESSOR OF EDUCATION,
TEACHERS COLLEGE, COLUMBIA UNIVERSITY, NEW YORK, N. Y.**

Dr. ANDERSON. In connection with this subject, we are discussing such things as bottlenecks to skilled trades and things of that kind. I know the witness and his background, and should like to question him to show the type of expert we have.

Dr. Clark, you are an economist?

Dr. CLARK. I am.

Dr. ANDERSON. How long have you been working in the field of economics?

Dr. CLARK. For the past 15 years.

Dr. ANDERSON. You have done expert study in the field of occupations and their relationships to our economy?

Dr. CLARK. I have.

Dr. ANDERSON. Have you published?

Dr. CLARK. Yes.

Dr. ANDERSON. What have you published?

Dr. CLARK. We have here a little volume on Economic Theory and Correct Occupational Distribution, another on Life Earnings in Some of the More Important Occupations in the United States, and some 160 technical articles in various journals.

Dr. ANDERSON. I might say, gentlemen of the committee, inasmuch as this is a field which I know something about, that this little volume on Economic Theory and Correct Occupational Distribution was the most provocative writing in the whole field of occupational distribution that has ever appeared in economic literature in this country, and Dr. Clark, prior to it, had developed the educational implications of occupational distribution to a degree that no other scholar has done in this country. Since then he has examined this whole field of occupational earnings and the relationship of economic theory and planning to occupational distribution, the very topic we have been discussing.

Would you proceed, then, with your testimony, Dr. Clark?

Acting Chairman O'CONNELL. You are at present professor of education at Columbia?

Dr. CLARK. Yes.

Mr. Chairman and members of the committee, the topic I want to discuss is the allocation of the labor supply of the country and its effect upon the level of economic welfare. First, I want to call to the committee's attention the fact that the bottlenecks caused by shortages of skilled labor in particular industries constitute one of the greatest dangers to a country in time of war.

The holders of these bottleneck positions in times of crises are in a monopolistic position, and are almost certain to take full advantage of that fact. The danger, however, is not due to the exceptionally high wages that will have to be paid in those fields, but to the fact that production will be held up in many fields. This, in turn, may cause dislocation in a large part of the economy.

Mr. PIKE. Do you think of any at the moment, Dr. Clark—any examples you care to give?

Dr. CLARK. Yes; I think we could all put our fingers on one or two, particularly in the machine-tool industry.

(Senator O'Mahoney assumed the chair.)

Dr. CLARK (continuing). It, of course, would have been child's play to prevent that. The type of community organization that I am going to try to outline in a few moments should have effectively prevented that very happening. That is just plain stupidity.

There is only one proper solution of this difficulty. This solution consists in having a large number of highly trained people for all fields. Adequately trained workers would have great flexibility in adjusting to a wide range of occupations. These bottlenecks could all easily be avoided by a rationally organized training program.

Mr. PIKE. You mean, there, the sort of training that leaves a certain amount of elasticity in the person so that if this job is displaced tech-

nologically, or doesn't require a full force at the moment, he can go over to another job that requires rather high schooling and swing into it in a short time.

NEED FOR CATALOGING OF AVAILABLE JOBS

Dr. CLARK. I mean that, but I mean something more than that, too. I mean a training program designed to achieve what in the past we might have called overtraining. The man will have a breadth of training that will enable him to go here or there, plus the fact that each community will have such a carefully drawn up plan that you will be able to look forward and see where your shortages are likely to develop. At the present time we never know until it is right upon us. We can go back now and see that there were indications that this shortage was going to develop whenever your machine-tool industry reached a certain stage of expansion, which it could reasonably be expected to reach at a certain time. In other words, in 1932 you should not have dropped your training program. There is no earthly reason for letting a man stay on relief, idle, when he will be very much better off being trained. We could have used the past 10 years, the greatest period in human history, to get an overtrained labor force without any expense. We didn't use it because the individual communities didn't have the plans drawn up in terms of their being likely to need people when the expansion came. It wouldn't have cost us a red cent.

The CHAIRMAN. How could that have been done?

Dr. CLARK. I would like to postpone the answer just a little, if there is no objection. If I do not get to it, I trust you will remind me.

The CHAIRMAN. Very well.

Dr. CLARK. The level of economic welfare of a country probably depends more on the quantity and the quality of the training of all of its workers than on any other one item.

There are those who would like to tell us that the level of economic welfare of a country is determined almost exclusively by basic resources, or a lack of them. A very casual comparison of such countries as Switzerland and Colombia, South America, would readily disclose that Colombia has far more resources. The difference between the two countries lies in the quality of their trained labor force. I have spent a considerable amount of time in the last 15 years studying and working in 58 different countries in the world trying to find out what does determine the relative levels of economic welfare, and you find essentially no relation between the basic physical resources and the level of welfare in that country.

Denmark, with almost no basic natural resources, has had an exceedingly high standard of living. Mexico, with large resources, has had a relatively low standard. Denmark has perhaps the most highly trained and skilled farming population in the world. Mexico's population is essentially untrained. Training of the workers, then, seems to be the key to determining the level of welfare of any country or even of the major sections of the country.

This highly trained labor force would also be a powerful factor in suggesting and bringing forth a continuous flow of new industries that would make possible a higher standard of living than this country now has.

In other words, your highly trained worker is able to see the next step; he is able to see the new industry that ought to be established; he has training, and certainly should be able to work out the technique of getting the capital and closing the gap.

A substantial amount of unemployment is caused by the lack of flexibility in the total labor supply.

There are many well authenticated case studies of heavy unemployment in a city and still a substantial number of jobs going unfilled. The classic one is the one in Philadelphia, made a few years ago, at a time of heavy unemployment. It was an actual factory-to-factory survey on one minor job, asking the manager how many people he would employ if a trained man for this job appeared, and it showed that quite a large number would be employed.

One of the classical cases existed in the Panama Canal Zone up until a few years ago. The case study can be found in a volume by F. W. Hosler, entitled, *The Administrative Organization for an Apprenticeship Program in the Panama Canal Zone*. This study showed clearly that many of the key positions in the Canal Zone could not be filled by adequately trained persons when they fell vacant. There was no systematic training program for them. This applied to many of the higher positions as well as to large numbers of positions requiring lower skill. There were actually substantial numbers of positions unfilled because no qualified persons could be found to fill them. At the same time there were large numbers of individuals unemployed but unprepared to do any specific thing.

The unfortunate fact is that modern technical industrial society does not have any mechanism to anticipate where jobs are likely to be and to provide adequate training for them. Each individual is left to flounder in his own ignorance and to collect what little information he can casually pick up. Some more systematic arrangements must be made to all communities to see that a complete and up-to-date record is kept of the probable need for new workers.

I want to outline in just about half a minute, if I may, and start on the answer to the chairman's question.

Dr. ANDERSON. I want to ask this question. You have stated that there are situations in which jobs are available of a skilled character. Are they usually of a skilled character?

Dr. CLARK. Almost always.

Dr. ANDERSON. And workers are not available to fill them. Do you care to generalize as to the extent of that in the total economy, or where it is located, how it manifests itself?

Dr. CLARK. I should like very much to generalize to this extent, that we do not know with any degree of accuracy, and the reason we do not is that we haven't the machinery that could possibly give us the answer. That is the basic point that I want to discuss for a moment, if I may.

I see no chance of making any real progress on this point until we get a change, in addition to what you might call your community organization. We need what you might call an occupational planning group in every community in the United States, representing every type of occupation, carefully organized, systematically meeting, studying the occupational need, being in contact with all the technical groups, looking as far forward as possible, making the plans for that particular community.

If in this community, after the most careful study, you find out that you are going to have 10,000 boys and girls leaving school—and we will just take the school-leaving group as an illustration—and you look over all of the occupations in the community and you find that only 9,000 can be absorbed, at that point you have, for the first time, set up the machinery to frankly face the issue of unemployment. Until you have that much information, you can't even discuss unemployment intelligently. In other words, you can't even get the answer to your question, you haven't the facts on which you can start. You have to go back and set up some kind of machinery of that order in every community in the United States.

If you find that 9,000 can be absorbed in present jobs, then the question is, what are you going to do with the other 1,000? Then you can begin to discuss it on a variety of bases. You can ask intelligently, "Do you want to reduce hours, and if so, how much would they have to be reduced in the reallocation of the labor force?" "Do you want to establish new industries? If so, what would they have to be?"

For the first time, then, you can frankly face the question of how many new industries you would have to establish, at what rate, of what kind, where would they have to be? Otherwise your talk must be in very vague generalities.

Mr. MAGINNIS. Professor Clark, do I understand that your idea would be to set up such a body, whether a commission or otherwise, with a certain number of members, say three members? Do you mean each large community, at the expense of that community or the Federal Government, would make it a permanent proposition?

Dr. CLARK. I would very much rather it would be a voluntary representative body from all the occupations, elected members from every occupation, meeting as an occupational planning body with no power, of course, in compulsion, but to really get the information continuous. It might meet once a month. In the larger communities, of course, it would have a small, paid technical staff.

Mr. MAGINNIS. Don't you think the practical difficulties about such voluntary propositions are that they only last just a short time and that sometimes the period is very short because every man is too busy to devote the time necessary?

Dr. CLARK. I don't think so. I think we have some experience in our city planning councils. I would not be dogmatic on that point, but I think we have enough experience from the planning of the physical resources to lead us to think we could get the ablest people from all the occupations. After all, it is one of the 2 or 3 most important aspects of the total community. I wouldn't want to argue the point. If we find out we ultimately have to pay for it, all right. I would be very insistent, though, in my own opinion at least, that they root in the community, that they grow out of the community. I would want as little overhead compulsion coming down from Washington and the State capital as I could possibly get. I would try to get it springing up out of all the occupations, all the communities, with a minimum of coordination.

Mr. O'CONNELL. The problem is rather a national problem than a community problem.

Dr. CLARK. You have to have a coordination, plus or minus, in your communities.

Mr. O'CONNELL. You might have 1,000 extra workers in one community that might not be solved by that community.

Dr. CLARK. It is a fairly simple coordinating job in a State, I think, if those local bodies are really functioning actively.

Dr. ANDERSON. There will be difficulties arising in connection with the mobility of labor.

I am thinking now not only of occupational but also of geographical mobility.

MOBILITY OF LABOR

Dr. CLARK. Quite; that is a complication which you would take into account in setting up your plans for your individual community. It is no objection to the plan; only another complication in carrying it out accurately. In the early stages it would introduce another inaccuracy in your estimate, but it makes it all the more important, if you are trying to set up a training program in your local community, that you have made the best guess you can of how many of those people are likely to be absorbed in the particular community on the basis of past experience, on the basis of the intention of all the people, and everything else.

The CHAIRMAN. How could a local community do that with respect to a national industry? Let us take, for example, the telephone industry, because it covers the entire country. Yet, because it is a national institution, governed by a board of directors operating from, ordinarily, some one central head, how could a community in the far West make any effective plan with respect to training the youth of that community for employment in the telephone company?

Dr. CLARK. You gave me an awfully easy one, Mr. Chairman.

The CHAIRMAN. Good.

Dr. CLARK. I have worked a little with Mr. Bridgeman and some of the other technical men of the staff there, and it would be simplicity itself for them to make the estimates—

The CHAIRMAN (interposing). For whom to make the estimates?

Dr. CLARK. For the people in the telephone company to make the estimates of what they thought they were going to do. Then they pass that back down to a little town of 10,000 in central Nebraska. They employ 9 people. They estimate a certain rate of expansion. They estimate that they will take another employee in 2 years. That information could be obtained right today in any community that wants to take the trouble to get it. There isn't any excuse at all for its not being done, probably for 25 to 40 of the major large organizations.

The CHAIRMAN. The telephone industry is one, as was pointed out during the testimony of Mr. Harrison, the vice president here at these particular hearings, which depends for its success upon the number of contacts it makes with individuals. It is a direct producer to consumer industry, so to speak.

Now, another industry is the railroad industry, the transportation industry, and there are many communities on various systems which are service connections to the railroad and which do not at all depend upon the amount of business that those particular communities produce. They may have a large or small demand for labor, dependent not upon anything that happens in that particular community but

upon what happens on the whole in the whole field of the railroad itself.

Dr. CLARK. Right.

The **CHAIRMAN.** And the decision as to what shall be done in this particular community, in the shops for example, is made not upon the basis of anything that exists in that community but upon the judgment of the board of trustees or the operating vice president in a distant community upon consideration of the over-all picture of the transportation industry.

Dr. CLARK. And all I am saying is that we should have arrangements by which the best guess he can make moves down to this planning body in the local community.

I happen to have graduated from high school in a little railroad town. What did the individual do there? He had to guess at all of that and make his guess as to whether there was going to be a job for him in the railroad shop when he finished high school.

Now, as you know, all you have said is that it isn't a perfect guess that the vice president of the railroad is going to make in the light of all the factors. It is going to be a lot better than this boy's in the local high school. All I am saying is, let's get all the information we can. It will not be any better than our technical knowledge, but it will be incomparably better than this poor little individual's trying to guess, "Is there going to be a job there? Are they going to move these shops? Is this particular process going to fade out of the picture?" with no contact between the school system, the people giving the guidance, and the people making the decision.

The **CHAIRMAN.** There are innumerable communities in the United States which, by reason of the development of the national industry, are pay-roll communities dependent upon the contributions in wages made by national industry which happens to pass through that town. You may have a railroad running through it, you may have an airplane line running through it; you may have, and probably do have, a number of chain stores in almost every one of these communities. And you have the oil industry, with filling stations that are owned and operated or sometimes just leased by a large oil company, the whole policy of which is directed from some other and distant community, industries over which the local community as a community, as a city or a town, the county as a county, and even the State as a sovereign unit in the United States has no jurisdiction, or no effective jurisdiction, at least, whatever.

Such communities are dependent almost upon the largess of those who are managing these great national industries. In my State, and in most of the Western States, for example, the farmer and the rancher, the rancher who raises livestock and wool for the market, must ship their product to the packing centers, and they are dependent upon what the managers of the packing industry are content to pay. Perhaps I shouldn't say "are content to pay"; what they do pay, but the determination of the price is made not upon a basis upon which he is willing to sell or desirous of selling, but upon the basis on which the purchaser is willing or desirous to pay.

And so, in an ever-increasing degree you have this divergence between the economic independence of the local community and the local citizens of the community, and the control exercised by a national industry.

Now, will training help to bring the sort of solution that you were talking about?

Dr. CLARK. The very least we can ask of those organizations is that they send the plans back. At least I think it is a perfectly reasonable request. We have tried it a little with them and we have every reason to think that with all of the other faults that those organizations may or may not have, they will be willing to pass down the best estimates that they can make of what is likely to happen. The specific issue here is whether it would complicate the local community estimates of the training and employment situation, and I am quite inclined to think that we can handle it all right.

Mr. O'CONNELL. Let's see how your plan would work in connection with New Castle, Pa., which is a case which was described to us before this committee last week, where, in a town of 50,000 people, some 1,600 people were let out. Under your plan what would have happened?

Dr. CLARK. Most of the tragedy of New Castle would have been prevented.

Mr. O'CONNELL. It would have been?

Dr. CLARK. It is going to be a beautiful case study when somebody goes back in the record and pins the blame: "There was the day that could have been predicted," in 1900, 1905, 1910, I don't know how far back. But long ago somebody should have known that there was likely to be a change. At that date a storm signal should have gone up over the high school and every school in that community saying, "There is danger ahead here, and here are the facts. Here are the reasons why we think there is going to be a calamity in this community. In the light of that, do you want to make your plans to move out, to make your contacts?"

No; we wouldn't do that; we pile them up, pile them up, the same thing that I have seen in coal community after coal community in Pennsylvania when everybody on earth knew that the coal mine was going to shut down for 3 years or 5 years, except the people running the local school. They wouldn't take the trouble to find out, they wouldn't give the warning. All I am saying is, let us do the best we can. Now in some cases it is very well done. At least it will give the boys and girls a little better chance.

The CHAIRMAN. Of course, you realize how difficult and distasteful it would be for the principal of a high school in that dying community to say, "Now look out, boys, this town is near the end of its rope."

Dr. CLARK. I know those little mid-western towns well enough, having spent most of my life in them, to know that he couldn't hold his job and do that, but he could present certain factual evidence and say, "This decision has been made," and this or this or this. All I am saying is that he certainly hasn't really helped those boys and girls to let New Castle reach the stage that he has. That is all I would say: get the best information you can, the best in the community on the total situation.

PRODUCTIVITY OF TRAINED LABOR

Dr. CLARK. I think I had better move on to my next item. A trained labor force produces more than an untrained one. I am going to omit (a) if I may, entirely. Dr. Norton referred to it. Essentially it is the argument that if you get it down to a specific case the trained farmer will produce more than the untrained one.

(b) Presumably, farmers are trying to make these adjustments all the time, and the same is true of all individuals. But lack of training constitutes perhaps the major barrier that keeps people from making these shifts and moving from places of lower productivity to higher productivity. In my little book, *Economic Theory and Correct Occupational Distribution*, this discussion is followed through at length, and I think it is amply demonstrated that there are all kinds of barriers in our society due to lack of training which prevent many persons from moving from occupations of low productivity to those of high productivity. It is a perfectly safe guess that in any country in the world a very great extension of the training of the working force will enable such shifts to take place and make it possible for workers to move from where they would be producing little to where they would be producing much.

I want to start at this point to answer the question raised in the early discussion of Dr. Norton about the consumption of this increased production. I obviously do not claim that I have anything like the final answer; it is just a little light on the issue.

Some individuals are bothered with this point because they say, "We cannot buy or consume or use all we can now produce, so why train more people to produce more?" It is too well established for argument that one of the reasons we cannot buy more is that there are all kinds of monopolistic tendencies that hold up prices, and among these monopolistic tendencies are relative shortages of trained workers in particular fields. This great expansion of trained labor would reduce the cost of many products and would thereby enormously expand purchasing power. There seems to be no possible answer to the contention that, all other things being just as they will be, a highly trained group of workers will produce, distribute, and consume more than a poorly trained one.

The next point I think goes into the discussion more fully. Presumably, much of the reason that we have difficulty over this consumption issue, to put it mildly, is lack of purchasing power. The American way of bringing about a fairer distribution of the income and production of the country is to provide more nearly equal opportunity. Certainly as far as earned income is concerned—and this constitutes perhaps 80 or 85 percent of the effective spendable income—any presumed unfairness in its distribution is caused almost entirely by lack of opportunity. This lack of opportunity hinges quite largely upon lack of training. You see, we are beginning to chisel away at this lack of purchasing power. First, we are going to actually produce things more cheaply, people will have effective purchasing power in greater quantity; second, as far as the earned income is concerned (and keep in mind that is something between 80 and 85 percent of it), you can bring about almost any distribution of that if you are willing to set up a training program to train where you have the high incomes and to pull the people out of the low incomes; that is your easy, obvious, American answer to your lack of purchasing power.

The CHAIRMAN. You don't mean to say that training of itself will do that.

Dr. CLARK. Training will do practically all the job, Mr. Chairman.

Dr. ANDERSON. In other words, Mr. Clark, the returns in any unusually highly paid or compensated occupation are returns for a scarcity position.

Dr. CLARK. A monopolistic tendency, right.

Dr. ANDERSON. And if you multiply the number of competent people offering that service you thereby divide the amount available for that expenditure among them, reducing the amount anyone receives, making the price lower to any consumer of that service.

Dr. CLARK. And at the same time you are pulling the people away from the bottom, creating less pressure on the income down there, so that their income goes up automatically. The important thing is, of course, the total production of goods and services.

The CHAIRMAN. But training of itself would not create the jobs, would it?

Dr. CLARK. The training will do most of it, Mr. Chairman.

The CHAIRMAN. That is a very simple answer.

Dr. ANDERSON. One point bothers me greatly in examining that theory. You are presuming that occupations are at work in a competitive field. Now, how competitive are these unusually scarce occupations, for example, the skill of a highly trained surgeon or the managerial skill which brings Mr. Watson around \$400,000 a year? Even though you put 10 Mr. Watsons in the field, would you thereby create 10 Watson jobs and split the \$400,000 among them?

Dr. CLARK. We have a great deal of evidence on the question. Now, I am quite willing to admit that you may have certain positions that seem to be so highly protected monopolistically that you cannot get into them, and some of the very top movie salaries may be in that class. Personally, I doubt it. If we may take the case of the railroads, there was a time when the railroad salaries, as you know, in the eighties and nineties of the last century, were relatively very high as compared to almost all others. I am not saying that is the only reason that railroad salaries have gone down, but as you have trained more people capable of doing this thing—we haven't done it deliberately and consciously, it has just been a little accidental—there has already been pressure down; there are other reasons, of course, but there are two basic answers to the question. The first is that it wouldn't make very much difference in the total purchasing power if you ruled out a few hundred or a few thousand of these very large incomes. Certainly, after you get out of those, competition will work. The fact that you have a limited number of people here trained for these jobs enables these people to get relatively high semimonopolistic incomes—

Mr. PIKE (interposing). You are thinking, say, of the building trades having priced the housing possibilities almost out of the market, and that sort of thing?

Dr. CLARK. I would want that investigated awfully carefully to see if there were monopolistic elements in it. At least the issue ought to be investigated. All I would say here is that a rational society will see to it that as many as possible of those monopolistic protections to positions are removed, and that will, if you train enough people, tend to adjust income to a fairly equal level, which will bring the purchasing power and will consume your goods.

The CHAIRMAN. Now suppose that we were to establish a school in Washington, D. C., to train telephone operators on the manual switchboard. What good would that do?

Dr. CLARK. Oh, absolutely none. Obviously, all of your planning for occupations must be in terms of the way your technology is moving.

The CHAIRMAN. In other words, your training must be keyed to the opportunity for jobs.

Dr. CLARK. It has to be, always. But you—

The CHAIRMAN (interposing). All right, then, which comes first, the training or the opportunity for jobs?

Dr. CLARK. No question about that, the training comes first. The evidence is clear the world around.

The CHAIRMAN. I wish you would develop that.

Dr. CLARK. Well, you can look at it comparatively in the various countries of the world. The countries that have the trained labor force are those that have, the world around, moved up. For instance Denmark was just a sand stretch sticking out in the North Sea.

The CHAIRMAN. Now, of course, I haven't studied this question as you have, but the impression that I get from a rather inadequate view of economic development is that training inevitably is a result of the desire of some man to do a certain thing. Necessity is the mother of invention. Men became trained to build bridges across rivers because first of all they wanted to cross the river on a bridge. They didn't undertake to train bridge builders before they conceived the necessity and the desire to cross a bridge.

Likewise, no railroad workers, to jump through many centuries, were trained until after the opportunity for the job had been developed, and the first training in railroad employment as in every other line of human endeavor came from the practical application of an untrained person's mind and body to the doing of a job which his mind had conceived. If that be true at the beginning doesn't it necessarily follow that it must be true all the way through our development? Now the training, for example, of a man to operate a continuous strip mill depends upon the conception of the strip mill first.

Dr. CLARK. But you see, the—

The CHAIRMAN (interposing). In other words, the creation of the job first.

Dr. CLARK. No.

The CHAIRMAN. Give us the other side.

Dr. CLARK. You have a job situation existing in the United States at the present time.

The CHAIRMAN (interposing). We have a job situation in the United States nonexistent at the present time.

TRAINING TO REDUCE UNEMPLOYMENT

Dr. CLARK. Quite right, to the extent of 8,000,000 or 10,000,000 workers—nobody knows quite what. Any movement toward sending more people, training them for, moving them toward the high-paid jobs, will create more jobs, it will create more purchasing power, it will move toward the solution of your consuming problem, which was bothering the committee an hour ago. The mere fact that it will move toward that will bring about a better distribution of your income. Probably most economists would admit that if you have a more nearly equal distribution of income, the income would tend to be spent more smoothly, and I think again most economists would agree that if your total income were spent fairly smoothly we might move fairly quickly toward the picking up of this unemployment.

The CHAIRMAN. I wish you would come down to my office after this session is over and go through the list of applicants who have written in to me, trained applicants, who would like jobs somewhere or another. They can't get them in industry, they can't get them in government; they are trained, they are capable, they are educated, they have good characters, they have all the qualifications that go to make up a competent worker or a competent educator, but they just don't have the job.

Dr. CLARK. Now, we find that objection raised chronically by people saying, "Well, why train any more doctors? I know four doctors who are on W. P. A." So it doesn't make any sense to say train any more. But we have to watch that. You have to watch that argument awfully carefully. If you put it to the extreme the other way and say, "Well, why not train more doctors?"—if you do, then doctors' incomes will tend to go up more, you will tend to accentuate the inequality of income, you will cause all kinds of other incidental things to happen in your economy, and you will actually cause more unemployment by the process. If you tend to train more doctors, the tendency will be for doctors' incomes to go down.

The CHAIRMAN. The tendency will be to develop socialized medicine.

Dr. CLARK. I am inclined to think it is far more likely to happen if you keep to the present rigid determination of the number of doctors. Essentially all we are arguing for is to try to find out the total number of people that ought to be trained for the present occupations. Then you would be in position to say how many new occupations you would have to train to be in a position to move right up to that issue.

The CHAIRMAN. In other words, instead of having through W. P. A. during the last 5 years created jobs, made work in many instances, for trained and untrained persons, you would have given them more training. Is that the idea?

Dr. CLARK. We have a double answer to that.

The CHAIRMAN. Before you answer it, let me just call your attention to this. The W. P. A. comes annually before the Appropriations Committee of Congress to ask for funds that may be necessary, and in the showing the Administrator always lays before the committee the schedule of wages. It is divided into unskilled, semiskilled, and skilled at least. In other words the W. P. A. administrative force divides the labor supply into various classes of skills. Now, these skills run all the way from the manual laborer to the highest kind of professional or cultural skill.

Dr. CLARK. But there is exceedingly little at the top. We have this very large study of about 5,000,000 people on W. P. A., so we happen to have the facts there, and it is overwhelmingly weighted toward the bottom. Now, you are quite right in saying we do have substantial gross numbers at the top, but that still doesn't change the—

The CHAIRMAN (interposing). We had a witness here speaking for the white-collar office worker. His complaint is that this highly-trained, well-educated office worker, sometimes of a professional character, a college graduate, trained in economics, and the like, has been unable to secure employment. I ask would it be beneficial to him and to society to give him more training or train him in a different field?

Dr. CLARK. You can't even say whether you need any more economists, perhaps you have too many already.

The CHAIRMAN. Now, we come down to need, don't we?

Dr. CLARK. There isn't any way to answer that question with our present machinery, absolutely no way at all. I would like to go back and answer part of one of your earlier questions. If you had had the proper kind of organization in your community, saying that your unemployment was here and here and here, and that you could only use this many people in your present occupations, it is conceivable, at least, that if half of the money that has gone into W. P. A. had gone into the careful development of those new industries and occupations in industry we would not have a shortage of workers in the United States at the present time.

Mr. O'CONNELL. In your reference here to earned income, you don't mean that earned income is 85 percent of all income, do you?

Dr. CLARK. No.

Mr. O'CONNELL. Earned income generally is more spendable than income from dividends—

Dr. CLARK (interposing). No; it isn't that. All I was taking out is the money that under any economy has to go back into improving the capital plant, and you can't spend it, it isn't spendable for ordinary consumer goods.

Mr. O'CONNELL. What do you mean by "earned income?"

Dr. CLARK. All wages and salaries.

Mr. O'CONNELL. Regardless of how high?

Dr. CLARK. Regardless of how high, and I would throw in all farm income, all salaries of all kinds. It would compare with the usual figure of 60 or 65 percent—the one you usually get.

Mr. O'CONNELL. Would you say that \$400,000 that would be received by Mr. Watson would be as spendable as a practical matter as the equivalent amount if divided among 400?

Dr. CLARK. No; it wouldn't, and I don't think we have made it clear yet as to why real competition in the long run will put some pressure on those high-paid jobs, and will get more people in them. Now, it won't do it quickly, it won't do it suddenly, and that is the reason it is awfully hard—

The CHAIRMAN (interposing). Competition of what kind? Competition to cut down the compensation?

Dr. CLARK. No; competition of capable people who could do the work and over the long periods—

The CHAIRMAN (interposing). Won't that result in the reduction of compensation?

Dr. CLARK. Definitely, yes; it will.

The CHAIRMAN. So that you train more people in order to lower the price which the trained worker receives; in other words, to lower the wage.

Dr. CLARK. Right.

The CHAIRMAN. That is correct?

Dr. CLARK. Certainly; but you are doing another thing; you are raising the total. You see, his is coming down, and the bottom is coming up. That is the reason you are chiseling at the consumer problem.

Mr. PIKE. Referring to the scarcity of wages, whether they be wages, salaries, or profit percentages.

Mr. O'CONNELL. In fact, a higher percentage of income going into consumer's goods. Taking Mr. Watson's case as an example if his \$400,000 salary were paid to a hundred persons at \$4,000 each, I take it, a much more substantial percentage of the total would go into consumer's goods.

The CHAIRMAN. That might result in the reduction of the hourly rate and the weekly wage of carpenters, and on the other side of the scale in the annual salary of faculty members.

Dr. CLARK. Quite likely. The annual income would be almost certain to drop.

The CHAIRMAN. The annual income of the worker himself, the individual worker.

Dr. CLARK. The hourly wage of the individual building worker, the carpenter, to whom you referred a while ago, would almost certainly do that.

The CHAIRMAN. But he would work a longer period during the year at a lesser rate; he would have more work and less leisure for the same pay.

Dr. CLARK. Probably. He should have that choice though.

The CHAIRMAN. And the professor would get along without his sabbatical year, I suppose.

Dr. CLARK. I shouldn't be at all surprised.

Dr. ANDERSON. But isn't it true that we have developed a whole series of institutionalized forms and protections, so that there is an extreme rigidity against any such inroads as you suggest? You would have to do more than simply multiply the number of workers for a given level of employment. You would have to do this occupational training and placement program that you indicated earlier in your community approach, and beyond that you would have also to examine into the reasonable ways of breaking down the institutions protecting this rigidity.

Dr. CLARK. Yes; and that, of course, is a long term affair and some people get awfully pessimistic and say "Why discuss it?" The only thing is the longer we put it off the worse it is going to be. We have to make a start on it.

Dr. ANDERSON. I would suggest a break in lunch hour and come back for this.

The CHAIRMAN. Your paper has elicited more questions than we had expected. The committee will stand in recess until 2:30.

(Whereupon, at 1:05 p. m., a recess was taken until 2:30 p. m. of the same day.)

AFTERNOON SESSION

The committee resumed at 2:30 o'clock, on the expiration of the recess.

Acting Chairman KING. The committee will please be in order.

Dr. ANDERSON. Mr. Chairman and members of the committee, just before lunch, we were interrogating Mr. Harold Clark, who is ready to continue and close his presentation.

Dr. CLARK. I want to emphasize one point again, that perhaps was not made clearly. There is an obligation so to organize our communities that we will use all the people to do all the work. It is that positive approach to the problem that I think we are all interested in.

There is one other thing I should like to say, emphasizing the

difference between a short-term and a long-term approach to the problem. The question was raised this morning whether just a training program alone, just training more people, would automatically solve this problem of unemployment. Well, obviously it would be unreasonable to expect that to happen.

We did not make it clear this morning that there is a fundamental difference between the short-term effect of training more people, and its effect in smoothing out incomes, increasing purchasing power, getting a better flow of many things in the economy.

It is partly for that reason that I would like to emphasize the difference, that in your long-term program, if you start to plan properly for the use of your human resources, many things happen that should very greatly ease these drops.

Mr. PIKE. You are thinking in terms of a generation now, aren't you?

Dr. CLARK. Fully, yes, and it would be a very great mistake to assume that I was advocating this morning that we could go out and train these 11,000,000 people and unemployment would disappear.

The other point is the important one, that gradually, if you raise your level of training over a long period, it has the indirect effect toward equalizing income, and that would go far to answer the question raised by the chairman as to how it will have a good effect upon the question of purchasing power.

INCREASE COMPETITION FOR HIGHLY PAID POSITIONS

Dr. CLARK. If any of your earned incomes are unduly high as compared with others, the most effective way to deal with this situation is to increase the competition for those positions. Essentially, this means equipping more people with adequate training to enter the competition.

In my volume, *Life Earnings in Selected Occupations in the United States*, a report of the income to be expected for various lines of work in this country is made. There can be little doubt that much of the differences in these occupational groups is caused by lack of adequate training to enter the more highly paid ones. The United States would be far better off if it paid less attention to some other efforts to redistribute income and paid more attention to the historic American claim of providing equality of opportunity and adequate training. We have not been doing this. Consequently many of these inequalities have become much larger than they would have become if we had lived up to our claim of equality of opportunity for training.

Acting Chairman KING. Of course, you appreciate the fact that there is a very heavy responsibility in order to achieve the end to which you refer, resting upon the parents and upon local communities?

Dr. CLARK. Yes; and they should be encouraged in every way we know, to strain themselves to the limit to do it.

Acting Chairman KING. Your thesis does not contemplate the Federal Government taking over the training and education and public schools?

Dr. CLARK. I would be strongly opposed to it, and I emphasized at great length the extreme importance of building up these local planning bodies to deal with it. I would have just as little Federal control as possible in it, and just as little State interference and control. I

would throw everything back on the community and back on the individual that I could possibly get there.

Acting Chairman KING. There may be considerable technical development under the totalitarian state, but there is a deprivation of those fine qualities which are essential to the development of the highest form of citizenship, including moral and spiritual qualities.

Dr. CLARK. I have said on various occasions that a dictator can solve unemployment very easily by just saying, "You have to go out and dig this ditch," but it isn't worth that price. In other words, we have to work it out on a democratic basis, working up from the bottom, showing the people of each community how they could organize together at that job.

Acting Chairman KING. Don't you think there has been too much emphasis in some of our schools upon the proposition that they must aspire to the highest political job, and the expression is frequently heard, "Hitch your chariot to a star," as a result of which many of the young people, instead of qualifying themselves for positions in what some call the "humbler" but after all, they are the basic things of the community, and get off on an intangible theory?

Dr. CLARK. I agree entirely with that.

Acting Chairman KING. Proceed.

Dr. CLARK. All things considered, the most effective and fairest way to bring about a reasonable distribution of the income of the country is to move as nearly as we can toward equality of opportunity, to begin with—and perhaps the crucial element in this is completely free and open training for all of our citizens.

The sixth and last point, one very much neglected and extremely important part of the training to all individuals is to train people to do things for themselves.

This does not mean going back to a nonspecialized or handicraft economy. But particularly for the third of the Nation that is reported to be ill-fed, ill-housed, and ill-clothed, it is extremely important that we explore every possible way to train them to provide as many things as possible for themselves.

For instance, evidence is quite clear that in many communities the diet is very inadequate. Evidence is equally clear that in many of these communities even the poorer members of the community, by making certain changes in their old habits, attitudes, and actions, could very greatly improve their diet. There are many rural and semirural communities which have very bad diets. We have made a very careful check in some of these communities and have found that by adequate training those people could produce all the things necessary for an adequate diet.

A good many people objected at first. They said, "Well, you will stop the purchasing of goods if they produce these things for themselves." But that misses the point. Because they only have a limited amount of money, they are going to spend the money anyway, and if they can produce more things for themselves, that is, particularly the bottom part of the economy, the total economy will be that much better off. Our relief load will be less and their standard of living will be that much higher.

The Sloan Foundation is carrying on certain experiments that may turn out to be of historic importance to this country, in trying to discover what persons of these very low-income communities can do to

increase the adequacy of their food supply, their housing, and their clothing. If the longer studies now projected bear out the same conclusion or the preliminary experimentation, we may find the most powerful evidence in support of training people and thereby improving their own level of economic welfare.

There has been a rather sensational development in certain low-income communities, in the Southeast and Middle West, where some profound changes are occurring in the economic conditions of these people by simply helping them to grow things for themselves or helping them to do certain things about their own housing; many of the things that you were suggesting this morning—working with their hands, doing a long list of very important things.

(Senator O'Mahoney resumed the Chair.)

Dr. CLARK. From any standpoint, then, it is of crucial importance to a country to have the proper allocation of an adequately trained labor force. An inadequately trained labor force may very well be a disastrous factor in time of military crisis. Economic welfare of countries in general depends probably more upon quantity and quality of the trained-labor force than any other single factor. An adequate and expanding capital equipment and highly trained labor force will almost guarantee the economic welfare of any country.

Substantial unemployment is caused by the lack of flexibility of a labor force inasmuch many times there is heavy unemployment and at the same time there are jobs unfilled because there is no one trained to fill them.

All the detailed studies that have been made indicate that a trained labor force actually turns out more goods and services than an untrained one. The American way to produce a fairer distribution of the income of a country is to offer the necessary background and training so that each individual can compete for the top positions. This would probably bring about a distribution of earned income that would come close to satisfying most individuals of this country.

And, lastly, it is extremely important to train particularly the very low-income groups to do as many things as they can to increase their own level of economic welfare. Seemingly the results will be sensational if they do.

The CHAIRMAN. Professor Clark, we are very much indebted to you. Are there any questions to be addressed to the witness?

We were very happy to have had you with us, Professor, and thank you very much for the statement.

Dr. ANDERSON. Mr. Chairman, the next witness for the afternoon is William Green, president of the American Federation of Labor. You will remember that he was invited to appear early in our proceedings and due to unforeseen difficulties in his schedule was unable to do so.

We are very happy to have him here this afternoon to make a statement that represents the viewpoint, I presume, of Mr. Green and of the American Federation of Labor on the subject of Technology and Unemployment.

The CHAIRMAN. You have been previously sworn by this committee, haven't you?

Mr. GREEN. No.

The CHAIRMAN. Do you solemnly swear that the testimony you are about to give before this committee shall be the truth, the whole truth, and nothing but the truth, so help you God?

Mr. GREEN. I do.

The CHAIRMAN. You may proceed, Mr. Green.

**TESTIMONY OF WILLIAM GREEN, PRESIDENT, AMERICAN
FEDERATION OF LABOR, WASHINGTON, D. C.**

Mr. GREEN. Mr. Chairman and honorable members of the committee, I am happy indeed to come and make my contribution toward the study you are making of a very important national question.

These are days of swift change which sweeps the surface of our economic living. These are years also of deep and far-reaching readjustments in our economy, some of which have been taking place over a period of many years but have made themselves acutely felt only recently.

After a decade of severe unemployment, economic instability, and of tremendous wastage of our resources, the American people have the right to ask: What are the real facts? What of the future? What provision can we make? The American people can rightly ask these questions, and it is the public responsibility to secure unbiased, impartial facts that would provide this vital information. And labor can ask these questions and seek this information with more justification than any other group.

The record of hearings of the Temporary National Economic Committee opened with a broad inventory of economic conditions in the United States since 1929. The committee properly began its investigation into the causes of idle factories and idle men. The facts summarized in this inventory brought out forcefully the changing nature of our economy and of its setting and the vast complexity of our economic problem.

Unemployment is the central problem in America today. The idleness of men, machines, and capital has been slowly eating into the very marrow of our economic organism. We cannot accept it or even any part of it as a chronic condition without admitting defeat. But in devising any means, no matter how effective, to bring about reemployment, we must fully recognize the impact of technological developments on production.

The crux of the problem we are facing today is the relationship of technological developments to employment opportunities. But before approaching this basic problem, we must first examine the outstanding features of our employment trends in a living, growing, changing national community. How has technological change affected the employed worker? What is its relation to labor costs? Have rising or falling wages speeded up or slowed down mechanization? How much is known of the net effect of industrial mechanization on employment? All these and other questions are of crucial importance to all men and women wage earners. I earnestly hope that an approach to more complete answers than we have today will grow out of the present investigation. Labor's future depends upon a full, equitable, and democratic solution of this problem, and labor's future is inextricably bound up with the destiny of our entire Nation.

Manpower is the greatest wealth, the richest resource, of the American Nation. The standard of our living depends upon the productive activity of our workers, skilled and unskilled—managers, mechanics, and day laborers; farmers and seamen; architects designing sky-

scrapers and miners burrowing into the bowels of the earth, or any others who take part in production of goods and services.

Our Nation is generously endowed with natural resources. Coal, oil, and precious metals, fertile soil covering fields, broad pasture lands, and lumber-producing forests, as well as life-giving rivers and streams, make this a country rich in resources.

To these we have added man-made resources. We have built cities and towns, we have constructed highways, power houses, and transmission lines. We have built dams and irrigated large areas of land, and have built factories and homes. Above all, we have built machinery and mechanical equipment for the use in production of goods and services and their distribution. All these man-made resources we have developed and perfected. But we must remember that it is from the productive work, the skills and the activity of men and women who perform their daily tasks on farms, in factories, in mines, in offices, and in hundreds of occupations that we derive our vitalizing strength for the development and intelligent use of our other resources.

When I speak of manpower as the most significant of our resources, I think of it in terms of experience, skill, and intelligence, combined with productive activity and the heritage of human knowledge, always expanding, which gives that activity direction. Manpower, however, cannot be thought of as a resource only—it cannot be separated from its human terms. A worker, no matter in what occupation, is a member of his family and a member of his community. He has obligations to himself, to his family, and to the community which he must fulfill. And so the community also owes a responsibility to him. As an individual, as a member of the family, and as a member of the community, he, as a producer, is entitled to his share in the return from the economic process. By all the tests, the man as a producer must be considered the source of our greatest wealth, and yet he, as the source of human labor, must clearly and for all time be distinguished from any commodity or article of commerce. This distinction was made, clearly and unequivocally, many years ago, because such was the sense and the will of the American people.

In discussing manpower as a resource of our Nation, it must also be pointed out that manpower which is not put to use is a perishable resource. Much has been written and said about the waste in the exploitation of our natural resources, but I believe these wastes are relatively insignificant when compared with the waste of trained labor forced to remain idle because the economic mechanism is hopelessly jammed. Ten million idle workers remaining unemployed over a period of time is an incalculable loss to our whole nation. It means more than the loss in potential national income due to the unemployment and the loss of earning power of such a large number of wage earners. Loss of skills caused by unemployment makes a scrap heap of their ability and experience and prevents them from making their contribution to the national growth. If we are in agreement that manpower is the most important resource of the nation, we must give our foremost attention to the utilization of manpower above everything else. For the very welfare of our Nation, labor must be given prior consideration. Full employment of labor is the first order of business of our Nation.

The CHAIRMAN. In other words, you feel, as many of us do, that the natural resources which are around us in such great abundance are

perfectly useless unless the people who inhabit the earth can use and consume those resources?

Mr. GREEN. You have put it just right, Senator; that is it exactly. It means nothing, it is of no consequence, unless we can develop and utilize the manpower of the Nation. Then it becomes a contributing force toward the promotion of our civilization, our social and economic well-being.

The CHAIRMAN. People are both producers and consumers?

Mr. GREEN. Producers and consumers.

The CHAIRMAN. And we must have the consumer if we are going to promote production?

Mr. GREEN. That is it.

Let us consider the facts surrounding the general problem of employment. Our population today is estimated at 131,000,000. Although our population is growing, the rate of growth has been steadily declining for a long time. In 1830 it is estimated that there were on an average 5 births per 100 of our white population, while in 1930 there were only 2 births per 100. This was to some extent offset by a decline in death rate and by increased longevity.

From the average rate of 19 per 1,000 at the end of the last century, the death rate dropped to 11 per 1,000 in 1930. The average annual rate of increase in population, which was $1\frac{2}{3}$ percent from 1900 to 1920, has dropped to less than 1 percent in the past decade.

(Mr. O'Connell assumed the chair.)

INCREASE IN AVAILABLE LABOR FORCE

Mr. GREEN. These facts are important to bring out because of the recent developments affecting employment. The number of persons available for the production of goods and services, who can also be described as persons with gainful occupations, may be secured from census data. When I speak of persons with gainful occupations, I do not mean only those employed; by this term, I include all men and women available for productive activity, employed and unemployed, farmers, professional workers, and self-employed. While our total population increased from 40,000,000 in 1870 to 131,000,000 in 1939, persons with gainful occupations increased from 13,000,000 to 56,000,000. In other words, while in 1870 persons with gainful occupations represented 32 percent of the total population, by 1930 this percentage had risen to 40 and by 1939 it is estimated to have come to about 43 percent of the total population.

Another significant fact bearing on employment is that on the average, our population is getting older. In 1880, about 38 percent of our population was under 15 years of age. By 1930, however, only 29 percent of the population was in that age group. While people on the average live longer, the proportion of the younger people has diminished. We have a larger proportion of mature and older workers today, and the continuation of this trend is indicated for the future. Inasmuch as persons with gainful occupations are mostly those over 18, this relative reduction over the 50-year period in the number of young persons provides one of the reasons for the increased proportion of persons with gainful occupations.

The important fact, however, is that a proportionately larger number of men and women have become available for productive activity.

Our imperative objective is to utilize their productive ability—not at any fixed level of production such as that of 1929 or of any other year, but at a level dictated by the considerations of the best utilization of labor in productive use in order to bring up the standard of living of workers engaged in useful production. Nor can the utilization of productive ability serve our purpose if it is done as a makeshift arrangement on a chronic basis. Productive ability of our workers must be utilized at such standards as will insure them a living compatible with the American standard of living and fulfill the obligation of the community to these workers as producers.

This growth in numbers of persons with gainful occupations gives a clear indication that the country can draw upon a proportionately larger reserve of available manpower now than was the case in the past. In tracing these changes we must give particular attention to the shifts in occupational groupings which have taken place in our total labor force. Considering the proportions of each broad occupational group, we find that since 1870 manufacturing and mechanical industries—which include also building trades, printing trades, etc.—comprise about the same share of those gainfully employed as they did in 1870. It is true that manufacturing and mechanical industries accounted for a growing proportion of persons with gainful occupations up to 1920 and that there has been a decline since 1920. The growth of our manufacturing production and the expansion of markets for our products accounted for a steady increase in the number of wage earners employed in manufacturing to 1920. Although between 1920 and 1930 the production expansion continued, employment during this period, as reported by the census, showed a slight decline.

In 1870 manufacturing industries accounted for about 17 percent of persons with gainful occupations. This proportion had increased to about 27 percent by 1920. From 1920 on the proportion of persons with gainful occupations employed in manufacturing industries was in a decline and by 1930 was only 23 percent.

The most outstanding shift in the economy as a whole since 1870 has been the decline in the number of persons who considered agriculture and its immediately related operations as their normal, gainful occupations. In 1870 nearly one-half of all persons with gainful occupations were attached to agriculture. It is estimated that today agriculture claims less than 20 percent of our total labor forces. At the same time there has been a marked occupational shift toward service occupations, with the largest proportional increase in trade and transportation.

It is clear, then, that the center of gravity of our economic machine has shifted and that adjustments have to be made or its most vital parts will be burned out and destroyed. Broadly speaking, distribution and service fields have to be given special consideration in dealing with employment opportunities under changing conditions.

A clear appraisal of the occupational distribution of all those who have productive qualifications, whether they are employed or not, is essential to our analysis of the problem. Equally important to us is a detailed knowledge of employment facts, and by that I mean facts revealing the actual employment situation. Although employment data have been greatly perfected since 1930 and are vastly superior to the prior information, they are still far from complete. Labor hopes that complete and adequate information on employment

wages, hours, and labor costs will in time be made available so that we would have a complete and continuous set of facts in order that we could study them, analyze them, offer solutions, and devise remedies based on realities.

Acting Chairman O'CONNELL. Mr. Green, may I interrupt you for a moment? How do you think that material ought to be collected?

Mr. GREEN. I think it ought to be collected under the statistical department of our Government, and that, I think, should be better set up so that the facilities would be more serviceable in order to collect that data.

Acting Chairman O'CONNELL. You mean the—

Mr. GREEN (interposing). Now, for instance, we speak in round numbers of 10,000,000 unemployed people, but there is no person in America who knows how many of those 10,000,000 are unemployed employables and how many of them could, perhaps, be classified as impaired unemployed employables, and then another number, another grade, perhaps, of really unemployed unemployables. Who can answer that question? Nobody. Now, shouldn't we have it in order to determine a great question such as you are studying?

Acting Chairman O'CONNELL. Yes.

Mr. GREEN. Now, that is what I mean. Better statistical service, more available facts and data, because, after all, we ought to make a clear diagnosis of our problem and then of the case before us, that would enable us to deal with it in a more realistic way, a more practical way.

Acting Chairman O'CONNELL. That would require a larger, probably better set-up organization in the Government to compile the material, and it would also involve a degree of cooperation with industry and labor, and so on, with those who come to collect the material?

Mr. GREEN. Labor and our State organizations.

Colonel CHANTLAND. Continuity and up-to-dateness are vital, I think.

Mr. GREEN. How's that?

Colonel CHANTLAND. I say that continuity and up-to-dateness are vital.

Mr. GREEN. Yes; continuity and up-to-dateness. It ought to be available continuously, right up to date, so that we could deal with the problem effectively. For instance, look how much better we could deal with unemployment if we had the groupings I mentioned.

Dr. ANDERSON. Would you include in the data to be collected similar adequate data on agricultural employment?

Mr. GREEN. Oh, yes; because as I pointed out, 50 percent, some 40, 50, or 60 years ago, were employed in agriculture, and now we are down to 20. Why is that, and what does it mean, and how does it come about? What are the facts? They ought to be assembled and made available.

Dr. ANDERSON. Just as employment data should be kept for both industrial and agricultural workers?

Mr. GREEN. Absolutely.

Needless to say, any estimates of total employment or any other basic facts on which our information is incomplete, made at a time when we are taking our great national inventory, must be accompanied by some reservations. Our attempts to compare the total non-agricultural employment in 1929 and 1939 are also subject to such reservations with regard to the 1939 estimate. The Bureau of Labor

Statistics' estimate of 33,686,000 employed nonagricultural workers in 1939 may not exactly represent the actual number of workers employed, but it does give us a range for the purpose of comparison. As compared with the 36,160,000 employed in 1929, this estimate indicates that roughly 2,500,000 fewer workers were employed in 1939 than in 1929 in such nonagricultural employments as manufacturing, mining, construction, transportation, utilities, trade, service, etc.

PRODUCTION AND INCOME SINCE 1929

Mr. GREEN. Now, in making any such comparison, it is important to determine, first, how 1939 production compared with 1929. First, let us compare the volume of production in manufacturing on a sample basis. While the 1939 production of nondurable goods (such as textiles, tobacco, paper, rubber, etc.) averaged only 4 percent below its 1929 average, the durable goods production (such as steel, lumber, shipbuilding, automobiles, etc.) for the entire year 1939 was about 22 percent below 1929. Between 1929 and 1939, the loss of employment in the manufacture of durable goods was more than 700,000, while in nondurable goods the decline was around 16,000.

Great losses in employment also occurred in construction, where between 600,000 and 1,000,000 workers had been displaced during the 10-year period. In transportation and public utilities, as many as 800,000 jobs were wiped out. In the combined fields of trade and service establishments, we note another decline in employment to the extent of 800,000 jobs.

While the Federal Reserve index of industrial production is the best available indication of the pattern of industrial production and its various branches, it is only the best sample, and does not by any means provide a complete picture. Probably the best clue we have to the relative volume of goods and services produced in 1939 is derived from the annual comparisons of our "national income produced." Our "national income produced" in 1929 was \$82,700,000,000. In 1938, our next best year, the income was \$71,900,000,000. In 1939, it was \$68,500,000,000. The meaning of the "national income produced" was fully described in a Senate report in 1934.

This concept was used in the basic studies on productivity by the National Research Project and has gained acceptance without serious challenge. It merely represents the net value of the goods and services produced, the result of which appear on the market place of our economy. "National income produced," in order to serve as a reliable measure of annual production of the quantities of goods and services, must be adjusted for the changes in the value of money.

I have just shown that the 1939 national income was approximately \$14,000,000,000 less than the record total of 1929, but now I want to point out that this 17 percent change took place at the same time with a 19-percent drop in wholesale prices and a 15-percent decline in the cost of living. Neither of these price adjustments is sufficient to make the correction precise, but it gives ample indication that the total quantity of goods and services produced in 1939 was very nearly the same as that of 1929. The same conclusion has been reached by the economic analysts of the United States Department of Commerce in their Economic Review of 1939.

Don't let this conclusion be taken to mean that if our 1939 production of goods and services was about equal to the previous all-time

peak of 1929, we were really as well off as we had been in 1929. We must not forget that our 1939 production had to provide food, clothing, housing, and service to 10,000,000 more people, and on a per capita basis we should have produced at least 7½ percent more of everything to equal the 1929 level. As it is our living standard is just that much lower.

But the fact with which we are especially concerned here is that our 1939 production about equaled 1929, and yet our total employment dropped some 3,000,000 below the 1929 employment level. The loss of employment of this number of workers cannot be charged up to production declines.

Of the total number of unemployed, which we estimated at 10,200,000 in 1939, some 8,400,000 represent the total increase in unemployed during the 10 years, as we started out with 1,800,000 jobless in 1929. Our estimate, of course, takes into consideration, together with all other elements. The fact that during the past decade some 12,000,000 people reached working age. Having made a generous allowance for increased school attendance and earlier retirement, we estimate that 5,300,000 people came to look for work, wanting to earn an independent living. The new job seekers, brought by population growth into the struggle to earn a living. Cannot be excluded from the count of those who must be provided with jobs.

Let us bear clearly in mind these facts: There were 10,200,000 unemployed in 1939. This represented an increase in unemployment of 8,400,000 from 1929. Employment in 1939 was roughly 3,000,000 below 1929 employment, and yet, the volume of 1939 production about equaled 1929.

At the same time, we must remember that, entirely apart from any changes in the methods of organization of production, standards and conditions of employment changed. Average hours of work in manufacturing changed from more than 48 per week in 1929 to less than 38 per week in 1939—a decrease of over 22 percent. Had the same workweek been maintained in 1939 as in 1929, our unemployment problem to day would have been much larger. Without making sweeping generalizations on a question involving the relationship of output to production schedules and other modifying factors, it may be merely pointed out that a production crew of 100, which is employed 48 hours a week, will put in 1,000 more man-hours of employment per week than when it is employed 38 hours a week. But with the shortening of hours from 48 to 38, these 1,000 man-hours make possible full-time employment of 26 additional men.

When labor raised its voice for the shorter work-week 7 years ago, it spoke for the employed and the unemployed workers alike, insisting that sound recovery must be accompanied by a full measure of re-employment. Through the application of principles of our proposal embodied for 2 years in the N. R. A. codes, through the ceiling placed on hours of work by the Fair Labor Standards Act, and above all, through collective bargaining. Labor has succeeded in averting a greater economic blight and a worse disaster than we have seen. If positive progress is to be made in resolving the persisting and deepening unemployment problem, further shortening of hours must be achieved in our industry and trade.

Considering the plain evidence that the shortening of hours since 1929 mitigated the unemployment situation to some extent, we still

have the stubborn reminder of a basic change in the speed of production. Although during the entire period, production passed through several drastic fluctuations, a simple comparison of 1929 and 1939 shows that a similar volume of goods was turned out with the use of fewer workers but also in shorter work time. To what extent can we attribute this to increased productivity, technological development, or specifically to the use of labor-saving devices?

INCREASED PRODUCTIVITY

Mr. GREEN. In order to measure changes in industrial productivity, we must measure changes in the amount produced per worker for a given unit of time. While a number of fragmentary studies have been undertaken recently, our information with regard to productivity is still far from complete.

One of the latest studies on the subject by Dr. Frederick C. Mills, of the National Bureau of Economic Research, reviews changes which have taken place from 1899 to 1929 and from 1929 to 1935. The measurements of productivity per worker per man-hour in manufacturing made available by Dr. Mills show that during the 30-year period ending in 1929, man-hour productivity had increased 125 percent. According to this estimate, the rate of increase in the volume of output per man-hour remained about the same from 1899 to 1919. During this time productivity measured on this basis increased about 24 percent in each 10 years. Between 1919 and 1929, however, this rate of increase rose sharply, being nearly doubled, as shown by the estimate for this decade of 46 percent. It will be noted that the number of wage earners represented in this estimate increased only 68.5 percent over the entire 30-year period. The figures just cited on the increase in the rate of productivity shows striking evidence that the post-war developments brought about changes in technology and greatly speeded up the rate of production. This jump in man-hour productivity registered in the 1920's explains the fact that in a decade of a rising manufacturing output, employment failed to increase proportionately. A substantial portion of the unemployment which already existed in 1929 must be attributed to displacement caused by these developments in the preceding decade.

According to Dr. Mills in the period 1929 to 1935, while employment in the manufacturing industries studied decline 31 percent below 1929, and production in these industries was 13 percent below 1929, estimated output per man-hour was 27.2 percent above the 1929 output.

Broadly similar conclusions were reached as the result of a detailed and painstaking study of productivity conducted by the National Research Project, in collaboration with several agencies and institutions. The index of output per man-hour for 59 manufacturing industries analyzed in this study rose from 69 to 100 between 1919 and 1929, and rose further from 100 to 124 between 1929 and 1936. In the 59 manufacturing industries considered, the rise in output per man-hour was thus indicated to be 24 percent. In substantial agreement with these conclusions is the recent study by Dr. Spurgeon Bell of the Brookings Institution.¹

¹ Spurgeon Bell, *Productivity, Wages, and National Income*, Brookings Institution, Washington, 1940.

It must be remembered, of course, that technological change as such does not necessarily mean displacement of labor in our industry in every instance. The increases in productivity are usually due to the installation of new improved machinery which yields a greater rate of production on the amount of investment. Greater productivity may also be due to better organization of production or to increased work requirement. In individual industries, we have seen mass tragedies of workers subjected to inhuman working conditions where, through "stretch-out" and "speed-up," every ounce of their energy is extracted in order to derive greater output.

Some of the equipment installed does not represent labor displacing equipment. Much of the machinery that has come into use has been supplementary to labor operations and has been used in addition to, rather than in place of, normal work activity performed by the labor force.

With these qualifications, however, it must be said that the major effect of technological change upon employment has been the displacement of workers through labor-saving machinery. The labor content of our basic products has been declining. When we note that the tobacco industry, including cigars and cigarettes, dropped 27,000 workers between 1929 and 1939 (when cigarette consumption rose 45 percent), we cannot pass this fact over by merely saying that this is due to the rapid introduction of machine processes for hand processes.

Nor can we pass over the fact that in industry after industry the introduction of the machine process has meant complete and irrevocable destruction of jobs. In the glass container industry, to use but one example, the glass bottle blower is a highly skilled craftsman. Years of apprenticeship and of day-to-day experience were necessary to build up the skill and dexterity required by the high standards of the trade.

In 1904 and 1905 the Owens machine was brought into the manufacture of glass containers, and, with later modifications, made the glass-bottle blowing process almost completely automatic. Whatever else the use of this machine has meant to the industry, it destroyed the individual and collective skill of some 28,000 craftsmen on whom the industry had depended for its output. For me that is the tragic development which has taken place in this technical development of modern industry, the destruction of skill, skill acquired just the same as the student acquires professional knowledge, skill that resulted in lifting the American family to a higher level of living, and then suddenly overnight that skill was destroyed and the level lowered because that skilled worker is no longer fitted for any other occupation except common labor. That, to me, is tragic.

Thus for each one of these technological changes labor is paying a terrific price—that is labor that paid that price, the skilled worker. The change comes suddenly, like a stroke of lightning, and the life-giving source of employment is withered and dried up for all time. In furniture manufacturing hand carvers, jig-sawyers, hand finishers, and other skilled workers have all given up their place in industry to machinery. In the tire industry, in the mining industry, in the railroad industry, in the shoe industry, I could tell you story after story of human tragedy and despair which would turn cold figures into the flesh and blood of human reality. But here I am concerned only with the total picture, and I want to impress upon you the national scope of the problem.

In doing this, I want to call your attention to a phase of the problem which I consider basic. It is often argued that any and all technological changes in production which increase production, although they displace labor, are of ultimate benefit to the workers because they ultimately increase employment. According to this argument, the initial reduction in labor force is merely a temporary effect of technological change, and the reduction in the price of the product made possible by the introduction of labor-saving machinery would widen the market and eventually lead to greater employment. It is important to realize that while this had held true in the past, there is no magic in this formula and it is unlikely that it will hold true in the future.

When textile machinery was introduced in England at the end of the eighteenth century, it made possible much cheaper production, and rendered unemployed some 600,000 weavers and other textile workers who used to make cloth by hand for the greater part of the civilized world. There was much rioting and much talk of permanent unemployment. Gradually textile machinery became an accepted fact and its use grew apace. Eventually the mechanical textile industry in England absorbed a larger number of wage earners than the original number of artisans who used to make hand-woven cloth and fabrics.

The use of cutting machinery and other power-driven devices revolutionized the dress industry not very many years ago, and while the machinery had displaced a large number of manual operators, the drastic reduction in the price of dresses, having brought the \$4.98 and the \$2.98 dress within the reach of women of low income, has expanded the market enormously and given rise to unprecedented growth of this large and important industry.

While all this is quite true, it is also true that in a number of industries new installations of machinery have appeared, driven by electric power, operated by electric controls with more than human precision, which in their operations call for no manual operations, no manipulation, or other human activity for which mass-production industries have to date required large numbers of semiskilled workers. In the operations of these completely mechanized plants most of the labor requirements may consist of a small skeleton maintenance crew of skilled mechanics and a negligible supervisory force. There may be a watchman, but even a sweeper is practically unnecessary because the machinery is installed in an air-conditioned building.

Although plants such as this are not yet numerous nor typical, they cannot be disregarded, and may prove to be an indication of things to come. The significant point about this development is that when you do away with the most of labor, it does not matter how cheap the product becomes, nor how great the demand for it, for the production and sale of that product simply is not going to give anybody employment.

TECHNOLOGY AND WAGES

Mr. GREEN. One of the important questions in connection with technological unemployment is the question of its relationship to wages. Whenever a question of general wage increase is debated, there is always someone to argue that by gaining a larger share in production returns through increased wages workers would eventually lose because management through the installation of more effi-

cient equipment would "beat" the increased wage and supplant workers by more productive machinery. It is extremely important therefore to examine the facts on the actual relationship of productivity, wages, and labor costs.

(Senator King assumed the chair.)

Mr. GREEN. A recent study by Spurgeon Bell shows that since 1919 to date productivity in manufacturing industries showed a steady increase over the entire period. Hourly earnings, having shown a slight increase during the 1920's, dropped sharply during 1929-33 and following the drop advanced more rapidly than productivity between 1933 and 1939.

Between 1923-25 and 1938, however, the rate of productivity per man per hour increased 44 percent, while hourly earnings increased only 18 percent. In other words, between 1923-25 and 1938, productivity increased twice as much as hourly earnings. As Dr. Bell points out, "In monetary terms, therefore, labor did not absorb all the savings arising from the increase of output per man-hour."

Another significant fact brought out by this analysis is that, while during the period as a whole man-hour productivity increased substantially and hourly earnings increased appreciably, unit costs were reduced by 17½ percent.

The figures I have just cited referred to manufacturing generally. It is interesting to compare these with the figures of some other industries. In railroads Dr. Bell's figures reveal a similar picture. Between 1923-25 and 1938 productivity rose 44 percent; hourly earnings, 19 percent; while unit-wage costs declined 17 percent.

In mining industries, however, the picture is even more striking. In this group of industries between 1923-25 and 1938 man-hour productivity rose 99 percent, or almost double. At the same time hourly earnings, after steadily declining for 10 years from 1923 to 1933, rose by 1938 only 8½ percent above 1923-25. This took place in the face of sharp reductions in unit-wage costs, which between 1923-25 and 1938 were reduced by 46 percent.

In the electric-light and power industry productivity rose during the same period 116 percent, while average hourly earnings rose 35 percent. Unit-wage and salary costs in this industry were reduced 31 percent.

Thus, in industries with widely differing proportions of labor costs to the total value of the product, increased productivity invariably outran wages. At the same time wage increases which took place neither speeded up the fairly constant rate of technological change, nor increased the operating costs of the industry as a whole.

The 1925 convention of the American Federation of Labor declared that "social inequality, industrial instability, and injustice must increase unless the workers' real wage—the purchasing power of their wages—is advanced in proportion to man's increasing powers of production." That is an unassailable fact. It is clear to me today in the light of the facts I have shown that the essence of our problem is that, while we have increased enormously our ability to produce, we have not increased the workers' real wages, nor the purchasing power of their wages, in proportion to this production.

Only this approach can enable us to deal at all effectively with the problem of job displacement which results from technological change. In our attempts to deal with the problem we must remem-

ber that these technological developments are one of several basic changes. I have emphasized the shifts in occupational distribution of our population. The shrinkage of production industries as an occupational field and the expansion of the distributive field of transportation, trade, and service industries gives some indication of the changing direction of the trend.

Technological development and industrial mechanization may in time completely revolutionize the methods by which goods and services are produced and our economic wants are satisfied. Our whole way of life may be changed. But it would be idle speculation at this time when our immediate needs are so urgent and so vital to muse on the possibility of the triumph of the machine over man.

The current rate of technological change has been fairly well indicated to us by the recent studies I have cited. We do know that the technological rate of displacement of labor is large. We do know that of the 3,000,000 difference between 1939 and 1929 employment a large portion, though probably not the entire number, have been displaced by increased productivity. There is no reason to believe that this rate of technological progress within the range of the past two decades will change substantially. To offset this tide of new unemployment and to channel those already unemployed into productive activity is the problem before us.

It is being said in many quarters, and with stubborn finality, that America as a nation has stopped growing; with no frontiers, with no new markets, with a population growing at a relatively slow rate, we must resign ourselves to the fate of economic stagnation. Now that is the language of the defeatist, and I cannot accept this defeatist philosophy because to me it seems not only false, in fact, but also treasonable to our entire American heritage.

Acting Chairman KING. As a great labor leader you ought not to accept that.

Mr. GREEN. Never, never, Senator. Never that. It is clear, of course, that in all industries and especially in manufacturing, we can achieve no substantial gain in employment without a marked increase in production and a further shortening of working hours. That is so we can distribute the amount of work available among a very much larger number of people. We must maintain our effort of gradual reduction in the weekly hours of work in order to attain this end. The question of achieving a large increase in production in order to gain full employment seems to have been the stumbling block of all of us in these past years.

We suggested recently that a \$10,000,000,000 increase in our national income would be sufficient to provide reemployment for the majority of the workers now unemployed. Considering that 93 percent of all families and single persons in America have incomes of less than \$3,000 per year, and that three-fourths of them have incomes under \$1,500 per year, we must realize that this is the income group that buys 78 percent of all consumer goods sold on the American market. The answer is clearly that with the release of the purchasing power of the wage earners, and through the maintenance of their real wages at the level necessary to sustain a rise in the national income, enough productive activity can be generated to achieve this reemployment. The question is how to release the flow of goods and services,

how to release the pent-up savings and investment funds to put our money, equipment, natural wealth, and manpower to work. We are now giving careful study to a proposal which, after further analysis and consideration, I hope I will be in a position to place before the country as a practical program for reemployment and as a realistic approach to our immediate problem.

It must not be forgotten that in addition to all other dislocations discussed, readjustments have taken place traceable directly or indirectly to war developments abroad. In some sections of industry, plant has been expanded beyond immediate domestic requirements. That is something we have got to think about. Pulp and paper industry has developed much new production in the South and Southwest, which is also attributable to technological advances. Shipbuilding, aircraft construction, and machine tools have been directly affected by war activity, with employment in these groups reaching extremely high levels. Other changes, such as the elimination of the tobacco purchases from England, have adversely affected certain groups. It is clear from this that the period of readjustment at the end of the European war will present many difficulties. The problem of employment opportunities already caused by industrial changes will be further aggravated by these special conditions. Organized labor calls upon industry and the public to take full cognizance of these developments so that a joint and representative consideration of changing conditions can be made nationally and so that standards would be devised national in scope. Only national consideration of employment channels, provided through public employment offices, and of other factors which enter into this complex problem can adequately approach a satisfactory solution.

SUGGESTIONS FOR DEALING WITH LABOR DISPLACEMENT

Mr. GREEN. Among the ranks of our unemployed a large number of workers have lost their jobs because of technological developments. Additional workers will lose their jobs or will be denied jobs because of further increase in technology in the future. After hearing all testimony I know that your committee will be in a position to reach broad conclusions with regard to the entire problem. In this general statement I want to leave with you these suggestions derived from my presentation.

1. More complete and detailed facts are needed, especially on employment, wages, hours, labor costs, and productivity in order to enable us to understand changing conditions.

That is what I dwelt upon a moment ago when you asked me the question. What we need is better statistical facilities so that all the facts ought to be assembled and presented to Congress, to the Nation. It is probably similar to a physician diagnosing the illness of a patient. First of all, he may not be able to lay his finger upon the cause, and it may be necessary for him to make a more scientific analysis, but finally he makes a diagnosis of the case, then he can apply the remedy.

Acting Chairman KING. Mr. Green, have we not at the present time—and I am asking for information—many sources of statistical information which pretty well cover the field to which you refer? Dr. Lubin of the Labor Department and his fine agency have done

most excellent work in providing statistics with regard to labor and costs, wages, and so on, and I know of other agencies which are furnishing us—I will not say complete and adequate information, but a vast amount of statistical information. Of course, I agree with you that we ought to have as nearly as complete information as it is possible to obtain, dealing with these complex questions of wages and hours, and so forth, to which you have just referred.

Mr. GREEN. Yes; the Department under Dr. Lubin is rendering excellent service, it is doing fine work.

Acting Chairman KING. I didn't know that Dr. Lubin was here when I made that statement. I just came in. I will not retract it, however.

Mr. GREEN. We all say that, whether he is away or whether he is here.

Dr. LUBIN. Thank you so much, Mr. Green.

Mr. GREEN. He is doing a fine piece of work, but I know he will admit, if you will put him under examination, that his facilities are inadequate. Of course, we depend perhaps on the census now that is being taken to assemble a lot of facts that we can analyze and study and consider. Just as I remarked a while ago, Senator, here we have in round numbers 10,000,000 unemployed, some say more, but where is the department in our Government that can tell us the classification of these unemployed, whether there are 5,000,000 unemployed employables and then another grade with so many million of partly incapacitated, and then perhaps a certain number of unemployed unemployables. They aren't able to go into that, they haven't got it yet. Don't you think if we could assemble those facts we could then find where each group properly belongs and how to treat and deal with each group separately.

Acting Chairman KING. We ought to have that information to make a proper distribution, if that is the proper term, of the unemployed and unemployable, the migrants, and so on.

Mr. GREEN. Yes; the cause of it all, why is it, the wherefore, what about it? How is this economic machine operating? What is it doing here?

Acting Chairman KING. Speaking of our physical health, we not only want a health chart, but we want a proper labor chart, a graph, to tell the causes of unemployment, the causes of dislocation, and so forth.

Mr. GREEN. Second, I suggest a further shortening of the work-week as essential to future reemployment, because we feel that the real solution for our unemployment problem is the reabsorption of these unemployed back into private industry where they will be producers of wealth and goods and will be consumers of wealth and goods. If the facts—and that is what we must deal with—show that we can't find work for all these people on, say, an 8-hour day, then we must face that issue courageously and make the adjustment so as to find them employment in private industry.

Third, increase of our national income by \$10,000,000,000 in order to make this reemployment in productive activity possible. A practical proposal for accomplishing this is being developed by the American Federation of Labor.

We are working on that and I hope we will be able to supply you with our recommendations on that in a reasonable length of time.

After all, it is a matter of buying power. We must try and balance the facilities of production with our ability to consume, or raise our market buying power to a higher level in order to consume, these goods that are constantly flowing from industry. In other words, establish an equilibrium. What is the use of producing cheap goods if nobody can buy them and use them? That doesn't count.

Acting Chairman KING. I take it that this committee will die in the not distant future, and if you have any suggestions along the line you have just suggested, I take the liberty of indicating you submit them as soon as possible to the chairman.

Mr. GREEN. I will do that. I hope the committee doesn't die.

Fourth, special consideration should be given to insure to productive workers their share in the return from technological improvements.

Fifth, exhaustive consideration to employment opportunities should be given on a national basis with participation of representative groups.

In conclusion, I want to express my urgent hope that through our common endeavor we shall succeed in devising a truly effective, cooperative instrument with which we could adjust the existing economic unbalance and bring our Nation back upon the upward path of economic rise. I sincerely believe that if we achieve real understanding of the problem and real willingness to cooperate, we can bring about full utilization of our wealth and full reemployment through our own efforts. I feel confident that the work of this committee will contribute much toward this end.

I don't know of any committee in Congress that is dealing with a more vital question than this one, and nobody will be able to adequately appraise the value of the service you are rendering society through this investigation.

Acting CHAIRMAN. Thank you very much.

Have you any question to ask, Dr. Anderson?

Dr. ANDERSON. One or two questions. First I wonder if the committee would care to ask any.

Acting Chairman KING. You had better get yours off first.

A. F. OF L. ATTITUDE TOWARD DISMISSAL WAGE

Dr. ANDERSON. We have had testimony as to the methods used by various labor groups to meet technological displacement in particular instances; such things, for example, as the dismissal wage. Does the American Federation of Labor make much use of the dismissal wage to alleviate the effects of displacement?

Mr. GREEN. Yes; yes, we have. We have utilized that in some of the relationships that have developed between members of the American Federation of Labor and employers. I can't recall at the moment the names of some industries in which we have jointly worked that out with the employers. It has afforded relief, temporary relief at least, and has helped tide the displaced worker over a serious part of his life.

Dr. ANDERSON. You look upon it, however—

Mr. GREEN (interposing). We have looked upon it with favor.

Dr. ANDERSON. But as a temporary affair?

Mr. GREEN. Temporary only.

Dr. ANDERSON. Does your unions seek to include in their contracts clauses dealing with technological change?

Mr. GREEN. Well, we have; yes, in some instances. We have provided in some instances for moving these who have been displaced from one section of a plant into another, so that they have been accorded some work. We have found it possible to do that among the younger workers, but it is not so easy where the workers are older, say 45 or 50 years of age.

Dr. ANDERSON. What do you think is effective for older workers?

Mr. GREEN. My point of view is that we have to move up the retirement age in order to adjust it with these economic needs. Here is an army of younger people coming in, displacement is going on, and we have to work out some plan by which the older worker may move out at an earlier age so as to afford opportunities for younger people.

Dr. ANDERSON. Do you think, Mr. Green, that labor should have a share with management in the solution of these difficult problems of technology, the rate of introduction of technological change, and factors of that sort?

Mr. GREEN. By all means. They are a matter of joint interest and each one should participate in the discussion of the problem.

Dr. ANDERSON. When you speak of shortening the workweek to spread employment, do you include also maintaining the weekly wage, or do you propose also to spread the pay?

Mr. GREEN. Well, no good would be accomplished if you merely reduce the buying power. The buying power must be maintained in order to prevent further unemployment. We have met that question, however, in a realistic way. Our position is that weekly wage rates ought to be maintained even though the hours of labor are reduced. That is in order to maintain a balance between buying power and production. But there have been particular cases where wage adjustments have been made in order to create opportunities for a larger number.

Dr. ANDERSON. Do you think spreading the work through reduction of hours is realistic, in the sense that it can be attained in the immediate future?

Mr. GREEN. It can be, but it will have to be done not in a revolutionary way, but in a progressive, practical way, so that the necessary adjustments can be made. Some industries are better suited to the change quickly, immediately; others probably would have to make adjustments before the change could be made.

Acting Chairman KING. I suppose, Mr. Green, war conditions abroad with their impacts and repercussions would affect our economic conditions, affect wages, affect industries, change the current of production; some streams, so to speak, are swollen, others are diminishing. That produces dislocation. We have to take into account those changes and can't establish a rigid rule now in the light of the world chaotic situation.

Mr. GREEN. The war situation is having a profound effect upon our economy. We probably don't realize it fully and completely, but it is. I am apprehensive over the reaction that will come when the let-down period arrives, when we will be face to face with a very serious problem.

Acting Chairman KING. Of course, the let-down period will more seriously affect, perhaps, the European nations.

Mr. GREEN. Oh, more seriously there, but—

Acting Chairman KING. I was going to say that even though it will affect them more seriously, it will have serious repercussions in our economy.

Mr. GREEN. Probably the effect on the European nations involved in the war will be one of the direct causes of the serious affect here.

Dr. ANDERSON. I don't believe your summary included any allusion to the youth problem, as we are learning to speak of it. I wonder if you will give us the viewpoint of the A. F. of L. on that.

Mr. GREEN. Well, I think I referred to that just a few moments ago. We have this youth problem, this growing army of young people coming in every year. Now, first of all, their needs must be met by broadening, perhaps, the activities of our Government just at the present moment. Secondly, I think we ought to move up the retirement age of older people. That is, we must not do that in a destructive way or a revolutionary way, but it ought to be a matter of study. Where should it be in order to take care of this army that is coming in? We ought to give special attention to the employment needs of the youth of the Nation. I think we have neglected that a little too much and have considered merely the general aspect of the whole situation.

But here would be, as I see it the older worker moving out and the youth coming in. That is a matter of study. I couldn't at the moment express what it should be or how it should be done but it is a matter for study and a problem that ought to be tackled.

Dr. ANDERSON. The group of educators who testified this morning stressed the importance of vocational education and guidance for youth. Do you agree with that position?

Mr. GREEN. We have consistently supported that. I think perhaps we pioneered in advocating vocational training and vocational education. We have our committees functioning cooperating with the agencies of Government in the promotion of that, but after all, that is merely equipment. The question, the big problem, is the job. How are we to find work for them, even after they are trained and are given a vocational education? That is the thing I am thinking about more than the other problem. As I mentioned a little while ago, take the glass bottle-blowing industry. Here we had an apprentice system, a highly skilled trade. Young boys, young men, came in as apprentices, just like the young high-school student entering college to equip himself for his life work. In comes the apprentice all inspired by hope and vision, and as a young man he learns his trade, as is provided for under our union rules. As you know, all these rules provide for so many apprentices.

And suddenly, over night, a machine is invented that is substituted for the skilled workers and the apprentice. Out they go. There is the hope blurred; that is a tragedy.

Mr. O'CONNELL. Mr. Chairman, I don't have a question, but with your permission I wanted to make one very brief comment about one statement in Mr. Green's statement. It has to do with his statement about the school of thought which has apparently resigned itself to the thought that we are in for a period of economic stagnation and

decline. I thought it proper for somebody on this committee to make a statement about it at this time, because the philosophy has been in some quarters attributed to some members of this committee, and I feel very strongly that those people have a mistaken impression, arising out of a misconception of what is really only an unusual awareness on the part of some members of the committee of the unusual seriousness of the problem. The fact that they have discussed the problems in not too optimistic a way has led some people to believe they subscribe to the theory that nothing can be done. It seems to me proper to say that there is no member of the committee who subscribes to the philosophy you mention in your statement. We, with you, are inclined to believe that while the problems are difficult and apparently becoming more so, there is nothing constructive about saying nothing can be done about it.

Mr. GREEN. I am glad you brought that point out, because I say to you truthfully that I never had heard of any member of your committee assuming a defeatist attitude.

Mr. O'CONNELL. I understand that.

Mr. GREEN. I wouldn't want you to think that that was made as applicable to anyone. I get it out among my own people. I think it is perhaps due to the pessimism of the people. They probably sink down to a low point of discouragement sometimes, but none of us, no thinking person, can ever accept such a philosophy as that in America with its inexhaustible resources.

Acting Chairman KING. Are there any more questions? Mr. Green, we are very grateful to you for your message.

Mr. GREEN. Thank you for the opportunity of coming. I hope I may have made a little contribution toward your study of the subject, and I will be glad to cooperate any time in helping you along.

Dr. LUBIN. Mr. Green, may I say I think I am expressing the opinion of the committee that we are all going to wait with bated breath for your memorandum on the \$10,000,000,000, and I suggest to the chairman that we make arrangements now to leave the record open at that point so that when this memorandum does come we can get it in. We want it badly. We will need it.

Mr. GREEN. I have raised your hopes, you see.

Acting Chairman KING. The only difference I have with Mr. Green is that it ought to be more than \$10,000,000,000, and with our inexhaustible resources and our great manpower and technological skill, there is no reason why we should not get, with some degree of normality, to a \$100,000,000,000 or \$110,000,000,000 productive period. America doesn't confess any defeatism.

Are there any other witnesses this afternoon?

(The witness, Mr. Green, was excused.)

Dr. ANDERSON. Mr. Chairman, the next witness for today is a Government expert, Dr. J. C. Wright, Assistant Commissioner of Education, in charge of vocational education, who is speaking on the topic, Vocational Education and the Future of Workers Old and Young. Dr. Wright has not been before the committee.

Acting Chairman KING. Dr. Wright, do you solemnly swear the testimony you shall give in this hearing shall be the truth, the whole truth, and nothing but the truth, so help you God?

Dr. WRIGHT. I do.

TESTIMONY OF DR. J. C. WRIGHT, ASSISTANT COMMISSIONER FOR VOCATIONAL EDUCATION, UNITED STATES OFFICE OF EDUCATION, WASHINGTON, D. C.

Acting Chairman KING. Proceed, Doctor.

Dr. ANDERSON. What is your position with the United States Office of Education?

Dr. WRIGHT. I am Assistant Commissioner for Vocational Education.

Dr. ANDERSON. Your duties, then, are in the definite field we have been discussing, that of vocational training, guidance, placement of vocational trainees?

Dr. WRIGHT. That is correct. In my division we administer the acts of Congress known as the Smith-Hughes Act, the George-Deen Act, and other acts relating to vocational education.

Dr. ANDERSON. How long have you been engaged in such work?

Dr. WRIGHT. I have been in education for 43 years, the last 28 of which have been in vocational education and the last 23 of which have been with the Government. Since 1917 I have been in this present work, under the Smith-Hughes Act.

Dr. ANDERSON. And you have published in the professional field of vocational education?

Dr. WRIGHT. Yes, sir. I have published a number of books, some dealing with technical phases of the program and others with professional phases of administration, supervision, and training.

Dr. ANDERSON. I suggest, Dr. Wright, that you highlight your prepared statement as much as possible, in order to see if we couldn't encompass it in the hour that is before us.

Acting Chairman KING. Proceed as best you may to carry out the suggestion.

Dr. WRIGHT. I will be glad to do so.

Mr. Chairman, I beg your indulgence in the beginning to express my appreciation of two remarks that were made earlier in the day, one that was made by the chairman himself with respect to the importance of securing, on the part of our public schools, an appreciation of the dignity of labor, the willingness and right of every man to work whether it be at a highly skilled job, a professional job, or a job of common labor, so long as it is honest work. I believe that we in the school business, and the public, should give the same respect to the worker that we do in the more highly skilled and professional occupations.

My second comment, if you will permit, is to compliment the previous speaker, President William Green, of the American Federation of Labor, on the very wholesome and helpful data which he has presented to us, and which we in the field of vocational education will take occasion to study and digest.

A century ago the question of training men and women for work was not in any sense a national problem. Boys and girls in their early years were quite naturally inducted into the work of the family, both as regards to the upkeep of the home and the prosecution of the main business of the father and mother. Practically 90 percent of the usefully employed population was engaged in farming, lumbering, mining, and fishing. Manufacturing was largely a series of activities

which were either a part of the household routine or closely connected with the household. Large families of children were assets rather than liabilities, because there was neither public sentiment nor public law against having these children participate in such activities.

William S. Knudsen, president of General Motors Corporation, has well stated the educational value of work experience, when he says (Trained Men, vol. XX, No. 1, 1940, p. 4, International Correspondence Schools):

The pioneers were men of little education. So were the immigrants. Consequently, there grew up a great reverence for book learning. The man who made his living sitting at a desk, wearing a white collar, was looked up to and envied. His life was easy, clean, "genteel." He seemed of a higher social class.

From this came many good things. It provided the urge for universal education in America. It gave every American mother the ambition that her child should have "the highest possible education."

But maybe we have gone a little too far in our reverence for book learning; maybe in our concentration on that we have forgotten other things which are just as important. This is the knowledge of how to work with our hands, how to create with practical skill.

I am not belittling education. What I am trying to say is that a person educated entirely through books is only half educated. There is a kind of practical knowledge and good sense which can flow into the brain only through the use of the hands.

What to do about it? Well, I think all our schools should put more emphasis on training in manual skills, give more opportunity for the youngsters to test the theories they learn in actual practice, let them compete with one another in building useful things. You can tell a boy what a pump is; but if he gets a pipe, and, by means of a cork on a string, draws water up through that pipe, he really understands what a pump is.

Today, the entire scene is changed for a large part of the public. Even in present-day rural communities most of the home-manufacturing activities have disappeared, and the production formerly thus supplied now comes from highly concentrated and highly specialized industrial concerns which are far removed from the home of the worker who participates. During the period of the development of this highly complicated industrial and commercial system, the general tendency has been to depend upon the facilities still existent in the industries themselves for training the workers. At the same time, large dependence has, until recent years, been put upon foreign countries for the supply of skilled workers in the more generalized trades.

It is safe to say that at the present time a very large percentage of all those who are working in industrial and commercial occupations have received their training "on the job" either by the "pick-up" method, by the "show-and-tell" method through fellow workmen, through organized instruction carried on by the industry itself, or by some combination of these methods. Although there are no statistics available that show conclusively the relative percentage of such workers who have been trained through the unorganized type of training and the percentage trained through the organized type, it is safe to say that many more have been trained through the unorganized type than through the organized type of training. The most prevalent of the organized type of plant training are the vestibule school and apprenticeship.

THE VESTIBULE SCHOOL

Dr. WRIGHT. The vestibule school is usually operated by an individual plant. Its purpose is to give novices in the shortest time possible, sufficient training to enable them to take their place at a machine

in an assembly line, or at a hand operation and perform skillfully enough to avoid spoilage—of machine, of raw material, or material in process. This type of training is suited to a narrowly specialized operation which can be taught in a relatively brief period of time and is practicable only in plants that use comparatively large numbers of workers in the various processes for which training is given.

Whenever possible, operatives being trained in a vestibule school are paid on a piece-work basis. This means that the training is, in most instances, given on the workers' own time. Recent interpretations of the Wage and Hour Administration are aimed at reversing this situation and requiring the training to be given on company time.

Apprenticeship, as it developed in the European countries and as it existed in the early industrial days in this country, practically insured an employer or master the services of an apprentice for many years after he attained his journeymanhood. It also assured the apprentice of employment by the master usually as long as he was a faithful worker and desired to remain with his master.

Apprenticeship included not only instruction in the manipulative skills of the trade, but also in the necessary related technical instruction which 50 years ago was not extensive, but which has increased until, at the present time, a real craftsman in the skilled trades is the possessor of a wide range of technical knowledge concerning tools, materials, mathematics, science, drawing, and so forth, basic to the application of the skills inherent in the trade.

Formerly the master was also responsible for teaching the apprentice to use the basic tools of education, namely, reading, writing, and arithmetic. Moreover, he was responsible for the social, civic, and religious training of the apprentice.

With the development of the large corporation and the wide separation of the actual employer from the journeyman worker and the apprentice, there has been an increasing narrowing down of the responsibilities of the master to the present-day situation in which the master, as a usual thing, feels responsible for giving the apprentice an opportunity to acquire only the manual skills connected with the trade.

Recent trends in social legislation and social development have supplemented the increased technical requirements of the trades to the extent that the training of apprentices, at the present time, is quite generally considered acceptable only when there is opportunity for the apprentice to acquire skill not only in the manipulative operations of the trade, but also the related technical knowledge.

Some programs of apprenticeship carried on by individual companies include not only manipulative practices on the job but also classroom instruction in the related knowledge by instructors hired for that purpose by the company. In other instances, cooperative relationships are set up with schools, usually public, although sometimes private, in which the related technical knowledge is offered in the school at public expense.

The inherent difficulties in apprenticeship, at the present time, are, in part, due to the high degree of division of labor and consequent specialization, and, in part, due to the general restiveness of the American workman and the lack of close employer-employee sympathy and coordination.

In many instances, an apprentice is taken on with the understanding that he will be given an opportunity to acquire the skills necessary in the various operations and different classes of work of the whole trade.

The economics of production are such, however, that in order that the employer may get a return on the apprentice commensurate with the wage he has to pay, he breaks him in on a single operation or a narrow range of operations of the trade; makes him, in a comparatively short time, actually productive; then keeps him on this narrow range of operations because he is productive. In other instances, the apprentice is used as a helper to save the time of the more highly paid journeyman. In either instance, the apprentice fails to acquire the basic skills necessary in the whole range of operations in the different branches of the trade.

The Federal Committee on Apprenticeship is promoting the idea of a written indenture which will contain a list of the operations to be taught the apprentice and the class of work he is to be taught to do. For the purpose of securing conformity to the agreement, local advisory committees will be expected to supervise the work of the apprentice to the extent of seeing that he gets the all-around training that is specified in the indenture. The obvious way to overcome the handicap which tends to make the employer use the apprentice either as a "fetch and carry" man for the journeyman or as a specialized operator, is to see that the apprentice, before he is put on as an apprentice or during the initial steps of his apprenticeship, has an opportunity, through organized instruction either in a company school or in a public school, to be taught the basic operations of the various branches of the trade. This is considered to be the legitimate function of what is known as the "all-day school." So far as the related technical instruction is concerned, it is now quite generally recognized that this is to be given in the school. This instruction may be designated preapprentice training.

The Federal Committee on Apprenticeship advocates and requires, for an approved apprenticeship program, that arrangements be made to provide for at least 144 hours of instruction per year in related subjects for each apprentice.

The foregoing relates very largely to organized programs of apprenticeship. By far the greater number of persons who have gone into a shop as novices and have later become journeyman have become so not through organized training but through a program of unorganized training which usually consists of a period of service as a helper plus a period of service as a "two-thirder and improver," or a job with some similar terminology which means a stage between that of helper and journeyman and the stage where the learner is allowed to use the tools and machines of the craft under the supervision of a recognized journeyman. The labor unions by and large are securing the discontinuance of the helper as a recognized worker, presumably with the hope that, with the disappearance of the helper and the appearance of common labor to do the fetch-and-carry work for the journeyman, it will be possible to organize and build up a system of apprenticeship.

PRIVATE SCHOOLS

Dr. WRIGHT. Private schools are of two kinds. The endowed schools are the result of the interest of some individual in the problem of training for the skilled trades. The individual usually provides a building and sometimes provides an endowment which will, in part, support the program of training. In a few instances, these schools have maintained the original purpose of training of a trade type. In many other instances, however, these schools have aspired to what they considered to be higher levels of operation and have become technical institutions, junior colleges, and colleges of engineering. For the most part, these schools have been pioneers in the field and have done much to arouse interest in training for the skilled trades and have tried out various methods of teaching and types of equipment. So far as the numbers trained in these schools is concerned, they have been and are negligible. By far the greater number of private schools are the ones which have been and are being operated for profit. In quality these range from some of the best trade training in the country to those which are nothing more or less than a racket. We have no means of knowing the numbers enrolled, but, on the basis of experience of those schools which must be certified by State departments of education before they are allowed to operate, we know that the numbers run up into the hundreds of thousands and that the money paid to them runs up into millions of dollars.

These are the schools of air conditioning, refrigeration, Diesel engine operation, auto mechanics, airplane mechanics, radio mechanics, and numerous others. This type of school flourishes in the heyday of the development of an industry. They make all kinds of promises and, all too frequently, fulfill none of them.

In this connection, it might be pointed out that the correspondence schools of this country are also connected with the program of training for and in the skilled trades, though, as a usual thing, they do not offer instruction in the manipulative operations and usually do not pretend, at least in the correspondence part of their program, to teach manipulative skills.

PUBLIC SCHOOLS

Dr. WRIGHT. During the past 20 years, there has been a remarkable development in the field of training for and in the vocations connected with industry, agriculture, and business, particularly the distributive occupations. I will not take the time to rehearse all of the aspects of this program except to point out the importance of the all-day trade preparatory industrial school in its relation to the development of a sound apprentice-training program which will fit in with modern industrial and economic conditions and, at the same time, afford real apprenticeship. And second, to point out the importance of the so-called diversified occupations program as a supplement to an apprentice-training program, particularly insofar as it relates to opportunities for training for the skilled trades in the smaller communities which could not of themselves afford to support a day trade-preparatory school, and for whom there is no free instruction offered in a State or regional school of the trade-preparatory type. The first exhibit is a description of the diversified occupations program as pre-

pared by a member of the trade and industrial education staff of the United States Office of Education.

(The document referred to was marked "Exhibit No. 2719" and is included in the appendix on pp. 17486-17488.)

Dr. WRIGHT. In connection with the Federal-State aided program of vocational education, there are a number of facts which might be pointed out:

1. The present agricultural education program makes use of the home opportunities for education and ties up the school instruction with a series of home projects carried on by the boy on the home farm but under the joint supervision of the teacher and the parent. This and the home economics program of a similar nature is one of the noteworthy attempts to preserve educational opportunity that still exists in the home and on the farm. (See "Exhibits Nos. 2720 and 2721" for statistics on these programs.)

2. The trade and industrial education program was apparently not designed by Congress to afford opportunities for training of a trade-preparatory type except for those occupations which require a relatively long period of training. The requirements are that the school shall be in session at least 9 months of the year and 30 hours a week, and that the instruction should be for those who are preparing to enter upon a trade and industrial pursuit. (See "Exhibits Nos. 2720 and 2721" for statistics on these programs.)

3. The trade and industrial education enrollment in part-time and evening schools is nearly twice that of the all-day preparatory school, which means that the Federal-State aided program reaches more workers already employed in the trades than it does those who are preparing to enter upon a trade. It is quite probable that one reason for this is a recognition on the part of workers of the necessity of keeping abreast of the time during an era of unprecedented technological development. This will be discussed again under another part of this testimony.

4. It should be remembered that the country, as a whole, has not as yet accepted the philosophy that education at public expense should be available for adults. One of the first activities to be eliminated by a community in a period of economic stress is schools and classes designed primarily for adults. Comparatively few of the communities of the country maintain educational programs aimed primarily to meet the needs of adults.

(The documents referred to were marked "Exhibits Nos. 2720 and 2721" and are included in the appendix on pp. 17489-17492.)

Dr. WRIGHT. It is assumed that the terms "retraining" and "rehabilitation," as used in this testimony, apply only to persons who have worked successfully at some occupation and, in some instances, are still working successfully at an occupation, but in other instances, have been forced to leave the occupation and must be rehabilitated and retrained for some other occupation.

There are a number of factors which enter into the possibilities of retraining and rehabilitation and that modify the methods used in retraining. In general, it may be said that the factors which bring about conditions which make retraining necessary are the age or physical condition of the individual, and the technological changes that have occurred, are occurring, or probably will occur in the occupation in which the person is engaged or has been engaged. In

general, it may be said that retraining has to do with two groups of workers—those who are still employed and those who are unemployed.

RETRAINING FOR THE EMPLOYED AND UNEMPLOYED

Dr. WRIGHT. The old saying, "An ounce of prevention is better than a pound of cure," applies in this situation. If we can foresee the situation of the future and take steps to help an individual, put him in a position that will enable him to avoid unemployment, we have done much more for him and at less cost than would be the case if we waited until he became unemployed and then tried to retrain or rehabilitate him for reemployment.

Depending upon the type of work at which a man is engaged, we can foresee to some extent the age at which he will probably become unemployed even if the company for which he works stays in business and considers his work satisfactory. Whether or not it is a matter of public knowledge, it is certain that some concerns try to avoid retaining the services of an employee beyond a certain age. In some types of occupations it is impossible for a worker to continue beyond a certain age, for such reasons as partially disabling accidents, failing eyesight, loss of fine muscular control, and numerous other causes associated with occupational hazards and age. In some occupations, technological changes come about which make the position unnecessary and it ceases to exist. Some workers engaged in piecework are certain to have their earnings decrease when they reach a certain age. With this type of individual it might be possible to get him established in a small place where he could supplement his industrial income with a small contribution to the larder of the family from a garden and chickens.

It is possible for some of these workers to build up a small business on the outside, either with a service station, a roadside stand, a paper and magazine business, or other small entrepreneur undertakings. In the case of technological changes as they appear on the horizon, it is possible to offer courses of instruction in evening schools which will enable the worker engaged in one occupation either to supplement his skill in that occupation or change to a closely related occupation. Examples: The steam engineer who can readily become a Diesel engineer, or even the operator of an electric engine. The pressman who has had experience on the cylinder press to be trained to run a high-speed automatic press or platen press in connection with which it would be unnecessary for him to lift the heavy forms that are used on the cylinder presses. The watchmaker or watch repairer, because of failing eyesight or muscular control, may become an instrument maker or instrument repairman, or even a radio repairman. The plumber or the sheet-metal worker who learns to use a welding torch or arc. The telegrapher who becomes a radio operator. Every employer knows that, other things being equal, it is better to retrain an employee than it is to fire him and take on a new employee. Particularly is this true if the company has an indemnity company policy, and if the job which the employee holds is governed by this policy.

The steam engineer on the railroad who learns how to operate the Diesel engine knows the policies of the company, knows the personnel, knows the procedures, knows the road, and in all respects is everything that is signified by the term "trusted employee." It is more economical

to capitalize these assets rather than to teach all of these things to a new man, however competent he might become as a Diesel-engine operator. In other words, retraining of employees to remain in the service of an employer reduces the cost of labor turn-over and conserves the wages and the morale of the employee who otherwise might be forced into the ranks of the unemployed.

Training costs increase with the amount of training to be given to an employee. It is, therefore, general practice in good adjustment programs to attempt in any retraining to salvage all of the fine old skills and knowledge which can function in a new type of employment. When retraining is to be given, it is also the usual practice to find a new job which is as closely related as possible to the job formerly held by the trainee. The general morale of any company is strengthened by the knowledge among the employees that it is the policy of the company to meet the demands arising through technological changes, and to retrain those already employed rather than to fire them and hire others who have the new skills or knowledge required.

The evening-school program should be built, to a large extent, upon newly developed and developing requirements of industry in the way of new skills and additional knowledge.

Much of what is said about the economy of retraining the employed may be applied to retraining of the unemployed. It has often been said that retraining of the unemployed will not in any sense reduce unemployment because the retraining of an unemployed man makes him ready to take the place of an employed man. This is not entirely true because, when the unemployed man is retrained to start a small business of his own or to render personal services which are ordinarily performed by the individual himself, there is no replacement of an employed person. The older employee, who is retained to operate a news, candy, and general notion stand does not necessarily replace someone else who is already operating such a stand. It may be said that the business he gets will be taken away from some other entrepreneur who is already operating. On the other hand, experience shows that increasing the number of salesmen does not necessarily mean merely increasing the amount of business taken away from some other manufacturer. It frequently means increasing the number of persons who purchase certain commodities. Certainly the rendering of personal service which ordinarily is performed by the individual himself is not displacing another worker.

Although it may not exactly be called retraining, consideration should be given to the offering of opportunities for those who are unemployed to keep up their level of competence during the period of unemployment; opportunity for the stenographer to keep up on shorthand speed, for the concert singer to keep "in voice," and for the machinist to maintain skills formerly used, to brush up on skills not so frequently used, or even to acquire new skills.

In the present industrial condition, many skilled mechanics have found themselves forced into positions of specialization on the job in which they have little opportunity to use more than a narrow range of the skills belonging to the old trade. Before these skills disappear entirely, it would appear to be economical to exercise these skills with a view to extending opportunities for employment.

At this point it should be recalled that the number of persons engaged in industry, who are not working at skilled occupations but rather at

semiskilled or unskilled occupations, is probably at least twice the number engaged in skilled occupations. In this testimony no attempt will be made to discuss whether more or fewer private schools should be encouraged. The testimony will deal entirely with the need for and methods of establishment of a larger publicly supported vocational education program.

THE NEED FOR A LARGER VOCATIONAL PROGRAM

Dr. WRIGHT. There are about 6,000,000 young persons enrolled in public 4-year secondary schools at the present time, of whom slightly more than a million are graduated annually. From 30 percent to 35 percent, or more than 300,000, of these high-school graduates enter colleges or other post-secondary schools. Yet the major portion of the secondary-school programs is built upon and consists mainly of subjects aimed at meeting college-entrance requirements. There are those who would say that an increase in the vocational-school facilities would offer these young persons a better opportunity to prepare themselves for their future occupations than does the present academic college-preparatory course. This is probably true, but an increase in the present vocational-school facilities with the retention of the present aims of the day vocational school would not be a complete solution of the problem because the present-day school facilities aim to prepare young persons for advantageous entrance into the skilled occupations only.

It is a generally accepted fact among those experienced in the field of vocational education that training for a skilled trade is not the best opportunity that could be offered to the young person who eventually is to find himself engaged in unskilled or semiskilled work. On the basis of actual experience, no one at the present time can say what the best training would be for this great group that probably will be earning a living in the semiskilled and unskilled occupations, but it is perfectly safe to say that there is some education on the secondary level that would be more satisfactory than either the present unit trade courses of the day trade-preparatory vocational school or the academic college-preparatory course.

The question may be raised as to whether or not it is possible to increase the number of young persons who will be prepared to enter skilled trades, and the answer to this is to look into the present field of occupations and we discover that not more than 20 percent of all the persons who are gainfully occupied are employed in occupations which require training beyond high school, at any rate that require professional training of a college level. That approximately 25 percent of the persons already gainfully employed are employed in skilled occupations, including the skilled occupations in business and skilled occupations in industry.

The differentiation made here between professional occupations and skilled occupations is that professional occupations require university, collegiate, or technical preparation of from 3 to 8 years beyond high school. A skilled occupation is one in which, to succeed, it is necessary to have either on the job or in school, or through a combination of on-the-job and in-school training, 2 to 4, or more years of combined school and work training.

The question naturally arises: How is it to be decided which individual shall take the college-preparatory course, which shall take

the courses leading to the skilled trades, and which shall take the more general courses that aim to prepare for employment in occupations, the specific preparation for which will be largely learned on the job? The best available answer to this is that a period of general education of an extensive type be offered to all pupils at the beginning of the secondary school period, and that all pupils continue in this general education program until they have demonstrated that they are qualified, through aptitudes, interests, abilities, and desires, to branch off either into special fields leading to professional work or into special fields leading to skilled occupations. The extent to which this general course for all pupils should permit of emphasis in any direction would depend upon a number of factors which need not here be discussed. The fundamental idea of this period would be discovering, or rather helping the individual to discover, the kinds of instruction best suited to him as an individual, taking into consideration his past experiences, present assets, and future opportunities. His instruction should function as a springboard from which he may make up his mind as to the occupation he wishes to follow.

The probabilities are that, in view of the economic and occupational situation, about 20 to 25 percent of the pupils should find themselves in the college preparatory course, about 10 to 25 percent in courses aiming at the skilled trades, and at least 50 percent in the more general type of secondary education.

We are concerned here primarily with the 10 to 25 percent aiming at the skilled trades and the phases of the work for the 50, or more, percent that look toward general occupational competency. From the sheer standpoint of numbers, there is at the present time far too small a number enrolled in the vocational courses looking toward the skilled trades. In the Federal-State aided program at the present time, there are about 200,000 pupils enrolled in day trade-preparatory industrial schools, and about 250,000 in the all-day agricultural schools. Of this latter number, certainly fewer than one-half expect to be engaged in or will be engaged in wage-earning occupations other than farming (entrepreneur), so that it is safe to say that not over 5 percent of all the pupils enrolled in secondary schools are enrolled in federally aided vocational courses other than home economics. Even if we were to make a liberal interpretation of what might be called "vocational commercial courses" looking toward employment in skilled occupations, less than 10 percent of the pupils now enrolled in secondary schools are enrolled in vocational courses aimed toward the skilled occupations.

This means that perhaps 350,000 of the 6,000,000 high school enrollees go to college or other post-secondary schools, and perhaps 600,000 are trained to enter the highly skilled trades and commercial pursuits—a total of less than one million, or, roughly, 15 percent of the total high school enrollment. This leaves 85 percent who leave high school before graduation or who receive a general academic education of a type that may be described as a more or less modified college-preparatory training, but without specific vocational value.

What has been said under "Economic Potentialities of Vocational Retraining" makes it evident that the present facilities in extension training, available to those employed in wage-earning pursuits, is

pitifully meager. There were about 49,000,000 "gainfully occupied" persons at the 1930 census, and our evening and part-time extension training program reaches about 1,000,000 of these, counting in farmers and homemakers who comprise about one-half of the number reached through the evening and part-time extension courses.

If we are to stabilize employment which has come about through technological changes, our greatest hope is in the evening and part-time trade extension school. Whether these extension opportunities be offered by the public schools, by the Y. M. C. A.'s, Y. M. H. A.'s, Knights of Columbus, churches, or private agencies, it is apparent that the public program must be extended beyond the confines of a few larger urban centers, and it must have much more diversified offerings than does the evening school of the present. The general public must be converted to the idea that educational opportunities for adults are as much a part of the public program as are educational opportunities for youth.

It should be noted that the statistics here quoted are for high schools over the country, large and small. They must be discounted by the fact that we continue to conduct many small secondary schools with enrollments of from 10 to 100. Of the Nation's 23,000 high schools, 50 percent have enrollments of fewer than 125 pupils; 75 percent enroll fewer than 250 students. Thus, three-fourths of secondary schools have little possibility for vocational training other than in agriculture and home economics.

These data on size of high schools must be distinguished from the proportions of the total secondary school population who attend small schools. The 1930 census showed 95 cities with populations of 100,000 or more, or 31 percent of the total population. There were also 284 cities with populations of from 25,000 to 100,000. Both classes of cities thus comprise more than 40 percent of the total population. It is clear that approximately 100 cities should be able to provide complete and highly diversified vocational programs, and that an additional 300 cities should be able to maintain limited vocational programs of a high order of effectiveness. There remains more than 50 percent of the total population resident in communities of fewer than 25,000 inhabitants, of which perhaps 45 percent are rural in the sense of less than 2,500 population. Unless large-unit (county, region, or State) vocational training institutions are set up under State-planning and State-Federal support, at least half of our high school youth can receive no formal vocational preparation other than that in agriculture and home economics. It is also clear that diversified occupations programs in trade and industrial and in distributive occupations offer about the only solution for vocational education in medium-sized communities.

HOW A LARGER VOCATIONAL PROGRAM SHOULD BE ESTABLISHED

Dr. WRIGHT. 1. Apprenticeship should be made a major activity of industry through and with the support of Federal and State Governments. Preparation for apprenticeship in preparatory courses should be recognized as a part of a training program. Through the development of such programs as the diversified occupations program and the establishment of State, regional, and county schools, opportu-

nities for such preparation as well as for extension training opportunities for those already employed should be made available to every section of the country.

2. The secondary school, as its main objective, should direct its education to the preparation of young people for citizenship, economic competency, physical well-being, social integration, and the fullness of living. This will mean new subject matter, new objectives, changed administrative policies, and, above all, a new attitude on the part of the general public toward the secondary school as the stabilizing influence of the country. It also means a secondary place for the college preparatory academic course in its highly specialized role of preparation for college. It will mean an adaptation of buildings, through suiting new building programs to new purposes, and reconstruction of present buildings and equipment to meet new needs. It will mean specific education on the part of the secondary school as to the placement and follow-up of students either graduating or leaving the school before graduation. To the extent that the school modifies its practices in the light of what happens to its pupils after leaving school, it will be successful.

3. Teacher-training institutions will need to adopt a new philosophy, new points of emphasis, and new methods of procedure to meet the changed conception of this type of secondary school.

INDUSTRIAL TRAINING

Dr. KREPS. I notice in your first recommendation you say, "Apprenticeship should be made a major activity of the industry through and with the support of Federal and State governments. Preparation for apprenticeship in preparatory courses should be recognized as a part of a training program."

(Mr. O'Connell took the chair.)

Dr. KREPS. Would you like to elaborate for us just how the Federal and State Governments' support would be given to an apprenticeship program; in what industries you would establish it; in what centers you would establish it? You have been working with this for a long time.

Dr. WRIGHT. I would establish apprenticeship in practically every skilled trade and occupation, many of which are not called trades; they are sometimes called occupations.

Take, for example, the program to which one speaker referred this morning, that is put on in the Canal Zone. I happen to have been called down there 4 years ago to make a survey and to recommend a program. There we recommended apprenticeship for those occupations that have heretofore been common to apprenticeship, such as machinist, carpenter, and patternmaker, but we also extended the same principles, only under the title of "learnership," to those occupations in the commissary that are commonly known as salesman, buyers, stockmen, and so forth, where a considerable knowledge, technical knowledge, perhaps, and a certain amount of skill is necessary.

Dr. KREPS. Did you establish those in schools, or in the industrial plants?

Dr. WRIGHT. In the Canal Zone the industry is conducted entirely by the United States Government. The commissaries are operated by the Government. The largest maintenance-repair plant is operated

by the Government, but on a basis about the same as it would be if it were private industry.

Dr. KREPS. Then, returning to the mainland, would you establish schools in industrial plants in various industrial centers, or would you establish—

Dr. WRIGHT (interposing). The plan that is carried on in the Canal Zone provides that the apprentices are put to work by industry, but the school gives the related instruction. In that particular instance all the apprentices and learners were to be graduates of the high school, and the related instruction was carried on in connection with what they called their junior college.

Dr. KREPS. This would not be a substitute at all for the small-industry training programs that are necessary to train a semiskilled worker in 30 days or 60 days?

Dr. WRIGHT. No, sir. It is generally recognized that occupations which can be learned in a matter of months are hardly apprenticeable. Perhaps 1 or 2 years' length is about the minimum for which apprentices should be taken on.

Dr. ANDERSON. Dr. Wright, in an apprentice course of this kind, are you confining your effort only to those occupations which require that long a period of time, or have you devised ways of making a vocational training effective even for those persons who are going into a variety of semiskilled occupations?

Dr. WRIGHT. The present program as operated by the Federal Committee on Apprenticeship is one calling for, I believe, the minimum of 2,000 hours. That effectually sets up about a 2-year program. I do not believe that a formal apprenticeship ought to be set up for occupations which require only a few months for training.

Dr. ANDERSON. Mr. Green said something about the traditional set-up in the A. F. of L. which provided a certain number of apprentices per master. Is it true, as we heard, that the apprenticeship system is being broken down, and that some public agency such as the school must take over the training of masters?

Dr. WRIGHT. Apprenticeship as it existed 100 years or even 50 years ago has almost disappeared. At that time the apprentice was indentured to a master workman. The master had time while working to stop and instruct the apprentice. He was oftentimes responsible for the apprentice in the matters of education, matters of almost loco parentis.

Today master workmen do not have time to stop and instruct an apprentice. Modern methods of production call for high speed. Therefore, we have had to develop a new type of apprenticeship, one where the related instruction that the old master used to give on the job is now taught in the school, and where the apprentice gets his training on the job.

Dr. ANDERSON. In certain localities where I have noticed vocational training in progress, I have found some resentment on the part of craftsmen—for example, among electrical or other building tradesmen—against the schools entering this field. Is that characteristic or exceptional?

Dr. WRIGHT. Labor has consistently objected to any attempt to train more people for an occupation than there were opportunities for employment. In other words, I imagine, and I myself would agree with this statement, I think labor would—and I differ with one of the

speakers this morning—that the training should precede the opportunity for work. I think that it should be fairly well known that there is an opportunity for employment and that there are jobs before we set up a training program, and that there should be some definite relationship between the number trained and the opportunities for work. That enables us to make the training more specific.

Dr. KREPS. Would you care to elaborate on that just a moment—

Dr. WRIGHT (interposing). If you will permit me, just a moment—

Dr. KREPS. Because opportunities for work are obviously not a fixed quantity.

Dr. WRIGHT. If you will excuse me, I should like to finish my answer to his question.

The manner in which the relation between opportunities for work and the training provided are brought into balance is through the use of advisory committees, joint advisory committees, representative committees made up of labor, employers, and representatives of the schools. These committees are for the most part local, although there are State and national committees that advise in a general way. During this past year there were 1,343 of these committees in active operation.

These committees settle such questions. In addition, there are committees that are locally responsible for the indentureship of these apprentices under the Federal Committee on Apprenticeships Plan.

Dr. KREPS. Economic opportunities in any occupation cannot be forecast at a given time with any great degree of accuracy. You can never say that the opportunities now existing are the only ones that will exist in the future. Moreover, the number of opportunities that exist depends upon the price. It is quite conceivable that if you have increased the number in any skilled craft a great deal, that service will be available at a lower price. The demand for such services would be considerably expanded, for construction workers, or machinists you mentioned. Isn't it conceivable that a large increase in the number of machinists might decrease their hourly wage, but increase their annual income, and particularly the opportunities for machinists? Therefore, when you say we won't train people until we see opportunities, you have the cart before the horse.

Dr. ANDERSON. Let me add this one point because Dr. Kreps wasn't here this morning. That was precisely the thesis that Dr. Clark advanced this morning and caused considerable stir in the committee. When you said that you had some difference of opinion, it was on that very point, was it not, Mr. Wright? Apparently there are two very definite schools of thought on this subject, one that workers shouldn't be trained for jobs that are not available, the other that the field should be looked over to find the places where occupational returns are high. Therefore, since these are scarcity fields, new workers are shoved into them because the returns there are disproportionately high.

Mr. PIKE. May I make one observation at that point? During the lunch hour I was reading the proceedings of the New England Council last week in New Haven, and the head of one manufacturing company making, incidentally, precision tools, in talking to other manufacturers, said that he had been forced by the lack of fully trained mechanics, machinists, and inferred that it was due perhaps to the apprentice policy of only training men when there were jobs available, restrict, as it came to be, over a period of years by the

natural eagerness of that particular labor group to protect itself so that it dried up the supply, so when extra orders came he could not get trained mechanics, and he stated very flatly that now he was making better tools than ever without the trained mechanic or machinist in the old sense in his factory. He didn't have enough employment of that sort left to keep one trained toolmaker in his shop, he sent that work out. A few years ago he wouldn't have thought of putting anybody but a trained machinist or mechanic, a highly skilled workman, on any precision job in the shop. Now he is through with them and he doesn't need them any more.

That struck me, coming right after Dr. Clark had spoken, as being sort of first-hand evidence on the point favoring him.

During this particular meeting several other people in the same line of manufacture gave similar stories, that due to the lack of skilled people available they had split their work up in such a way that the average training period now necessary was not over 200 to 250 hours before a man could do any job in the shop, but he was in no sense a skilled man except on that particular thing. I thought it was evidence bearing directly on that point.

Dr. ANDERSON. This is perhaps the most crucial and controversial aspect of the topic of vocational training and placement. Because you are the head of a large enterprise that develops practical policies for the expenditure of Federal and other funds, we should like to have your opinion in the matter.

Dr. WRIGHT. Mr. Chairman, I am an administrator, I am not an economist, and therefore perhaps I should not take issue with those who are experts in that line. I differ with the statement to which you refer, if I correctly understood the speaker, that he would train people for jobs at the top without regard to the number of jobs that would be available, if that be a fairly correct statement of the problem. My reasons for differing with him are these: That vocational education at the best is more expensive than other forms of education, because unless the pupil has selected an occupation for which he wishes to be trained within reasonable limits I know of no way by which we can organize the instruction so that it will function in his occupation, in his future, as vocational training. Furthermore, unless we have a teacher who is occupationally competent, a master of the trade, and who has in addition been trained to teach, we have a very inefficient set-up.

OCCUPATIONAL TRAINING IN PUBLIC SCHOOLS

Dr. WRIGHT. We have throughout the country, as you all know, schools in manual training, industrial arts, industrial education. They are very essential parts of our public-school system, but they are not vocational. They may have in the shop the identical tools in the way of lathe equipment, machine-tool equipment, which would be used by another teacher with another group of pupils to teach the machinist trade, but the subject matter will be entirely different in many respects, the time given to it will be different, and the objective or the purpose for which the pupil takes it is different. It seldom inducts a boy into the occupation. I think it is a waste of the public's money, I think it is a waste of the pupil's time, and otherwise undesir-

able economically to attempt to train too many people for the higher jobs, and then let them percolate below.

My own view is that we need to select certain unit trades for what we call the day school, trades that can be analyzed to determine what subject matter should be taught, for which we can find a competent occupational teacher, and put him in charge of pupils who have been properly advised in the way of a guidance-testing program, and who of their own volition have chosen this occupation and want training in it. We should then give them the best training we can.

The best training that we can give under those conditions never takes place out of an apprenticeship, because it is impossible to duplicate in the schoolroom the conditions under which an apprentice has to work on the job. The matter of human relations, work with fellow men, spoilage of material, the calling down that he gets from the boss, and whatnot, are conditions that are foreign to the classroom, and we can't give him enough productive work, enough training for speed, to keep up with his fellow men as a journeyman. We in the vocational field admit and agree and believe that for the youngster in the secondary school the vocational school is never a supplement for full apprenticeship, but it is a school that advances him on his apprenticeship and makes him employable.

Then before leaving the top they must come to the other type of school. There were a little more than 2,000,000 enrolled in all the vocational schools during the last fiscal year under what we call the Federal-aid program. Of the 2,000,000, something over 1,100,000, or considerably more than 50 percent, are enrolled in the evening and part-time schools. They are not the youngsters who haven't yet got a job; they have a job; some of them may be temporarily out of a job due to these changing conditions, but they are workers and they are coming back to the school in the evening or in the daytime, even as a part of their working time, to secure a training and education which will enable them to progress and get ahead on their job.

I believe that that program which is for the employed people is of much greater importance vocationally than the other one, because they already have a job, it isn't a question of employment, but it is a question of giving them help which will enable them to keep their job or to get a better job. Have I answered your question?

Dr. KREPS. Let me see if I accurately get the picture you are trying to draw. I take it that you feel that the group at the top, the managerial group, cannot be trained?

Dr. WRIGHT. What do you mean by the managerial group?

Dr. KREPS. That group which you find in any large corporation which we call the executive group.

Dr. WRIGHT. Yes; I do believe that they can be given training. As a matter of fact, 20 years ago, or 19 years ago, I put on such a program myself at Big Stone Gap, Va., for the Stonega Coke & Coal Co. In one group which I had for 3 weeks for 3 hours a day were the general manager, his engineers, and some of his superintendents, 11 of them. In the afternoon for 3½ hours for 3 weeks I had a group of foremen, but I was not giving them training in the job of mining coal. It was a conference on what we called foremanship, and the first group in the morning were merely brought together for the purpose of acquainting them with the program that was being put on in the afternoon for their general foremen in the principles of managing men.

Dr. KREPS. If I understand you correctly, then, they could be trained in special schools in industry or special graduate schools of instruction or—

Dr. WRIGHT (interposing). It is on-the-job training, or training given in connection with their employment.

Dr. KREPS. You don't think we need to wait for an opportunity there. We can train as many as we like and hope we can reduce the compensation and get an increase in the supply of managerial talent in the country?

Dr. WRIGHT. With the exception of the engineers in this group, 3 or 4 engineers, the rest were all men who had been promoted to positions of superintendent from the ranks. I learned last Saturday night when I went down to their graduating exercises that one of the men who drove me from one camp to another who was a mine foreman, is now the superintendent in a large colliery. Another is general manager.

Dr. KREPS. Let me ask you another question. As I get it, the group at the bottom, the common laborer, semiskilled laborer, labor that can learn its occupation in 15 to 30 days, have nothing to gain from vocational education.

Dr. WRIGHT. Not in the field of coal mining. Using this same illustration, there are in that series, in that region of 5 counties in the western part of Virginia, about 1,500 to 2,000 miners attending evening classes each year. Last Saturday night I addressed 152 of them who had for 2 years taken a program of instruction sponsored by the State, in coal-mine timbering, in mine gases, in ventilation; there were 15 unit subjects dealing with underground work in the coal mine. They had successfully passed a stiff examination and were awarded diplomas. They had taken this because the State of Virginia requires that officials in the coal mine, beginning next July, must have a license.

Dr. KREPS. Does it extend beyond coal mining to a substantial range of manufacturing enterprise, or would you say the coal-mining example was somewhat exceptional?

Dr. WRIGHT. The same principle does not extend on a State-wide basis, so far as I know, to other fields. It does extend to various occupations in the city governments, such as inspectors of plumbing and electric wiring and other things of that sort. They must be licensed, too, if that is what you mean.

Dr. KREPS. Then what percentage would you estimate of the labor force can profit from an apprenticeship program?

Dr. WRIGHT. That is a very difficult question to answer. I know of no basis on which to set a percentage. I think it perhaps would always be a small part of the entire group, perhaps not more than 10 percent, but that is a guess.

TRAINING OF THE UNEMPLOYED

Dr. KREPS. Could vocational training be used as a way of helping people who were displaced to find another job in which they might utilize their capacities?

Dr. WRIGHT. Vocational training and education does not create work; it creates an ability on the part of human beings to do work.

Dr. KREPS. Do you think it should be used to educate persons who have been displaced who are still educable?

Dr. WRIGHT. I do, by all means. There are a considerable number of programs that have been organized in the past 6 or 7 years throughout the country for those whose jobs had to be changed. For example, when the Pennsylvania Railroad changed from steam engines to electric engines, a training program was put on in the State of New York in advance to give the training to steam engineers and firemen they would need to operate the electrically driven engines. Other illustrations could be cited in the same way. Where it is known that jobs are changing due to the introduction of new equipment or new methods, schools should be available for the purpose of giving the necessary training. I will give one more illustration. About 3 years ago, maybe 4, it was known in Portland, Oreg., that several large buildings were to be erected under specifications where the plumbing work would be welded instead of by the old screw method. The plumbers in the city, a union organization, held a meeting and took cognizance of the fact, and somebody proposed that they get back of a plan to be trained to weld by this new method.

They came to the Board of Education, and a plan was put up, teachers were secured, and 300 plumbers in that city within 6 or 12 months were given training in the field of gas welding or electric welding, whichever method was used, as a part of the tool of the plumber. Welding is not a trade; it is a tool in many trades. That is a pretty good illustration of these changing conditions and the extent to which vocational education can serve to keep them employable. As a result, instead of importing plumbers who could weld into Portland, when the buildings were erected the plumbing work was done by local plumbers.

Mr. PIKE. You made a pretty strong statement, Mr. Wright, which I can't find myself in total agreement with, that education cannot create work. I think Dr. Clark made a pretty good showing this morning on the other side, and I should more properly have asked the question from him, but I think you have had experience enough to answer this one that is in my mind. Suppose the opening toward all sorts of education were as free as he recommended. Wouldn't you have the same situation we always had in school, that a great majority of the boys showed a vast and consuming lack of interest in further education, beginning with the first or second grade? I remember quite a few that had to be whipped to school at eight, and as soon as they got too old to be whipped, quite a few of the boys quit. I am wondering what proportion in your work, say at Stonega, of the people who were entitled to take training were actually willing to take it and go through with it.

Dr. WRIGHT. I couldn't answer that question except to say that they had about 8,000 or 10,000 employees in their 10 different collieries. The largest group enrolled in any evening school year that I know of was 3,000.

Mr. PIKE. That would be the total enrollment, not stating whether they finished their courses.

Dr. WRIGHT. I couldn't say as to that.

Mr. PIKE. One could perhaps use the illustration of correspondence schools, where, even though at the learner's expense he has bought the course, yet in some cases he doesn't go on and finish it, even though it may be a good course. That was a thing that worried me when Dr. Clark was on the stand.

Dr. WRIGHT. If you will pardon me, I would like to use a chart I have back here to further answer your question.

On the morning of last June 2 I arrived in Buffalo at 7 in the morning. I was met at the station by the principal of the Burgard Vocational High School.

Dr. ANDERSON. That photograph will be admitted in the record.

(The photograph referred to was marked "Exhibit No. 2722" and appears facing p. 17158.)

Dr. WRIGHT. He said, "Before you go to your hotel I should like you to come over to our school, because I have something there to show you."

I went with him to the school, and here was a line of boys from the front door of the building extending back for seven blocks. These boys were graduates of the elementary schools and some 1 or 2 years in high school, and they had come on that morning to enroll in this school for the coming September, that particular morning having been set aside by the schools for enrollment in the seven vocational high schools in Buffalo for the coming September.

There was a total of 1,100 boys who came there that morning to enroll. Only 400 of them could be admitted. Of the 1,100, 700 wanted to take aviation, and the school maintains a department in aviation training giving an enrollment of a total of 400. That department of aviation admits 100 boys each year, and I said to the principal, "Well, if you are maintaining a total enrollment of 400, then it would seem to me that you would need to admit more than 100 freshmen, running the 4-year course."

He said, "No; we have practically no drop-outs. Ninety-seven percent of the boys who enter into this course finish."

I said, "What becomes of those 97 percent?"

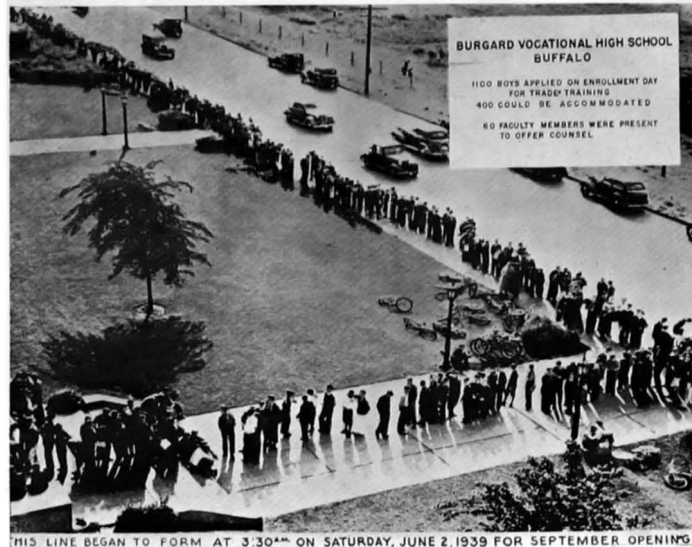
He showed me the records extending back over, I think, about 10 years, which are kept for a period of 5 years for each boy after graduation, and I found that 90 percent, as I recall, of the boys who had entered into the aviation employment were still engaged in that particular field. I point this out merely as an answer to your question to this extent, that these boys, the 700 who came there, especially the 100 who were chosen, had very definitely made up their minds as to what they wanted to do.

In December of last year, the Board of Education announced that on the evening of January 2 they would open their evening schools in Buffalo, which had been closed for the first half of the school year because of lack of money. That group of 1,380 men came at 8:15 in the evening to enroll in this school. Only 1,200 of them could be accommodated by the capacity of the school. Thereafter they had to open another school, beginning about 4 o'clock in the evening, to accommodate the others.

Practically all of those 1,380 men were employed in the automotive industries, in repair stations, garages, filling stations; a large number of them were employed in aircraft. As many as could wanted to get into the aircraft business. Why? For two reasons. Buffalo has 2 very good aircraft factories, and they have very good relations with those factories, the factories are prepared to take all of the men the school can turn out.

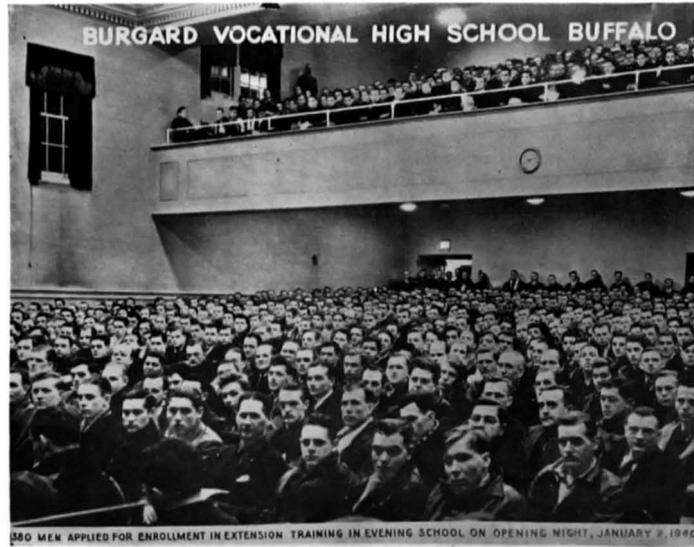
I think these two pictures are illustrative of your question because they point to this one thing that is essential to a successful vocational

EXHIBIT No. 2722



124491-41-pt. 80 (Face p. 17158)

EXHIBIT No. 2723



124401—41—pt. 30 (Face p. 17150)

program, and that is that the youth or the adult must know very definitely what it is he wants to be trained for. When the school gives that training, you do not have these drop-outs that are so prevalent in other situations. I think that the drop-outs we have in our colleges due to failures and for other reasons would be materially reduced if the pupils went to college and paid their own way, rather than because it is the fashion, or because they are sent by their parents.

Dr. ANDERSON. Those people I presume in substantial number are unemployed?

Dr. WRIGHT. Quite a few of them, I wouldn't say a majority of them.

Dr. ANDERSON. We know, don't we, that a very substantial proportion of the youth population of 16 to 21 is unemployed and out of school.

Dr. WRIGHT. The average age is 23 of these in this evening school.

ADEQUACY OF PRESENT TRAINING PROGRAM

Dr. ANDERSON. Knowing the facilities available for vocational education so well, what in your opinion is the adequacy of the program? Is it meeting the need of all who desire it throughout the country? What proportion are not accommodated as a result of either lack of funds or other reasons that you might care to indicate?

The picture "Burgard Vocational High School, Buffalo" is submitted for the record.

(The photograph referred to was marked "Exhibit No. 2723" and appears facing p. 17159.)

Dr. WRIGHT. Mr. Chairman, I would like your permission to answer the question with the chart on vocational agriculture.

Dr. ANDERSON. The chart you refer to is submitted for the record.

(The chart referred to was marked "Exhibit No. 2724" and appears on p. 17160.)

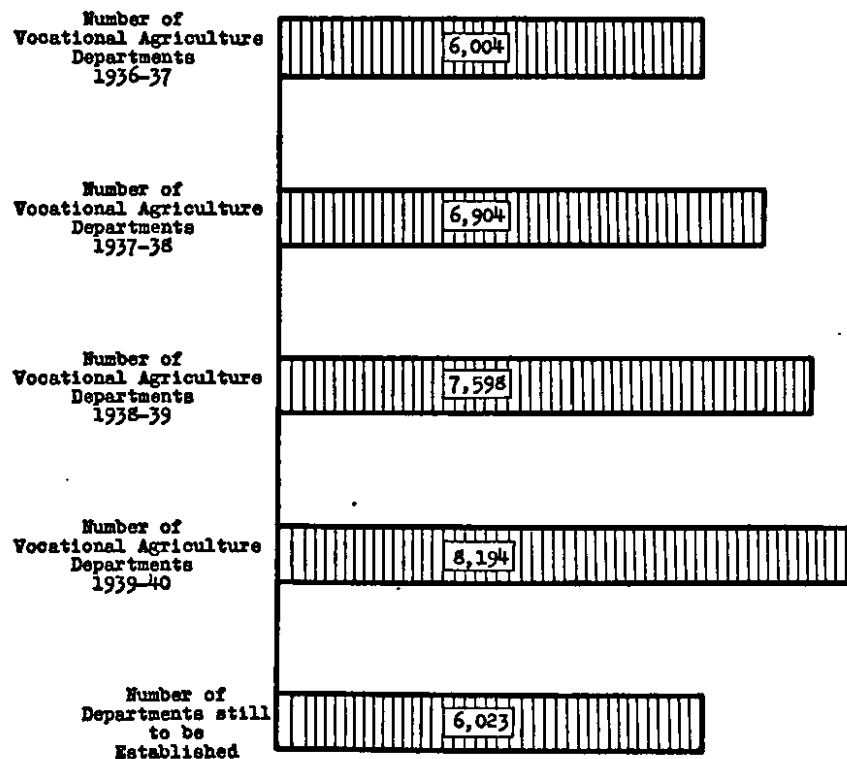
Dr. WRIGHT. We ought to give agriculture a little recognition in this part of the program. This chart shows that for the year 1936-37 there were 6,004 departments of vocational agriculture in the rural high schools of the country. That number increased the next year to 6,904. In the following year, for 1938-39, it increased to 7,598, and in the present fiscal year the number is 8,194, enrolling about 250,000 boys and a few girls in vocational agriculture. But there yet remain 6,023 rural high schools in which there are no departments of vocational agriculture. There are no opportunities for those boys who live in those particular areas where these 6,000 schools are located, something more than one-half, about 60 percent, of these opportunities.

Dr. ANDERSON. This next chart you have put up, "Vocational Agricultural Departments," is admitted as an exhibit.

(The chart referred to was marked "Exhibit No. 2725" and appears facing p. 17164.)

Dr. WRIGHT. The pins on the map which have been photographed in black represent these 8,000 different departments showing the distribution over the country and the opportunities for these young men in vocational agriculture.

EXHIBIT No. 2724

VOCATIONAL AGRICULTURE48 STATES

Here is another chart, "Enrollment in All Schools Operated Under State Plans," including federally aided and nonfederally aided.

(The chart referred to was marked "Exhibit 2726" and appears on p. 17161.)

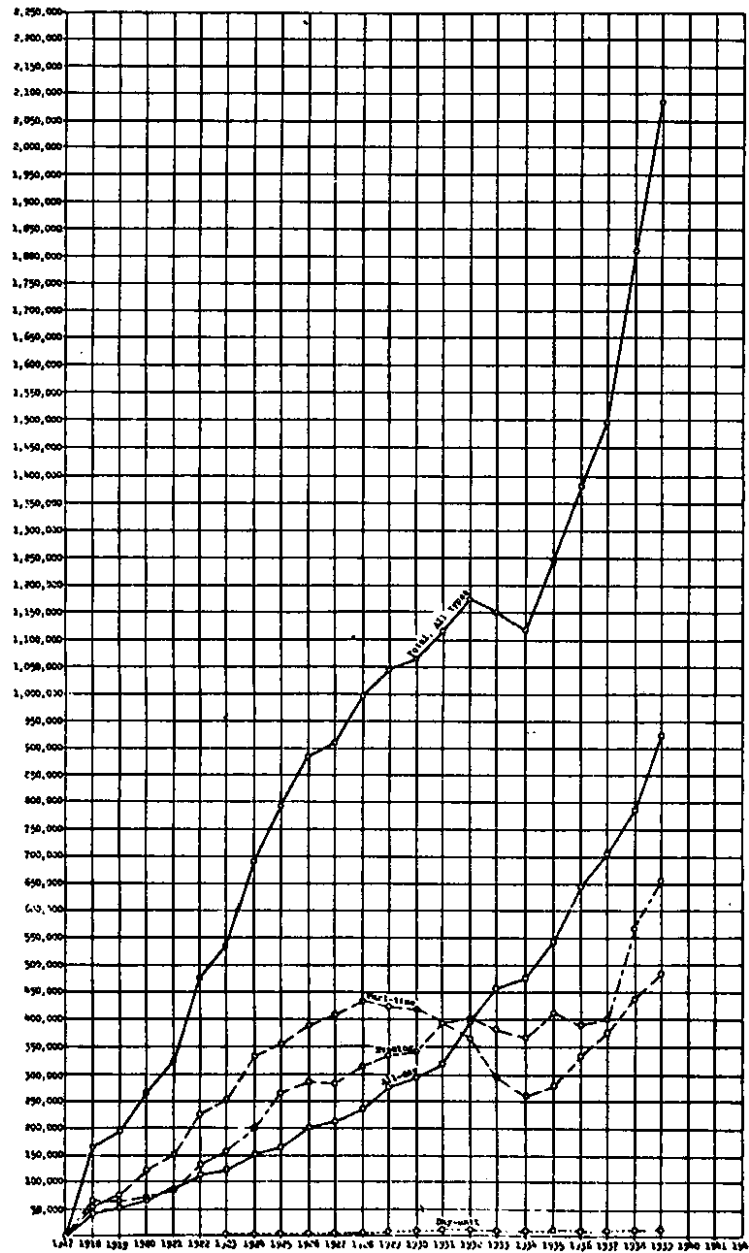
Dr. WRIGHT. The upper line represents the total enrollment in all vocational schools, something over 2,000,000, for the fiscal year ending June 30, 1939, and the lower curves show the proportion of these that are in the part-time, evening, and all-day schools. Notice that the part-time fluctuates with conditions of employment. In 1929 it began to drop and began to rise later.

The green line represents the evening school and shows a fairly steady rate. Until the last few years there has been a decided upward trend.

I think you will find a little bit more specific information on your question in this chart, "Enrollment in Federally Aided Trades and Industrial Classes, by Years, 1918-39."

EXHIBIT No. 2726

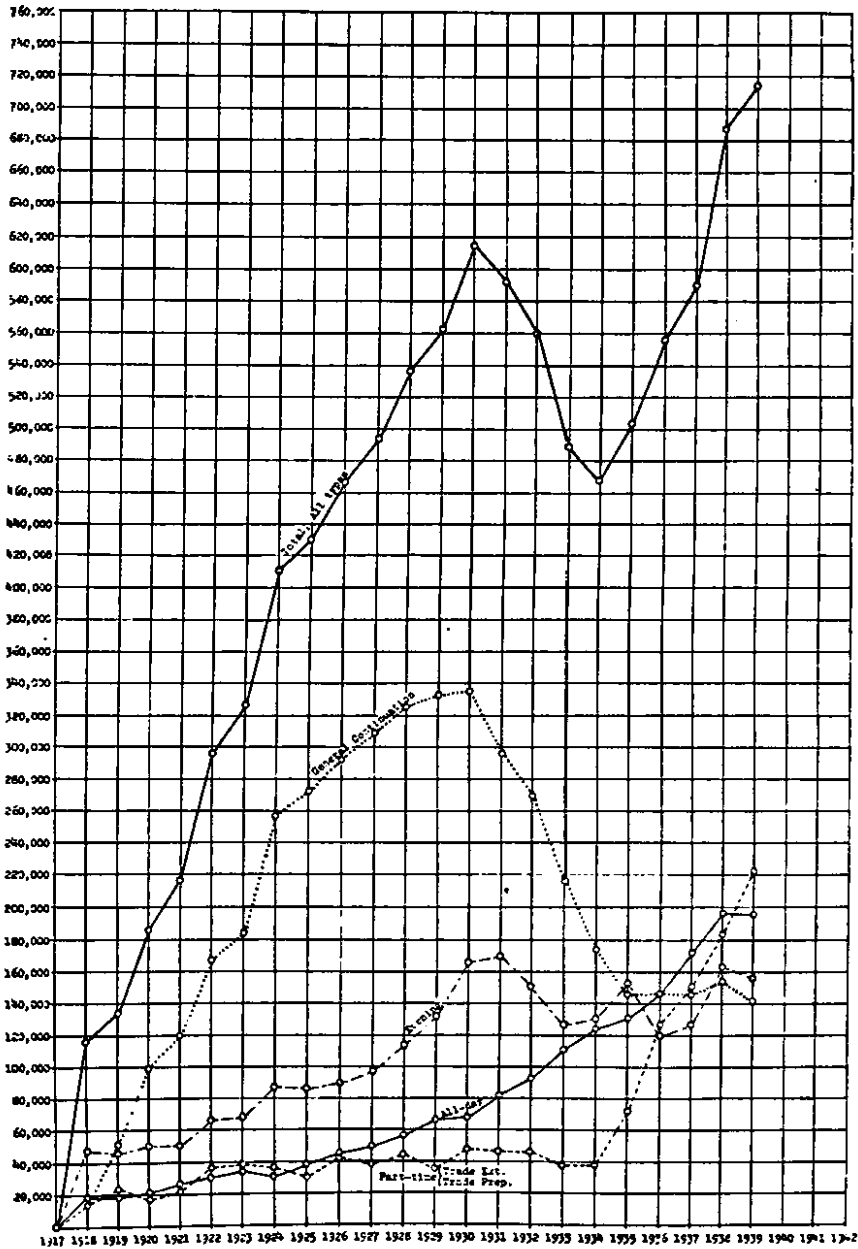
DIAGRAM I.—Enrollment in Vocational Schools or Classes Operated Under State Plans, by Years, 1918-39



CONCENTRATION OF ECONOMIC POWER

EXHIBIT No. 2727

DIAGRAM V.—Enrollment in Federally Aided Trade and Industrial Classes, by Years, 1918-39



(The chart referred to was marked "Exhibit No. 2727" and appears on p. 17162.)

Dr. WRIGHT. Again the upper curve represents the total enrollment. Then we have what we call the general continuation part-time school, which is operated for that miscellaneous group of employed young people who are oftentimes employed in jobs for which no specific training can very well be set up—office, messengers, and clerical positions. The green curve is the evening school and the yellow is the all-day school and below, the part-time trade extension. It is significant that this enrollment in the trade industrial classes fluctuates with conditions of employment.

A number of years ago the Y. M. C. A. made a study of their enrollments in evening classes and the conditions of industrial activity. It was found that during periods of unemployment men did not come to their evening classes, but that during periods of industrial activity when jobs were more plentiful, they began to come with a lag of about 6 months, I believe, in their enrollment. So you see, beginning again in '29 and '30, the enrollment in this group dropped very rapidly and since then has been increasing, due, of course, to two things, increased Federal funds available, but more largely, I think, to the upward trend of the evening school.

Dr. ANDERSON. You would say, Dr. Wright, in conclusion on this matter of attendance, that both in agricultural and industrial classes in the country no such thing as a full complement has been reached of either students' enrollment or facilities available for their schooling.

Dr. WRIGHT. I think the present program of the all-day school is available to only about 5 percent of those who want it, slightly less than 200,000 in total number. That, of course, covers the enrollment of 2 years at least, in some cases 4, which would be only about 100,000 for any 1 given year. It is a little bit difficult to answer your question exactly, but it would be easily safe to say that the program that is offered here is not yet available to large numbers of our people.

Dr. ANDERSON. Is that because of the newness of the program? I see the period goes all the way back to 1918, which would indicate that it is not a broad, new program. What is the cause of this tardiness in meeting the needs of our people?

Dr. WRIGHT. Largely a matter of funds and facilities in the way of buildings and equipment. Many of the public schools are just now beginning to awake to the need for providing buildings and equipment. I think it is due more, though, to the realization of the need of providing this type of training. When I was a member of the high-school faculties, previous to going into this program, I was earnestly working to get more and more pupils into this school. That was 30 years ago. Now two-thirds of all of our pupils of high-school age are in high school, 67 percent, and we don't know exactly what to do with them. There is a strong tendency on the part of school administrators today to turn toward vocational education as a solution of some of these difficulties. For my part, I again feel that the program of vocational education should not be introduced into the schools unless the school is prepared to maintain certain standards of instruction, qualifications of teachers, equipment, and buildings that will guarantee their ability to really give the student an employable asset.

Dr. ANDERSON. Is it fair to say that there is no oversupply of qualified teachers in this field of vocational education?

Dr. WRIGHT. No; there is an undersupply. The teachers in trades and industrial subjects must be secured from the trades, and today we are having difficulty in getting teachers from the trades who are not rather old.

Dr. ANDERSON. This would offer a fruitful field, then, for employment, would it not?

Dr. WRIGHT. As a teacher?

Dr. ANDERSON. Yes.

Dr. WRIGHT. Yes; but a teacher of a trade subject must first serve his apprenticeship or the equivalent of it, become a master workman, and, on the average, have experience of about 8 to 10 years as a journeyman before he is qualified to teach in the vocational school. Of course, we do have teachers of related subjects who do not go through that same experience. They perhaps have an engineering training and are qualified to teach the growing science of mathematics, English, and civics. But there would be, of course, to the extent that teachers are drawn from the trades, an opportunity for others in the trade to enter the trade to take the jobs that would be vacated.

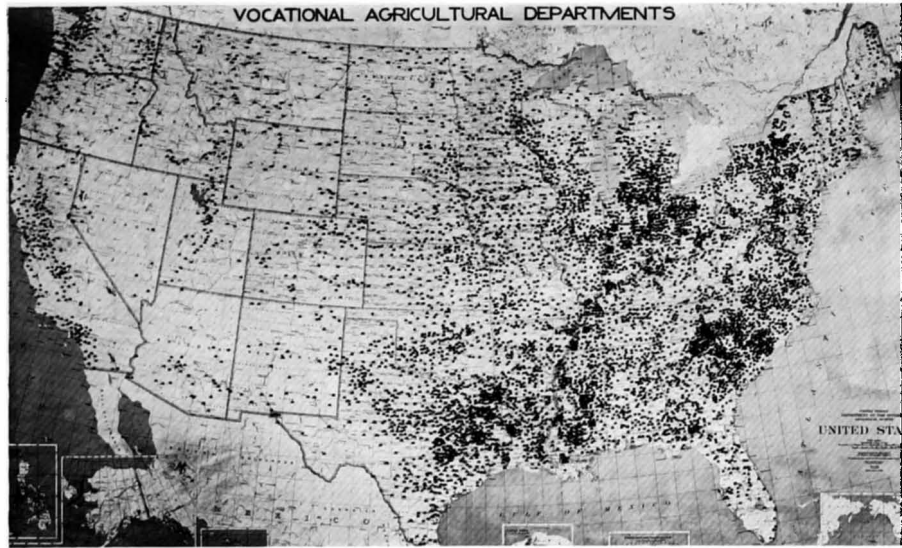
Dr. KREPS. Dr. Wright, I am impressed with the intensive character of the training that seems to characterize vocational-guidance programs. I may be wrong in this impression, but I wonder whether in addition to teaching them specific skills you teach them how to be a member of that trade. Do you teach them, for example, how to take their place with their fellow workers in a trade-union organization, how to read, interpret, and negotiate collective bargaining agreements; how to interpret the place of their vocation and their trade in the industry and in the business, and, furthermore, whether you go beyond teaching them to be industrial citizens, to be intelligent worker consumers, and teach them something about the market for their services. Is all that material extraneous to the courses and to the curriculum of vocational training as now given? Is it limited pretty specifically to development of particular skills which some new set of machines may make obsolete as opposed to giving them what I would call a training as a member of a vocation which might stand them in good stead no matter what particular machines were utilized?

Dr. WRIGHT. Well, I am not sure that I can remember all of the questions you have asked me, but I will try.

Dr. KREPS. There are two parts to it. One, do you teach them to be industrial citizens?

Dr. WRIGHT. We do not do very much, and it is a question that has not yet been answered as to how much we ought to try to do with the young people that are, let us say, 16, 17, or 18 years of age, in the way of teaching them the matters of labor organization, collective bargaining, and other matters that sometimes get into controversial fields. To the extent that a teacher who has been employed, and a great many of them are, is a member of a union organization, there is no objection on the part of the school to his explaining such matters as a part of his trade instruction, but there have been several examples in the last several years, and going on now in California, where classes of older workers and business agents, even, are brought together under a teacher of their own choosing, or a conference leader, to discuss mat-

Exhibit No. 2725



124401—41—pt. 30 (Face p. 17164)

ters in collective bargaining and organization, and so forth. For my own part I think it is a safe matter to include in the adult program, but there is still a question as to the advisability of putting it into the secondary program.

EFFICACY OF VOCATIONAL GUIDANCE

Dr. ANDERSON. Dr. Wright, there is a problem that has always bothered me as a person who has had some background in the field of education and in fairly close relationship to the field that you have been discussing. It seems implied in any program of vocational education that an effective vocational-guidance program will either accompany it or precede it or in some way be associated with it. You are very familiar undoubtedly with the vocational-guidance programs the country over. What would your judgment be as to their effectiveness in actually getting at the material that is basic information for youth, for those to be guided, and in making that material effective in the guidance of youth into occupational life?

Dr. WRIGHT. I think the first responsibility that the schools have in that field of occupational information and guidance is one of occupational information. I think that information ought to be given to our pupils in the secondary schools in an entirely unbiased way so that the pupil would not be unduly directed toward one field or one occupation over another. At least, he ought not to be taught that it was degrading to be employed in any one field of honest endeavor. The second thing is that we need to get a great deal of information about our pupils.

That information should be secured throughout a rather long period of years, beginning fairly early, and made accumulative through pupil record cards, so that at the time when the pupil thinks that he needs advice about occupation, whether he should go to a vocational school or college or what he should do, the counselor then would have before him a fairly good history of the pupil for a considerable period of years. It is needless to say that this counselor is serving or should serve in the position of the parent, as the parent used to do, but which parents have now fallen down on in that they are so remote from many of these activities, and do not counsel their own children. He should give this advice to a pupil or pupil and parent in a factual way and without bias, and leave it to the pupil and parent to make their own selection as to the field of training in which the pupil wants to enter. If that field calls for high-school graduation and college, then that is the activity which they ought to advise them in. If on the other hand it does not, and the economic situation of the family calls for earlier wage earning or there is lack of funds to attend college, perhaps the youth will elect to enroll in the vocational school and get into productive work at an earlier age.

Dr. ANDERSON. Dr. Wright, what is your opinion of the effectiveness of the programs you have seen the country over.

Dr. WRIGHT. I think it is fairly effective, because we don't have a large turn-over in our vocational schools such as we had 20 years ago.

Dr. ANDERSON. Do you attribute that to the greater effectiveness of the guidance aspect of the program?

Dr. WRIGHT. Yes, sir. There are about three fundamental characteristics of an efficient teaching situation, as I see it. The first one is that your pupils should be properly selected on the basis that they are prepared to receive the instruction and will use it after they have received it. The second one is that your teachers should be occupationally competent and trained to teach. The third is that the subject matter that is taught should be functioning in the occupation for which the pupil is being trained—

Dr. ANDERSON (interposing). There is only one other question that comes to me beyond this excellent summary you have given, and it is one that has caused some doubt in the minds of people out West, at least, and I presume in other States. Is it your opinion that it is a function of the State to provide adult education at public expense of a specific training character as well as other kinds of adult education?

Dr. WRIGHT. Absolutely. I believe that we are at the point in America where all education for youth up to a certain year—perhaps 16, perhaps 18—should be regarded as a public responsibility to provide an opportunity. I think that we also are in this country at the point where we recognize that we owe to the adult a similar opportunity to come to an evening school and secure his training at public expense.

Dr. ANDERSON. Do you think that is both a socially desirable and economically sound policy?

Dr. WRIGHT. I do.

Acting Chairman O'CONNELL. Mr. Wright, it is now beyond the time we usually adjourn. Have you anything in particular you would like to emphasize in the statement?

Dr. WRIGHT. I do have, sir, just one, which will take just a moment. I brought with me a few publications. Here is one entitled "Training for the Painting and Decorating Trade." It illustrates the procedure that we use in developing subject matter through the assistance of journeymen workers in the trade. And on pages 5 and 6 of this publication we have some data that, with your permission, I would like to suggest be included in the record. And diagram I on the subsequent page discloses a most interesting story about that fact that today many of our highly skilled occupations are becoming old men's trades. The average age I think in this particular case is something like 55.

Acting Chairman O'CONNELL. In what trade is that?

Dr. WRIGHT. Painting and decorating. Whatever the figure is, these six points that accompany the chart will disclose the point I want to make, unless you wish to give me time to review them.

About 62½ percent of the persons employed are from 25 to 40 years of age, and I think the statement is made that there are more men over 60 in that occupation that are working than there are under 25 years of age. I reserve the right to correct these figures, but it clearly shows the fact that in that particular trade according to the United States census, it is becoming an old man's occupation. The gravity of the situation is that the number of apprentices that are in training are entirely inadequate to take the place of those who will be passing out. I have about five of these if you want them.

Acting Chairman O'CONNELL. They may be left with Dr. Anderson as a file exhibit.

(The document referred to was marked "Exhibit No. 2728" and is on file with the committee.)

Dr. ANDERSON. Before we adjourn, in order to clean up the business of the day, there are several—

Dr. WRIGHT (interposing). May I make one more statement? I sent over to my office as a result of an arrangement made this morning for a little publication called "Automobile Facts and Figures." It was issued by the Automobile Manufacturers Association. I am not prepared to say how accurate these figures are that come from it, but you will know as much as I do about it.

On page 47 I find a statement of numbers that are employed.

Mr. KREPS. Is that number employed or number representing themselves as having an occupation in the automobile industry?

Dr. WRIGHT. The heading says, "Millions Employed in Motor Transportation," and so forth.

Mr. KREPS. Is that a census of employment?

Acting Chairman O'CONNELL. Dr. Wright doesn't know, but we will accept the figures.

Dr. WRIGHT. The question of whether it is the full number or not is immaterial to the point that I want to make. There are about 6 columns in this table. The first column shows that there are 713,611 employed in the manufacturing end of that business out of the 6,000,000. The next column shows a little over 1,000,000 employed in sales servicing, and then there are 267,000 Federal and State road building, and then we come to an item of 3,544,956 that are said to be employed as truck drivers with an additional 177,000 as bus drivers and those are the 2 figures that I want to talk to, because they represent more than 50 percent of this number that are represented as being employed, and the statement was made this morning, or inferred, that many of our new industries that grow up do not provide new jobs for which training is needed, that things were handled by automatic machinery, and so forth. In this industry if there be over 6,000,000 employed and if there be over 50 percent of them employed as truck drivers and bus drivers, they alone call for a training program. They are operating equipment over our roads. You go touring, as I did 2 weeks ago to Florida, and you will meet many of them; they are traveling at 50 and 60 miles an hour.

You will meet on a trip of that kind a half dozen situations where the driver and his assistant and maybe the second car will be stopped and they will be down under fixing some part of the apparatus or the engine is out of repair or something needs to be done to it to keep it rolling. There is too much equipment, too much investment, for those men to be put in charge of those jobs who do not know how to make repairs and keep them going. I happen to have specialized some in that field some years ago, I am the author of four books on that subject, and I know that those men have to be trained in some way. It is not a common labor job. While you are sitting up there at the wheel steering along, that seems very simple, but when something goes wrong, if it is only once on a half-dozen trips, the man must be just as well prepared as though it happened every hour.

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CONCENTRATION OF ECONOMIC POWER

Thank you.

Acting Chairman O'CONNELL. Thank you very much, Mr. Wright.

Dr. ANDERSON. Mr. Chairman, we have several additional exhibits for insertion in the record.

Acting Chairman O'CONNELL. They will all be admitted.

(The documents referred to were marked "Exhibits Nos. 2729 to 2734" and are included in the appendix on pp. 17493-17503.)

Acting Chairman O'CONNELL. The committee will stand in recess until 10 o'clock.

(Whereupon, at 5:25 p. m., a recess was taken until 10 a. m., Friday, April 26.)

INVESTIGATION OF CONCENTRATION OF ECONOMIC POWER

FRIDAY, APRIL 26, 1940

UNITED STATES SENATE,
TEMPORARY NATIONAL ECONOMIC COMMITTEE.
Washington, D. C.

The committee met at 10 a. m., pursuant to adjournment on Thursday, April 25, 1940, in the Caucus Room, Senate Office Building, Mr. Joseph J. O'Connell, Jr., special assistant to the general counsel, Treasury Department, presiding.

Present: Mr. O'Connell (acting chairman); Senators O'Mahoney (chairman) and King; Representatives Williams; Messrs. Kades, Pike, Lubin, Hinrichs, Kreps, and Brackett.

Present also: S. Abbot Maginnis, Department of Justice; William T. Chantland, Federal Trade Commission; and Dewey Anderson, economic consultant to the committee.

Acting Chairman O'CONNELL. The committee will be in order.

Dr. ANDERSON. Mr. Chairman, we agreed to come here at 10 o'clock this morning in order to make an attempt to wind up the 3 weeks' hearings during the day. The schedule is very heavy. We have three witnesses this morning. The first witness is Dr. William G. Carr, executive secretary of the Educational Policies Commission and director of research of the National Education Association, who will make the summary statement concerning education and its relationship to the problem of technology that the committee has been discussing.

Dr. Carr is before you and ready to be sworn.

Acting Chairman O'CONNELL. Do you swear that the testimony you are about to give in this proceeding shall be the truth, the whole truth, and nothing but the truth, so help you God?

Dr. CARR. I do.

TESTIMONY OF DR. WILLIAM G. CARR, SECRETARY, EDUCATIONAL POLICIES COMMISSION, WASHINGTON, D. C.

Dr. ANDERSON. Dr. Carr, what is your position in the Educational Policies Commission?

Dr. CARR. I am secretary of the Educational Policies Commission.

Dr. ANDERSON. What is the commission itself?

Dr. CARR. It is an organization of 20 people, created by the National Education Association to develop American educational policy in this critical period.

Dr. ANDERSON. What is the National Education Association?

Dr. CARR. It is a professional organization of workers in education.

Dr. ANDERSON. How many members does it have?

Dr. CARR. Roughly, 200,000.

Dr. ANDERSON. Is it the principal organization in the United States affecting workers in education?

Dr. CARR. Yes. It enrolls more than any other national organization.

Dr. ANDERSON. And your position is what?

Dr. CARR. I am the secretary of the Educational Policies Commission, and director of research for the association.

Dr. ANDERSON. You have worked in the field under review, that of training citizens to meet the problems of the present-day economy?

Dr. CARR. Yes, sir.

Dr. ANDERSON. You have published in that field?

Dr. CARR. Yes, sir. The Educational Policies Commission has a volume on the purposes of education in American democracy, which they asked me to draft. It is part of a series that Dr. Norton referred to yesterday.

Dr. ANDERSON. And beyond that, have you written in the field of citizenship and the training of citizens?

Dr. CARR. We have just finished a Nation-wide study of the work of American high schools in training for economic citizenship. In the course of this study we have visited 90 schools in 27 States. We have interviewed many thousands of teachers, laymen, members of boards of education, labor leaders, editors, and the like, and have observed over 2,000 classroom teachers of superior quality in their classrooms at work making American citizens.

Dr. ANDERSON. And that work was under your direction?

Dr. CARR. It was.

Dr. ANDERSON. Some time earlier did you not publish a book in the field of citizenship and citizenship training?

Dr. CARR. A long time ago; not recently.

Dr. ANDERSON. All right, Dr. Carr, if you will proceed.

Dr. CARR. Mr. Chairman, knowing the limitations of time on your committee, I shall not, if I may, read the entire statement that I prepared, but simply ask that it be incorporated in the record. I am referring to the one headed "Education and economic literacy."

Acting Chairman O'CONNELL. The statement will be incorporated in the record as it has been prepared.

Dr. CARR. The staff of the Educational Policies Commission has just completed a study of the pioneering aspects of citizenship education in American secondary schools. My comments will be based in part on the observations of our staff in connection with this investigation, and in part on the Commission's publications on Education and Economic Well-Being in American Democracy¹ and The Purposes of Education in American Democracy.²

The civic education study involved first-hand observation of the work of 90 first-class American secondary schools of various types. The schools were located in 27 different States and were scattered in many kinds of communities throughout the country. The field work involved conferences with school officials, school-board members, teachers, students, and interested members of the public; the

¹ National Education Association and American Association of School Administrators, Educational Policies Commission. Education and Economic Well-Being in American Democracy. Washington, D. C.: the Commission, 1940.

² National Education Association and American Association of School Administrators, Educational Policies Commission. The Purposes of Education in American Democracy. Washington, D. C.: The Commission, 1938.

examination of school records, courses of study, and other printed materials; and the observation of the work of approximately 2,000 classroom teachers who are doing outstanding work in the development of intelligent citizenship.

NEED FOR ECONOMIC LITERACY

Dr. CARR. As long as we aspire to operate our common affairs through representative and democratic procedures, we shall need economic intelligence on the part of the masses of the people. Problems of citizenship and government are today closely related to problems of economic adjustment. In advanced industrial countries it is probable that the level of economic welfare is depressed as much by the lack of economic intelligence and social cooperation among the masses of the people as it is by inability to produce and consume.

The people of the United States are called upon to make decisions with reference to a wide range of economic matters. It is true that, in some of the more technical aspects of these decisions, they may, and indeed should, utilize the judgment of qualified experts. But the definition of goals and, to a considerable degree, the choice of methods for reaching those goals will be controlled by the diffusion of knowledge and ideals, or by the lack of knowledge and ideals, among the people. An ability to deal with economic forces and facts in a realistic manner, plus a social idealism to direct the necessary adjustments to modern technological conditions, are proper and legitimate purposes of that system of universal education which is provided everywhere in the United States.

Many schools are already making deliberate efforts to render the entire population literate as far as economic problems are concerned. Verbal, or alphabetic literacy, has already been practically achieved. Illiteracy of this particular type has declined in the United States to the point at which the Census Bureau felt it unnecessary to include a literacy question in its 1940 enumeration. The Bureau has substituted in its place a question relating to the grade level of schooling attained. But, without appropriate educational methods, verbal literacy will not automatically extend to the mastery of other fields of knowledge.

One may be very modest in what he claims schooling can do to develop economic literacy, and still make a powerful case for dealing with economic facts and problems in the schools. Much of the urge toward dictatorship in the world today arises from the necessity of securing action on economic issues that are not sufficiently understood by the masses of the people. Ignorance is the great subverter of democracy because, in the presence of ignorance, necessary action can be taken only by deserting democratic principles.

It may be well at this point to emphasize a point which has already been stated by other witnesses. We do not provide universal education in this country solely because it may aid in increasing our economic welfare. There are many other excellent reasons for providing general education. Furthermore, it is entirely possible to think of a type of schooling that would not increase the economic welfare of society one bit. We could all study astrology for 20 years and still not materially increase our economic well-being. This, of course, is an extreme illustration, but it demonstrates a

source of real difficulty. If we wish schooling to improve economic welfare, it must be reasonably well adjusted to that end.

Economic literacy may be narrowly defined as such acquaintance with basic economic facts as will make it possible for citizens to comprehend the economic problems which confront them. More broadly conceived, the term covers attitudes and ideals as well as knowledge and skill in the economic sphere. Unless the average citizen is the final arbiter of economic issues, democracy is functioning poorly; and yet, unless the average citizens has some information upon which to base his judgment and some social philosophy within which it may be exercised, the resulting decisions are apt to be haphazard, inefficient, guided by prejudice, and of doubtful value to the general economic welfare.

Education affects economic well-being in two ways. First, and most easily, education can disseminate knowledge. The development of social statistics and the other social sciences in institutions of higher education and in governmental agencies is helping greatly to increase the range and specificity of our knowledge about social problems.

Second, education can help people to apply this knowledge wisely to human needs—individual and social. From this part of the educational process arises a public demand for remedial action directed toward unsatisfactory economic conditions. Without this public demand, political leadership will remain impotent, no matter how high-minded or well-equipped in the technical sense that leadership may be.

In order that he may deal wisely with the economic problems on which, through ballot and otherwise, he registers an opinion, the citizen must be acquainted with some of the basic economic facts and problems. He should be sensitized to the importance of these problems, to the difficulties involved in their solution, and to his own responsibility with relation to them. He should know the proposed remedies for economic difficulties and the advantages or dangers which these solutions may involve. He must know the reliable sources of economic information which he can use with confidence to supplement his own knowledge. Such a standard is beyond the present attainments of the average adult. It appears, however, entirely practicable to achieve such a standard through a well-conceived program of education. The relentless pressure of political and economic developments make such education more necessary with the passing of every hour.

ECONOMIC INFORMATION NEEDED

DR. CARR. Let us enumerate, by way of illustration, a few of the basic economic facts which every citizen ought to know and some of the outstanding economic problems with which he should be conversant. I attempt no complete or authoritative catalog; others are more competent than I to present such an analysis to this committee.

The blessings of this country in natural resources are well known to all students of economy. This knowledge should be extended to the entire population. The American people should know that their land is enormously wealthy in its natural resources, and that although the soil has been used with reckless abandon and its fertility depleted in many sections, it is still capable, by and large, of producing the necessities of the American people, as well as a part of the necessities of the rest of the world.

The citizen who is economically literate will also know in general about our network of transportation and communication. He will have a general understanding of the relation of the various means of transportation and communication to each other, to the public, and to the Government.

The educated citizen will know something about other aspects of the rich and varied capital resources of the Nation. He will know that by no means the least important of the great resources of the United States is the cultural and technical heritage which the people of the country possess; first, in recorded form, and, second, in the knowledge and skill of individual citizens. It would be impossible, of course, to estimate the monetary worth of the learning possessed by the Nation's scientists, its professional and business men, and its laboring classes, and of the general level of intellectual attainment throughout the country.

The educated citizen will have some information about the industrial organization of the United States. He will know about the growth of modern industry, the importance of machines, particularly power-driven machines, the specialization of labor, the demand for large markets, the credit basis of many transactions, and group action on the part of producers and workers. He will know about the status of various social reforms designed to ameliorate the impact of economic changes upon the individual, such as workmen's compensation laws, laws relating to public health, public housing, and social insurance of various types.

A mere knowledge of the facts alone is important, but it is not sufficient. Upon the measure of success which citizens achieve in identifying and solving the problems which grow out of these facts is dependent the future welfare of this country and its continued existence as a democracy. And the quality of national decisions on economic questions is conditioned partly by the intelligence and information of the voters and partly by their personal and social ideals.

Generally speaking, it has been our observation that the schools of America are doing a reasonably adequate job in transmitting to young people a factual knowledge along lines such as I have just outlined. There are, of course, many imperfections in connection with this task, imperfections which grow out of the limited ability of some students, and of some teachers. A much better job could be done, and no doubt will be done in the future, in the imparting of information. This, however, is probably one of the least of the problems facing American education with reference to economic literacy. Information by itself is relatively uninteresting and relatively low in social value. Unless related to some problem which is sensed by the learner, facts are learned with difficulty and forgotten with astonishing ease and rapidity.

The economic problems pressing upon the United States are, as this committee is well aware, highly complex in their relationship. For the purpose of discussing what the schools might do and are doing with reference to these problems, it may be convenient, although admittedly an oversimplification, to identify them in four groups: (1) Problems relating primarily to production; (2) problems relating primarily to consumption; (3) problems relating largely to governmental functions; and (4) the major problem which relates to the type of economic organization which will be most effective in serving

the economic welfare of the country and in conserving its political and social ideals. The fourth problem, of course, is basic to all the others.

To say that the United States is faced with economic difficulties does not necessarily imply that all of them must be solved by the Government. It does mean, however, that they must be met in some fashion by the citizens of this country either through Government or through business, social, and other nongovernmental groups. In either case an intelligent solution waits upon the considered action of intelligent individuals making up the electorate or comprising the business and social groups involved. Therefore, the more widely diffused is economic literacy, the more likely will be a happy solution of these critical economic difficulties.

Let me list a few of the problems which you would be likely to find under discussion if you would visit for a few days any one of hundreds of good American secondary schools.

1. Problems relating primarily to production.

a. The business cycle—its possible causes, its control, and the effects of periods of depression on human beings.

b. Industry—its historical background since the industrial revolution, the growth of large industrial enterprises, and the problems accompanying such growth, regulatory legislation.

c. Agriculture and its economic problems—farm debt, farm production, crop irregularities, price irregularities, and the measures taken to offset the disadvantages of agriculture.

d. The conservation of natural resources—the natural endowment of the United States, the use of that endowment, its exploitation, the possibilities of conservation and wise use in the future.

e. Transportation and communication problems—the historical development of various types of transportation and communication, the relation of Government to commerce and communication, Government subsidies, Government regulation versus Government ownership, freedom of speech as related to control of the media of communication, tax policies with reference to the communication and transportation industries.

f. Public utilities—their monopolistic nature, regulation, public ownership, other possible solutions.

g. Labor relations—the operation of trade unions and of employers' organizations, collective bargaining, wage rates and conditions of employment, legislation protecting labor, safety legislation, workmen's compensation laws, wages-and-hours legislation, the enforcement of labor laws.

2. Problems relating primarily to consumption:

a. How the national income is distributed.

b. Savings and other provisions for social security, including Government action.

c. The protection and education of the consumer in the fields of food, clothing, and housing particularly—the role of private enterprise and of Government regulations in protecting the consumer.

3. Problems relating primarily to governmental functions:

a. The control and issuance of money.

b. Public finance—taxation, the public debt, the distribution of public expenditures, the efficiency of public administration, the number

and size of tax-levying units, types of taxation, and the economic effects of tax levies.

c. The relation of Government to problems of production and consumption listed under 1 and 2, above.

4. The major problem relating to the type of economic organization to be chosen in this country—the nature and disadvantages of the various possible forms of economic organization—possible modifications in the present economic organization.

SUMMARY

Dr. CARR. Most of us look at our economic problems through a lens of exceedingly short focus. The members of this committee who hold their positions because of the votes of their fellow citizens in various parts of the United States would probably agree with me that it is by no means easy to persuade voters to look at national economic and political issues from a long-range, Nation-wide viewpoint. All of us tend very naturally to consider only our own immediate business and that of our friends and neighbors. It is probable that this tendency of human nature will persist. However, it is possible, through a properly devised program of education, to do several things about this difficulty. In the first place, education may make the citizen aware of conditions affecting his own personal welfare which, without the education, he would not recognize as being of any importance to him. He can be made aware of the distinction between a temporary change and a long-time trend. Furthermore, the possibility of broadening social viewpoints, of breaking down narrow provincialism, and of increasing an unselfish devotion to the common good through education, is by no means remote.

Government has always been closely related to economic problems. Whether or not that relationship is becoming closer with the passage of time, it is certainly true that the major problems of public life have important economic aspects. The issues upon which elections turn, the questions which agitate the public mind, the problems debated by legislative bodies, and the duties of public officials, are very frequently economic in nature or in origin. The citizen of a democracy, therefore, needs to acquire the information, the experience, and the willingness to deal constructively with collective economic problems. Each needs also information, experience, and motivation to maintain his own economic contribution at a high level.

The person who is economically literate has found out, by direct or vicarious experience, that goods and services usually vary greatly in quality; that advertising is interested in selling goods, services, or ideas; that collective expenditures, in cooperatives or in public finance, for example, may be either good or bad depending on the attendant circumstances; that getting something for nothing, through gambling in any of its forms, always means that the other fellow gets nothing for something; that every dollar spent is an economic ballot voting for necessities or for trash; that war uses natural resources to destroy human resources; and that individual economic advancement through deceit or exploitation of others is unworthy of an honest man.

The citizen who is economically literate is acquainted with certain broad economic issues, conditions, and procedures. He has become familiar through frequent usage with currently important economic

concepts, with the ideas of supply and demand, investment and profit, capital and labor, scarcity and abundance, monopoly, the market, wages, and prices. He is informed concerning the principal economic developments under public auspices, such as the Tennessee Valley power projects and the Social Security laws. He sees these trends and conditions in the light of their historic antecedents. He knows certain facts which are crucial to the economic life of the country—its basic physical and human resources, its potential and actual productivity, the distribution of incomes and wealth, and the degree of concentration or dispersal of ownership and management. Only as a growing degree of competence and interest in these matters is diffused among the people can democracy function in the teeth of technological change.

Should an investigating committee which is studying the economic effectiveness of this country be concerned with matters of education? The whole burden of my testimony, and that of the other witnesses, has been to the effect that education has highly important effects on the efficiency and equity of the economic system. In order to maximize these effects, certain types of legislation are required and certain public attitudes must be developed.

A school system which fails to reach a large proportion of the young people of secondary school age cannot make these particular young people economically literate. Hence, legislation which keeps youths in school and which provides schools for them to attend is legislation in the interest of economic well-being.

If the schools are so overcrowded and so meagerly financed that an adequate program can scarcely be offered, economic well-being is decreased. Consequently, State and Federal legislation which looks to the lessening of the inequalities of educational opportunity and the provision of adequate funds and personnel for education is in the interest of economic efficiency.

If public indifference or antagonism prevent realistic instruction in the current problems of citizenship and of economic adjustment, education for economic literacy is stymied and economic well-being is thereby depressed. Consequently, anything that can be done by way of legislation—Federal, State, or local—to protect the integrity of the educational system from those who would bar the discussion of economic issues or would limit discussion to a single prejudiced point of view is in the interest of education for economic literacy, and therefore in the interest of economic well-being for the people of the United States. What goes on in American schoolrooms with reference to economic teaching or what fails to go on in these schoolrooms will reappear in the economic life of the Nation within the next few decades, just as surely as the day follows the dawn.

I will comment on it very briefly, calling your attention, repeating, if I may, to one or two paragraphs which I think summarize the entire statement. The first paragraphs give a little of the nature of the evidence on which this report is based, largely in connection with the various publications of the Educational Policies Commission and in connection with this study of citizenship education which we are now engaged in writing and to which Dr. Anderson has referred.

The general nature of the problem is set out in the next paragraph. As long as we aspire to operate our common affairs through rep-

representative and democratic procedures, we shall need economic intelligence on the part of the masses of the people. Problems of citizenship and government are today closely related to problems of economic adjustment. In advanced industrial countries it is probable that the level of economic welfare is depressed as much by the lack of economic intelligence and social cooperation among the masses of the people as it is by inability to produce and consume.

Repeating again:

One may be very modest. I think one should be very modest, in what he claims schooling can do to develop economic literacy, and still with that modesty he can make a very powerful case for dealing with economic facts and problems in the schools. Much of the urge toward dictatorship in the world today arises from the necessity of securing action on economic issues that are not sufficiently understood by the masses of the people. Ignorance is the great subverter of democracy, because, in the presence of ignorance, necessary action can be taken only by deserting democratic principles.

(Senator King assumed the chair.)

Acting Chairman KING. Political ambitions in connection with economic questions impel many people to do so.

Dr. CARR. That is true as far as the ambitious politician is concerned, but since in a democracy he must in the last analysis secure his position through the suffrage of the people, I think you will feel that public ignorance is part of the problem.

In the presence of ignorance, necessary action with regard to crying economic and social needs cannot be taken by democratic means, and hence autocratic means are resorted to.

Just a word as to the definition of economic literacy which this paper supposes.

Economic literacy may be narrowly defined as such acquaintance with basic economic facts as will make it possible for citizens to comprehend the economic problems which confront them. More broadly conceived, the term covers attitudes and ideals as well as knowledge and skill in the economic sphere. Unless the average citizen is the final arbiter of economic issues, democracy is functioning poorly; and yet, unless the average citizen has some information upon which to base his judgment and some social philosophy within which it may be exercised, the resulting decisions are apt to be haphazard, inefficient, guided by prejudice, and of doubtful value to the general economic welfare.

DEMOCRACY DEPENDS UPON ECONOMIC KNOWLEDGE

Dr. CARR. I shall not take your time to develop any of the additional points. Knowledge of economic facts alone is important, but it is not sufficient for this country, or for any democracy. Upon the measure of success which citizens achieve in solving economic problems, which in part requires the acquisition of facts and in part assumes ideals and attitudes and social philosophies, our democracy depends.

The quality of national decisions on economic questions is conditioned partly by the intelligence and information of the voters and partly by their personal and social ideals.

I should like, therefore, to suggest that we think of economic literacy in that dual sense. It has been the observation of our staff in visiting these American schools that the secondary schools are doing a reasonably adequate job in transmitting to the younger

generation a basic factual knowledge with regard to many of our economic issues. There are, of course, many imperfections which arise from the ability or lack of ability of the students and of the teachers. No doubt a better job can be done and will be done in the future in this factual area. But this is probably one of the least important aspects in the development of economic literacy. Information by itself, as we all remember from our own school days, is relatively uninteresting unless it is related to some issues which the learner himself feels to be important. If it is not so related, the information is acquired with great pain, and forgotten with remarkable speed.

I should like to introduce, if I may, Mr. Chairman, into the record at this point some examples of how American schools are developing their instruction in these economic areas. In the testimony quoted above, I have outlined a series of economic problems which we find American schools are dealing with, and I have prepared here a statement headed "Examples of study units on economic problems from American secondary schools," which illustrate the approach that is being followed in American schools with reference to these problems. This printed material I am sure you will realize is a very poor substitute for the exciting experience of stepping into a classroom and seeing a teacher in action, but it is the best we can do for this committee, and I would like to introduce that information in the record.

Acting Chairman KING. It may be received.

(The document referred to was marked "Exhibit No. 2735" and is included in the appendix on p. 17054-17515.)

Acting Chairman KING. I would like to inquire if in statement you have just made you include only the public schools, or the universities and those so-called higher branches of education?

Dr. CARR. Our actual observations, Senator, are limited to secondary schools and junior colleges. I have reason to suppose that the same generalization would apply to the higher institutions. Perhaps, and this is just a guess, our higher institutions emphasize the factual side of economic literacy, even more to the exclusion of the idealistic and attitudinal side than the lower institutions do. I couldn't back that up with evidence; it is just a guess.

I should like to repeat the concluding three paragraphs of the testimony which I prepared for this committee:

Should an investigating committee which is studying the economic effectiveness of this country be concerned with matters of education? The whole burden of my testimony, and that of the other witnesses, has been to the effect that education has highly important effects on the efficiency and equity of the economic system. In order to maximize these effects, certain types of legislation are required and certain public attitudes must be developed.

I would like to interrupt my written testimony there to say that I do not by any means, nor do educators generally, assume that the solution of educational problems stems wholly from legislation by the Congress or by State legislators or city councils or boards of education; it stems in considerable part from the wisdom, the intelligence, and the devotion to the ideals which the schools represent, which the common people hold; but let us take some examples in the legislative area.

A school system which fails to reach a large proportion of the young people of secondary school age cannot make these particular young

people economically literate. They are not in the school. Hence, legislation which tends to keep youths in good schools and which provides schools for them to attend is legislation in the interest of economic well-being.

Again, if the schools are overcrowded, if they are so meagerly financed that you just can't offer an adequate program, economic well-being is indirectly decreased. Therefore, State and Federal legislation which looks to the lessening of the existing inequalities of educational opportunity and the provision of adequate funds and personnel for education is in the interest of economic efficiency.

I should like the members of this committee to have been with me time and again when we visited these American secondary schools. Almost without exception they all bulge. They are built for 1,500 students and they have 1,800, 2,000, 2,500, double shifts, no room in the cafeteria, no room on the playground. They are doing a splendid job against great handicaps, frequently understaffed, staff working from early morning until late at night to carry on the program, with no loss in efficiency. Now, anything which improves the effectiveness of the school itself, if you grant my primary assumption, will be in the interest of economic well-being for this country.

Again, if public indifference or antagonism prevents realistic, honest instruction in the current problems of citizenship and of economic well-being, education for economic literacy is stymied and education for economic well-being is thereby decreased in efficiency. And so anything that can be done by way of legislation or by way of modification of public opinion which will protect the integrity of the educational system from those who would bar the discussion of economic issues or who would limit the discussion of economic issues to a single prejudiced, partisan viewpoint is in the interest of economic literacy and hence, in the long run, in the interest of economic well-being in this country. What goes on in American schoolrooms with reference to economic teaching or civic teaching or the lack of it will be reflected in the economic well-being of this country in the next generation just as surely as the noon follows the dawn.

Now, Mr. Chairman, may I move over very rapidly to an attempt, hastily conceived, to summarize the testimony of the other members of the panel with reference to education? I would like to suggest that there be distributed to the members of the Committee the statement headed, "Summary of testimony relating to education."

Acting Chairman KING. May I inquire whether or not you have been selected to summarize and to draw the deductions from the testimony heretofore obtained or whether you are speaking for yourself alone?

Dr. CARR. I am speaking in part for myself alone, and in part as a representative of my colleagues. We met at noon yesterday, and my colleagues asked me to do this. I did not have an opportunity to submit my statement to them.

Dr. ANDERSON. The "Summary of Testimony Relating to Education" will be admitted to the record as an exhibit.

(The document referred to was marked "Exhibit No. 2736" and is included in the appendix on p. 17515.)

Acting Chairman KING. Proceed.

USE OF EDUCATION FOR RECOVERY

Dr. CARR. Education, provided it is right in amount, in kind, and in distribution among the people, can and will improve the economic well-being of the American people.

That, I think, is our central conclusion, and the evidence is drawn in part from the recent report of the Educational Policies Commission on Education and Economic Well-Being, from other reports of the Commission, and from this study of citizenship education which we have just completed in 90 schools.

Now, this committee is interested in how that generalization might be applied in actual things to do, and I have attempted to set down in this summary some of the things which ought to be done in order to make this generalization effective in American life.

First, the American people should encourage qualified youth to remain in school through the legal school-leaving age, and beyond, if possible, by: (a) development of technical and vocational schools at the upper high-school and junior college levels—Dr. Wright pointed out yesterday the shortage of such agencies; (b) by the provision of scholarships by public initiative, such as the National Youth Administration, and through private philanthropy; (c) by adapting the course of study to individual needs.

I am afraid that sounds like a pedagogic axiom to you gentlemen, and I should like to put more meat into it if time permitted. I can only say very briefly that the history of our secondary schools is that of a college preparatory institution. They have now moved from college preparatory institutions into common schools, enrolling most of the people of appropriate age.

They have not been brought into the secondary schools by any campaign on the part of educators. The primary reason for their presence in the schools is economic and social forces outside of the school which have thrust them in. We are in the midst of a period now when a college preparatory institution, designed for a very small percent of the total population, is being adjusted to take care of the common needs of all the people. Just as years ago even the elementary schools were looked upon as schools that only a few people could profit by, and the ability to read and write was the mark of a learned man, so today the secondary school, formerly a school for the education of just a few people, is becoming part of the common general education that we expect all American people to possess and to enjoy.

That is what I mean by saying that we must adapt the course of study to the individual needs. We cannot continue to operate a college preparatory institution and expect it to serve the needs of all of the people.

The second general thing that we ought to do is to remove youth from the labor market—at once. This should be done, I believe, (a) by approval of the Federal child-labor amendment; (b), by fixing the school-leaving age at 16 years in every State.

This, of course, is a matter of State legislation in which the Federal Government cannot take a part. Some States have already reached that limit; a few have exceeded it. All should move to at least 16 years.

That is about 10 years of schooling. Ten years of schooling, gentlemen, is not too much to equip boys and girls to deal with the problems

of this society. Every boy and girl becomes a voter, and in an ideal democracy a participant in the affairs of his country.

We should improve the enforcement of school attendance laws, especially for children in industrialized agriculture and street trades, and other occupations.

The third thing we must do is to encourage revision and vitalization of economic education, first by better vocational guidance based, as Dr. Clark outlined yesterday on community and national service to determine occupational opportunities, and on surveys of individuals to determine aptitudes and abilities and interests.

The teaching profession is struggling to develop that vocational guidance program. It is a great need, and one which we have not been able to achieve yet. I should like to call your attention at this point to a chart presented yesterday, entitled "The Jobs Youth Want and the Jobs They Get," taken by courtesy of the American Youth Commission from the Maryland Youth Study.¹

The heavy line down in the center divides what youth want to do from what jobs they get. And these are proportions of all the youth studied. The top row represents the professional desires. These people on the left are the ones who want to go into the professions; the ones on the right are the group that get in. The figures on the second line, left, are the groups who want to go into the managerial operations, and the ones on the right are the ones who get in.

When we get into office work, we get a more nearly equitable balance between what they want and what they get.

The next to the last line is domestic service, and you see there a tremendously large number of people going into domestic service. Relatively few say that that is what they want to do. We believe that an honest and intelligent program of vocational guidance, without using any compulsion upon the students, can help to overcome this terrific dislocation between the hopes of young people and what they are destined to achieve.

Mr. O'CONNELL. Do you think it practical to expect that in this top group, for instance, everybody would be somewhere near in balance, so that the people who wanted to be in professional or technical lines could ever expect to arrive there?

Dr. CARR. In terms of "ever," perhaps, yes; but in terms of any reasonably immediate future, no.

There is always going to be this ambition to rise, but I would like to point out that this so-called ambition to rise in the professions is due partly to the halo of prestige which attaches to professions and partly to the fact that the professions are, on the whole, very much better off economically. So that if anything were done to increase the number of persons in the professions, thereby reducing the average earnings in the higher-paid professions, that differential would tend to disappear.

I can imagine, for instance, that if I could take a group of high-school students and tell them, "If you will go into domestic service you can look forward to \$25 a week," that situation which I showed you on the chart would not exist, in quite as great a degree, at least.

¹ See "Exhibit No. 2712," appendix, p. 17479.

Acting Chairman KING. Don't you think that a good deal of our education—I will modify that—don't you think that some segments of our educational teaching and development do not emphasize sufficiently the dignity of labor?

Now, I have been a laboring man, and some of the wisest men, some of the most patriotic men, some who have been the most useful to the moral and spiritual development of this Republic, were men who worked with their hands.

I think that too many of you educators devote too much time to what you call the intellectual and cultural things, and, of course, a man can be cultivated and be intellectual and work on the farm, in the coal mine, or do any form of manual labor.

I was reading this morning in the paper of a young man 37 years of age in England who has written the best work this last few weeks, and when the reporter went to confer with him he found him in the barnyard milking the cow. But he was cultured, he had read, he was a thinker, and yet he wanted to remain on the farm and work with his hands and develop the soil and make contribution to the material as well as to the moral and spiritual development of this country.

I think you educators—I beg your pardon, I fear sometimes that the educators have fallen a little short in emphasizing what might be termed the fundamental things in life.

INCREASED EMPHASIS ON SKILLS

Dr. CARR. I think, Senator, that education is subject to such stricture in part, and I notice you have limited it to part. I will say—and I expect you would agree—that I do not think it is a matter of choosing between this emphasis on the dignity of work and an equal emphasis on the cultivation of the mind and of the spirit. Indeed, what you said indicates you would like to see both developed concurrently.

Booker T. Washington, I think it was, said that his race would prosper in proportion as they were able to put brains, spirit, and ability into the common manual tasks. I think his viewpoint, while it is not representative of the entire teaching profession, is becoming quite representative. I think if you could have talked with the many thousands of teachers as we have in the last few years in this civic study, you would be quite encouraged by the shift that has taken place.

Acting Chairman KING. The old Romans had an expression which I think you teachers ought to emphasize, *Laborare est orare*—labor is worship. Too many of you teachers and too many of these dilettantes look down a little upon the laboring man, the man who works in the mines and the mills and on the farm. Labor is worship.

Dr. CARR. Of course, that "looking down" is a reflection, Senator, of what the rest of the culture does. It is not exclusively in the schools. After all, when a laboring man leads a most precarious economic existence with little or no security, it is not to be wondered at that boys and girls do not rush eagerly into the unskilled and humble tasks.

Acting Chairman KING. Proceed.

Dr. CARR. The question of guidance, to which I referred a few moments ago, is illustrated in this exhibit.¹ These are various groups

¹ See "Exhibit No. 2713," appendix, p. 17480.

of the youth population, showing the proportion which have received guidance in the schools with reference to the choice of a vocation, and the proportion which have not. The group on the right is the proportion which have not. The school people would like to change that. We think that the revision and vitalization of economic education should involve vocational training and that this training should utilize the public schools, industry, labor, private efforts—wherever we can get help in this gigantic job we ought to use it.

We think this should involve consumer education, and I understand if there is time the committee will hear another witness in the field of consumer education.

We think that this education should involve conservation education, development of an understanding of the resources of our country and of the importance of using them wisely.

We think that health education in our schools is a very important measure toward the development of economic well-being. The figures on the loss of income due to illness, to incapacity of one kind and another, are staggering, and we think that health education which will teach young people to maintain their health wisely is a real contribution to the economic well-being of the country.

Acting Chairman KING. That is being emphasized more and more in our public schools, isn't it?

Dr. CARR. Yes, sir; quite right, very hopefully so.

Acting Chairman KING. As chairman of the District Committee I can say we are emphasizing it in the District of Columbia, and doing all that we can to bring to the attention of the children the importance of health.

Dr. CARR. Yes, sir; that is true, I know that is so.

Finally, there should be vocational retraining for workers displaced by illness or accident or technological change. That will pay big dividends to the country as a whole, far beyond the relatively small cost of providing the training.

Mr. MAGINNIS. Dr. Carr, the chart that you had a few minutes ago showed the relative number of youths or young people desiring to enter the professions and the number who enter.¹ There is quite a decided difference; I should say offhand about one-eighth, roughly. Is that correct? Are those based on figures of any kind?

Dr. CARR. Yes, sir. These figures are based on interviews with young people in school and young people who have finished school and secured employment.

Mr. MAGINNIS. Now, considering the situation as it exists today, many, you might say 100,000, young people would be turned out each year, with the difficulty of absorbing them into the professions. Wouldn't it be well, in your judgment, if perhaps the plan along educational lines was directed further into vocational rather than professional lines? Might that not be desirable?

Dr. CARR. In the skilled trades I believe that would be so. However, all the figures we have been able to bring together (I am not sure they would coincide with the figures of this committee) indicate that the proportion of unemployment among unskilled and semi-skilled occupations is much greater than unemployment in the professions. That is, the competition for a job is greater in the unskilled

¹ See "Exhibit No. 2712," appendix, p. 17479.

group. If you want to lessen that competition at its worst point it would appear to be desirable to move qualified people, and only qualified ones, up into the higher branches of vocational and professional training.

Mr. PIKE. You notice, Dr. Carr, that the four eminent jurists on this side of the table are trying to keep new competition from entering their profession.

Acting Chairman KING. I should supplement my friend's statement by saying that the earnings of the lawyers throughout the United States only a few years ago were less than \$800 per year and during this depression many lawyers are upon relief.

Dr. CARR. Yes, sir.

Acting Chairman KING. I think the earnings by and large of many of the lawyers have been less than of some of those who worked on the farm or in the mines or elsewhere.

Dr. CARR. I am quite sure that is so.

Acting Chairman KING. The legal profession hasn't been so profitable to the great mass of the lawyers.

Dr. CARR. That is true of all professions, isn't it?

The fourth point I wanted to emphasize is that education for economic citizenship may be improved by giving public support to the discussion of important economic issues in secondary schools, in colleges, and in adult forums; second, by improving the preparation of teachers; and third, by supplying much better teaching materials and more of them, including textbooks, recordings, pamphlets, motion pictures, and other means of instruction.

Again, if you could have visited these schools with us you would have been struck time and time again with the sight of eager qualified teachers trying to do their work without tools, not only because the school board didn't have the money or was unwilling to supply the tools, but because the tools of instruction haven't been fashioned yet in this economic sphere. That, of course, I realize is not a matter of legislation.

Fifth, we should use free education as one of the means to improve the Nation's economic well-being by removing the artificial and financial barriers which now debar many youth of real and proved ability from advanced training which would greatly benefit them and society. If I could leave just one point with you I would certainly choose that one.

An exhibit already entered in the record is a picture of why youth leave school.¹

WHY YOUTH LEAVE SCHOOL

Dr. CARR. These are based on the responses of the young people themselves, which may not be wholly reliable, but which were taken by skilled interviewers and I believe to be substantially accurate. The division in the chart here is between males and females. The long bar at the top is the youth who said that they had left school because of lack of funds. You notice the immediate drop to the other points. I shall not discuss the chart in detail, but these young people, many times of unquestioned ability, who are being allowed to go to seed,

¹ See "Exhibit No. 2710," appendix, p. 17477.

represent a wastage of human resources which this country ought not to tolerate. We don't know how many Pasteurs, how many Edisons we are throwing away for lack of opportunity. Now I know it will be said, "Well, if he has it in him it will come out," but I have yet to see the evidence of that. There are plenty of cases, of course, of poor boys struggling upward and making a great deal of themselves, but there are many, many cases where if you give a youth a small scholarship, some small amount of assistance which will enable him to go to school, he will become a contributor in a very large way to the economic well-being of the country. We have abundant evidence on that in the report which Dr. Norton referred to yesterday.

We should also use free education as one means to improve the Nation's economic well-being by destroying the monopoly or partial monopoly in certain occupations by opening up training opportunities. I know the technical and political disadvantages of that problem, but it seems to be the desirable thing to do.

Sixth. Let America proceed to make good on the claim that this is a land of equal opportunity. In order to do that, there will have to be, in the first place, provision for State funds to reduce the inequalities of educational opportunity among the districts. You can go to schools within the boundaries of the same State, where the legislature of that State is mandated by its constitution to provide a free and equal educational opportunity, and yet see the most striking differences in educational opportunity; situations where the buildings, the teachers, the equipment, everything in one school is incomparably inferior to that in the other school. I do not advocate, Mr. Chairman, identity of educational opportunity for the people of America. I do not advocate that a community with a great burning desire to do an exceptionally good job by its children should be told, "No; you can't do that; you must chip into the common treasury." I do advocate a reasonable minimum of educational opportunity for every child born under the American flag. Until we come to grips with that problem, we are just not making good on the American promise.

We ought to have Federal equalization of educational opportunity among the States. Evidence has been introduced before various committees of Congress time and again which, in my judgment, leaves no doubt that there are in the United States whole areas which, with the best intention in the world, cannot finance an educational system at a reasonable minimum of effectiveness. The only agency that can remove those difficulties is the Federal agency, and our experience has been that that can be done without the interposition of Federal control or dictation in any undesirable way on the school.

We ought to have effectively free education. I have already referred to that. By effectively free education, which we do not have now, I mean education provided in such a manner that the lack of money on the part of a youth or his parents will not of itself debar him from securing that education. We do not have effectively free education now.

The last two points are in the nature of exceptions.

Seventh. I just want to make the point that we in education recognize fully that many factors, many causes, affect the economic well-being of this country. We are not so overcome with the importance of our profession as to suppose that we have the exclusive key to the answer that this committee is seeking. We do believe that education is

only one factor, but an exceedingly important and powerful factor, a good lever to put under the inertia of this economic system and get it rolling in the direction we want.

Eighth. I would like to say that education has many highly important values other than the economic values, Senator, you were referring to this yesterday. An emphasis on the economic values of education, which we have selected here for emphasis because we understood that was the committee's primary concern, does not in any sense ignore or minimize these other values of education.

Acting Chairman KING. Thank you very much. Are there any questions?

Dr. ANDERSON. Thank you, Dr. Carr.

(The witness, Dr. Carr, was excused.)

Dr. ANDERSON. The next witness is Mr. Kennedy, who will discuss technology and its effect in the coal industry. Before this, gentlemen of the committee, we have presented representatives of two groups, management and labor, in the particular industries under review. Because this is the final day of testimony and we are attempting to rush this thing through today, we have asked the witnesses to be as brief as possible and to file as much of their material as they can. In this connection, management has been very cooperative, and Mr. Charles O'Neill, president of the United Eastern Coal Sales Corporation, expressing the point of view of management, has very kindly agreed to file his statement in toto with the committee and not make a personal appearance.

At this time, Mr. Chairman, I should like to submit his statement to the committee to be incorporated into its deliberations as if read.

Acting Chairman KING. Any objections? It will be received.

(The document referred to was marked "Exhibit No. 2737" and is included in the appendix on pp. 17516-17535.)

Dr. ANDERSON. The next witness for the coal industry is Thomas Kennedy, secretary-treasurer of the United Mine Workers of America, and with him is associated Dr. Walter Polakov, director of the engineering department of the same organization.

Acting Chairman KING. Do you and each of you solemnly swear that the testimony you are about to give in this proceeding shall be the truth, the whole truth and nothing but the truth, so help you God?

Mr. KENNEDY. I do.

Dr. POLAKOV. I do.

**TESTIMONY OF THOMAS KENNEDY, SECRETARY-TREASURER; AND
WALTER N. POLAKOV, DIRECTOR, ENGINEERING DEPARTMENT,
UNITED MINE WORKERS OF AMERICA, WASHINGTON, D. C.**

Dr. ANDERSON. Mr. Kennedy, what is your position at the present time?

Mr. KENNEDY. Secretary and treasurer of the United Mine Workers of America.

Dr. ANDERSON. Is that an affiliate of the A. F. of L. or the C. I. O.?

Mr. KENNEDY. C. I. O.

Dr. ANDERSON. How many mine workers are organized in your United Mine Workers organization?

Mr. KENNEDY. Six hundred thousand.

Dr. ANDERSON. How many mine workers are there in the entire country mining coal?

Mr. KENNEDY. We figure approximately somewhere in the neighborhood of 650,000 or 660,000.

Dr. ANDERSON. So that you are speaking for the vast majority of coal miners in America.

Mr. KENNEDY. I believe so.

Dr. ANDERSON. Dr. Polakov, you are an engineer?

Dr. POLAKOV. I am a management engineer.

Dr. ANDERSON. How long have you been engaged with or related to the United Mine Workers organization?

Dr. POLAKOV. I am director of their engineering department and have been for a little over 3 years.

Dr. ANDERSON. And both of you have been studying this problem of the impact of technology on mine workers and mining?

Dr. POLAKOV. That is right.

Mr. KENNEDY. Yes.

Mr. CHAIRMAN. I have prepared a summary of the facts and data which are contained in this table which will be filed with the committee.

Acting Chairman KING. It will be received.

(The document referred to was marked "Exhibit No. 2738" and is included in the appendix on pp. 17536-17550.)

Mr. KENNEDY. Coal mining has been considered a sick industry for many years. As far back as March 1932, the U. S. Supreme Court, in the case of Appalachian Coals, Inc., took cognizance that "unemployment mounts and communities dependent upon profitable production are prostrated."

The United Mine Workers of America have consistently supported measures tending to stabilize the coal industry. They sponsored the National Bituminous Coal Act, the establishment of minimum prices, and in every other way possible have been helpful.

While this legislation has as yet not had a chance to operate, it is safe to say that the force of technology is closing the economic scissors that cut the life line of employment on which hundreds of thousands of coal miners precariously hang.

One blade of these scissors continually cuts the number of men needed to produce each ton of coal, while the other blade cuts the number of tons needed to carry on industry, transportation, and the generation of heat, light, and power.

INCREASED PRODUCTIVITY

Mr. KENNEDY. The technology of coal mining has steadily increased productivity of labor from less than 3 tons (2.98) per day in 1900 to 4.6 tons in a much shorter (23.9 percent) workday in 1938. Since the advent of mechanical loading, the time needed to produce 1 ton of bituminous coal has been shortened by 17 minutes; this means that 15 years ago the production of 1 ton of coal required 18.6 percent more time.

Such speeding up of production would have eliminated 131,000 jobs in and around the bituminous mines of this country, but due to the reduction of hours, the reduction of the number of days mines operate within a year (in 1929 mines operated 219 days, in 1938

only 160 days), and the sharing of work among miners, the total disemployment from mechanization and other means of increasing labor productivity was actually 75,715 men in the bituminous coal industry. This number of men and their families were denied the right to work within the 15 years from 1923 to 1938.

In the anthracite field, while mechanization and the general rise of labor productivity were even more pronounced, showing an increase of 48.3 percent in hourly productivity per man, the total disemployment due to this cause was less—about 2,500 men displaced by mechanization—within the same period, because the reduction in the number of days operated per year was in about the same proportion as the increase in productivity per man-day.

The total elimination of jobs by technological changes in labor productivity reached during the last 15 years the ominous figure of 78,140 men.

During the same period (1923-38) the consumption of coal was gradually reduced by 219,000,000 tons of bituminous coal and by 47,200,000 tons of anthracite.

Acting Chairman KING. Was that reduction in part due to the increased consumption of gas and oil?

Mr. KENNEDY. Yes. I come to that later on, Senator, I have that all worked out.

This reduction of coal consumption is not due to the economic depression alone. As a matter of fact, our total energy consumption increased 20.8 percent—from 21,308 trillions of heat units (B. t. u.) in 1921-25 to 25,739 trillions of heat units in 1937.

The principal cause of the reduced coal consumption has been technological progress in almost every engineering activity.

Wherever coal is used, it is used in smaller quantities for securing the same results. Mechanical stokers, pulverized coal burners, automatic combination controls, economizers, preheaters, and so forth, greatly enhance the efficiency of steam generation.

The use of steam produced with a smaller quantity of coal is in turn made more efficient by the use of high-pressure, high superheat steam, better pipe insulation, the use of regenerators, superheaters, and so forth. Steam engines gave way to three-stage steam turbines of greater efficiency. The wider use of electric current from large and economical central stations took the place of isolated plants of lower efficiency. Thus public utility plants alone reduced their coal consumption by 40.4 percent per each kilowatt-hour generated.

Likewise in railroad practice modern locomotives, improved roadbeds, roller bearings, and so forth, reduced coal consumption 22.0 percent per 1,000 ton-miles of freight moved, and by over 15 percent per passenger car-mile.

In the cement industry coal consumption per barrel of cement was reduced by some 20 percent, and in pig iron production by 14.6 percent, and so on through achievements in various branches of engineering.

Domestic heating is no exception—the development of domestic stokers, of automatic combustion and heat regulators, and the more efficient insulation of houses has considerably reduced this important market for coal.

Translating these economies in coal utilization into the number of men needed to mine the coal which is no longer required, we get

another group of 34,000 miners who lost their jobs due to engineering efficiency in coal utilization within the last 15 years.

At the same time the technique of geophysics has made noteworthy strides in locating new oil and gas wells. Whereas we knew of only 15 to 20 years of oil reserves at the close of the World War, we are now reasonably certain of 30 years of an increased supply of these substitute fuels. Along with the opening of new oil and gas fields, perfected methods of recovery have increased their yield.

This yield of crude oil is refined by technically improved processes, and this increased production of gasoline is accompanied by an increased output of fuel oil and Diesel oil.

Mr. PIKE. I think I would have to take a little exception on that point, Mr. Kennedy. There is an increase in the total over a long period of years due to a great increase in the total amount of oil put through the refineries, but by and large the proportion of fuel and Diesel oil from the barrel is rather less than it was. After you have built up your gasoline, say, to 45 or 50 percent of the total of the barrel of crude put in, as against perhaps a natural yield of around 25 or 27, as a rough guess, a good deal of that increased production of gasoline comes right out of the fuel and the burning oil cut.

Mr. KENNEDY. Is that under the new process?

Mr. PIKE. Under the new process I think they burn all the gasoline.

Acting Chairman KING. Does the engineer desire to make an observation?

Dr. POLAKOV. We have it worked out in our figures here.

Mr. KENNEDY. Our figures show an increase.

Mr. PIKE. In the total number, yes; but it is a rather decreased proportion. Of course, the oil industry has grown very substantially over the period. That is the only exception I wanted to make.

Mr. KENNEDY. Residual oil (fuel, gas, Diesel) is not, in our judgment, priced in proportion to the cost of production, but fuel oil is subsidized by gasoline sales. Thus, technological advances in the petroleum industry have made it possible to put liquid fuels on the market in competition with coal.

Diesel-engine installations by 1940 represent over 15,000,000 horsepower, which otherwise would be largely generated by coal. Fuel-oil consumption increased between 1923 and 1937 by 84,000,000 barrels. This amount of fuel alone replaced nearly 15,000,000 tons of coal and eliminated the jobs of at least 16,000 miners.

The technology of natural-gas production and transportation has likewise made great strides and offers for sale this substitute for coal at somewhat advantageous prices. While only a portion of the natural gas enters into direct competition with coal or with manufactured coal gas, the portion has grown tremendously. Some 530,000,000,000 cubic feet of natural gas have displaced coal in domestic and industrial uses. This quantity is equivalent to some 22,000,000 tons of coal. The resulting elimination of jobs which would have been necessary to mine this tonnage put about 24,000 miners out of work.

Last, but not least, important technological progress has been made in the design and construction of hydroelectric plants. In 1937 nearly 44,000,000,000 kilowatt-hours were produced by water power. Coal

burned for this purpose would have given employment to 34,500 miners. The increase in hydroelectric output between 1925 and 1937 alone is equivalent to over 6,000 miners' jobs.

Acting Chairman KING. The Government then through T. V. A. and these hydroelectric plants constructed by the Government are in competition with the coal mines.

Mr. KENNEDY. In a certain sense; yes.

To summarize this technological displacement of miners within the last 15 years, we add these groups by causes of disemployment.

Mechanization and increased productivity of labor.....	78,140
Increased efficiency of utilization.....	33,950
Substitute fuel oil.....	16,100
Substitute natural gas.....	23,900
All hydroelectric power.....	34,540
Total.....	186,630

The unaccounted-for balance of disemployed miners may be due to some extent to the conservatism of the above calculation. It is reasonable, however, to presume that these remaining unemployed lost their jobs because of the economic depression, which reduced industrial production and transportation as well as compelled a large section of our population to economize on heating their homes, illuminating their rooms, and otherwise curtailed their former standards of living.

DECLINE IN EMPLOYMENT

Mr. KENNEDY. Statistics of the United States Bureau of Mines indicate that the total shrinkage of employment between 1923 and 1937 was:

In bituminous mines.....	<i>Men</i> 214,022
In anthracite mines.....	58,553
Total.....	272,680

By 1938 this figure on unemployment reached a still higher level of 297,250 men. Therefore, the unemployment not directly allocated to technological displacement is:

Total.....	<i>Men</i> 272,680
Technological.....	186,630
Due to depression (in 1937).....	86,050
In 1938 (about).....	110,000

Of course, all of these men are not necessarily totally without work. The computation was made on the man-year basis, which in 1937 was equal to 1,372 hours of employment and in 1938 shrank to 1,120 hours per year. It is quite possible that some of these men whose work was made unnecessary by technology were sharing work with others, so that instead of 272,000 men working zero hours and 589,000 working full time, some of the men worked fewer days per week to prevent starvation of disemployed families, at the cost of undernourishing their own children.

What the future holds for employment in the coal industry is reasonably certain. Extended mechanization will continue to take its toll in men swept aside by machines. This displacement will gradu-

ally slow down until a new type of machine will again accelerate the rate of displacement.

A careful inspection of new mining equipment, as it is exhibited annually at the Mining Congress conventions, gives a much better picture of the trend in the future than all the economic compilations and legal considerations can possibly disclose. And the writing on the wall of the exhibition halls is that within a few years the productivity of labor will approximate 1 ton per man-hour.

The other blade of the economic scissors—the reduction of demand for coal—can be foreseen from the examination of engineering evidence. Little can be expected in better equipment for combustion of competing fuels. As gasoline is sold in ever-increasing quantities for motor transport, a greater quantity of fuel oil will be available and will become the chief competitor of coal unless and until new processes of oil fractioning are perfected which would yield more gasoline and less fuel and gas oil, which I think is being brought about. Natural gas may be expected to continue to compete and to displace coal wherever possible.

But deposits of both petroleum and gas are much more limited than of coal. It is officially estimated on the basis of present-day technology that petroleum deposits will last 15 to 30 years. Unless new discoveries are made within that time, competing fuels may go up in price or otherwise become restricted.

The opposing force which may retard the shrinking employment in the coal-mining industry is to be looked for in the development of the technology of coal byproducts, liquefaction of coal to derive motor fuels, and the expansion of chemical industries.

In other words, the "long view" on the situation of the present ravages of technological disemployment offers some solace that perhaps in the not distant future new industries will spring out of new technology or multiple production, using coal as a raw chemical as well as a crude fuel.

In the meantime the United Mine Workers of America believe that the Federal Government should give some consideration to the matter of assisting the bituminous and anthracite industries to advance their markets and create employment. Increased employment in the mining industry constantly aggravates the national unemployment situation and is a vital factor in that problem.

Acting Chairman KING. May I interrupt you, Mr. Kennedy? I am very much interested in the suggestion you have just made about the obligation or duty upon the part of the Federal Government to find means for a larger utilization of coal. Will you elaborate that point a little, if you care to?

Mr. KENNEDY. Yes.

As against competing fuels, labor plays a very important part in the production of coal, as evidenced by figures showing the relation of labor costs to the total cost of producing various goods in this country. Oil, gas, and so forth, come from practically laborless industries.

Now, fuel oil is one of our serious competitors in the coal business. We have made constant overtures to the Federal Government to put an excise tax on the imports of oil. We have had up with the Federal Government the question of taxes in these so-called trade agreements with foreign countries, for instance the Venezuelan

Trade Agreement. We made overtures to the Department of State urging that nothing be done to interfere with the tax on Venezuelan oil. We believe it should be taxed. Well, they reduced the tax on that oil. We believe, in connection with the Canadian agreement, that something could be done to facilitate the sending of our coal into Canada. There is a tax of some 50 or 60 cents on a ton now against American coals into Canada. That was reduced very little in the last agreement.

Mr. PIKE. They have some mines of their own to protect, haven't they, Mr. Kennedy?

Mr. KENNEDY. But they don't protect them. The Canadian mines have a potential productive capacity of about 50,000,000 tons a year. They consume from 90,000,000 to 100,000,000 tons in Canada, but the former Canadian Government, that is, the Bennett government, made a trade agreement with Great Britain in which they subsidized Great Britain's coal even against Nova Scotia and British Columbia coal, and against our coal. So that anthracite lost about 2,000,000 tons of a market that it had in Canada as a result of those trade agreements. I mean the agreement between Canada and Great Britain and the tax that is levied against American coals by Canada.

Mr. PIKE. That probably goes into the shipping situation to some extent.

Mr. KENNEDY. I think it does to some extent.

Mr. PIKE. To give perhaps a boat for grain from England to Canada.

Mr. KENNEDY. I was personally acquainted with Mr. Harrington, of Nova Scotia, at that time, and I got the impression that the coal industry in Canada was sold out in the interest of the grain and fruit industries.

Mr. PIKE. The maritime provinces frequently had that feeling.

Mr. KENNEDY. That is right.

Somewhere along the line, recognition of this factor must be accepted by the American people and by the Congress. Legislation contemplating equalizing taxes on competing fuels and imports of oil and solid fuels, together with the possibility of taxation and regulation within the realm of labor-saving machinery, may be pertinent and necessary.

In this connection, of course, the United Mine Workers are strongly on record apropos of the convening of a national meeting by the President or by Congress in which labor and industry and finance might be represented, and which should give some consideration to an approach of this problem of unemployment and its solution.

In any event we believe Congress should do what is necessary to bring about a national economy that will put our unemployed back to work on a basis of hours that will be geared to the trend of modern industry; and wages and opportunity for earning that will bring about sufficient and adequate purchasing power to provide for continuing steady employment and prosperity in this Nation.

Acting Chairman KING. Thank you very much, Mr. Kennedy. Are there any questions?

Dr. ANDERSON. I think Mr. Polakov was to read his statement following, or are you to insert it in the record?

Mr. POLAKOV. I leave it to the committee whether they want to hear a somewhat different approach to the subject from the engineering point of view, or insert it in the record.

Acting Chairman KING. How many more witnesses have we?

Dr. ANDERSON. One more this morning.

Acting Chairman KING. How long will it take?

Mr. POLAKOV. Twenty minutes.

Acting Chairman KING. This is a very interesting subject. I would like to hear the engineer.

COMPETITION OF COAL AND GAS

Mr. PIKE. May I ask a question of Mr. Kennedy? This matter of competition between gas and coal is a very difficult thing. Gas, as you say, in its inception is almost entirely a laborless industry. There is a great waste of gas going on in our Southwest, considerable waste, let me put it, which our National Resources Commission want stopped, and I think we would all like to see stopped. So we have a Federal interest in utilizing that gas. At the same time it is utilized, it comes right in to your product and competes more.

Under this present bituminous law, we have a stabilized price of coal at or a little bit higher than the rate it has been selling at, let's say, over the last 2 or 3 years. In the meantime, another agency of the Federal Government is trying quite hard to get down the prices of delivered natural gas. If those prices come down, natural gas displaces more coal.

It is pretty contradictory, it seems to me, and I wondered what your reaction was.

Mr. KENNEDY. I have an idea that somewhere along the line there has got to be a correlation of these prices in the industries affecting all kinds of fuel, solid, liquid, gas—it just doesn't make sense.

Mr. PIKE. The thing you said is very true; our resources of gases and oil are quite limited. The National Resources Planning Board estimates there is the equivalent of about 4,000,000,000 tons of coal in sight in form of oil and about the same heat value in the form of natural gas. There will be more of these discovered, of course. On the other hand, 2,500,000,000,000 tons of coal are in sight. The difficulty of competition is probably just a matter of this generation, but it doesn't help this particular generation very much.

Mr. KENNEDY. That is true in Pennsylvania during the administration that I was associated with over there; we kept natural gas out of Pennsylvania; we wouldn't permit to enter there. I don't know what the present administration is going to do, but we are in hopes they will continue that policy.

Dr. ANDERSON. Mr. Kennedy, your competition with other fuels is made more serious, isn't it, but isn't the coal by the highly competitive nature of the coal industry—some 6,000-odd units fighting over price?

Mr. KENNEDY. It is very highly competitive.

Dr. ANDERSON. That is one of the major problems that you face in attempting to solve the employment problems of the workers in the industry?

Mr. KENNEDY. It was one of the problems that we faced, and which we hope has been solved by the enactment of a National Bituminous Coal Act in the publication of prices. We think that may help to solve that problem.

Dr. ANDERSON. Is there any feeling that one of the ways to solve at least part of the coal problem is to unify the industry into larger, more monopolistic groups?

Mr. KENNEDY. Well, I don't know; we had that situation in anthracite, where they had virtually a monopoly up until 10 years ago, and since that time it has disintegrated. We now have less monopoly there than we ever had.

Dr. ANDERSON. In other words, when industry was unified, you could get at the problem quicker.

Mr. KENNEDY. Much better.

Mr. O'CONNELL. It was that disintegration, I take it, that was in part responsible for the Pennsylvania Bituminous Coal Act.

Mr. KENNEDY. That is true, but we do not have any such act in anthracite.

Mr. O'CONNELL. Are there many competing units in the anthracite field?

Mr. KENNEDY. More now than ever in its history; we probably have 200 or more units there now where we formerly had about 60 or 65.

Acting Chairman KING. Has the number of units increased by reason of developing new anthracite coal mines, or by a division of the former areas of coal?

Mr. KENNEDY. We had very keen competition in prices there for a number of years, and a lot of companies folded up and leased their mines out to individuals. There are a greater number of independent operators now.

Dr. ANDERSON. Mr. Kennedy, we had testimony concerning what is occurring in steel towns as a result of a new stripping process, and closing down of old mills. I understand that you have also faced that in the plight of the coal miners, and that has been met by closing of mines.

Mr. KENNEDY. We have a number of those cases. Dr. Polakov can touch on them. Right in my own State, up in the anthracite regions, we have many ghost towns.

Dr. ANDERSON. Is the problem being accentuated, or growing less?

Mr. KENNEDY. Well, I don't know; it is not being aggravated. The loss of employment by thousands of miners in certain sections of the anthracite really brought on the so-called bootleg mine problem, because the whole community was lost by shutting down all the mines in a given territory.

Dr. ANDERSON. I understand in England they have finally come to the conclusion that they have to move whole populations. What is your judgment on stranded populations and the possibility of moving them?

Mr. KENNEDY. I was in England last year at the miners' convention there in South Wales. That was the really bad area in England, South Wales. Since the war, that problem has sort of disappeared, rather since they started to prepare for the war. The Government had built manufacturing establishments in some of those Welsh valleys, which meant industries. That was working out pretty well until

the war reached them, and now the mining industry is working full blast, together with steel and all other industries in that section of England.

Dr. ANDERSON. The Government had to intercede to the extent of actually going in with capital equipment and building factories, inviting new industries to engage in their business there and by so doing, link the factor of coal to industry.

Mr. KENNEDY. That is right, right in those valleys.

Dr. ANDERSON. How realistic is such an approach in the solution of our problem here?

Mr. KENNEDY. I think it offers something, especially in the mining area.

Dr. ANDERSON. All right, Mr. Polakov.

Acting Chairman KING. Mr. Kennedy, we appreciate very much the contribution of this important subject.

Mr. KENNEDY. We have a gentleman here from the Pittsburgh district who lost his job the other day as a result of the introduction of machinery. Do you care to question him, or see him, or talk to him? This is Mr. Renton.

Acting Chairman KING. Do you solemnly swear the evidence you are about to give in this hearing shall be the truth, the whole truth, and nothing but the truth, so help you God?

Mr. RENTON. I do.

TESTIMONY OF WILLIAM RENTON, OF COVERDALE, PA.

Mr. KENNEDY. Where do you live?

Mr. RENTON. Coverdale, Pa.

Mr. KENNEDY. It is in Allegheny County. How old are you?

Mr. RENTON. Forty-six years old.

Mr. KENNEDY. What is your occupation?

Mr. RENTON. Coal miner.

Mr. KENNEDY. When did you last work?

Mr. RENTON. On the 20th of January 1940.

Mr. KENNEDY. How did you lose your job?

Mr. RENTON. By introduction of machinery.

Mr. KENNEDY. How many men were displaced at your mine by machinery?

Mr. RENTON. From the 20th of January until the present time there have been 200 men displaced.

Colonel CHANTLAND. Out of how many?

Mr. RENTON. Out of 800.

Mr. KENNEDY. Do you think your age had anything to do with your loss of employment by not going on the machines in the mine?

Mr. RENTON. My not going on the machines is the reason I am unemployed.

Mr. KENNEDY. They usually put younger men on machines?

Mr. RENTON. Yes, sir.

Mr. PIKE. You mean they think you are too old to go on?

Mr. RENTON. On going around to the other mines, 45 years practically is the limit to go on a machine.

Mr. PIKE. They are apt not to hire a man over 45, or apt not to keep him if they bring machines in.

Mr. RENTON. That is right.

Mr. O'CONNELL. Generally speaking, were the men let out—the older men?

Mr. RENTON. Mostly older men; yes, sir.

Mr. KENNEDY. What are you doing now, Mr. Renton?

Mr. RENTON. I am not employed at the present time.

Mr. KENNEDY. Have you employment insurance compensation?

Mr. RENTON. I did up until last week.

Mr. KENNEDY. That is given for 13 weeks in Pennsylvania, is it not?

Mr. RENTON. Yes, sir.

Mr. KENNEDY. And you are finished on that. What are you going to do now, from now on after your insurance runs out?

Mr. RENTON. Well, I will have to go—these last few months I have been trying to get employment with these other mines, but I have been unsuccessful, and about the only thing left now is to try and go on relief, and I don't want to do that.

Mr. KENNEDY. Do you own your own home?

Mr. RENTON. Partially I do.

Mr. KENNEDY. You are paying for it on the installment plan?

Mr. RENTON. That is right.

Acting Chairman KING. Have you a family?

Mr. RENTON. Yes, sir; 3 children.

Mr. HINRICHs. Was this January the first time you have ever drawn unemployment compensation? Have you had unemployment compensation before?

Mr. RENTON. I did last year, in April.

Mr. HINRICHs. How long were you out in April?

Mr. RENTON. Seven weeks, at the time of the strike.

Mr. HINRICHs. And you hadn't drawn compensation before that?

Mr. RENTON. Yes sir.

Mr. MAGINNIS. Were you paid any wages at all when you were let out because of machinery?

Mr. RENTON. No sir; except the unemployment compensation.

Dr. ANDERSON. But you were paid no dismissal wage when machinery was installed in your coal mine and you were dismissed?

Mr. RENTON. No; unless we had earned it.

Dr. ANDERSON. I mean dismissal wage.

Mr. RENTON. No sir.

Dr. ANDERSON. Do you know of any such among your acquaintances or work in the coal mines?

Mr. RENTON. I do not.

Dr. ANDERSON. And when you go from one mine to another and apply for work what do they tell you?

Mr. RENTON. Well what they have told me is that they are sorry they are laying men off and putting machines in. That has been my answer all through the valley.

Dr. ANDERSON. You look like a perfectly healthy and strong man. Why is it you can't handle a machine?

Mr. RENTON. I haven't had an opportunity to handle the machine because I can't be reemployed.

Dr. ANDERSON. But you could handle a machine.

Mr. RENTON. I could.

Dr. ANDERSON. Why do they want younger men to handle the machine?

Mr. RENTON. The way I see it, they can mold the young men to what they want them to do more than an older man.

Dr. ANDERSON. You mean it will take some time to train a man to handle a machine?

Mr. RENTON. On these big machines; yes.

Dr. ANDERSON. And you don't think a man of your age can learn just as well and rapidly as a young man?

Mr. RENTON. I certainly do.

Dr. ANDERSON. Who thinks differently?

Mr. RENTON. The foreman thinks differently on that.

Dr. ANDERSON. Well, when these young men are taken in your place, are they taken from miners already at work in the mines, or are they taken from outside unemployed workers?

Mr. RENTON. They are taken from the lads in the mines.

Acting Chairman KING. They didn't bring in new men?

Mr. RENTON. No, sir.

Acting Chairman KING. They took the younger men who were working in the mine?

Mr. RENTON. That is what they only partially did. They brought in some other men when they started that first, some cutters, we called them, that cut the coal. We didn't have enough at the mine at that time to take those positions.

Acting Chairman KING. Then the new men brought in were persons that had skill that none in the mines possessed.

Mr. RENTON. That is right.

Mr. HINRICHS. How many years have you been employed by the company?

Mr. RENTON. Since 1930.

Mr. HINRICHS. So that you have been with them for 10 years.

Mr. RENTON. The past 10 years, all but 6 months. Two years ago I didn't work for 6 months, and then I was reemployed at that same mine.

Acting Chairman KING. What did you do before you worked in the mine?

Mr. RENTON. Before I came back to this mine, I was sealing mines.

Mr. KENNEDY. That is sealing up abandoned mines.

Acting Chairman KING. You have been in the coal mining business many years, then.

Mr. RENTON. Yes, sir; the last 30 years I worked in the coal mines.

Acting Chairman KING. In Pennsylvania?

Mr. RENTON. No; since 1914 in Pennsylvania; I came to Pennsylvania in 1914.

Acting Chairman KING. You came from Wales?

Mr. RENTON. From Scotland.

Mr. HINRICHS. Had any of the younger men who are kept on in the mine been with the company for a shorter period than you had been?

Mr. RENTON. Absolutely.

Mr. HINRICHS. Men who had been there for only 2 or 3 years?

Mr. RENTON. That is right, sir.

Mr. HINRICHS. So that you weren't protected by any form of seniority.

Mr. RENTON. That is right.

Mr. HINRICHS. And seniority protection would have protected you as a particular individual?

Mr. RENTON. That is right.

Colonel CHANTLAND. What do these machines consist of?

Mr. RENTON. Well, it is a conveyor system. The machine goes in on the coal face and takes the coal up a boom and enters it onto the car. Then they have other types that go in with a shaking system that does practically the same thing, but it is a different kind of machine.

Colonel CHANTLAND. Mr. Kennedy, how nearly typical is this man's example throughout the industry—I mean how many instances of this has occurred within this short time that he speaks of—during the last 15 months?

Mr. KENNEDY. There is quite a lot of it in the bituminous, for one of the reasons advanced by Mr. Hinrichs. In many sections we do have seniority rights. In a lot of sections in the bituminous, we do not have seniority rights, especially in the newly organized fields, the coke fields in West Virginia, Kentucky, Tennessee, and other newly organized districts.

Where we have seniority, we can protect our older men; that is, men older in point of service.

DISMISSAL WAGES

Colonel CHANTLAND. What about any dismissal wages anywhere in the industry?

Mr. KENNEDY. There is no dismissal wage in the coal-mining industry that I am aware of. We have it in the chemical end of our industry, but not in the coal-mining industry.

Dr. ANDERSON. How abrupt was the notice you got? When were you told you were to be dismissed?

Mr. RENTON. I was told on January 20, and the next day was my last day.

Dr. ANDERSON. And you had no inkling that that was going to occur?

Mr. RENTON. Absolutely not; I didn't think I was going to be laid off.

Dr. ANDERSON. There wasn't any rumor afloat that the mine was going to move into mechanization and you had better get ready?

Mr. RENTON. There was to that effect, but we didn't pay any attention to it; we didn't think we were going to be laid off until the day before the assistant foreman told me, "Bill, tomorrow is your last day."

Mr. HINRICHS. Even if you had known the mine was to be mechanized and they were going to lay off workers, you as a particular individual wouldn't have known whether you were going to be one of the 200, or whether it was going to be someone else, would you?

Mr. RENTON. That is right.

Mr. HINRICHS. Your notice as an individual came before the mechanization took place.

Mr. RENTON. That is right.

Mr. O'CONNELL. Had you known it a week or 2 weeks in advance there wasn't very much you could have done about it.

Mr. RENTON. Couldn't have done a thing about it.

Acting Chairman KING. Will you proceed, Mr. Polakov?

Mr. POLAKOV. I will abbreviate.

Acting Chairman KING. Your paper will be printed if you desire.

(The document referred to was marked "Exhibit No. 2739" and is included in the appendix on pp. 17551-17557.)

Mr. POLAKOV. The economic consequences of such changed technique in mining are grave and far-reaching. With 78,000 men who lost their jobs in mines due to mechanization within the last 15 years, with a total of 187,000 displaced by all forms of changed technology, and a total of 272,000 men out of jobs, the industry and the Nation is faced with a problem of what to do with these men and their dependents, a total well over 1,000,000 people.

One director of personnel department of a typical coal company wrote to us recently, and I will read his letter.

We mine bituminous coal and employ 6,000 men. When we are fully mechanized we will have laid off about 1,000 men. I realize that the general thought is that these men will be employed in other industries, as there will be more men employed in the manufacturing of these machines. But, to start with, this type of labor, and the age of these men, will make it practically impossible for them to even do this type of work, and besides the automobile and steel plants and machine shops are reducing their personnel and have the same problem. Industry is using the best talent and research for improving its machinery so as to lower their costs and in many instances to just maintain their present business. Of course, no corporation can afford to maintain these extra men, and if industry doesn't take care of these men the government must—and in the end the industry must pay for this in the way of taxes.

-Now, that is a quotation from a letter of one of the large coal companies.

The United Mine Workers of America have favored the introduction of a 6-hour day, 30-hour week, with 200 days a year guaranteed work ever since Mr. John L. Lewis proposed this measure at the 1933 Bituminous Coal Code hearings.

When the 7-hour day, 35-hour week was finally secured, it was obvious that this measure was no longer adequate, that the securing of it was delayed too much, and it was unable to absorb the technological displacements, and again in the wage negotiations in 1939 the 30-hour week was sought but not attained.

Miners themselves, rather than see their neighbors and their children starve, frequently demand that the local management reduce the number of working days for all instead of laying off completely men whose jobs are eliminated by machines. "Work together, starve together" seems to be a motto in most of the mining camps. And work for 2 or 3 days a week instead of 5 is frequent in many localities. In other words, in such closely knit and mutually supporting communities we find that among miners disemployment appears in two forms, direct displacement by technology and indirect underemployment created by the sharing of unemployment. How great is this indirect disemployment is difficult to estimate, but it is certain that it is at least half as large as direct unemployment. That is, it affects not less than 40,000 families.

In Illinois, for instance, where mechanization of mines is more advanced, W. P. A. conducted a census in 3 counties, Williamson, Saline, and Franklin. It was found that—

a large part of the working population is completely stranded. * * * Coal miners constitute the great bulk of the worker population. * * * Mine operators have mechanized the loading of coal to the point where thousands of hand loaders have been eliminated.

Acting Chairman KING. Is there as much coal produced now as there was a few years ago, before the discharge or separation of the service of a considerable number of employees?

Mr. POLAKOV. The production of coal essentially changes with the market conditions, but potentiality or capacity for production now is greater than it has been before mechanization.

I will introduce these charts in evidence.

LABOR DISPLACEMENT BY MECHANIZATION

Dr. ANDERSON. This chart, headed "Displacements of Miners by Mechanization in Deep Bituminous Mines in the U. S. A." will be entered in the record.

(The chart referred to was marked "Exhibit No. 2740" and appears on p. 17201.)

Mr. POLAKOV. In other words, with a quantity of coal that requires three men (3.15) to produce by ordinary hand methods, which represents about 75 percent of coal production today in this country, it takes only two men with the aid of conveyers—of which the weak victim we saw a few minutes ago was one—and it takes only one man with a fully mechanized mobile loading mine.

Mr. PIKE. Are those adapted for all mines, or are there only particular mines in which they can be introduced?

Mr. POLAKOV. Theoretically speaking, they are adapted to probably 95 percent of mines. From the point of view of sound economy and sound management, it is easily applicable to 50 or 60 percent.

Acting Chairman KING. What is the character of the mechanization, the cutting of coal or hoisting it or taking it from the tunnels or from the face of the drift to the surface and unloading it there and loading it onto the cars?

Mr. POLAKOV. Well, mechanization today covers practically every phase or stage of the coal production.

Acting Chairman KING. That is—

Mr. POLAKOV (interposing). Undercutting instead of kerfing is done by the machine. Drilling is done by electric drills instead of by hand. After it is shot—and now less and less explosives are used and more and more carbon dioxide or compressed oil in rubber tubes—the coal is loaded not by shoveling into the cars but by self-loading conveyors or pit car loaders—you have probably seen them in the gravel yards and things like that—or by mobile loaders which are a combination of conveyor and a grabbing, eccentric attachment in front which grabs the broken, loose coal and loads it on the conveyor, which carries it all the way to the tipple, in some instances, or on the main haulage train, in some others.

Acting Chairman KING. Where you have a very slender layer of coal, say a foot or 18 inches or 2 feet, have you used machinery there to load that coal?

Mr. POLAKOV. In many places in Alabama and in some places in Kentucky where there are thin seams, 20 inches plus or minus, they use conveyors. Men lie down on their sides or on their backs and

EXHIBIT No. 2740

DISPLACEMENT OF MINERS

By Mechanization

In deep Bituminous mines, U.S.A.

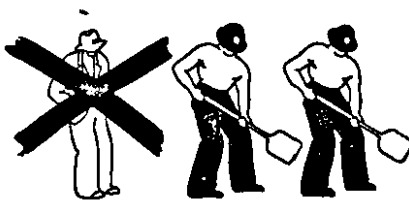


3.15

Hand Loading

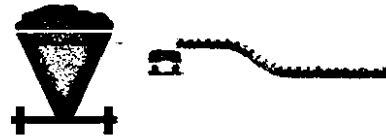


18.28 Tons

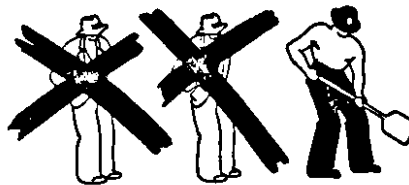


2.02

Conveyor



18.28 Tons



1.00

Mobile Loading



18.28 Tons

Source:
United Mine Workers of America
Engineering Department

Engineering Dept., U.M.W.A.
Walter M. Polakov, Director

shovel coal from the face on these conveyors, having only a couple of inches or a few inches above between the roof and the top of the conveyor, but still it is being done.

In central Pennsylvania, similar methods are used in low veins, the low conveyors.

Acting Chairman KING. Of course where you have very thick seams—in my State we have some seams there 6—one seam, as I recall, is some 10 or 15 feet.

Mr. POLAKOV. That is right. In your State more than 80 percent of the coal is mechanically mined and loaded, but even with thick seams sometimes it is not safe to use mechanical loading, as for instance, in the Pittsburgh seam, which has a tender roof. And the danger is increased out of all proportion.

Acting Chairman KING. They have to use a good deal of timbering, do they not?

Mr. POLAKOV. Which they usually fail to use because it obstructs the free motion of the machinery. So they take the risk of life with men.

Dr. ANDERSON. You mean the laws of Pennsylvania permit them to continue to risk human life in order to avoid proper timbering of mines?

Mr. POLAKOV. The laws are written in the books and the inspection of the mines is left to human beings.

Acting Chairman KING. There is a human factor there.

Mr. POLAKOV. That is right.

Acting Chairman KING. Proceed.

Mr. HINRICHS. On Exhibit 2739 you haven't any unit of time. I presume that those are comparable.

Mr. POLAKOV. Average day.

Mr. HINRICHS. That means a 7-hour day.

Mr. POLAKOV. Yes.

One of the most telling effects of mechanization was recorded in the town of West Frankfort, Ill. In 1930 the population of that town was 14,700 people. In 1939 it had shrunk to 12,000. During 1926 the average output per man-day in a town of 6,000 mine workers was 5.4 tons within 8 hours. By 1937 efficiency increased so that one man working 7 hours produced 8.9 tons, due to mechanization, an increase of 63.2 percent.

To equal the all-time record of coal production, West Frankfort, Ill., operators need to rehire only 700 men to replace 3,000 men displaced.

Another case is reported in Ziegler, Ill.,

At the time the census was conducted by W. P. A., there were 3,017 persons living in Ziegler; 774 of them were engaged in private employment, either in the service industries or in mines; 269 were on W. P. A., N. Y. A., or in C. C. C. camps; 107 were without any work of any description. Thus a total of one-third of all Ziegler workers were without private employment during the census week. These figures show unemployment in one of the most active coal towns in Illinois during the peak of the year's activity.

In West Virginia the district north of Morgantown (Scott's Run) and the southern part of the State in Logan County are perhaps even more desperately hit. A special report was prepared by the National Research Project of the W. P. A. describing the plight brought by the machines which was so shocking that the report was not published,

In Pennsylvania, both central Pennsylvania coal fields and the anthracite region offer many similar examples.

With only 25 percent of the underground coal loaded mechanically, and with the immediate possibility of using labor-saving equipment in mines, the mechanization of loading has not yet gone halfway. Considering that in 1935 only thirteen and a fraction percent of coal tonnage was mechanically loaded and in 1939 25 percent was so loaded, we may expect within the next 4 or 5 years to double the mechanical tonnage. This would throw out of employment within the next few years at least 80,000 more miners.

This estimate takes into account merely the existing state of technique and projects it into the future. Yet we are reasonably sure that further steps in technology will be of even more drastic nature. Recent reports indicate the successful operation of coal mines on a wholly different basis. In Russia, for example, we are informed that some mines are sealed and set afire, which is maintained by a regulated supply of air and steam to produce "water gas" underground. This gas is then cooled and purified in the scrubbers and piped to distant points of consumption, at a cost said to be one-fourth the cost of gas generated from mined coal. Such a process requires a very small crew of gas workers and mechanics on the surface, virtually eliminating all mine labor as such.

I don't know whether I should proceed with the conclusion; if we have time I will.

Dr. ANDERSON. I have one more witness.

Acting Chairman KING. It will be in the record, and we thank you for your appearance. May I ask just what particular field you occupy in connection with the mining operations, mechanical engineer or electrostatics or what? What field do you cover?

Mr. POLAKOV. The engineering department is a new venture with the United Mine Workers, and in the first few years of its existence we handled all sorts of problems. We started with the study of mechanization in connection with the operating agreement that the United Mine Workers will study that jointly with the operators. Since the operators, however, have shown no inclination to cooperate with us for the last 2½ years, we have been doing that work exclusively ourselves.

Besides that, the function of the engineering department covers economic and statistical matters of production, cost of living, accidents, safety engineering, and a number of allied functions of that type.

Acting Chairman KING. And you have charge of that activity in the organization with which you are affiliated?

Mr. POLAKOV. Yes. I should like to introduce my remaining charts as exhibits.

(The charts referred to were marked "Exhibits Nos. 2741 to 2747" and are included in the appendix on pp. 17558-17564. Exhibit No. 2748 is on file with the committee.)

Dr. ANDERSON. The final witness for the morning session is Prof. Caroline Ware, associate professor of social history and social economy, American University, and chairman of social studies, American Association of University Women.

She is here to testify on a twofold aspect of our problem, which she has stated is a problem of effective participation as a producer and as

a consumer. Dr. Ware is an expert in the field of consumer education and labor studies.

Acting Chairman KING. Do you solemnly swear the evidence you are about to give in this hearing shall be the truth, the whole truth, and nothing but the truth, so help you God?

Miss WARE. I do.

TESTIMONY OF DR. CAROLINE F. WARE, ASSOCIATE PROFESSOR OF SOCIAL HISTORY AND SOCIAL ECONOMY, AMERICAN UNIVERSITY, WASHINGTON, D. C.

Dr. ANDERSON. State your name and address, please.

Dr. WARE. My name is Caroline F. Ware, and my residence is Vienna, Va.

Dr. ANDERSON. Dr. Ware, what is your professional position at the present time?

Dr. WARE. I am associate professor of social economy and social history at the American University graduate school in Washington.

Dr. ANDERSON. In your connection as chairman of social studies, of the American Association of University Women, what has been your duty?

Dr. WARE. My duty in the association has been to act as chairman of the committee which prepares material and responds to requests from study groups and the branches in the field of consumer education and other related subjects.

Dr. ANDERSON. How large an association is that?

Dr. WARE. Sixty-seven thousand members.

Dr. ANDERSON. Scattered over the United States?

Dr. WARE. Scattered over every State in the Union, and the consumer study groups are in 300 different communities. There are in all 870 branch groups in the organization.

Dr. ANDERSON. Studying consumers' problems?

Dr. WARE. Three hundred out of the 870 have been studying consumers' problems.

Dr. ANDERSON. And the others studying social problems?

Dr. WARE. Studying various problems; social, welfare, labor standards, and general economic problems.

Dr. ANDERSON. I understand you prepared a statement for the record. Do you wish to talk from it, or do you wish to read it?

Dr. WARE. I have a very brief statement that I would rather talk from than to read. What I have to say is chiefly this, The American system of public education was, as we all know, established on the assumption that in order to have an effective democracy it was necessary to have an educated citizenry. That system was established many years ago. The problem which led to the establishment of public education is with us today in the specific form, "How can we have a democratic citizenry in a technological society?"

As I understand the essence of a democratic citizenry, it is a citizenry whose members are competent to participate in the affairs which relate to their own problems in their own daily lives. That means that for us, for the people in our technological society, the problem is, How, through education and through other means can we develop the ability to participate effectively in the economic activities which are real to all our citizens.

Technology itself has determined the form in which we must answer that question, because the technology itself has, you might say, driven a wedge between the producer activities of the individual and the consumer activities of the individual. We no longer produce, most of us, most of the things which we consume; we produce for somebody else to consume; we consume what somebody else has produced, and it is this very fact of technology which you are discussing which has produced that situation.

Now, since technology has divided our individual economic activities into these parts, the problem of effective economic citizenship is a twofold problem of effective participation, as a producer and as a consumer. I would like to discuss the subject of adult education for economic citizenship under the two general heads of workers' education and consumer education.

I am making certain assumptions. First, I think I have already made clear the assumption of the continuing validity of the democratic premise.

Secondly, I am assuming that insofar as our economic system depends upon the bargaining relationship, whether between employer and employee or between producer and consumer, the parties to the bargain have to be equipped to bargain if the bargaining relationship is to be a real one.

Thirdly, I am assuming that, insofar as we have an economy which relies upon administrative action on the kind of decisions which are made when machinery is introduced, for example. Many such decisions are administrative decisions rather than buying decisions. In order to function as economic adults and to participate in bargaining and in administration, individuals need to have an understanding of the economic system of which they are a part, and particularly an understanding which is directly associated with their own economic function.

They need to understand the industry in which they work, and the factors affecting the goods which they buy. Moreover, as the extension of the technological society has brought more and more activity into the realm of public activity through the provision of public service and the intervention of Government to adjust and to regulate, it has become necessary for these same individuals to understand governmental activity relating to their lives. But it is not enough for individuals in our technological society to understand the economy and the Government. They must have the necessary tools with which to participate actively, if the principles of democracy are to obtain today.

(Mr. O'Connell assumed the chair.)

Dr. ANDERSON. Are you willing to be interrupted?

Dr. WARE. Yes, indeed.

Dr. ANDERSON. What do you mean by the generalization "by understanding the economy"?

Dr. WARE. I mean, specifically, that as lies within his power, the individual should understand the meaning of the economic activity in which he is engaged; he should understand his relation to the parts of the economy which he touches as a worker and as a consumer.

Dr. ANDERSON. Should that be specific understanding in the sense that he knows what the nature would be, for example, of a labor negotiation. Should a person who is affected by such a negotiation be able to read and interpret such negotiations?

Dr. WARE. Certainly. I am assuming that the things which are of direct bearing on his own economic life demand his understanding in just the way that things which have a direct bearing on his political life demand understanding.

Dr. ANDERSON. Do we have the facilities for such training and equipping of individuals?

WORKERS' EDUCATION

Dr. WARE. That is one of the things which we are beginning to develop through the field of workers' education. Workers' education is young in this country as compared with other forms of education. It has developed during the past 20 years, first from very small and privately sponsored beginnings, through the development of education within unions and through the extension of the services of the Federal Government, by the workers' education specialists in the W. P. A., and to workers who are seeking such an understanding.

If a worker is not merely an adjunct or temporary substitute for a machine, he must know not only his job on the line, but the plant and the industry of which he is a part. In one part of the rayon industry, for example, the union organization duplicates management from top to bottom. Opposite each subforeman, each foreman, each superintendent of the room or building or the plant or the company, there is a worker chairman of the same group; a worker chairman of the same group needs to know as much as management at that point in organization.

A very interesting illustration of what this can mean came out recently in a steel community in Pennsylvania, where the steel union was conducting a 2-month training course for union officers. In one community the classes were so good that the foreman who had to deal with these trained union stewards are reported to have stormed the class and demanded to be allowed to take part in it, too.¹

The International Ladies Garment Workers, at its 1937 convention, resolved that I. "An applicant for a paid office in the I. L. G. W. U. who has not previously served, shall not be qualified to run as a candidate unless he or she shall first have completed a satisfactory course of training conducted or approved by the educational department of the I. L. G. W. U., in localities where such courses are available." The kinds of things which were included in those courses of training are: 1. Background of theoretical courses in (1) History of the I. L. G. W. U. and (2) Economics of the Garment Industry; II. Practical Training Courses in (1) Parliamentary Procedure, (2) Trade Union Technics, and (3) I. L. G. W. U. structure and function.² Two years after this rule in the union went into effect the union's educational director reported that more students than could be handled had enrolled for these courses.³

Mr. MAGINNIS. May I interrupt you? I would just like to ask you one question. I don't quite understand your statement there in the rayon industry.

Dr. WARE. I had reference to the union organization in the viscose plants, the rayon workers union. In those plants the union organiza-

¹ Alice Hanson, Workers' Education on the March, *American Teacher*, April 1939, p. 2. (Dr. Ware's footnote.)

² *Justice*, March 5, 1938. (Dr. Ware's footnote.)

³ Hanson, *op. cit.*, p. 2 (Dr. Ware's footnote.)

tion down through the plant is so set up that for every representative of management there is a corresponding chairman, a shop chairman, for the union.

Mr. MAGINNIS. Is that corresponding or shop chairman, as you call it, working along with the other one?

Dr. WARE. He is a worker in the shop.

Mr. MAGINNIS. Do you mean there is an additional representative of the union working alongside the regular employee, whether he is a foreman or shop foreman or superintendent?

Dr. WARE. No, I just mean that if a foreman has a group of, let us say, a hundred workers under him, those hundred workers have a worker chairman in the union; if a superintendent has 500 workers, including the 100 under the foreman, there is a chairman of that 500; if there is a squad of 10, 15, or 20 men, with a subforeman, then there is a worker chairman of that same group.

Mr. MAGINNIS. And in that squad, that particular set of employees, they elect their chairman?

Dr. WARE. Yes, that is right.

Dr. ANDERSON. I take it the W. P. A. Workers Education program stems from earlier beginnings with the unions themselves and other private efforts?

Dr. WARE. Yes.

Dr. ANDERSON. It has taken on such proportions now, and has been in existence long enough, so that we may hazard a guess as to its future. Would you say that it had proved its worth to management and workers both, to make it look like a permanent institution, necessary in this complex economic situation in which we find ourselves?

Dr. WARE. My own answer would be very definitely yes. May I read an excerpt from a recent report of the Workers' Education Specialist of some of the demands from workers for the services of the W. P. A. Workers' Education Service. This is a report by Hilda Smith, the director, of one evening on a field trip in which she met with rubber and automobile workers in a midwestern town. I don't know the town. She asked them what kind of classes they wanted, and they asked, among others, these things:

Something to explain Social Security and how these new laws worked; classes on consumers' problems for the wives of union members in the newly organized women's auxiliaries; a teacher to talk about hygiene and the care of children; more help with English in the classes in parliamentary law and public speaking; advice from a librarian who knew which books and pamphlets would be most useful in a small library built up by one of the local unions; a motion-picture projector so that pictures might be shown before or after a union meeting or on a holiday.

Then what about someone to help with the newly organized sports league in one of these locals? Here as in many other places, the shorter workday in industry and the beginning of paid vacations had brought a new interest in recreation of all kinds. Could someone go along on their fishing trips, asked one young man, and teach "biology and all that wildlife stuff." Orchestras, choruses, drama groups, were mentioned and briefly discussed. There was no lack of interest in the fields of music and art, if only leaders could be found who understood not only music and art, but also how to use them in workers' groups.

Some union had made a survey of changes in their own industries; the displacement of men by new machines, accident rates, changing wage scales. Figures had been collected, but only a few people understood them. Could they get some help in making charts to show clearly and simply the results of these industrial studies? Maybe then their members would understand what the figures said and be able to use them in discussions of contracts or proposed legislation. Social science workshops, they had heard, had been started in other places. "What about one here?" these union leaders asked.

Miss Smith's comment on this report is:

That meeting with its suggestions of new needs and new directions for workers' education could easily have taken place in almost any industrial center in our country today, and in many rural districts also.¹

Colonel CHANTLAND. Miss Ware, is what you are trying to develop here or are developing a sort of postgraduate vocational education divided into two broad parts: First, to let each one learn more of his individual position and knowledge of the trends and effects, and, second, the specialized part of it which puts the certain number of better qualified ones up farther in the scale so that he can stand opposite his identical man from the other side in the industry? Is that something of the nature of it?

Dr. WARE. The word which I would have to be sure I was using the same way that you were is the word "vocational."

Colonel CHANTLAND. I am accepting it as it has generally been used in the discussions here, vocational education, that is the elementary training in a trade.

Dr. WARE. I am not talking about training in a trade.

Colonel CHANTLAND. I know you aren't; that is what I am trying to find out. Are you talking about something that would be in the nature of a postgraduate course following that? You assume that back of what you start with, don't you?

Dr. WARE. I assume a worker on the job, whatever his previous training; a consumer with a market basket, whatever her previous experience. With that as a starting point, I am talking about a form of adult education which builds upon the direct experience on the job and the market basket, and from that goes to and attempts to develop in individuals an understanding of their activity and an ability to function more effectively in their whole body of economic relationship.

Colonel CHANTLAND. Pick him up as a trade man, as a journeyman rather than an apprentice, and start from there?

Dr. WARE. You pick him up where you find him. You may find him with no formal education at all, or you may find him with school or college education back of it, but you pick him up on the job and go from there to the question of his desire to understand the job.

Perhaps if I quote from the President's Advisory Committee on Education the definition of workers' education as they see it, it will make it clear.

Colonel CHANTLAND. No doubt.

Dr. WARE. I hope it will make it clear. The President's Advisory Committee on Education, commenting on this program of the W. P. A., says:

Workers' education is an attempt to satisfy the individual's expressed desire to understand the problems of the working-wage class or group to which he feels that he belongs, to comprehend the relationship and responsibilities of that group to the rest of society, and, so far as possible, to apply the intellectual comprehension and emotional attitudes thus engendered to the process of living.²

Colonel CHANTLAND. That is pretty general, but you added something more specific to that when you had these more highly capable people as standing opposite—able to meet with and talk with their

¹ Smith, Hilda W. "New Directions for Workers' Education." *Journal of Adult Education*. April 1940, pp. 162-163. (Dr. Ware's footnote.)

² Campbell, D. S. Blair, F. H., and Harvey, O. L. *Educational Activities of the Works Progress Administration*. The Advisory Committee on Education, No. 14, Washington, 1939, p. 91. (Dr. Ware's footnote.)

parallels in industry. That is beyond this. It may be in there generally, but I thought you carried it specifically further.

Dr. WARE. I think this second definition carries it further still. The first definition which I read was from the person who surveyed the field. The second definition is from Miss Smith, the Workers' Education Specialist, and here is what she says: "Workers' education is a program offering to industrial, office, store, domestic, and agricultural workers an opportunity to train themselves in clear thinking through the study of those questions closely related to their daily lives as workers and as citizens," and then later she says, "Workers' education leads straight from the classroom to the community, encouraging the student to analyze his own situation as a worker and as a member of that community; to follow the classroom's term with further study of industrial and social problems; and on the basis of new facts discovered to assume definite responsibilities."¹ Carrying through to participation in a responsible manner is of the essence of the kind of education which I am talking about.

HEALTH PROGRAM ARISING OUT OF WORKERS' EDUCATION

Dr. WARE. I don't want to take the committee's time for illustration, but I would like either to give an illustration or to insert it in the record, whichever the committee wishes. The illustration is of a group of workers (this illustration again happens to be from the rayon industry) who went into the problem of health in that industry, and before they got through they touched the whole community, the Department of Labor had come in with a study, the compensation laws were involved, and the workers in the next State were trying to get a comparable law. Shall I introduce this in the record?

Acting Chairman O'CONNELL. Why don't you just tell us about it?

Dr. WARE. The story was this.² When the union was organized in the viscose industry, the union had a hard time finding in some of the rooms, workers with enough vitality and enough concentration, enough energy, to assume even shop steward jobs. They began to inquire as to whether maybe there wasn't something seriously wrong there.

There are two serious poisons, carbon disulphide poison, to which workers in the churn rooms are subjected in the regular course of their work, and hydrogen sulphide poisoning to which the spinners are subjected. In spite of these dangerous occupational disease hazards, almost no information on these poisons was available in American medical scientific or industrial journals when the union started organizing the rayon workers in 1937.

Acting Chairman O'CONNELL. I take it the management had no adequate information on these diseases?

Dr. WARE. Apparently not. There is some difference in the practice among the rayon companies with respect to health protection, and I am not fully informed. I can only give you this story here.

The union then set out to demonstrate the need for a study of the health conditions in the rayon industry. They set-up a health com-

¹ Smith, Hilda W. "Workers' Education at Determining Social Control." *Annals of the American Academy of Political and Social Science*. November 1935; pp. 82-92. (Dr. Ware's footnote.)

² Hanson, Alice. "Health Committees in Rayon," in *Workers' Education Through Action*. Affiliated Schools for Workers, February 1939, pp. 24-26. (Dr. Ware's footnote.)

mittee. They surveyed the plant conditions to try to make a systematic report on all cases of sickness, and they had an expert criticize their questionnaire. They had reported to their committee all cases of illness which developed, and they began getting not only occupational illness but accidents, until they got a basis for checking not only on illness, but on compensation cases and the proper handling of accidents.

As information about this survey went out into the shops, the workers began to come into the union office for information, and the health committee had to go out and find doctors and lawyers who would advise the committee and the patients about their cases and about their probable claims. After this activity had been going on for several months the United States Department of Labor requested the Pennsylvania Department of Labor to cooperate on a study of health hazards in the rayon industry. When they undertook the study, it was, of course, carried on by experts, but the union group cooperated in bringing cases before the experts that were making the study.

While the study was in progress, various community developments occurred. The Governor of the State mentioned the preliminary studies in a speech and brought the wrath of several chambers of commerce down upon his head. One newspaper offered as refutation of the studies finding a front page statement that "after all, we have the mute evidence of healthy workers walking the streets of Chester. This study after this can't be true."

Mr. MAGINNIS. Do I understand that management had nothing whatever to do with trying to meet that danger in the industry, that it was entirely the unions and the Department of Labor?

Dr. WARE. This sorry is entirely the story growing out of the union.

Mr. MAGINNIS. I understand that, but didn't management have anything to do with that?

Dr. WARE. No.

Mr. MAGINNIS. They didn't make any effort to try to protect their employees?

Dr. WARE. I can't answer that categorically without more information than I now have. As I understand it, the answer to your question is "No." As I understand it, whereas certain of the companies making some of these same things had acknowledged the presence of health hazards and had established conditions within the plant to try to deal with them—

Mr. MAGINNIS (interposing). In some of the companies the management were trying to deal with the problem.

Dr. WARE. That is right.

Mr. MAGINNIS. Then you couldn't say categorically the management had nothing to do with it.

Dr. WARE. No; I was talking of this specific situation, in a specific company.

Mr. MAGINNIS. You are dealing from the union angle entirely and you don't pretend to answer for what management has done or attempted to do to meet this situation.

Dr. WARE. I don't know the answer to that. I know only that when the study was undertaken it was not possible to find technical information.

Dr. KREPS. Miss Ware, I may say, as one who has studied the chemical industry, there are, of course, certain well-known poisons, and management is the first to try to see to it that the workers are protected. On the other hand, there are a number of chemicals concerning which the physical effects are not well known. We have had experiences with that in the administration of the Food and Drug Act. That sort of debate also takes place in industry, and there is a predisposition, a perfectly natural predisposition, in such a controversy for management to say, "Well, let's see; show us." There is such a thing as mere complaint on the part of the worker, and there is such a thing as management's resistance to action on every complaint by the worker. Now, the case that you mentioned is not, as might seem, an isolated one. I could demonstrate it in industry after industry. It is quite characteristic in this debatable area.

Dr. WARE. Thank you, Mr. Kreps.

Mr. PIKE. I have one along that same line. I was in a mine in Canada 7 or 8 years where they had been troubled with silicosis and knew they had trouble with silicosis for years. I asked the manager in what part of the mine people worked who contracted silicosis, and after many years' experience he didn't know. It never occurred to him to find out whether they got silicosis in the mills, at the faces, at the haulage levels, or where. I think within 6 weeks he had a pretty good answer as to where it came from. That elementary thing had never occurred to him.

Dr. WARE. That sort of thing comes out in these workers' classes all the time. For instance, in a class that I was teaching at one time there were some garment workers and the girls from a particular room said, "The light in our room is placed in such a way that it reflects from the metal plate on our sewing machine into our eyes, and girls that have worked in that room for even a relatively short time get so they just cannot see on the job," and all the workers in the room knew it, but that particular piece of information didn't get up through management. There are countless things like this of minor and major importance—this rayon story happened to be one of major importance.

Dr. KREPS. I may be anticipating what you want to say later, but aren't you pointing out that here is an example where workers' education, by changing the basis of dealing with management from assertion to fact, tends to raise the whole level of worker participation in industrial citizenship—a level, incidentally, that in the economic sphere is one we ought to reach quickly in this country? I was going to ask you whether a good many of our problems in the industrial-relations field have not been due to lack of experience on the part of worker leadership, experience which they can only gain either by long operation in the trade or some process of worker education. I would go further and ask whether probably some of the pressure for higher rates might not be abated, as it has been in Sweden, I believe, (I take it you are going to mention Sweden a little later), and that the workers themselves see that the way toward full employment and toward the highest annual earnings is not necessarily through higher wage rates. It seems to me all of this can only be attained through a vigorous program of adult worker education.

Dr. WARE. Yes. The main point which I would make would be roughly what you have been saying there; that is, that the area of worker participation, if we are to have a democratic society and at

the same time a technological society, must involve the economic and the public sphere. It goes way beyond a mere bargaining over a specific wage rate, as you have said.

Mr. HINCHES. Coming back just a moment from exactly that point to what you were saying with reference to health, as I understand it you didn't mean to imply that the employer doesn't likewise have a function to perform, you didn't mean to say that in many instances he doesn't have a very vital concern in the production of health hazards. All that you were saying was that in this field of health and accident there is at the present time a high hazard to workers, part of which may be inevitable, but which can always be somewhat reduced by increased knowledge of the source of the hazard, increased knowledge as to the means by which the hazard can be eliminated, and the willingness to make the necessary expenditures to reduce the hazard that is involved, and given that hazard rate which does exist and our ignorance with reference to the source of the hazard, and our unwillingness at times, and inability at other times, to make the expenditures that are necessary to completely eliminate the hazard, there is certainly a field in which the worker has at least as vital a concern as the employer in actively participating, pushing to a situation in which lower hazards occur. That is what you were driving at.

Dr. WARE. Yes; very definitely. This particular story that I started to tell included the community education by the workers, who got a reprint of an article which appeared in a medical journal and got it distributed to all the doctors in the county, the problem being on a frontier of knowledge; an occupational disease law went into effect in Pennsylvania, and the problem then became one of preparing compensation cases, and the workers participated there. The rayon workers in the neighboring State of West Virginia, where there was no such law, studied the Pennsylvania law and the experience of the workers in Pennsylvania and started in West Virginia to work for the same kind of protection. I want to use it as an illustration of the way in which a specific problem in a specific plant—namely, the inability of the union to find sufficiently vigorous workers in a particular room to take a union job of shop steward—led out through this whole range of contact in the community and made for more adequate participation.

May I add just one more quotation, this from the educational director of the particular union from which I have taken this illustration, who says:

An active union today is no longer an isolated business unit concerned only with the settlement of grievances in the plant. The fact that the new unions so largely are made up of unskilled and semiskilled workers means that earnings in this group will not for a long time to come represent an income to sustain a good standard of health and decency. Supplemental income must appear in the form of public services—housing, unemployment, old-age and health insurance, extension of public-school facilities, and services.

The worker's dollar, moreover, must be stretched in its buying power through cooperatives, through price regulation, and through credit unions for handling loans and savings. It is the business of the union in protecting its members and increasing their access to the good life to foster all these public programs which are directed toward more adequately feeding, clothing, housing, schooling, and doctoring the underprivileged two-thirds of the Nation.¹

¹ "Workers' Education Through Action," Affiliated School for Workers, February 1939, p. 5. (Dr. Ware's footnote.)

Did you want me to turn to Sweden and draw on the experience there?

Dr. KREPS. You traveled there this last summer, didn't you?

WORKERS' EDUCATION IN SWEDEN

Dr. WARE. Yes. I traveled there this last summer and I visited the center of the Workers' Education, the Trade Union College at Brunnsvik, and visited classes there and talked with the head of the Workers' Education Association as well as the head of the school. In Sweden workers' education is spread throughout the country under the general direction of the Workers' Education Association, which supplies materials and lectures and advisory services. Nearly one-third of the entire adult population of Sweden is included in the membership of organizations which support the Workers' Education Association there in Sweden. In addition, this work receives extensive public support, supplemental to the support which comes from member organizations, and that support is both local public and national public support.¹

The most intensive and ambitious part of the program is this Trade Union College which meets for 3 months during the summer. There some 50 young trade-unionists assemble for a 3-month course. They are rank-and-filers, picked by their unions and representing their unions; they are expected by their fellows to be the future leaders who will assume responsible positions.

Their method of study is very interesting, and may I take your time just to describe it? They want the very best in education, they can't afford to keep the best economists in Sweden at the school for all summer, so they bring one of the ablest economists in Sweden there for the first 2 or 3 weeks and he gives a series of lectures; then he goes away and leaves a tutor behind him, and divides the workers up into groups to write reports on a series of topics. Those reports are mimeographed and put in the hands of the entire school. The professor then comes back at the end of the summer and holds seminar discussions on these reports.

May I read you the list of some of the subjects on which they were writing reports:²

Population Developments in the Labor Market.

Women in the Labor Market.

Working Hours, Intensity of Work, and Unemployment.

The Effect of International Economic Relations Upon the Structure of Price and Production.

Planning Public Works from the Point of View of the Business Cycle.

Regional Differences in Wages and Living Costs.

Housing from the Social Point of View and the View of Production.

Rationalization.

Possibilities of Smoothing Out the Business Cycle.

Should the State Set Minimum Wages?

¹ Eleanor G. Colt, *Government Support of Workers' Education*, pp. 20-24. (Dr. Ware's footnote.)

² Landsorganisationens Skola. *Förvaltningsnämndens Bekättelse*. Stockholm, 1939, pp. 7, 8; class materials, summer 1939.

Should the Trade-Union Workers Movement Become Further Centralized? If So, in What Manner?

Should There Be a Leveling of Wages, and How Can Trade Unions Work for This?

These are the sorts of things on which those workers were preparing their own reports to constitute the basis of their seminar discussions, and, as I say, they were not now union leaders, they were rank and file, young people in their twenties.

Dr. ANDERSON. Dr. Ware, don't we have a growing experience in the United States on the same thing? I think I still am a member of the board of directors of the Western Summer School of Workers, and I have taught on its faculty several times. We have the same sort of thing there that you have just indicated in Sweden, although I suppose we are not nearly so far advanced as Sweden. The thing has taken hold here and it is moving very rapidly, is it not?

Dr. WARE. Yes; we have it, only Sweden has gone so much further.

I was interested in the comment of the head of the Workers' Education Association in Sweden on the character of this program. I commented on its broad scope and his answer was:

It must be so, for in Sweden labor has power and responsibility, responsibility which extends out to the whole community. The broad problems of the whole community must be understood by the leaders of labor. A strictly trade union college cannot confine itself strictly to union problems, for the problems of trade-unions are the problems of the economy.

That is Sweden's experience, which is way ahead of ours. It is along the line of democratic economic citizenship, looked at from the worker's point of view.

May I turn from the worker's approach to the consumer approach? Historically, the two approaches have come from different groups. Actually, in subject matter and in essential meaning they are very close together. Workers' education started with the worker in the industrial plant and has extended to white-collar workers and even professional workers, in the government, for example. Consumer education, or consciousness of the problems of economic citizenship of the consumer, has developed first in the middle-income groups; in such a group as the members of the American Association of University Women, in which I am active. The two are coming very close together as the workers are coming to see what goes out of the pay envelope is as important as what comes into it.

Workers' education and consumer education have in common not only that they are aimed at effective economic citizenship but they both start with concrete daily economic experience; consumer education starts with the market basket; workers' education starts in the shop.

The need for consumer education, as I have said, is a direct product of technology. It is a product partly of the splitting of functions through technology and partly of the complexity and multiplicity of goods which technology has put on the market.

In a nontechnological society, the problem of the consumer is to find the physical things or to make them himself. In a technological society the problem is to know and choose and have the means to acquire those things, and it is that that has made the new problem of consumer education a very real problem.

Consumer education started, as I say, with the market basket, and has grown out like circles from a pebble in a pool.

It started with attempts of consumers to learn to be good buyers, but very soon consumers found that the means of knowing enough about the things they were buying to be a good buyer weren't available, in many cases. Consumer education, like workers' education, leads out into an attempt to do something as well as to learn. Consumers found themselves seeking ways of getting more information on labels, in advertising, and in the hands of sales people. Then they found that there was difficulty even here, because although in many cases information was in the possession of the manufacturer and of the distributor, there were many cases in which there were no adequate terms to describe goods that could have meaning for consumers. So consumers found themselves asking, "How can relevant means of describing merchandise be developed; that is, how can standards for ultimate consumer goods be established?"

Mr. PIKE. The necessary translation of trade terms familiar in the industry but totally unfamiliar to the consumer?

Dr. WARE. That, for one thing, but that not alone.

Mr. PIKE. Going forward from that.

Dr. WARE. Going forward. Of course, no industrial consumer, no buyer of industrial products for further manufacture, would buy without specification, and the work of the American Standards Association over the years has developed a very extensive standardizing procedure for goods which go into further manufacture. Some of those standards are relevant or applicable to the finished product, and the problem there is to find ways of getting that information passed on to the consumer. Many finished products, however, have not had standards developed, so that the consumers found that the job was a job of developing standards as well as getting out the information which is now available.

Moreover, the kind of standard which is informative to the manufacturer who is putting things together may be quite different from the kind of standard which is relevant to the consumer; the consumer wants to know what use he can get out of it. He wants a performance standard, whereas the manufacturer who has technical knowledge wants a standard based on composition.

Mr. PIKE. That answers the question most completely. For example, say in cotton cloth, the manufacturers know that a certain given number of threads would mean a certain thing, but to the consumer that wouldn't mean anything in the world.

Dr. WARE. Consumers are beginning to learn about thread count. But consumers feel that they should have, let us say, A B C standards for sheets for a particular purpose which would give a basis of comparison. After all, a producer can be technically informed about a particular product, but the consumer's activity is scattered over so many products that consumers can't be expert in everything. It is that problem that consumer educators are trying to get over.

In my organization we had an interesting experience the other day. A man from a company came to us and said, "Here is our last example of glamor advertising." He had a magnificent book—it was a fabric firm—all full of pictures of these fabrics, done up with oriental scenes and Lord knows what—it must have cost a lot—and he said, "We are

through with that. Now we are going in for fact tags, and we want to know whether this is the right information to put on those tags." He had the results of a survey of consumer opinion—I don't know how carefully he had conducted it—showing a very, very cordial response to the kind of information that he was going to put on the fact tags. That is evidence of the process of consumer education which is going on.

Mr. PIKE. You might say the education was going the other way, too, perhaps.

Dr. WARE. That is true. Consumers trying to educate themselves found very quickly that the job couldn't be done by self-education unless the educated consumer moved out into action.

Mr. PIKE. And educated the manufacturer as to what they wanted.

Dr. WARE. Educated the manufacturer as to what they wanted and developed procedures for getting the relevant information in the right place.

I think perhaps if I just read over the list of some of the subjects which are covered in consumer education, starting from the problem in the market place, it has gone to the problems of consumer economic citizenship.

The General Federation of Women's Clubs, with some 3,000,000 members, has recently developed a series of what they call one-day programs in consumer education, and this is the brief list of their study leaflets:

Government Services to Consumers.

The Planning of Savings and Expenditures.

Our Taxes and What They Buy.

Interstate Trade Barriers.

Consumer Protection in Food, Drug, and Cosmetic Industries.

How Far Can Consumers Help Themselves by Cooperation?

Social Security.

Agricultural Production Control.

Medical Care.

Consumer Credit.

That is where consumer education, which starts with the market basket, leads; those are the questions which the General Federation of Women's Clubs has turned to.

The material which the American Association of University Women study groups are using along with their study guide on Scientific Consumer Purchasing¹ includes such things as this (I won't go through the whole list): Material on so-called fair-trade laws; credit to consumers; judging fabric quality, and other things of that sort; material on developing standards; food and drug regulation; the Federal Trade Commission, the complaint of the Commission in the case against Good Housekeeping magazine; interstate trade barriers; the methods which are now being carried out for cooperation between retailer and consumer; consumer taxes; the challenge of underconsumption. Those are just some of the subjects.²

The main contribution of consumer education, as I see it, is in the orientation which it gives to economic problems. After all, consumer education assumes that the consumer is a person and not just a market,

¹ Alice Edwards, Washington 1939. (Dr. Ware's footnote.)

² See also Consumer Education Service, News Letter, published by American Home Economics Association. (Dr. Ware's footnote.)

and assumes that the purpose of production is in order to have the things people need. Although that is a terribly obvious and self-evident point, nevertheless it is almost a new point of view, largely because we have developed a thoroughly producer-minded society.

A nice illustration of that is the story behind this publication of the Bureau of Home Economics on Children's Body Measurements for Sizing Garments and Apparel. When a project to get more standardization of sizes for children's garments came up, the question was, Shall the standards be set in terms of the practice in the trade or in terms of the sizes of children? It took 2 or 3 years' battle to get the project finally set up in terms of the sizes of children instead of in terms of the practice in the trade.

One could illustrate endlessly the respects in which we have a producer-centered society, which goes on the assumption that somehow or other if the interests of the producer and the seller are taken care of, the interests of everybody as consumers will somehow come out all right.

Our habit of calling the balance of foreign trade favorable when we get rid of more goods rather than when we get more goods is just an illustration of something which goes through our whole society.

Acting Chairman O'CONNELL. One illustration was fair-trade laws?

Dr. WARE. Yes.

Acting Chairman O'CONNELL. Price fixing?

Dr. WARE. Yes. One need not multiply the illustrations, but they could be multiplied.

The possibilities of the consumer approach are endless. I was struck with the possibility in a meeting of teachers in the District of Columbia that I was attending the other day where the discussion centered on the community resources in relation to the schools. One of the men on the panel, after the discussion had gone on and had brought out various interesting possibilities, said: "Do any of you have any experience of any community which has set itself the problem of figuring out what it wants its young people graduating from high school to do and what it wants done in the community? The community is not going to let those youngsters starve. Have any of you any experience in a community which has thought through its wants and resources in that fashion?" Well, a pall of silence fell over the meeting. But it seems to me that there is the direction in which the consumer-education approach goes.

WORKERS' EDUCATION AND ECONOMICS LITERACY

Dr. WARE. In summary, I think I would say that the major contribution of both workers' education and consumer education to the development of economic citizenship lies in their method and approach rather than in the specific content of any part of their programs. Workers' education is built on the assumption that the worker as a human being takes precedence over the worker as a tool. Consumer education is built upon the assumption that the consumer as a human being takes precedence over the consumer as a market.

Traditionally we have assumed that democracy began in the political ward, not in the shop or the market place, and education for democracy has been built in those terms. To my way of thinking, worker and consumer education together provide a constructive educational approach to the problems of democracy in a technological society.

Dr. ANDERSON. You infer then that bargaining involves some equality—that a worker, for example, will know enough about the whole economic scene to be able to act on something like an equal basis with his manager or employer?

Dr. WARE. Well, we have a traditional economic theory which assumes that we get the right price, the right wage as the result of bargaining in the market. Insofar as we are relying on that kind of mechanism, I would say that we have got to have a bargain which is a bargain, and not a take-it-or-leave-it proposition.

Dr. ANDERSON. The bargaining itself implies equal bargaining power.

Dr. WARE. Yes.

Dr. ANDERSON. And would you then move in the direction of an educational procedure for workers in which very precise information would be in their hands? For example, would workers' education include such things not only as negotiation and necessary elements of negotiation, but the use of such an instrument as the strike and what the use of the strike means, what discipline is necessary to use it effectively, and when it should or should not be used? Is that part of workers' education?

Dr. WARE. Yes; just the same as the use of the ballot and the same as the use of any of the social tools. I think I could generalize the answer to your question in this way: One of the products of our technology is that we do things in groups; we don't do many things individually. Since we are doing things in groups, in order to be effective we have to know how to use group tools.

Dr. ANDERSON. In other words, you don't any longer put the strike in the same category as the supposed unmentionable social diseases we are now beginning to take a look at openly. You say that the way to proceed is to take serious cognizance of all these social tools, learn how to use them effectively, and you will raise the plane of bargaining and substantially reduce the friction points. Is that right?

Dr. WARE. That is right. You have just taken the strike as an illustration.

Dr. ANDERSON. Yes, that is all.

Dr. WARE. Of course, it is the last social tool to use, everybody, I think, would agree.

Dr. KREPS. In other words, as you see the problem of living with the machine and getting the benefits of the machine, it consists fundamentally in raising the level of worker and consumer literacy, economic literacy, rather than in trying to break so-called log jams by going around and suing a few people or trying to subsidize somebody or trying to tax somebody.

Dr. WARE. I wouldn't regard it as an either-or; I would regard it as a necessary "and" to any program which may be developed in any other area. I would not say that either workers' education, or consumer education, or a combination of them, was the answer to all the ills of our society; but I would say that if we are to operate a democratic society in the face of technology, no matter what other devices are used economic literacy has got to come along, too, and it has got to be the foundation.

Dr. KREPS. In other words, the ability to make economic adjustments and to use, as I understand the Swedish consumers have

used, their organized power to emancipate themselves from monopolies of various kinds—the ability of workers to restrain their own desire for higher wage rates because of the possible impact on the economy as a whole, that type of self-discipline which is necessary to civilize the machine comes into operation with the kind of worker and consumer education program which you have seen operative in Sweden.

Dr. WARE. Which I have seen operative in the United States more than I have in Sweden.

Dr. KREPS. And in the United States, I should say.

Dr. WARE. May I put as a footnote a little illustration from a class of Southern workers in which the question of technological unemployment was discussed?

This was a class of very limited literacy and very limited vocational experience, and it included both agricultural workers and industrial workers. The class started thinking about technological unemployment, and someone mentioned a cotton picker. One of the girls in the class said, "The cotton picker is going to be awful; it's going to put so many people out of a job."

There was an Arkansas sharecropper in the class, and I turned to her and said, "Will you describe cotton picking for us, Johnnie?"

And Johnnie described cotton picking, how heavy the bag was, and how all the youngsters were out working in the field picking cotton along with the adults. One of the industrial workers shook her head and said, "Gee! It sounds as if that cotton picker was going to put a lot of cotton pickers out of mighty poor jobs."

And another girl said, "Yeah, but a mighty poor job is better'n no job at all."

They all shook their heads over that, and then I said, "Well, suppose you were in a position yourself to decide how to use this machine. Suppose it was your machine." They thought about that for a while and one of them said, "You mean if the people that are working on the plantation had the machine and could use it instead of being put off by it, why then the kids wouldn't have to pick cotton; they could go to school."

I think it is a relevant illustration.

Acting Chairman O'CONNELL. Are there further questions?

(The witness, Dr. Ware, was excused.)

Acting Chairman O'CONNELL. We will recess until 2:30.

(Whereupon, at 12:55 o'clock, a recess was taken until 2:30 o'clock of the same day.)

AFTERNOON SESSION

The hearing resumed at 2:35 o'clock upon the expiration of the recess, Sumner T. Pike, Department of Commerce, presiding.

Dr. ANDERSON. Before I introduce the first witness, I should like to introduce as an exhibit the testimony of Thomas F. Burns, vice president of the United Rubber Workers, on technological unemployment and decentralization in the rubber industry. This statement would have been presented orally were it not for the shortness of the time.

Acting Chairman PIKE. It may be admitted.

(The document referred to was marked "Exhibit No. 2749" and is included in the appendix on pp. 17564-17577.)

Dr. ANDERSON. Mr. Chairman, two witnesses will summarize the case studies and their own observations on the effects of technology upon the employment of the national labor force. They are Mr. Corrington Gill, of the Work Projects Administration, and Dr. Isador Lubin, a member of your committee.

Mr. Gill is before you.

Acting Chairman PIKE. Do you solemnly swear that the testimony you are about to give in this proceeding shall be the truth, the whole truth, and nothing but the truth, so help you God?

Mr. GILL. I do.

Dr. ANDERSON. Mr. Gill is accompanied by Mr. David Weintraub, who is responsible for a great deal of the work that will be discussed.

Acting Chairman PIKE. Mr. Weintraub, do you solemnly swear that the testimony you will give in this proceeding shall be the truth, the whole truth, and nothing but the truth, so help you God?

Mr. WEINTRAUB. I do.

**TESTIMONY OF CORRINGTON GILL, ASSISTANT COMMISSIONER;
AND DAVID WEINTRAUB, WORK PROJECTS ADMINISTRATION,
WASHINGTON, D. C.**

Dr. ANDERSON. Mr. Gill, what is your position?

Mr. GILL. Assistant Commissioner of the Work Projects Administration.

Dr. ANDERSON. How long have you been employed in this field of activity?

Mr. GILL. In 1931 I became the economist and statistician for the Federal Employment Stabilization Board; in 1933, in the spring, I became Assistant Administrator of the Federal Emergency Relief Administration, and have been with W. P. A. since July 1, 1935.

Dr. ANDERSON. Prior to that were you engaged in a profession that is related to the field of your testimony?

Mr. GILL. Prior to that time I had done some 6 years of research work in the field of economics and business conditions. Prior to that I was in newspaper work here in Washington, covering the departments for financial news, and as business manager of the Washington Press Service.

Dr. ANDERSON. And you have published in this field?

Mr. GILL. One book and several articles.

Dr. ANDERSON. And the book is a recent publication, Wasted Manpower.

Mr. GILL. Wasted Manpower, published last September.

Dr. ANDERSON. In which you have covered a good bit of the topic that you are going to discuss today.

Mr. GILL. In a broader way. This is one phase of the broad subject.

When the Works Progress Administration was established in 1935 we had had 2 years of recovery. Industrial production was substantially above the low point of the depression; industrial employment, however, had not picked up nearly as rapidly; the unemployed numbered 10,000,000 to 11,000,000, or about a fifth of the Nation's manpower.

As a functioning part of the administration's program directed essentially toward recovery, the W. P. A. was vitally interested in the

prospects for reemployment of this labor force. Since technological advance was obviously one of the important factors which affected these reemployment prospects, we initiated a group of studies of the role that technology played in current unemployment problems and long-run employment trends. This was the origin of the National Research Project on Reemployment Opportunities and Recent Changes in Industrial Techniques.

The other day Mr. Kettering spoke here about the cooperative nature of industrial research. Since the W. P. A. was not the only organization which had an interest in these problems, we too sought and obtained the cooperation of other governmental and private agencies and of industry and labor. One series of the studies, for example, was conducted in cooperation with the Bureau of Labor Statistics; other studies were done in cooperation with the United States Bureau of Mines, the Railroad Retirement Board, the Department of Agriculture and various agricultural experiment stations, the Department of Commerce, the Social Security Board, the Bureau of Internal Revenue, the Federal Trade Commission, and the Tariff Commission. Among the nongovernmental agencies were the industrial research department of the Wharton School of Finance of the University of Pennsylvania, the National Bureau of Economic Research, and the employment stabilization research institute of the University of Minnesota. Throughout, in collecting information the project has also enjoyed the cooperation of industry, of labor, and of farmers.

We feel that the National Research Project, directed by David Weintraub, is currently contributing the greatest amount of information on this question of the role of technology in production, employment, and unemployment. Thus far more than 60 published reports have resulted from the project's work.

Dr. ANDERSON. In order to facilitate Mr. Gill's presentation, we would like to introduce his exhibits into the record, and will assign them numbers.

Acting Chairman PIKE. They may be received.

(The documents referred to were marked "Exhibits Nos. 2752 to 2783" and are included in the appendix on pp. 17577-17596.)

Mr. GILL. The reports have been widely distributed and the value of the findings is well shown by the frequency with which material from the project's reports has been used before this committee during the past 3 weeks.

The two main subjects which I should like to discuss before this committee are (1) the economic role which technological changes have played in recent years and (2) the impact of technological change on workers. I will discuss these subjects primarily from the viewpoint of an agency charged with the responsibility of caring for the able-bodied unemployed.

The decade that has just passed is unique in American economic history. It has been marked by the worst depression the country has ever known—a depression unparalleled both in severity and in persistence. At the end of the decade recovery is still far from providing normally full employment of the country's human and material resources.

Perhaps the best indication of how much worse the economic difficulties of the last 10 years have been than those of any previous period is afforded by a comparison with the so-called great depressions of the

1870's and 1890's. Production and employment are the most vital elements in economic well-being. Although it is only in comparatively recent years that employment figures have been gathered, reasonably satisfactory production data are available as far back as 1870. Indexes of general industrial production undoubtedly furnish the most satisfactory measures for a comparison of the course of the three depressions.

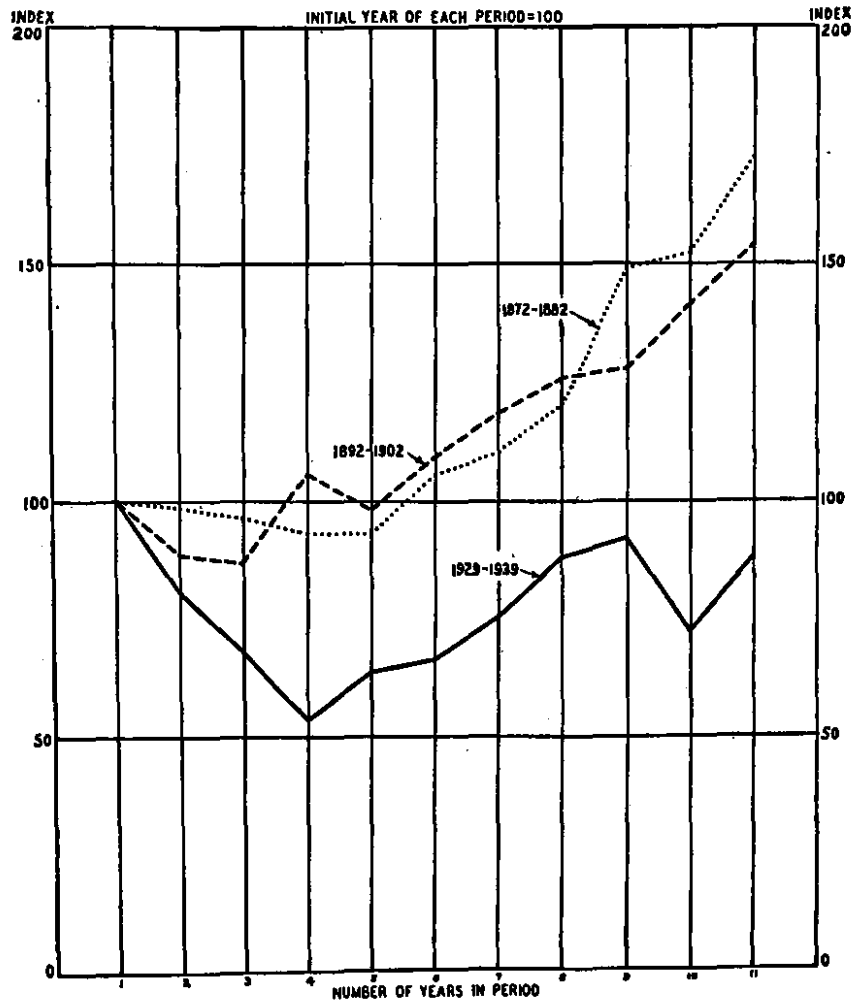
I should like to submit this chart for the record.

Dr. ANDERSON. It will be admitted.

(The chart referred to was marked "Exhibit No. 2750" and appears below.)

EXHIBIT No. 2750

Chart 1 INDUSTRIAL PRODUCTION DURING THREE DEPRESSION PERIODS
1872-1882, 1892-1902, AND 1929-1939



INDUSTRIAL RECOVERY AFTER DEPRESSION

Mr. GILL. This chart compares industrial production for the three decades—1872-82, 1892-1902, and 1929-39. The peak year of the preceding prosperity is in each case taken as the base. The unique character of the decade that has just passed is immediately evident. The differences in severity and length between the depression of the 1930's and the two earlier depressions is so great, in fact, as to suggest a difference in kind. From 1929 to 1932 industrial production declined by almost 50 percent, as compared with a maximum fall in the 1900's of 13 percent, and in the 1870's of 7 percent. The contrast in the three recovery periods is quite as striking. In 1939 production averaged somewhat below 1929. In each of the earlier periods it had far surpassed the previous prosperity peak; 1882 was 70 percent above 1872 and, 1902 was 55 percent above 1892.

Other indicators tell the same general story. No data exists on which to base a direct estimate of unemployment in either the seventies or nineties. However, some idea of the extent of unemployment in the earlier depressions can be formed from a study of production and labor-supply figures. The latter are available for census years; 1870, 1880, 1890, and 1900 were all generally prosperous years. Hence it is reasonable to assume that unemployment in each of them was at or near the practical minimum. The increase in labor supply can thus be taken as a rough measure of the increase in employment for the decades 1870-80 and 1890-1900.

I would like to submit the next chart.

Acting Chairman PIKE. It may be admitted.

(The chart referred to was marked "Exhibit No. 2751" and appears on p. 17224.)

Mr. GILL. This chart shows the trend of gainful workers, minus those attached to agriculture, for each of the three decades—1870-80, 1890-1900, and 1929-39. It also shows the course of industrial production in each of these periods. Many refinements for which the materials do not exist would, of course, be necessary before any detailed conclusions could be drawn. One central fact does, however, stand out clearly. The increase in the severity of the decline in industrial production in the 1930's was so great as to leave no room for doubt that unemployment must also have been considerably more severe than in earlier depressions.

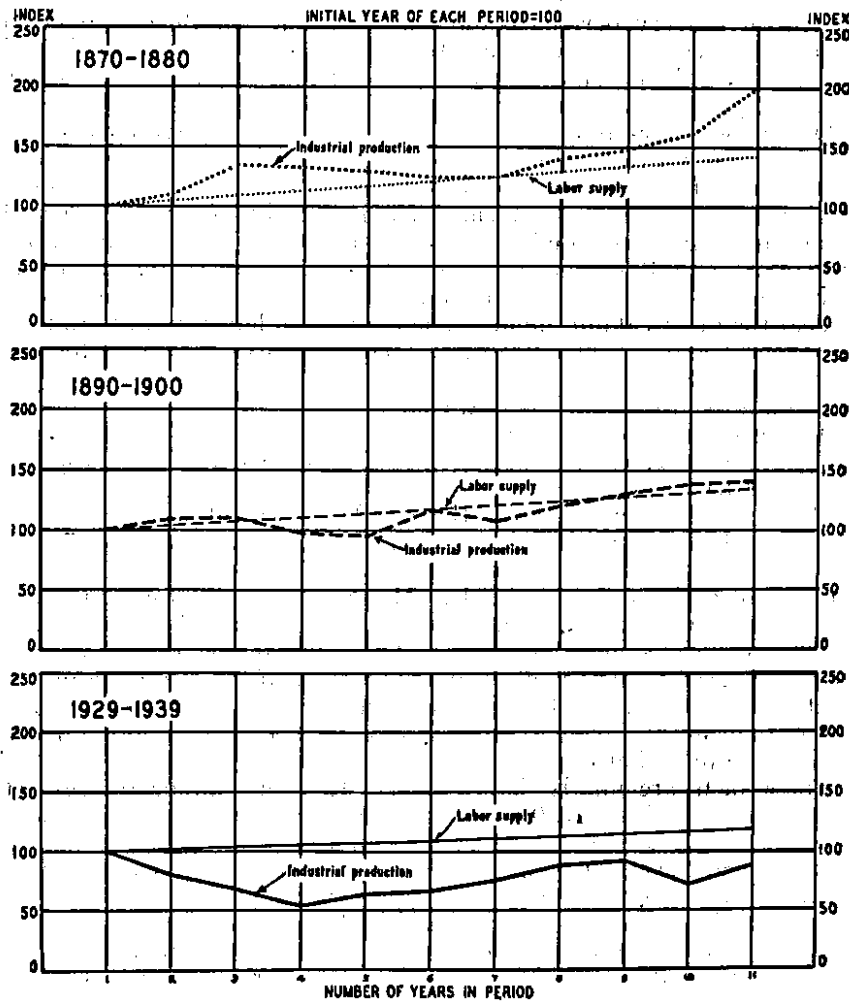
These facts are unmistakably clear. In every important respect the depression of the 1930's has been far more severe and far more persistent than any previous depression the country has seen. In 1939 we had 2,000,000 or 3,000,000 fewer persons employed than in 1929, although the volume of goods and services produced was almost the same. This unemployment was in addition to the 2,000,000 persons who were unemployed in 1929, and was aggravated by the natural increase in population which resulted in over 6,000,000 net new additions to the labor market. Consequently, despite recent attempts of some newspaper columnists to write them off, there were 10,000,000 to 11,000,000 unemployed in 1939. The major problem is thus one of fuller utilization of the productive forces of the Nation—natural resources, plant capacity, and labor.

With respect to the subject matter of these hearings, the question arises: What were the effects of technological changes on recovery in recent years?

As your chairman aptly put it the other day: "The measure of technological advance is the capacity of the masses to buy the products

EXHIBIT No. 2751

Chart 2 INDUSTRIAL PRODUCTION AND THE LABOR SUPPLY DURING THREE DEPRESSION PERIODS



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of technology." We are therefore interested not only in the physical aspects of changing industrial technics, but also in the social and economic ways in which these technics are used.

Traditionally, technological progress has contributed to a continually expanding economy by stimulating increases of production

through the reduction of costs, by introducing new products and new industries, and by increasing the demand for capital goods. Hence, technological progress has, in the past, played an important role as a factor of recovery from depression.

Now, it has already been pointed out to you by several witnesses that technological changes in industry are continuous and cumulative in their effects. There is no way of telling what the technological changes of the future will be, or precisely how they will affect employment and investment. Moreover, it is important to realize that the consequences of technological advances are by no means uniform.

The automobile industry, which has been discussed before you at some length, is a classic example of a technological innovation that, in the past, had created more jobs than it destroyed and also provided important indirect support to employment through its effect on investment and income.

That such an effect of technological change is by no means universal can be seen by a glance at our industrial history since 1920. The country's manufacturing industries were, throughout that period, subject to continuous and cumulative technological changes. The effects of these changes on labor requirements are reflected in the measures of increased labor productivity which are embodied in several of the National Research Project's reports. Many of these data have already been presented to you by Dr. Kreps and others. These increases in labor productivity were, during the 1920's, usually accompanied by increases in production. But in the face of the rate at which technological improvements were taking place, the increases in production were not great enough. The manufacturing industries, although their production increased by 50 percent during the 1920's, showed virtually no increases in employment. Other industries which, prior to the World War, were relied on to provide an increasing number of jobs for our growing population not only failed to continue this traditional role but in many instances also failed to maintain their previous employment levels. Mining and the railroads registered substantial declines. Employment in agriculture declined during the war period and showed no increase during the twenties.

These increases in the productivity of labor represent continuations of past trends in our economy. The particular feature of recent developments is the important part played by a multitude of refinements and improvements, which are a day-to-day outgrowth of developing science and technology. The revolutionary changes which are associated with the initial shift of an industry from a handicraft to a mass-production basis pave the way for a continuous chain of less spectacular changes whose effects on labor productivity may be even more important. Revolutionary changes which result in the direct displacement of workers are by no means a thing of the past, as you heard in the description of the introduction of the continuous-strip mill by an earlier witness. Today, however, such changes rarely occur. The typical changes in industrial processes at the present time are the day-to-day improvements of already existing equipment; they are usually not spectacular and many of them require relatively small capital outlays.

Thus the development of tungsten carbide steel has made it possible to increase the operating speeds on machine tools as much as thirtyfold without any important additional capital outlay. Metal-

lurgists have also developed more easily machinable alloy steel which has enabled many manufacturers to increase the output per unit of labor time from 30 to 50 percent. The important part played by increased knowledge of chemical changes and its application to industrial processes is illustrated by the introduction of organic accelerators, which reduced the time for curing rubber tires by one-half to two-thirds, with only small attendant capital outlays. Thus, operating costs and labor requirements have been significantly reduced by a series of refinements which create small or no investment opportunities.

ADVANTAGE OF SIZE IN MECHANIZATION

Mr. GILL. Many of the improvements and refinements in machines are associated particularly with equipment of large capacity. Aside from improved design, size is frequently an advantage in and of itself. Large-capacity equipment frequently requires no greater operating labor per operating unit than smaller equipment. Furthermore, the cost of manufacturing a particular type of equipment does not usually increase proportionately as the capacity of the machine increases. Accordingly, the capital investment per unit of capacity usually decreases with an increase in the size of the equipment. In the petroleum-refining industry, for example, for one type of equipment, operating costs per unit of capacity for the large units are only about one-third as great as for the small units. Similarly, investment per unit of capacity is only about one-third as great for the large as for the small units. These economies of large-capacity equipment are available principally to the large enterprises. This is due both to the technical possibilities of large-scale production and to the availability of funds for investment.

Other types of technological change which accrue principally to large enterprises are the mechanization of handling and the introduction of continuous processes. The most important economies associated with these changes follow the reorganization of plant lay-out to assure the continuous flow of materials and the necessary synchronization of one operation with another, that is, by improvements in the organization of production—an important phase of recent technical advances. I should like to illustrate this by reference to the conveyor assembly-line system of production which has effected spectacular economies in such mass-production industries as automobile and radio manufacture, which involve the assembly of numerous parts. The elimination of handling labor by the conveyor is only a small part of the total economies effected. Labor productivity is increased, principally through the reduction in stoppages and the increased intensity of labor, whose speed is to a very large extent set by the speed at which the belt operates.

In large-scale industries working with homogeneous materials, the introduction of the continuous-process principle has effected equally great economies, but has been accomplished somewhat differently. Previously distinct operations have been integrated, either directly or through the use of mechanical conveying equipment. The necessary synchronization is accomplished largely with the aid of instruments, and much operating as well as handling and storage labor is eliminated. In many of these industries, notably electric power, petroleum

refining, steel, glass, paper and pulp, and chemicals, after two decades of such developments, entire departments and plants are now operated from central instrument panels at which a few operators are stationed.

Such recording and controlling instruments, employed in large, highly mechanized plants, are an example of the type of equipment, auxiliary to the principal production units, which has found extensive application in recent years. Such auxiliary devices have involved only small capital outlays in relation to the economies which they made possible.

Numerous instances could be cited to show the reduction in operating costs effected through the precise regulation of processes with the aid of such instruments. According to one of the project's studies, the expenditures for controlling and measuring instruments per \$1,000 of machinery rose from less than \$4 in 1919 to more than \$14 in 1939. The increase in the use of industrial instruments which automatically control the operation of machinery or processes has been especially notable.

As a percentage of total sales, controlling instruments have risen from 8 in 1923 to more than 35 at the present time.

Not only are the larger enterprises the principal beneficiaries of the typical developments in industrial techniques, but they also possess the organization for systematic technical advance, through organized industrial research. As one of the project's reports has shown, the number of workers engaged in industrial research has increased five-fold during the past 2 decades. It is estimated that in 1940 close to 30,000 research workers are employed.

This work has been concentrated in the hands of relatively few companies; half the research personnel is employed by about 50 large corporations. Approximately 2,000 other concerns employ the other half of research personnel, while more than 150,000 manufacturing companies do not maintain any organized research. In 9 leading industries, one-fourth of the companies that operated laboratories in 1938 employed between 56 and 90 percent of the research workers in the respective industries.

Now, there are certain points which I should like to stress with respect to the characteristics of recent technological developments.

First, the establishment of the basic machine techniques, which was accomplished in the bulk of manufacturing industries before 1920, has multiplied rather than restricted the opportunities for technological change. There is, therefore, no reason to expect any cessation in the rate of increase of labor productivity, since it can be expected that as mechanization continues fresh opportunities for improvement will unfold themselves.

Second, while revolutionary changes in technique are still occurring, the emphasis in the recent period has been on detailed improvements in established techniques. These latter changes are, however, extremely pervasive; in time they cut across the whole production processes of an industry, spread from industry to industry, and their cumulative effect on labor productivity and their threat to the security of workers has been far greater than the occasional, spectacular, revolutionary changes.

Third, it is important to note that technological advances may be reflected in a reduction in labor requirements outside of the establish-

ment in which they occur. Illustrative of this is the reduction in the demand for coal as a result of improvements in the efficiency with which coal is burned. One of the project's studies shows that fuel consumption per unit of output was reduced by almost 80 percent at central power stations between 1899 and 1936, by 32 percent on steam locomotives between 1917 and 1936, and by 16 percent at cement plants between 1914 and 1935. The difficulties of the coal miners are in no small degree ascribable to this technological development outside of their own industry.

Fourth, the nature of recent technological changes has been such that significant increases in labor productivity have been accomplished in many instances without important additions to capital investments. The studies of the National Research Project present a mass of information covering changes in technology and productivity during the last 2 decades or more. During the last decade the emphasis has been on technological changes of a labor-saving rather than plant-expansion character. This is reflected in the project's findings on recent types of changes and on productivity in mining, manufacturing, transportation, communication, and power production. Notwithstanding the fact that many factors operate to reduce productivity when production is curtailed, the findings show that productivity continued to increase in most industries even during the decline of the early thirties.

In many instances, old and fully depreciated machines are replaced by improved machines, which are capable of much higher outputs but which do not involve an increase in investment. The economies effected through the use of auxiliary equipment are frequently accomplished with only small capital outlays. In many cases, moreover, the smaller capital outlays involved in the use of auxiliary equipment are a substitute for the larger capital outlays involved in the construction or in the equipping of new plants for additional production capacity. Although the introduction of handling and conveying equipment involves considerable investment, there is frequently no increase in investment per unit of output since the initial outlays are offset by savings in space, the fuller utilization of equipment, and the reduction of raw-material inventories and storage.

The fifth point I want to make with respect to the characteristics of recent technological developments is that they are obtainable principally by the large concerns. There is evidence that in many industries the small concerns are being forced out of business because they cannot keep abreast of new technological developments. In testimony presented to you by an earlier witness, the elimination of many small steel mills was attributed to their inability to employ the new processes.

In the bulk of American industry, the trend toward the elimination of small enterprises and the concentration of production in large corporations is an observed fact. Our studies have shown that this trend has a technological basis in the advantages in production costs gained by the organization of production in large plants, by equipment of large capacity, and by many types of special-purpose equipment which aid in economies of production while they add little to capital requirements. The economic advantage possessed by large enterprises with respect to the utilization of labor has been reflected in most of the manufacturing industries studied by the project. In mining operations, also, the benefits of mechanization tend to accrue to the larger

enterprises, and mechanization in agriculture favors production on larger farm units.

One more point. The strengthening of large enterprises through technological changes has its basis not only in the characteristics of their production techniques, but also in the concentration of research. This concentration tends to widen the technical and economic advantages of large enterprises over smaller ones which are without research facilities and cannot keep pace with new scientific developments. This factor is important in any evaluation of the prospects for the development of new industries and new products, on a scale sufficiently great to constitute a demand for capital goods substantial enough to stimulate general recovery. In considering the prospects for the development of new industries out of current industrial research, it must be remembered that though the companies which finance this research are interested in the development of new products, they are also concerned with the safeguarding and improvement of their existing investment in plant and equipment.

I have earlier referred to recent types of technological changes which typically find application where production is organized on a large scale. This is doubtless in part ascribable to the fact that most research is done by large enterprises which naturally concentrate on their own problems. The characteristic technological advances which they develop cannot usually be applied in small enterprises either because finances are wanting, or because the techniques cannot be employed on the production scale of such enterprises. Yet this is not a necessary development in all industries. Efficient production does not necessarily exclude small-scale operation, provided the technological base is studied specifically with a view to improving it; I am certain that in some cases at least research can fruitfully be redirected to problems of the small enterprise.

Some means should be developed for making the results of scientific research more generally available to small as well as large enterprises. Greater emphasis should be given to industrial research directed toward the development of new products or industries and to those technical problems which are peculiar to the small and medium-size producers now without adequate research facilities. Such a development, encouraged and perhaps in part supported by government, may make it possible not only to employ all of our trained scientific personnel, but also to stimulate capital investment.

Up to this point I have sketched the economic role which technological change has played in recent years. I come now to the second subject, namely, the effects of technological changes on workers.

EFFECTS OF MECHANIZATION ON WORKERS

Mr. GILL. The process of industrial change is by its very nature accompanied by a constant displacement and reabsorption of labor. When new occupations, plants, and industries come into existence while old ones decline, when new areas become industrialized while old ones become "stranded," when a technological change results in the displacement of an old product or process by a new one, when job requirements are altered, when fewer workers are needed to meet the requirements of production, workers lose their jobs. Under these circumstances,

even when such changes are accompanied by an absolute increase in the total amount of employment offered, unemployment of individuals and groups of individuals is continually being created because of changes in the location of activity, transformations in the nature of the employment offered, or changes in the types of persons hired.

One of the most important factors in changing the location of economic activity has been the persistent relative decline of agriculture as an employer of our nation's labor. As the technique of production in agriculture has been steadily altered and improved, it has been possible to produce food and raw materials for a growing population and an expanding economy with an ever-dwindling proportion of the nation's workers. In 1870, for example, more than half the working population was engaged in agriculture. Today only one-fifth of the population is so engaged and a large share of this one-fifth is no longer necessary to produce the volume of agricultural products which we consume. One result of this marked decline in opportunities on the land has been the migration of approximately 2,000,000 persons annually from the land to the cities in search of industrial employment. Industry, however, even in the 1920's, was unable to absorb this tremendous extra supply of labor that was "released" from agriculture. This is reflected in the fact that the 1920's saw annually an average of 1,500,000 persons leave the cities to return to the land. That is to say, some 3,500,000 migrations took place annually in this country as a part of the search for jobs.

The accumulation of people unable to secure employment and unable to maintain themselves on the land is continuing. Although there has been some reduction in the amount of migration from the land, this slackening is not caused by a lessening of the problem conditions on the land, but by the development of severe depression conditions in the cities. As a result, there are uncounted persons dammed up on the land who in recent years would have moved to the cities had conditions there warranted the hope that they might find employment. These constitute an unemployed reserve for industry that has not even been tapped, and one which is growing steadily. The continuation of technological changes in agriculture impel them to move, but in the current industrial situation there is no place for them to go.

Another broad industrial change which has been constantly creating unemployed workers, even in periods of generally rising activity, is that which results in the transfer of the location of industrial activity. America is dotted with cities and towns which can point to better days when they were flourishing commercial or industrial centers. As methods of transportation and communication have changed, many a canal and river town lost its locational advantage. As automobiles, trucks, and improved roads made large cities more easily accessible, many a rural shopping and marketing center has lost most of its trade. Stranded towns abound in areas where once rich deposits of coal, or timber stands, or bonanzas of ore have been exhausted, or where industries have lost out in the competitive struggle with industries in other areas. Thousands of skilled textile workers have been left stranded in New England towns when mills either moved southward or went out of existence because of their inability to compete with southern manufacturers. Over 200,000 coal miners lost their jobs between 1923 and 1929, when 3,000 commercial coal mines closed down. The better utilization of coal and the increased use of other fuels cut into the

market, and what demand was left went to the technologically more advanced mines.

In a true sense the populations that are left behind represent a group stranded through the operation of industrial and technological change. Their situation represents a pressing phase of our general unemployment problem which will continue to exist, short of an extraordinary expansion of productive activity.

As examples in this connection I would like to refer to some studies made by the W. P. A. in various localities.

In 1935, the year in which the great Amoskeag Mills, of Manchester, N. H., were shut down, more than 17,000 different persons had had employment in these mills. After the shut-down, there were a few other jobs to which the displaced workers could turn. In a field survey conducted late in 1936, only two-fifths of the men and one-fifth of the women interviewed had had any work since their last Amoskeag job in 1935. Only one-third of the men and one-sixth of the women were employed at the time of the interview. Of the total man-months elapsed between the last Amoskeag job and October 1936, only 15 percent were spent in employment. Under these circumstances the need for relief became acute and continued to be so through the ensuing years. About one-fourth of Manchester families were receiving general assistance or W. P. A. work in 1937. In 1938 the average rose almost to 29 percent.

Somewhat similar situations prevail in several of the declining Massachusetts textile centers. New Bedford is a good example. It had 31 cotton-textile mills running in 1920, and employed 34,000 textile workers. While new plants in the South flourished, New Bedford had slipped backward. By 1937 the number of cotton mills had been cut to 17, and the 34,000 mill workers employed had shrunk to 14,000. Between 1937 and 1938 another 6,000 cotton-mill workers were thrown out of work. During the two decades since the World War, New Bedford cotton textiles have lost about four-fifths of their workers. In spite of some new industry, New Bedford is clearly a chronically depressed community. About a year ago, 30 percent of all the available workers were jobless. Among workers whose last job was in the cotton mills, 37 percent were unemployed, and their average duration of unemployment was a year and a half.

Brazil, Ind., presents a similarly drastic situation affecting a somewhat smaller population. As a result of the general decline of coal-mining operations in the region and the collapse of the clay-products industry in the early thirties, more than one-third of the employables in the community were unemployed in 1936. During the 3 years preceding 1936, the number of different persons who had received public assistance of some kind was equal to 71 percent of the 1930 population.

A block of counties in southern Illinois, where coal mining is the major industry, presents another clear-out example of a depressed area with a large stranded population. The decline of activity in these counties (Franklin, Saline, and Williamson) began well before 1929, and had, by 1939, reached the point where two-fifths to one-half the available labor force was without private employment.

The peak year of employment was in 1923, when 36,000 workers were employed in 105 shipping mines. By 1937 the number of these mines had declined to 40. With mechanization, the man-day output of the surviving mines had risen from 4.9 tons in 1923 to 8.8 tons in 1938,

and at the same time approximately 5,000 additional men were displaced. In all, mine abandonment and technological advances had reduced employment opportunities by about two-thirds—from 36,000 workers in 1923 to 12,500 in 1937.

The cumulative effects of these developments on the community are shown by an unemployment census conducted in these counties about a year ago. At that time approximately 42 percent of the total labor force was unemployed; and about three out of five unemployed workers were dependent upon the W. P. A.

(Senator O'Mahoney, the chairman, resumed the chair.)

The CHAIRMAN. Did you have any studies made in any of the other coal-producing areas of the country?

Mr. GILL. Yes, we did, Mr. Chairman. We made some in Pennsylvania and in West Virginia.

The CHAIRMAN. Were the results of all these investigations substantially the same?

Mr. GILL. Substantially the same. I believe that the Illinois situation was a little worse, but it was only a matter of degree. It was quite similar otherwise.

EFFECT OF MECHANIZATION ON SKILLS

Mr. GILL. With respect to changes in the nature of jobs as distinct from their location, there can be no doubt that technological changes markedly influence the quality of labor requirements. Whatever may be the trends in production and employment at any time, the first effects of changes in technics are the displacement of workers, changes in the kind of labor required, and, as Mr. Murray's human exhibit so tellingly illustrated the other day, the obsolescence of particular skills and occupations. These often result in the need for unemployment relief even though, eventually, there may be increased demand for another type of labor somewhere else. The effect has been different in different occupations. Technological changes have favored semi-skilled jobs at the expense of both the highly skilled and the unskilled workers. In many cases new skills must be learned. Frequently the new jobs are lower in the occupational scale. Often it is a matter of months and sometimes several years before reemployment takes place. For the older worker it frequently means permanent unemployment.

The National Research Project's studies have shown that the jobs of factory production workers are steadily becoming more simplified as machinery is made more automatic or more specialized and as production methods are otherwise improved by management. Where an entire process is rendered highly automatic and continuous, both unskilled and skilled workers are eliminated. On the other hand, where auxiliary devices, such as recording or controlling instruments, simplify the method of work by eliminating operations which formerly required long training and great dexterity, semiskilled labor may be substituted for highly skilled workers. This reduction in skill requirements is naturally a prime objective of management, since the wages of unskilled workers are lower than those of the skilled, and unit labor costs are consequently reduced by the change.

While stranded communities present a spectacular type of problem, due to the concentration and isolation of the unemployed group, our

studies have indicated that industrial changes which alter the nature or volume of demand for certain types of labor can create special groups of workers who are as effectively stranded in a highly diversified industrial community as those residing around the tipples of shut-down coal mines.

The textile industry provides examples of a number of such occupations. Weaving and loom fixing in the woolen and worsted, carpet and rug, and upholstery-goods industries require a high degree of skill which cannot be used in other industries. These occupations have been declining since the early 1920's as a result of the introduction of more automatic looms and also because of a decline in the demand for the product of these industries.

The CHAIRMAN. To what do you attribute that decline in demand?

Mr. GILL. Partly the use of linoleums and other new floor coverings. I think that would be a major example.

The CHAIRMAN. That is technological substitution.

Mr. GILL. It is a substitution.

The CHAIRMAN. It is a substitution because the manufacturing has been vastly improved.

Mr. GILL. Vastly improved, but it is a shift. A different group of individuals get work in the linoleum plant than those which were displaced in Philadelphia, let us say, in the field of carpet and rug manufacturing.

The CHAIRMAN. In other words, the displacement of labor isn't at all to be ascribed solely to improved looms, improved machinery, but frequently to substitute materials for those that were—

Mr. GILL (interposing). That is true in this case, I believe, sir.

In Philadelphia, the center of these branches of the textile industry, 29 percent of the weavers and loom fixers were unemployed in May 1936. One-fifth of these unemployed had lost their last regular jobs earlier in that year. Twenty-eight percent had lost their jobs the previous year, 1935, 13 percent in 1934, 12 percent in 1933, 7 percent in 1932, and 20 percent prior to 1932.

The CHAIRMAN. What is the base upon which these percentages are figured? Twenty-eight percent of what?

Mr. GILL. It is the number that were unemployed in May 1936, adding up to 100 percent.

That is, one-fifth had been unemployed continuously for more than 5 years.

A sample study of the work experience of a group of unemployed railroad workers indicates that there also, because of the limited transferability of their skill to other industries, displaced workers were able to find little work in other industries. Moreover, the longer the attachment to the railroad industry, the more difficult it was to find work outside of this industry. The proportion of workers finding other work during periods of interruption of railroad employment ranged between a high of 63 percent for those with less than 5 years' service to less than 10 percent for those with service records of 30 years and more. The factor of age is, of course, partially responsible for inability to find work in other industries; but long years of attachment to an industry coincide with advancing age. Thus, when such workers are displaced they are at a double disadvantage in finding work in other industries or occupations.

The effect of changing skill requirements as a result of mechanization is illustrated by our study of cigarmakers after the process was converted from a system employing hand workers to one utilizing machinery and machine operators. One of the major results is the fact that the skill of the hand cigarmaker is not needed at the new process, and women are generally substituted for men. In our study, 5 years after the lay-off, 13 percent of the men were self-employed cigarmakers, another 17 percent were employed by others in the cigar industry. Though many of them searched for work as cigarmakers, the majority did not find it, and 25 percent of them found no work at all during the 5 years.

With these and other economic factors constantly augmenting the labor reserve, the size of which has been swollen to tremendous proportions due to the long continuation of depression conditions, certain special problems have developed within the general unemployment problem. Because of their age, their sex, their race, their skill or lack of skill, the nature of their previous experience, or even because of the length of time they have been unemployed, certain workers face particular difficulties in securing jobs. In a labor market crowded with aspirants for whatever job openings arise, they are passed over in favor of other job seekers who appear to the employers more desirable.

INCREASED UNEMPLOYMENT AMONG YOUTH

Mr. GILL. One of the most tragic of such special problems is that of the youth entering a labor market already crowded with experienced unemployed. The young people on the farms face perhaps the most desperate situation. They are growing up in a situation where, with advancing technology, agriculture is unable to provide a livelihood even for those who were formerly associated with it. In the cities also, particularly where opportunity has been declining or stagnating, the youths unable to secure even a first job in industry have been a most important element in the general unemployment situation. In Philadelphia, for example, 7 percent of the total unemployed in 1933 were workers who had never secured a first job; by 1936 this proportion had reached 20 percent of the unemployed; and by 1937, 21 percent.

While it may be impossible to designate the unemployed youth of this country as technologically displaced, it is nevertheless true that our production activity has failed to keep pace with productivity advances, that in spite of production levels almost equal to those of 1929, there were no jobs for them in 1939, and that as a result this important group is losing valuable years in which it might be fruitfully employed and contributing to our economic life.

The CHAIRMAN. Does that condition which you just described represent the situation as it is to be found elsewhere in the country? The figures you have taken are those of Philadelphia. How widespread is this condition?

Mr. GILL. It is widespread; it is all over the country, Mr. Chairman. It just happens that we made a study of this particularly in Philadelphia. We have a good deal of other data available at W. P. A., however, which indicate that the problem of the unemployed youth is serious throughout the country.

The CHAIRMAN. It is perfectly appalling, that it could be said of any community that 21 percent of the unemployed were persons who

had never had a first job, and you think that that condition may be found elsewhere in the country?

Mr. GILL. It is found elsewhere. We find it in the W. P. A., in the youth that we have there. A very high percentage of the youth that are employed on the N. Y. A.—that is the National Youth Administration—have never had a job and have striven unsuccessfully for months and sometimes even for years to get one.

The CHAIRMAN. Well, does that not indicate to your mind that a primary and supreme necessity is that of finding a way to stimulate the creation of normal jobs?

Mr. GILL. It does, yes, sir.

The CHAIRMAN. Productive jobs?

Mr. GILL. Yes, sir.

The CHAIRMAN. Would it be proper for me to ask you whether you consider the jobs that are created by W. P. A. as the type of job that can offer an opportunity for a permanent cure, or by N. Y. A. either, for that matter?

Mr. GILL. May I come to that later, Senator?

The CHAIRMAN. Certainly.

Mr. GILL. It is in the statement.

The CHAIRMAN. I have been anticipating your paper.

Dr. ANDERSON. In 1933, 7 percent of the unemployed were people who had not had a first job in private industry, it moved up to 20 percent in 1936, and to 21 percent in 1937. Have we leveled off, then, at a point where about 20 percent of W. P. A. is made up of these youth?

Mr. GILL. Between 1933 and 1936 unemployment was reduced in Philadelphia as in other parts of the country. What happened was that those who got jobs were for the most part experienced workers, so that the people who had not yet held a first job became a larger proportion of the total unemployed. But these figures do not refer only to W. P. A. workers.

Dr. ANDERSON. Oh, I thought they were W. P. A.

Mr. GILL. No, they are unemployed people; some were on W. P. A. and some were not. They were not in private industry.

Dr. ANDERSON. In other words, they are relievers or nonrelievers?

Mr. GILL. No, they are unemployed people.

Dr. ANDERSON. Unemployed regardless of their condition?

Mr. GILL. That's right. Some were on direct relief, some were W. P. A., some were living on their savings; there were all types of unemployed in that group.

Dr. ANDERSON. And do you think that will be the census figure for 1940?

Mr. GILL. I wouldn't like to forecast, but this is a census of Philadelphia, a complete census of a 10 percent sample of the city, made up on a very careful basis. I don't know, of course, what the census of 1940 will show for the country.

Mr. O'CONNELL. Were these figures intended to include the unemployables or merely unemployed?

Mr. GILL. The definition is essentially the same as that used by the census. It excludes unemployables, but no physical examination, of course, was made.

Dr. ANDERSON. Do you know of any other such studies which would give us a measure of the condition elsewhere?

Mr. GILL. There was a census in Michigan in 1934 or 1935, and a census made in Massachusetts in 1934, I believe it was, had similar material in it.

Dr. ANDERSON. It came to about the same conclusion, as I remember it?

Mr. GILL. Just about the same conclusions. I haven't the data here. Other National Research Project studies also have showed substantially the same results.

Colonel CHANTLAND. Mr. Gill, did you say that some of these who had not had their first jobs were living on their savings?

Mr. GILL. No; I didn't mean to say that. A good many of the unemployed, of course, were living on relatives.

Colonel CHANTLAND. I was just wondering about that.

Mr. GILL. This problem, to the extent to which it was met, was met almost solely through the work of the Federal Government, the W. P. A., the N. Y. A., and the C. C. C.

The older worker also faces a situation of increasing difficulty. Studies made by the National Research Project and others have shown that while the older worker may have some advantage in maintaining his job due to the value of his experience, once he is displaced he is less likely to regain his job and far less likely to secure another job. The result of this and other tendencies to pass over certain workers in filling jobs from a crowded labor market has been the creation of a group of chronically unemployed, who constitute one of the most serious aspects of our unemployment situation. For the passage of time itself proves to be a factor in the distribution of employment opportunity, and those longest unemployed are likely to have the last chances for jobs for that reason alone. Such evidence as there is points to an increasing seriousness of this problem—an increasing number of able and willing workers who, in an economic setting characterized by a persistently large volume of unemployment, are chronically unemployed.

I would like to make a particular point with reference to these long-term unemployed. In Philadelphia, a diversified metropolitan labor market, we made a special study of this problem in 1936. The group studied had not only suffered unemployment of long duration but they had also been continuously on relief or the Works Program for at least 2 years. They were, then, one of the groups hardest hit by the depression. Over 30 percent of them had not had a private job for more than 5 years. These long-term unemployed numbered 20,000, or one-fifth of Philadelphia's relief load at the time of the study. They were an unwanted part of the labor market, but they were certainly not an undesirable part. By every available test these people were employable. They were out of work only because, relative to other job seekers, they had some disadvantages of age, sex, race, or type of occupational experience. The disadvantages affected not their ability to work but only their ability to get jobs.

In all, the situation that has developed, the wide-spread unemployment and underemployment, the inability of the younger workers to find a place in our crowded labor markets, and the increasing chronic unemployment, particularly of our older workers, presents a wide variety of problems for which a solution must be found.

These problems, both the general ones and the special ones which have been indicated here, are not, it must be emphasized, temporary.

The process of rapid technological and industrial change will continue to raise problems through prosperity and depression, as the process of displacement and reabsorption of workers continues. They are aggravated during periods of depression, particularly as in the present situation, when widespread and long-continued unemployment adds new considerations and raises new questions as to reemployment prospects of the persons affected. Any attempt to gain full employment of our manpower must take into account technological change and its action in continually jeopardizing the job security of workers.

EFFECTS OF TECHNOLOGY ON EMPLOYMENT

Mr. GILL. I should now like to draw some conclusions.

The effects of technological change on employment and unemployment present two distinct sets of problems. We have, on the one hand, the situations where particular groups of workers, in specific industries or localities, have been reduced to a condition of unemployment as a direct effect of technological changes. Such situations exist even at times when business is prosperous and employment opportunities are plentiful. We need only to recall the situation which prevailed, even at the height of prosperity in the late twenties, in some of our agricultural areas, in sections of our textile industries, and in some of the coal-mining districts. Such situations will be recurring even at the best of times. The adjustment, whether through migration, retaining, or development of new employment opportunities, may be a long process, much too long to be taken care of by present systems of unemployment insurance. A permanent work program would be well suited to meet such situations. It would help maintain the work habits and morale of the displaced workers and would aid them in the acquisition of new skills in a manner that would yield returns not only to the individuals concerned, but to the community as well, through the execution of socially useful projects.

The CHAIRMAN. May I interrupt there, Mr. Gill? The implications of the statement which you have just concluded, this first paragraph of your conclusions, would seem to be that the conditions at present are not such as to encourage business—let me see, you speak of it as though we were in a depression—we are in a period of unemployment, but I think the evidence which we may gather almost any day, in fact every day from the newspapers, particularly from the financial sections of the daily press, would seem to carry at least some basis for believing that business in many lines is steadily improving.

Mr. GILL. That is correct.

The CHAIRMAN. I was very much impressed during the testimony a few days ago of Mr. Watson, of the International Business Machines, who quoted from an article in the Reader's Digest or a recent issue, which summarized some of the new industries which have come into existence during the last 7 or 10 years. I was glad to have him make note of that, because I had myself alluded to it in the opening statement at the beginning of this hearing. He called attention, as I did, to the development of trans-oceanic aviation, commercial aviation, building of streamliners on the railroads, improvement in the telephone, and many new industries as a result of chemical discoveries.

All of these, I think, are common knowledge, and as you testified, they seem to have no difficulty in getting capital with which to finance themselves. The Transcontinental Airlines, for example, which have been doing such a remarkable piece of work in conquering the air and providing safe traveling—they just completed more than 12 months of commercial aviation without the loss of a single life—have apparently not had much difficulty in securing whatever capital was necessary for development.

We are, therefore, confronted with this anomalous situation, that science and invention bring new industries, but they do not create new jobs. I remember very well the report of the Standard Statistics Co., issued about 6 weeks or 2 months ago, on the fiscal affairs of the leading corporations of the country. It told of the profits of 669 of the leading industrials, railroads, and utilities. These 669 corporations have made net profits of more than \$1,250,000,000 in 1939, as compared with net profits of something less than \$700,000 in 1938, an increase of only 83 percent, and yet the unemployment problem remains.

It seems to me to be perfectly clear that a condition which allows the advance of business and an increasing profit for business, cannot properly be called a depression period; at least not in the old sense. It is a period in which we have been unable to adjust advancing technology to human needs in such a way as to create new jobs while we have in certain lines been increasing the opportunities for profit.

Mr. GILL. That is very true.

The CHAIRMAN. Do you agree with that statement?

Mr. GILL. Very definitely. We are not in a depression from a business point of view, even from the point of view of industrial activity if the comparison is with 1929, but from the point of view of employment, we certainly are still faced with a very serious problem, because the increase in activity in business and industry generally has not been accompanied by a proportionate increase in the number of people that they have had to hire.

The CHAIRMAN. We are told by the Federal Reserve Board Index that production is back—well, it is above 1929 levels, but unemployment apparently is below 1929 levels.

Mr. GILL. Well below.

The CHAIRMAN. Our capacity to produce has so far outrun our ability to consume that the lack of jobs is the result.

Mr. GILL. I would like to point out again, if I may, Mr. Chairman, that another very important aspect is that there are some 600,000 workers, net, entering the labor market every year, and you have got to expand your industrial production of business activity and your economy over the previous year to take care of 600,000 workers every year if you are going to maintain—even maintain—the same level.

The CHAIRMAN. Yes; the same level; the same ratio.

Mr. GILL. That is right.

A different type of situation confronts us in times of contracting business. The groups of workers who are unemployed, directly or indirectly, as a result of technological changes are many and varied. There are, first, those directly displaced by labor-saving devices introduced during the depression. But in addition to these, there are others whose unemployment reflects the previous course of technological progress, although not always in a directly traceable manner. They are the ones whose previous employment was in technically backward

or temporarily revived plants, and those whose employment was contingent upon equipment installations during prosperity when technological change went hand in hand with plant expansion, but who were dispensed with once the construction was completed.

In periods of depression, with widespread general unemployment, these displaced workers become one additional element of an excessive labor supply. Although their existence in the labor market tends to reduce the general chances for employment, they are not necessarily the ones whose opportunities are lowest. In the general scramble for jobs, they are not necessarily the ones doomed to constitute the "hard core of unemployment." They do, however, tend to make the core harder and heavier, and to make the criteria of selection on the part of the employers more stringent.

The incidence of displacement of labor through technical improvements in a depression is thus not limited to any particular group of workers, but its effects are diffused through the labor community. Remedial measures cannot, therefore, be viewed as a matter of mere readjustment of any concrete group or groups. The maintenance of a flexible work program becomes a matter of necessity under such conditions, but the fundamental problem is that of remedy against unemployment, the problem of recovery.

In the comparative recovery achieved since 1932-33, the main drawback has been the lag of the capital-goods industries. Technological improvements introduced in recent years have been many and they have had very substantial effects on the productivity of labor and on reducing costs of production. But, as I have pointed out, those effects have in many instances been achieved without incurring capital outlays large enough to develop the cumulative demand for capital goods which is necessary for recovery. As a result of the available technical improvements, not only cost reduction but also the expansion of productive capacity can be, and in many instances has been, affected with comparatively small capital outlays.

As long as technical trends of this nature continue to prevail, a growth of demand for capital goods in a volume requisite to make the recovery cumulative can be expected only from a flow of investments directed at quantitative expansion of production on a vast scale. The failure of private capital expansion in the thirties not only resulted in the lack of employment in the capital-goods industries but contributed to a further reduction in purchasing power by withdrawal of savings from the economy, which were not reinvested. This failure of private capital expansion and the increasing productivity during the thirties had to be offset to provide employment. This necessitated the large-scale public-works program as measures for the relief not only of the unemployed but also of the capital-goods industries.

INCOME DISTRIBUTION AND FULL EMPLOYMENT

Mr. GILL. The problem of income distribution is, of course, an important part of the problem of full employment. The increases in wage rates due to the spread of collective bargaining and minimum-wage and maximum-hour laws, the expenditure of funds for public works, emergency work projects, unemployment insurance, and other forms of social legislation and relief have contributed to the removal of some of the deficiencies of the distribution of income during de-

pression years. But with a view to bringing about full utilization of our resources, we need, in addition to the public policy of strengthening the purchasing power of the mass of consumers, a policy of directly promoting an expansion of demand for capital goods by direct investments by public bodies in large-scale undertakings and by stimulating private investment in other directions.

Public capital investment has, of course, and of necessity, always been a contributing factor in developing opportunities for private investment—notably in transportation facilities. The public development of streets is a necessary condition for the growth of cities and the development of local construction; the development of harbors and navigable rivers was a necessary condition for the growth of national and international commerce; use and development of railroads were necessary conditions for the growth of domestic commerce; Federal land grants and subsidies were necessary conditions for development of the railroads; the development of hard-surfaced highways was a necessary condition for the growth of the automobile industry; and the construction of airports for the growth of air transportation.

I would like to point out, Mr. Chairman, that the air industry, the Air Transport Association of America, have given W. P. A. credit for the fact that they are able to have commercial aviation in this country today on the scale that they have it. The Government has contributed, by a subsidy, if you will, as far as the private industry is concerned, by constructing 197 new airports in the country, and they have assisted in the remodeling and bringing up to date, so they can be used, 337 additional airports. If it hadn't been for that public investment in airports in the past 6 years, you wouldn't have the business in the air-line travel or the profits that are now accruing to the private companies.

The CHAIRMAN. It may be worth mentioning to call attention to the difference between the terminal facilities of the railroads and of the air lines. When the railroads were undergoing their period of expansion, the costs of building railroad stations and yards was, and still remains, wholly a matter of expense for the railroad company itself, but aviation has been able to progress without that burden of expense. The public has invested whatever capital has been necessary for the most part in building the various airports, and W. P. A., as you say, has contributed tremendously in that respect.

Municipal airports cover the country.

Mr. GILL. Mr. Chairman, don't you think the land grants that were given to the railroads have more than made up for the fact that the Government didn't do anything directly for the railroads?

The CHAIRMAN. Of course, the land grants did make up substantially, but the railroads continue to pay taxes on all this physical property. The air lines are not paying taxes, at least upon the airfields. Then, of course, whenever you raise this question with a railroad man, he will talk about the compensation which the railroads have rendered the Government by reduced rates on transportation of commodities.

Mr. GILL. The air lines do pay quite a heavy fee to municipalities for the use of airports, which, in a way, is equal to a tax.

Capital requirements for the phenomenal expansion of the use of the automobile are not limited to the planned facilities required for

their production, for the replacement of parts, and for providing the fuel for automobile operation. The expansion and use of the passenger car, the truck, and the bus depended upon Federal, State, and local cooperation in building roads. Total expenditures on streets, roads, highways, bridges, and tunnels thereby rose in rank second only to education in total public expenditures. Among other transportation agencies, aid to the new aviation industry was provided as early as 1926 by the Air Commerce Act, and the successive emergency work programs have established airways and constructed airports and landing fields. More recently a legislative provision has been made to aid in the construction of ships for a merchant marine.

Federal, State, and local outlays for all types of construction formed a substantial proportion of the demand for capital-goods production during the 1920's. This public investment, in addition to supplying the needs of private industry, aids the expansion of the capital-goods industries and therefore multiplies the amount of employment created and thereby expands the purchasing power of the Nation for more consumers' goods.

Reduction in hours of work would help to maintain employment; increases in wage rates would increase consumption and employment; special programs have been developed and are required to meet the special problems of youth and the aged. But the solution of the major serious problem of unemployment necessarily depends upon full utilization of our resources and manpower—the problem defined by the President, by the committee, and by the witnesses appearing before the committee, as idle men, idle machines, and idle money.

The CHAIRMAN. We have no difficulty in diagnosing the ills, but the doctor who will prescribe the cure hasn't testified to us yet.

Dr. ANDERSON. Haven't you in your conclusion indicated, Mr. Gill, that while there is no cure-all, there may be cures? In other words, you have indicated some of the treatments that can be administered.

Mr. GILL. I tried to; yes, Dr. Anderson.

Dr. ANDERSON. And you think the actual cure lies beyond even the summation of all these special things that could be done.

Mr. GILL. It lies in the full use of all our resources. As I said, apart from increased, more widely diffused purchasing power we need a public policy of direct promotion of expansion in capital goods.

Dr. ANDERSON. You reviewed the situation in industrial research, pointing out that the larger business enterprises were able to carry on research, had the facilities, and benefited by the results of such research. Mr. Kettering, I believe, answered by saying that time has removed the restraints that once were presumed to limit the benefits of such research to the companies actually performing it, so that now the smaller corporations and companies benefit almost equally with these larger units. Would you care to comment on that?

Mr. GILL. I would say that most of the research carried on by the large corporations is of a type that is directed to their own problems only, and cannot be converted and used by the smaller manufacturer or the smaller business enterprise.

Dr. ANDERSON. And you wouldn't see in patents, for example, any restraining influence that would benefit those who held the patents

for the period of the patent life as compared with those who didn't have access to such patents?

Mr. GILL. I should certainly think that the holding of a patent would be restrictive in itself.

Dr. ANDERSON. You indicated in your testimony that technological advance in the field of agriculture benefited particularly larger agricultural units.

Mr. GILL. That is correct.

Dr. ANDERSON. We have heard testimony that a technological development, the all-purpose tractor, with small farm units of equipment, might set a new trend which would enable small farms, farms of 50 to 100 acres, to remain in business on competitive terms with these larger units. Have you gathered any data on that point?

Mr. WEINTRAUB. That is perfectly true, but the development of the small tractor is rather recent. All the material we have been able to gather on the relative efficiencies of small and large farms would tend to indicate that the larger farm today and in recent years has certainly been able to operate with less labor per unit of product than the small farms. What the all-purpose tractor eventually will do, we don't know, but the vast majority of the farms still don't have any tractor at all, large or small.

Dr. ANDERSON. Those are the questions I had, Mr. Chairman.

The CHAIRMAN. Thank you, very much, Mr. Gill. We are very much indebted to you.

Dr. ANDERSON. Mr. Chairman, our final witness is our own committeeman, Dr. Isadore Lubin, head of the Bureau of Labor Statistics, Department of Labor, who will testify at this time.

TESTIMONY OF DR. ISADOR LUBIN, COMMISSIONER OF LABOR STATISTICS, DEPARTMENT OF LABOR, WASHINGTON, D. C.

Dr. LUBIN. I think that the committee is perfectly conscious of the fact that there was once upon a time a year known as the year 1929. I do not know, however, whether this committee is conscious of the fact that exactly 11 years ago, to be specific, on the Senate calendar day, March 1, in that year 1929, the late Senator Couzens, at that time chairman of the Education and Labor Committee of the Senate, submitted a report to the Senate on the problem of unemployment.

I should like permission to take a minute to read 2 or 3 short paragraphs from that report. This, I want to reemphasize, was on March 1, 1929, when approximately 1,400,000 more people were employed in nonagricultural activity than are employed today, a year in which we, most of us, believed there was no problem of unemployment of sufficient size to concern the American people. In that report, issued in that year 1929, the statement is made—

During the past year or two, much has been said in the press and in public discussion about the great amount of unemployment that has resulted from technological changes in industry. Machinery and discovery are every day displacing men whose lives have been spent in developing the skill and ability necessary to their crafts. Efficiency methods which aim at eliminating wasteful and unnecessary processes are daily eliminating workers from industry. At the same time the amalgamation and mergers which have recently been going on at a pace faster than ever before in history have resulted in closing down factories and in moving plants and warehouses from one part of the

country to another. The declining markets for certain products resulting from the changing habits of consumers have also led to the shutting down of plants. Bankruptcy is also taking its annual toll of employers of labor, a tendency which we must assume will go on forever in a Nation which attempts to give full play to individual initiative and relies upon free competition to regulate its economic activity.

All of those forces make for unemployment; in good times and bad times they are relentlessly at work. Under the accepted competitive theories, it is assumed that they eventually lead to greater efficiency, lower production costs, and lower prices to the consumer. They are part and parcel of progress. The question arises, however, as to whether the laborers who are thrown out of work as a result of these movements in our economic life should be made to pay the price of such progress. Is it just that society should benefit at the expense and suffering of the dispossessed worker?

And one final paragraph included in the report of Senator Couzens to the Senate in March 1929:

Technological unemployment covers that vast field where through one device or another, and chiefly through a machine supplanting a human, skilled workers have found that their trades no longer exist and their skill is no longer necessary. What becomes of these men? What can be done about these thousands of individual tragedies? What do these individual tragedies mean to society as a whole? It is an imponderable thing. Some of the experienced witnesses who appeared before your committee stated that new industries absorbed the labor turned adrift by machine development; the automobile, the airplane, the radio, and related industries were suggested as examples.

Undoubtedly there is much truth in these statements, but, nevertheless, we are not relieved of the individual problem. It offers little to the skilled musician to say that he, who has devoted his life to his art, may find a job in a factory where radio equipment is manufactured. Then there is the little aid that in every period of idleness when readjustments are being effected, the suffering, the loss, the enforced change in environment. True, this may all be the price of progress, but society has an obligation to try at least to see that all this does not become the burden of the worker.

The CHAIRMAN. Would you be good enough, Dr. Lubin, to turn to the front page, the cover of that report, and see if you find there the list of the members of the committee, and read it into the record?

Dr. LUBIN. James Couzens, chairman; William Borah; Lawrence C. Phipps; Jesse H. Metcalf; Hiram Bingham; Frederick H. Gillett; Royal S. Copeland; Lawrence D. Tyson; David Walsh; Cyrus Locher; Morris Sheppard.

Mr. MAGINNIS. Dr. Lubin, to me, that is very interesting. May I ask, I didn't hear clearly, did you state the number of unemployed in the year '29 as compared with today?

Dr. LUBIN. No, I did not. I said that during that period, the spring of 1929 when this country was going along full speed toward that peak which culminated in the fall of the year, we were not conscious—when I say "we," I mean the rank and file of the American people—of the fact that there was a problem of unemployment on our hands, and this report, as I say, issued on the 1st of March 1929, restated in a sense the gist of everything that has been presented to this committee in the last few weeks.

Mr. MAGINNIS. Did it state the number of unemployed at that time?

Dr. LUBIN. In the report it was estimated that the number of unemployed was in the neighborhood of 1,000,000.

Mr. MAGINNIS. Of 1,000,000?

Dr. LUBIN. Yes.

Now, Mr. Chairman, 11 years later, the same problem that was presented to the Senate of the United States by its Committee on

Education and Labor has come to the forefront. We had witnesses here from every important branch of industry testifying to the existence of the same problem that apparently prevailed, and of which there was very definite evidence, in 1929.

The problem today, of course, is much more acute, because, as Mr. Gill pointed out a minute ago, a larger proportion of our labor supply is unemployed. In other words, the large unemployed mass that has to be absorbed by industry makes the problem of those who have been displaced by technological changes even more acute than it normally is. Under these conditions technological unemployment intensifies the whole problem of unemployment. What I should like to do with your permission is to point out the different types of problem involved as they have been presented to this committee and attempt to differentiate the causal factors that must be differentiated if we are going to deal with this problem at all.

In other words, all sorts of instances of so-called technological unemployment have been cited to this committee and yet no single cure-all, whether it be prosperity with full employment or some other general program, is going to solve the problems presented by technological progress as it affects workers. This is a fact which must be realized and accepted if this country is to go on and if progress is to continue. As a further matter of fact the worker's problem in facing technological change is not always the same. The character of his problem depends in large part upon the type of change involved and upon the conditions surrounding its introduction.

FACTORS AFFECTING LABOR PRODUCTIVITY

Dr. LUBIN. I have attempted to break down the types of factors that affect labor productivity. If I might say so, the thing that has impressed me most about these hearings has been that we have been talking about labor productivity as a problem in itself, as it were, without differentiating (and it was impossible, of course, to differentiate with the types of witnesses we had) the factors that bring about these changes in labor productivity.

Now, I should like to list for the record what we might call five different types of factors which affect the productivity of labor.

The first, as I said, is changes in technology, and these changes in technology may in turn be divided into four subdivisions. The first of these changes in technology are those that make possible the creation of new kinds of wealth—in other words, they are the types of technology which create new employment and bring about little or no direct or indirect displacement of labor.

The second is that type of technology that creates substitute products.

The CHAIRMAN. Can you give an example of each one?

Dr. LUBIN. I want to come back to that, if I may, Mr. Chairman. I just want to list them first and then come back.

There is technology which creates substitute products, and it does so by displacing other products. Some of this technology that creates substitute products, creates net unemployment; in other words, adds to the total number of unemployed in the country. Others create net employment. But all of them cause some direct displacement of labor, although the net to the country as a whole may be a gain or a loss.

The third type of changes in technology is the new methods of production, where you do not necessarily create a new product at all, but you substitute machines or tools for human workers.

Now, these three types come under this heading that I should like to call changes in technology, as distinguished from other factors that affect human productivity.

I also want to add a fourth, at this point, because it apparently will become increasingly important as time goes on, and you might call it labor-and-capital-saving technology. In many cases today new methods make possible not only a direct saving of labor through the introduction of new machinery, but it frequently happens that the new process involves the use of less capital as well, and thus results in an indirect saving of labor in equipment producing industries.

As I say, those four groups come under what I should like to term changes in technology.

The second factor in improving human productivity—and one which, incidentally, according to many of the witnesses who testified here, is of much more significance—is changes in the way of doing things. They are those changes that we might call managerial changes, that reduce labor requirements but do not substitute machines for human labor, and it is quite evident that in many industries, these managerial changes cause more displacement and increase productivity at a greater rate than revolutionary changes of a technological type.

The third type of factor that affects the productivity of labor might be put under a group called changes in types of raw materials. By using a new type of raw material to make the same product, you may require less labor.

The fourth is an increasingly important factor of changes in human productivity by changes that have been occurring in management-labor relations; the sheer change in the psychology of relationship and the conditions of relationship between the employee and management has had tremendous effects in many instances upon productivity of labor.

And finally, a very important factor, particularly in periods when the plant or industry is moving from low rates of production to high rates of production, is the relationship of output to capacity which affects the productivity of labor. In other words, a plant running at half-time requires more man-hours to produce a given number of units than if it were running at full capacity. There is no change in technology, no change in methods, no change in fuel or anything else, but the ability to get more use of your capacity through greater operation.

The CHAIRMAN. Well, why does it have that result?

Dr. LUBIN. Let me give you a concrete illustration: In the case of the steel industry, when you operate at 20 to 25 percent capacity, you require 35 percent more man-hours to produce a ton of finished product than when you are operating at 55 to 60 percent.

The answer, I think, is simple; to get 25 percent you have got to have a minimum number of men to keep the furnaces going, to keep that plant in operation, and you cannot operate with less than that minimum. Now, that same number of men, with the same machines, can produce twice as much, frequently—in the case of the steel indus-

try, 35 percent more—by just having more to do, with the same plant and the same equipment.

The CHAIRMAN. I can understand that an administrative force would have to be maintained in any factory regardless, or almost regardless of its size, but it would appear to me that that would not also be true of the labor force. When you talk about man-hours, required in production, do you refer to the entire labor force, including office management and so forth, or only to those who are paid by an hourly rate?

Dr. LUBIN. Even in the manufacturing process, you must have a certain number of people present to keep these furnaces going. To take care of them, you have to have a certain number of men at the machine, whether it turns out 1 unit or 100; and during periods of increasing industrial activity such as that between 1932 and 1940 (and I think it is rather important that we note this fact), this closer approach to capacity operation has in itself, without any change in management necessarily, brought about increased productivity of labor.

Mr. O'CONNELL. Yes; but that is a partial measurement of the extent to which your unit cost would decrease when you—

Dr. LUBIN (interposing). It is the unit labor cost. We know that the man-hours required, given the same wage rate, would be 35 percent less when you operate at 55 to 60 percent than it would at 20 to 25 percent.

Mr. O'CONNELL. Likewise, because of fixed charges, I take it that the unit cost would also tend to go down?

Dr. LUBIN. Yes.

Dr. ANDERSON. Is there a point where this difference tends to fade out?

Dr. LUBIN. Apparently there is, but we haven't found it. As a matter of fact, this study is based on an investigation that we made in the steel industry in 1935, and we are now trying to make arrangements to bring this thing up to date, because the industry, at no time during the period we covered, exceeded 65 percent capacity, so we had no record.

Dr. ANDERSON. And do you have it for any industries other than steel? I can understand the situation more easily in steel than I could in some more diversified field, or in one more completely organized on a belt line.

Dr. LUBIN. Well, your rate of change, of course, would differ with different industries, but there probably is a stage in every industry where you must have a minimum number of men to produce anything at all. I can hardly think of any industry in which capacity operation does not reduce unit labor time for maintenance workers. Steel is probably an extreme case of saving in direct labor costs, but it is by no means unique.

Dr. ANDERSON. Yes; that is true.

Dr. LUBIN. And the point at which you get into the period of, say, decreasing returns will vary with the type of product you are making and the type of investment you have.

In coal mining, that is a very significant fact; in other words, even when you shut down you have got to have your company force, your air force, you have got to have your men seeing that the roofs

don't fall in, and all that sort of thing. Frequently it is cheaper to maintain a mine at 5 percent capacity than to shut it down, because if you did shut down you would lose everything. So it is worth while putting in some investment so you can use the mine when you want to.

Now, I am going to touch briefly on the various types of technology that come under these different classifications that I have mentioned.

WORK-CREATING TECHNOLOGICAL CHANGE

Dr. LUBIN. Under the types of work-creating technology, where most of the employment created is net gain and there is little or no displacement of labor, either direct or indirect, the advantage is self-evident. With the telephone and telegraph, of course, you had some displacement of the pony express, but by and large there was a very great net increase in employment. There are photography and the development of the phonograph, air-conditioning, the pneumatic tire, the development of a number of medical supplies. The radio did supplant vaudeville actors, but the net increase in employment was rather marked. The same thing is true of most household electrical appliances, like vacuum cleaners and waffle irons, and all of those thousand and one electrical devices which create new products and which do not supplant them in other industries.

The CHAIRMAN. In referring to the telephone industry, I assume that you are thinking of it in terms of its entire life and not in terms of its recent life, during which the dial system has been introduced?

Dr. LUBIN. Yes; well, the technological changes that have occurred in the industry in recent years have not changed the product that we get. Those have been changes in the ways of giving us the product. I am thinking of the development of the telephone instrument as an instrument of communication, you see. It may temporarily have supplanted some messenger boys, but even immediately it created more employment than it displaced.

The CHAIRMAN. But the record offered to this committee with respect to the introduction of the dial telephone was that there has been a complete displacement; that is merely a segment in this larger picture to which you refer.

Dr. LUBIN. Yes.

Now, among those types of technology that create substitute products or substitute outlets, there is again a whole series of instances that are known to everybody here. In such cases the net change of employment may be large or small. It may be an increase or a decrease. But in all such cases some people are displaced, even if on balance there is an increase in total employment.

Take automobile and truck transportation. There is no doubt that automobile and truck transportation displaced a large number of people who were engaged in activities which had to do with horse transportation, but offsetting that you had road building and petroleum refining and steel and rubber and textiles and glass and real estate, and a thousand and one other activities that were not possible without the automobile. So there again there was a net increase in the number of people employed.

The gross increase in employment in these new activities was, of course, offset by the displaced employment in vehicle industries

and stables and raising mules and horses and water transportation and horse training, but, by and large, we will admit that the net has been a gain to the country as a whole in the total number of jobs.

Again, there are the movies. You had employment created in book writing and in making film and in the production of movies and distribution of movies, and that net was greater than the number displaced among vaudeville artists and musicians.

Rayon is another case in point. Through improved quality and through lower prices, there has been an increase in employment, which was offset in part by losses in the silk industry and in other natural fibers, like wool and cotton.

Electric power created employment through endless possibilities for cheaper light and cheaper power. On the other hand, it created unemployment in coal and gas and oil, but again I say there was a net increase for the country as a whole.

LABOR AND CAPITAL SAVING CHANGE

Dr. LUBIN. The third type of technological change that affects human productivity is new processes for making the same product or the same service with less human labor. The chairman mentioned the telephone as a case in point. In other words, the same service is given to us, we get exactly the same product but it is given to us in a different way, and in that way human labor is conserved.

Mr. PIKE. Miss Sullivan said that you changed the labor from the telephone employees to the subscribers. She said there wasn't any displacement.

Dr. LUBIN. Well, I said displacement of employment.

Mr. PIKE. Yes; I believe she used that word.

Dr. LUBIN. And, of course, one could, under this third category, mention a whole series of revolutionary changes, like automatic machinery instead of semiautomatic or hand operation. Among those you have the automatic cigarette-making machine, bottle-making machine, the hot-strip mill, automatic drills, electric welding—and one could go down the list.

The fourth type in this group of technological changes is what I call labor and capital saving devices; in other words, more efficient or better utilization of the things we are working with. We have heard a lot from witnesses this morning and witnesses this afternoon about coal and the locomotive. Take the case of the Diesel engine. That is an awfully interesting situation. The Diesel engine makes it possible to keep traffic moving day after day, year in and year out, without having to have the expensive equipment and the labor force necessary to keep it serviced.

I think I read of one the other day that had been in service exactly a year and a month and had been to the shop once. It ran 365 days a year, which makes it possible for 1 engine to do the work of 4, because you can use it 4 times as long in 24 hours, which is not only labor saving but also capital saving. You need only 1, whereas formerly you needed 4, and yet the power may be the same or even less.

Similarly, we have had examples cited here of better and more lasting equipment. Take the case of the creosoted tie. A creosoted tie costs more than one that is not creosoted, but you have to replace it only once in 21 years, whereas the old ones, uncreosoted, you had to

replace every 7 years; so that over the life of the tire you save as much as two-thirds in some instances. Again, that means not only saving labor because you have to replace it only once in 21 years, but saving capital.

Mr. Pew mentioned the case of new developments in his industry which make it possible to get 92-percent¹ realization of gasoline out of a barrel of crude. Again, that is saving not only labor but it is a capital-saving device. One plant with a given investment can turn out so much more than another plant could with the same investment.

Probably the best case we have is the modern automobile tire. You replace it once in 20,000 miles, whereas you formerly replaced it every 7,000 miles, which conserves labor in changing, selling, servicing it, and at the same time saves your capital investment, of course.

One could go on to cite cases of mergers and consolidations which bring about the same result. Also better materials are used in tools. Mention was made this afternoon, I believe, that by using a certain type of steel in a tool the tool would last so much longer, although it is exactly the same tool. The composition of the tool makes it possible to save both on the labor in using it and in the capital in replacing it.

The second series of factors which I should like to emphasize particularly bring about changes in labor productivity which are not technological in character, in the sense that they necessarily involve scientific discoveries or the application of new methods or even new materials. They are those changes which are due to managerial progress and result in reduced labor costs. There are no new machines used, no supplanting of machine labor or power for hand labor, and yet a very marked increase in the productivity of labor. You probably will remember Mr. Rieve, of the Textile Workers Union, and Mr. Merrill, of the Office and Professional Workers Union, emphasizing the fact that these changes that management makes, eliminating waste here and there, in their opinion, have caused much more reduction in employment in their industries than any mechanical changes that have occurred in recent years.

Instances can be cited in the shoe industry and the textile industry and in dozens of industries where by just changing the routing of your product, eliminating lost motion, as it were, in the mere movement of the product, has led to a tremendous increase in the efficiency of labor.

We made a study recently of the so-called bundle system of operation as opposed to the line system of operation in making cotton garments. The only difference between those two systems is this: In the old bundle system each girl went to the office, or wherever the goods were given out, and was given a bundle of pieces. She took them to her machine, sewed them together, put them back in the bundle, and returned that bundle to the office. Under the line system, one girl gets a bundle or somebody brings the stuff to her, she sews the two pieces together, just pushes it forward, and the girl in front of her takes it and sews it some more, and hands it to the girl in front of her, and so on until the garment is completed, and it is estimated that this change has increased the output of the workers over 20 percent. We have the same machine, the same fabric, the same

¹ See hearings, Part 14, p. 7190, and Part 15, p. 8350.

thread, the same temperature, everything is identical. The only change is in the way the work is arranged.

Let's take the case of job analysis and time-motion studies. The various systems that have been employed in various industries all give evidence of very marked increases in productivity of labor and the displacement of labor with no change in mechanical methods of production or in products made or used.

I might instance one other case in the steel industry. There is evidence that the elimination of job hazards and accidents and the bringing about of a very low accident rate as compared to the high one they had 25 years ago has affected the efficiency of the workers and there again, as I say, with no change of any significance in the type of production.

CHANGES AFFECTING RAW MATERIALS

Dr. LUBIN. Now, the third type of activity which affects the productivity of labor is changes in the types of raw materials used. You can't stamp cast iron, you can stamp sheet steel, and by the substitution of sheet steel for cast iron you can make all kinds of bathroom materials, bathtubs, lavatories, and so forth, and turn them out at a terrific rate, whereas when you make a cast-iron bathtub, you have to cast it and let it set and take the time for hardening, and so forth. It might interest the committee to know that just within the past 2 weeks the manager of one of the smallest steel plants in this country told me he was going to put in a strip mill. He has a hand-rolling mill now. I asked him why, because I felt that his mill was small for a strip process. He said, "I have to do it to meet competition. The product of the new rolled-sheet mill apparently lends itself more effectively to stamping than this hand-rolled product, and in order to meet the competition of these new rolling mills, I will have to put one in, because the people in this particular country"—it was in the far West—"are increasingly using sheets for stamping purposes." In other words, the major part of the demand was for making of steel products that were going to be stamped for refrigerators, and a thousand and one things. Now, the type of raw material in his plant is going to affect the output of his workers because he can get a product through this new mill that he can't get any other way, and when he puts the new mill in, he won't have to have as many people as he formerly needed.

The CHAIRMAN. Are all of these effects which you have been discussing evidenced in increased productivity?

Dr. LUBIN. Every one of them, but I think the significant thing is that the causal factor isn't somebody making a new machine and putting it in.

Dr. ANDERSON. You wouldn't say these so far enumerated factors operate in the majority of instances, or instances unknown in amount or number?

Dr. LUBIN. They are all happening all the time, everywhere.

Dr. ANDERSON. So that is one of the reasons we get this clouded effect and the inability to differentiate between causes.

Dr. LUBIN. Yes; and I think we are going to have to differentiate if we are going to attack the problem.

I mentioned as the fourth type of factor that affects production, the type of labor-management relations, the hours of employment in a

plant. One of the outstanding facts in the coal industry immediately after the shortening of hours under N. R. A. was the increase of productivity per man per day, before there was time enough to change methods of production. The methods of wage payment affect productivity. It has been found that under a group bonus system where a group of people work together and share the total amount paid to the group and they get a bonus after they produce a certain amount, it has almost in every case increased the output per worker. We have found in a report that we shall make to this committee very shortly that there are many plants in this country that pay much higher wages than any of their competitors, and when I inquired of them why they paid almost 50 percent more than their competitors, they said that by paying a higher wage they get the cream of the workers and their people produce more with the same methods that their competitors use.

The guaranteeing of employment has been known time and time again to increase productivity. A man knows that he has a job, he is not going to work himself out of a job, he is going to be taken care of. It affects his morale and his productivity moves up, and you will find many plants where the fact of security plays an important part in the picture. And I might even go a step farther. In some instances, the signing of a union contract has automatically increased productivity. The men have felt secure, they have felt they have something to protect them, and the union itself by giving this protection has been a factor in increasing the morale of their people, and output per man has gone up.

Of course, one must admit one can cite contrary instances, too, but those are factors that are working every day and must be distinguished from the machine or invention or new processes.

It is quite evident that by now what I am trying to emphasize is the necessity for distinguishing between productivity and technological displacement. It is quite evident we are confronted with a whole series of problems. It isn't the machine alone, and because there is a whole series of problems, I personally do not think that we will find a single solution to it.

Mr. Gill dealt rather elaborately today with the question of the ghost town. The ghost town was discussed in our hearings when the steel industry was discussed, and we heard the story of what the new rolling mill has done to certain communities.

As Mr. Gill pointed out, in New England today, and not only today but during the twenties, ghost towns were being created every year. Mills moved away, particularly from the textile areas in New England, because sometimes they could get cheaper labor, sometimes because of lower taxes, sometimes they got freedom from taxes entirely, and sometimes they were even given a brand new mill. On the other hand, ghost towns are being created every day by the exhaustion of raw materials. Northern Michigan is dotted with ghost towns that once thrived when there was lumber there. In the Southern States you will find areas of ghost towns where the raw material has been exhausted.

I have known of a ghost town that was created by a change in freight rates which affected the competitive position of the manufacturer in that community; he couldn't stay in business, so that it is quite evident that again no single solution is going to take care of this problem.

In the case of lumber, if we are going to eliminate the ghost town we are going to have to do it through selective logging or through some conservation program. In the case of cotton, or shoes, in New England—and ghost towns have been created in New England in the last 5 years by plants moving away from Massachusetts into Maine and into Vermont where prior to the wage-and-hour law they were able to get labor at lower costs than they would have to pay in Massachusetts.

In other words, all these phenomena of moving, bankruptcy, and disappearance of raw material, create what appears to be the same problem, namely, the ghost town in stranded areas, but they arise from different causes. And I think the significant thing that should be emphasized is that in this period of mass unemployment it is impossible to tell where technology has been the cause and where other factors in the economic picture are responsible.

I think that one wouldn't be going far afield in reporting what Senator Couzens' report to the United States Senate said; namely, that these are problems of competitive economy, they are problems that arise out of a desire to improve your own profit position if you are in business, and the fact that we have never compelled those who benefit from these changes to bear the burden of the costs involved.

SOCIAL ACCOUNTING FAULTY

Dr. LUBIN. Frankly, the problem of technological displacement, particularly, I think can be attributed to bad social accounting and to bad social bookkeeping. In other words, we haven't recognized the fact that progress, improvement, a better way of living, involve hazards for somebody. The hazards have been borne for the most part by labor, and nobody cared about it. You and I, who got a better product at a lower price, or the employer who got a better profit, didn't have to bear that burden. It was only because of this displacement that it was possible for us to get a better product and perhaps cheaper prices, and we took all the advantage to ourselves insofar as it was given to us, and the employer took as much of the advantage as the competitive system would let him have in higher profits, and we refused to recognize the fact that there was a hazard there, that somebody was bearing part of that cost, and we refused to share the burden of bearing that cost with him. That cost was borne by the displaced worker.

Now, as again Mr. Gill pointed out, the problem of this type of unemployment is accentuated during periods of abnormal depression. But we must not attribute our problem of unemployment entirely to technological change. Certainly we can't hold any of these forces that I have briefly outlined here responsible for the unemployment situation that appears today in the cement industry. There have been radical changes, no doubt, but, those changes don't account for the fact that the industry is only employing 60 percent as many people as it did in 1923-25.

Dr. ANDERSON. That exhibit is admitted.

(The chart referred to was marked "Exhibit No. 2784" and appears on p. 17254.)

The CHAIRMAN. Just let us see what that comparison is. What was the peak?

Dr. LUBIN. During the period 1923-25, during the seasonal period, the index was 100.

The CHAIRMAN. The base is what?

Dr. LUBIN. 1923-25.

The CHAIRMAN. That is 100?

Dr. LUBIN. Yes; and you will note the highest the index of employment has reached since 1930 was in 1937, when it temporarily reached about 76; it is now down to 59.4, which means that for every 100 people they employed in 1923-25 they now are employing approximately 60 people.

Similarly in the case of structural and ornamental metal work.

(The chart referred to was marked "Exhibit No. 2785" and appears on p. 17254.)

Dr. LUBIN. You will find the same picture there. The industry is now operating at the point where it is employing 703 people for every 1,000 it employed during the period 1923-25.

The CHAIRMAN. And the cause in these instances was?

Dr. LUBIN. I will come to that in just a minute. In the lumber (sawmill) industry employment at the present time is at 59.5, which means that 60 people are being employed for every 100 formerly employed.

(The chart referred to was marked "Exhibit No. 2786" and appears on p. 17255.)

Dr. LUBIN. In the brick, tile, and terra cotta industry approximately 55 people are being employed for every 100.

(The chart referred to was marked "Exhibit No. 2787" and appears on p. 17255.)

Dr. LUBIN. The explanation of these changes in employment, I think, is found in this chart on the Value of Building Construction, "Exhibit No. 2788."

(The chart referred to was marked "Exhibit No. 2788" and appears on p. 17256.)

Dr. LUBIN. Unless you are building houses you are not going to get employment in these industries. There is no doubt that the technological changes that have occurred in these industries are such that we can get back to our former levels of production without necessarily reaching the former levels of employment, but the major problem of unemployment in these industries is due to conditions that exist in the building industry. There, I think, we have a series of factors which were discussed before this committee last summer: the cost of building materials, the cost of financing, the labor costs of building houses, and a thousand and one other items.

My sole purpose of bringing in these charts is to point out that if you can solve technological unemployment tomorrow, that isn't necessarily going to affect the picture in housing.

As I said, during these periods of depression this problem of technological unemployment becomes accentuated because you add to an already large volume of unemployment more unemployed to make the problem still more severe. It is accentuated also for another reason which is that during periods like the present we become socially conscious that the problem exists. We are trying to find an answer. Some Members of Congress were interested in finding an answer in 1929, but the American people as a people weren't

EXHIBIT No. 2784

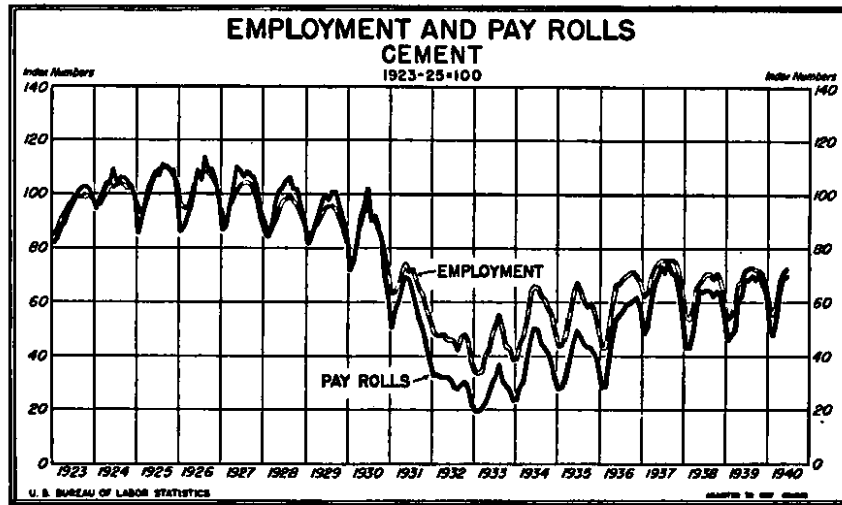


EXHIBIT No. 2785

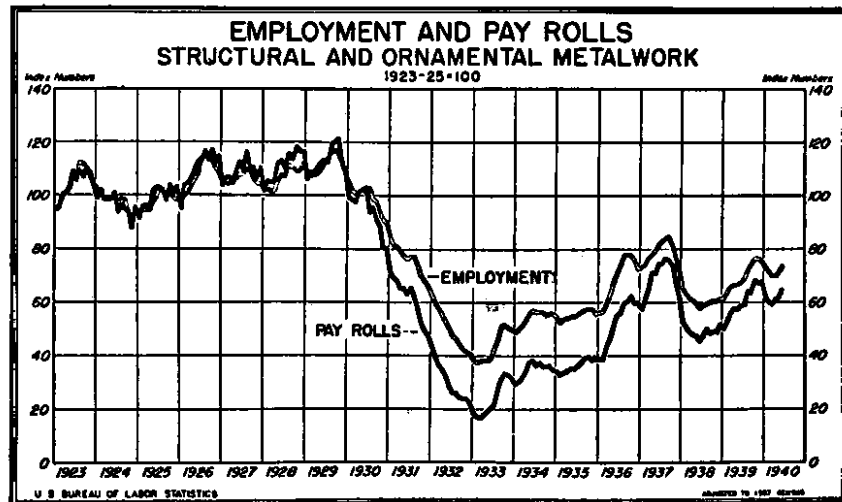


EXHIBIT No. 2786



EXHIBIT No. 2787

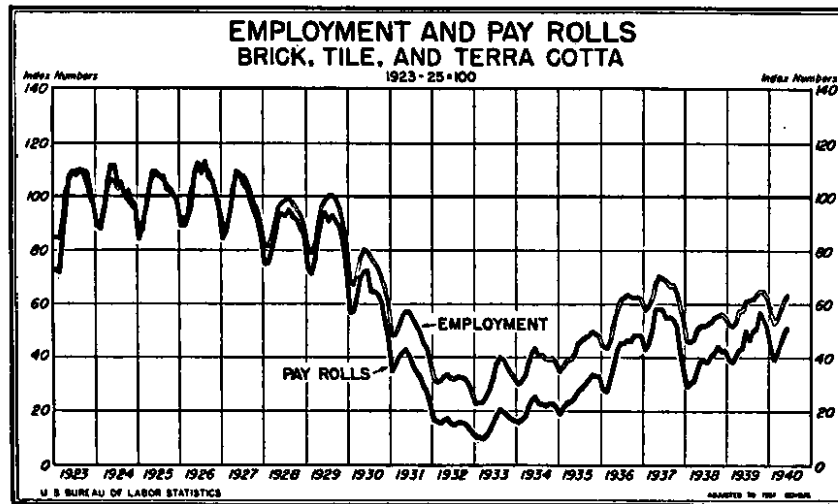
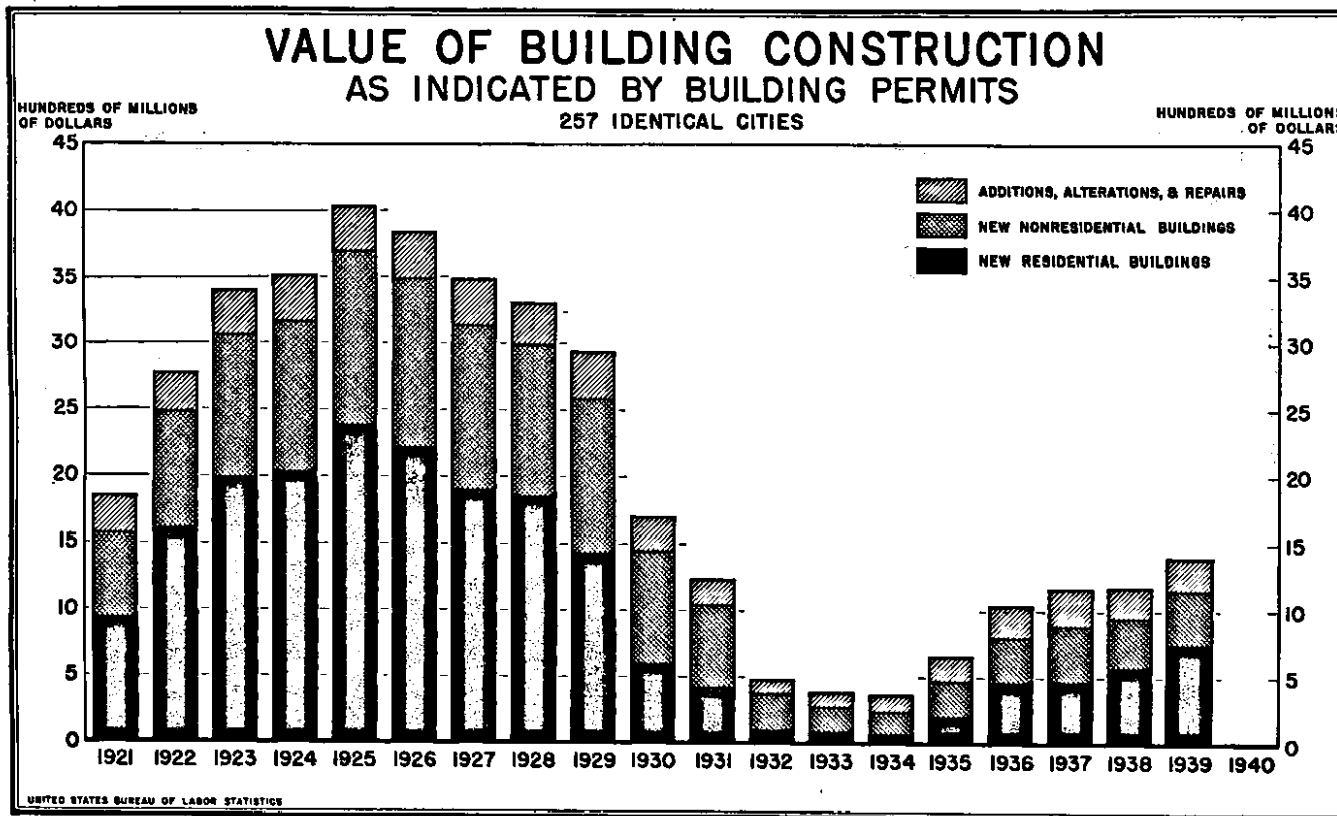


EXHIBIT No. 2788



17256

CONCENTRATION OF ECONOMIC POWER

interested. But when you have a problem of unemployment and you are trying to find out what it is all about, these other factors, everything that impinges upon it, becomes very, very important and you become conscious of them.

The displaced worker, however, has always been conscious of the problem, and he was just as conscious in 1929 as he is in 1940. But society wasn't, and society has been forced into that period of consciousness, as I said, because of a general abnormal economic situation rather than by these technological changes.

DISPLACEMENT AND THE YOUNG AND OLD WORKER

The CHAIRMAN. Of course the testimony of Mr. Gill emphasized that the displaced worker doesn't make up all of the unemployed, that we have now confronting us the worker who never had a job and therefore never could have been displaced.

Dr. LUBIN. Well, he was displaced in a sense, in part, to the extent to which his ability to get a job, even in the 1920's, was delayed. He may have been absorbed, but the need for taking him on was not as great, due to the greater efficiency in operation.

The CHAIRMAN. Not alone that, but as you, I think, have very correctly pointed out, due to a number of other factors which have increased the productivity of labor, not alone the machine, but all of these accumulating factors. But the thought occurs to me that while it may be true that we cannot assign to technological unemployment responsibility for the entire situation, if we look at it from the point of cure, we probably are compelled to come to the conclusion which was reached by Mr. Gill, namely, that unemployment is the central problem, unemployment whether by reason of technological advance or by lack of demand or new industries, of which you have spoken, or any of these factors. So that anything that contributes to providing employment, whether by machines or by hand labor or by new industry or what not, will by that very fact create increased consumption and thereby tend to overcome all of the factors which you have set forth.

Dr. LUBIN. I think very definitely; as a matter of fact, that is the conclusion I am gradually getting to. Before I get to it, though, I would like to point out one other factor, and it is the other side of the coin that Mr. Gill pointed to when he talked about the youth. He also mentioned the old worker. I think it is worth while emphasizing what Mr. Hook said in part and what Mr. Murray implied, that this problem of displacement, whether it be through machines or for other reasons, becomes ingrained in the public conscience because, during periods like this, displacement through any radical change in methods of production puts a rather heavy toll, probably a heavier toll than usual, on the old worker. In the steel industry, as Mr. Hook stated, the plants that were shut down were the less efficient plants, the more obsolete plants. Now the more obsolete plant is the older plant usually, and the older plant usually has more older workers; in other words, there are people there who grew up with it, stayed with it, and the result is that as you shut down these obsolete plants during a period of competitive stress, whether it be due to sheer competitive conditions or the invention of new methods, by shutting down those plants the proba-

bility is that you are throwing more older people onto the market than the general run of industry is doing. Of course, the older worker, during periods of very keen competition on the labor market, with more younger workers there looking for jobs, comes into a tight labor market and finds still more difficulty finding a job. As it is, he would have some difficulty, more than the youngster.

So because of the nature of the type of plant that is shut down because of these newer processes, you accentuate the problem of the older worker and you lengthen his period of unemployment, and again force back into the public consciousness the fact that it is the machine or the new process that has been a responsible factor, whereas the responsible factor may have been, probably is, for the most part, the tight labor market.

Despite the great scientific progress and the severity of technological displacement that has occurred, I cannot accept the idea that this is a permanent burden on society that we are never going to solve. I think that as unemployment decreases, as the economic system absorbs more and more people, the severity of the aftermath of technological displacement will become progressively less. In other words, I feel that the severity of the problem of technological displacement is geared into the whole question of the problem of recovery, and I believe that with the growth in the economy, as more goods are made, more services are available, and these goods and services are better distributed, as the national incomes goes up, you have a higher standard of living, and the impingement of these technological changes upon the employment situation will become progressively less severe.

But that is not to say that the problem is going to disappear, because even if we have full employment it is going to crop up every day at particular points and particular plants in different ways, and it is only during periods of more or less full employment that you can actually distinguish the technological element from all these other forces that operate. Of course, one can distinguish these forces today when you get a radical thing like a new steel mill going up or a new plant being erected, but by and large it is next to impossible to attribute a particular unemployment to a particular technological factor.

As I say, that problem is going to exist, it is going to keep cropping up, and will be appearing in every segment of the economy even though you have great industrial activity, and the question arises as to how the problem should be coped with. Again I am talking only about this specific problem of displacement.

DISPLACEMENT COSTS PAID BY WORKERS

Dr. LUBIN. I think one thing is evident, as shown by the testimony before this committee, that everybody is agreed the displaced worker should not bear the cost. I personally think that the cost should be borne by those who benefit from displacement. I think that industry, which profits by these displacements, and consumers who profit by this displacement should share some of the burden with the displaced worker. We have already given recognition to this principle of putting the burden upon those who benefit in our Social Security Act.

We have said in our Social Security Act to the ladies of this country, "If you want to buy your Easter bonnets in April and no other month of the year, and you are going to go without another hat until next fall, you are going to have to pay part of the cost of taking care of these unemployed during the period when you don't want to buy hats," and we have assessed the employer, we have taxed him, and those taxes are put into a pool, out of which funds are given to these unemployed workers. By taxing him we have made the cost of maintaining these people part of the cost of production, and you and I, who get the benefits of these services and you and I who can have all of our whims catered to, who buy today or tomorrow, are bearing part of the cost of taking care of these people who are in their present condition partly because of our whims and habits of purchase.

We have recognized that same principle in workmen's compensation. For over a generation now, workmen's compensation has been an accepted part of our economy. All but one State have workmen's compensation laws.

Now, how does the workmen's compensation law operate? Well, it says there is a hazard in industry. You and I want the products of this industry, and there are certain hazards to the worker in the industry and we must pay for those hazards. So the employer pays a premium on his pay roll, which again is attached to the cost of production, which he adds to the price which we pay, and if a man is injured, he is taken care of with those funds that you and I as consumers pay through the cost of production.

The CHAIRMAN. Of course, one difficulty about laws of that character is that they deal with only a segment of the problem; they deal only with the industrial worker in the sense of the worker who is employed in manufacturing or mining or work of that kind. There are usually exemptions, as in the Social Security Act; the agricultural worker is not included at all.

Dr. LUBIN. Of course, I would advocate the expansion of the coverage. Take the case, probably the best case we have, of the houseworker. A woman wants somebody to come in and help her just for 3 hours one day, and there is a person there to do that for her. During the rest of the week either W. P. A. takes care of the house worker or her family takes care of her. The way we have organized our method of living in this country a lot of people only want a person for 2 or 3 hours a day, and I feel that if I want that luxury I ought to pay an unemployment-insurance premium when I hire that person so that I will be paying my share of taking care of her so that she will be there next week when I want her.

Now, in the case of workmen's compensation we have said and the courts have held, that if a person is partially disabled he shall be entitled to a certain income, and partial disability has been interpreted by the courts as including inability to earn wages or full wages at the employment in which the employee was working at the time of the injury. In the State of New York we pay a man as much as 66 $\frac{2}{3}$ percent of his wages, with a maximum of \$25 a week, for as many as 6 years, and a man can get \$7,200 in cash over a period of 6 years in New York if, because of an injury, he can't go back to his old job and earn the wages that he formerly earned.

I can't see any distinction between my being unable to go back to my old job because I have lost a couple of fingers and not being

able to go back to my old job because a machine took my skill away and I am no longer needed. Yet in one case we have recognized the responsibility of society to take care of these people, and in the other case we have paid no attention.

Mr. O'CONNELL. Under the workmen's compensation law you get the compensation even though the injury were not your own fault, and clearly a man who is unemployed because of the economic situation is not to any extent responsible for his condition.

Dr. LUBIN. Or go a step further. Take the case of obsolescence of machinery. You put a million-dollar investment in a plant and equipment, and if somebody comes along and puts in something new, a change in the art, that obsolescence loss can be charged to depreciation, because of the accounting and tax structure, and it becomes a part of the cost of production. Many a firm has an obsolescence fund which they accumulate each year and it is charged to the cost of production, and you and I as consumers are making provision for that firm or that industry against the possibility of that machine becoming obsolete. The stockholder gets not only his regular return, he gets something additional. I noted, for example, that the income-tax division of the United States Treasury when the talkie made obsolete the old methods of production and the old methods of projecting movies, gave the industry the opportunity to write off more than it otherwise would of this obsolescence which suddenly came up it. In fact, the policy of business is to permit allowances not only for ordinary but also for extraordinary obsolescence of plant and machinery.

Certainly if it is the policy of industry, of our economy as a whole, to make the consumer pay for the obsolescence of the investment of the producer, society should be asked to bear the burden of the obsolescence that that very machine that makes other equipment obsolescent brings about in the case of the worker. And again I get back to what I said earlier, namely, I think we have had bad social bookkeeping, we haven't charged all of our costs of production. We have made certain people bear those costs of production, and in the case of technological changes it has been the worker or his family or his relatives or the public relief agencies.

Mr. PIKE. We have charged them but our allocation has been terrible.

Dr. LUBIN. We haven't charged them. Somebody paid for them but the people who got the benefit didn't pay.

Mr. PIKE. We haven't hit the right place.

Dr. ANDERSON. As a matter of fact, you wouldn't say that we had made any charge, that it was charged only in the sense of misery and poverty and deprivation. That is a definite social loss, but it doesn't appear in the bookkeeping.

Mr. PIKE. That is a big social charge.

Dr. LUBIN. Not only that, but workers' families and friends have paid part of the cost.

Dr. ANDERSON. That is true.

Dr. KREPS. In a sense the total cost, even when concentrated upon these workers, is larger than it would have been if we had diffused the cost of obsolescence to all the consumers, because it might well be that this perfectly valid cost charge would have tended to make

the introduction of some machines less speedy than would have been otherwise the case.

Dr. LUBIN. It might have in some instances; on the other hand, in other instances it might not have. But I want to come to that point in a minute, namely, what the results might be if we forced this burden upon those who really should bear it.

DISPLACEMENT COSTS CHARGEABLE TO SOCIETY

Dr. LUBIN. The question arises, then: how would you allocate this cost? One of the suggestions made to this committee by many witnesses was the dismissal wage. As you know, the dismissal wage is now in effect under voluntary arrangements in some instances and under collective agreements in other instances. I want to point out that the Congress of the United States, just as it has recognized the right of the investors to protect themselves against obsolescence in the income-tax law, has also recognized the equity of the principle providing for the displaced worker in the Railroad Transportation Act of 1933. Under that act, which makes specific provision for workers who are displaced as a result of railroad consolidation, an agreement was reached in 1936 whereby any worker who loses his job because of a merger of railroads, who has been employed for 15 years or over, is entitled to 5 years' pay on a basis of 60 percent of his average monthly earnings. In other words, we have undertaken to shift that cost from the employee who is displaced to the employer and thence to the consumer of the product. If he does not want to go on that sort of pension basis, he is entitled, if he has worked for more than 5 years, to a full year's pay, if he wants to withdraw from the industry. And we have gone even further. If as a result of consolidation a man has to move, the coordination plan provides that these workers be compensated for losses sustained by compulsory sale of their homes or other equities at less than fair value. So we protect not only their earning power but their capital losses. In other words, the principle, then, has already been accepted by the Congress of the United States in this consolidation law.

Not so very long ago in the case of the telephone and telegraph industry, when the Senate Committee on Interstate Commerce held hearings on a probable telephone and telegraph merger, that same suggestion was presented to the Congress. A merger will mean increasing the equity of the bondholder. At whose expense? The expense of 14,000 people who may lose their jobs. Of course, you are going to cut the cost of operation, you need fewer people when one company runs the system rather than two. It was recommended that for a certain number of years those savings in the equities of bondholders be shared with the workers; in other words, make provision for the workers over a series of years until they reach the retirement age, and only after they have been taken care of shall these increased equities and the values of the securities that arise out of this merger be given to the person who owned the equities.

Other cases were mentioned by various witnesses of similar attempts to handle the problem.

The question arises as to what the proper allocation of those costs might mean in terms of unemployment and technology as a whole.

I personally believe that the equitable allocation of these costs, the pooling of risk and some sort of insurance system, would, like the workmen's compensation system, not only tend to ameliorate the conditions of those who are displaced, it might even eliminate some of the causes.

We have found that the fact that workmen's compensation is charged to the cost of operation has led to cutting down accidents. In other words, it has made the employer conscious that he has to give consideration to the problem of his accidents, and similarly if he had to pay for displacement he would give more careful consideration to the problem of displacing labor. I think if he knew that it was going to cost him something he would be more careful in timing the introduction of his technological improvements. That may not necessarily delay improvements, it may even hasten them, if the employer tried to time this introduction to his labor turnover so he wouldn't displace people, that is time them to periods of increasing production when he is going to increase his employment. That has already been done by some employers, and some collective agreements like those of the Pressmen's Union, the Textile Workers' Union, and the Hosiery Workers' Union already have some provision for timing these changes so that they will bring with them the minimum suffering and displacement.

I think that the fact that the employer knows that the burden is being borne by him and his industry rather than by the worker himself will stimulate him to attempt to find jobs for displaced workers in his own plant, whereas now he doesn't care; it doesn't cost him anything, it doesn't cost the industry anything. I think that it will force him to retrain his workers, to seek some way of teaching them new jobs, so that his burden and the burden of his industry will be cut down. In other words, I think that such a system will not only shift the burden where it belongs, so that the hardship is no longer borne by the worker himself, but would, as I said a minute ago, tend toward elimination of the problem that we are trying to ameliorate through these dismissal wages.

Now, the question, of course, is as to how to cover these costs.

I recommend very definitely to this committee that it give careful consideration to the feasibility of a compulsory dismissal wage law to be tied up in some way or other with the unemployment-insurance system. I will admit that a voluntary system such as is now in effect in many plants would be an ideal way, or getting it through collective bargaining would be an ideal way, but the problem is too large, and I doubt whether we can wait that long.

Mr. PIRK. Isn't it also true, Dr. Lubin, that as brought out in the textile hearings the other day, in many of those industries that might need it most, where the problem is worst, the financial ability of the competing concerns is such that they couldn't do it unless it were put on all of them at once.

Dr. LUBIN. Exactly. Or let me put it this way, that the manufacturer himself, the employer himself, may be subject to the same forces that he may be technologically displaced by his competitor. Consequently it has got to be pooled.

Dr. ANDERSON. Do you include partial pooling as well as total pooling?

Dr. LUBIN. That is a question to be worked out. I don't want to go into the details. As I say, I think this is a question of experience. It took us a generation to iron out the knot in workmen's compensation. There is still controversy as to whether or not we should have a State system of unemployment compensation or a Federal system or a company system like Wisconsin has.

Dr. ANDERSON. It is more than a detail in this instance, I believe. The opposition to a universal dismissal wage would be tremendous, from a practical standpoint, were it to be a complete pool, on account of the variety of circumstances prevailing in the industry.

Dr. LUBIN. Well, those are administrative matters; I mean, how to determine whether a man has been displaced by a machine. And again I say, the only way you are going to solve the problem is to have to do it and deal with it. You have the problem, of course, as you probably know, in your own States, of certain boys at a university who went to work in the summer and their employers paid unemployment compensation benefits, and the boys went back to school in the winter, were not employed, but were drawing unemployment compensation while they were in school in the winter. Now, nobody foresaw that, but we are going to iron that out and find an answer to it; I mean, you are going to find that all the time.

Dr. ANDERSON. And you wouldn't make any distinction in dismissal wage procedure? You would take in all labor displacement regardless of cause?

Dr. LUBIN. I don't know. Frankly, I just couldn't answer that. I want to discuss the general idea. Now, I might point out that there are about 15 countries that have compulsory dismissal wages now. They apply to all dismissals. They make no distinction. Now, in a sense you have compulsory dismissal wages in the Unemployment Compensation Act. I mean, if a man loses his job, he is entitled to a certain number of weeks of compensation which, in a sense, is a dismissal wage, which they did not have before.

I feel definitely that the committee should give consideration to a compulsory dismissal wage, but with it should be tied up the whole problem of retraining and mobility; in other words, one of the conditions of receiving dismissal wage should be certain retraining programs, and if necessary, mobility, and it may be that that part of the dismissal wage might be used, for example, as in the railroads paying the cost of moving the family to another place where a job might be had.

My second recommendation is the extension of the benefit period under the Unemployment Compensation Act, again tied up with retraining and with mobility.

Such a system is going to create a lot of problems, but every new insurance idea, or pooling idea, is going to create a lot of problems. But I think that it is a direction in which we should look. I admit that during periods of large masses of unemployment the problem becomes much more difficult of administration than it would be when everybody was working; but that to me is no reason why we should not get moving in that direction now. If we can get started now, if another major depression occurs, we might have a working machine which will really cope with the problem of displacement even under such difficulties. If I might end these hearings in terms of a summary—our job would be, as I see it, to find a solution

of these problems within the framework and the pattern of private enterprise in our competitive system.

I think the solution can be found inside of that framework. In order to keep within that framework, however, I think that it is going to be our duty at all times to press to see to it that the system is kept flexible so that the mass markets can be exploited and more and more goods can be made available to more and more people; and incidentally, in keeping the system flexible, I want to make one point which may not appear very important and yet, to me, it is important.

As we discuss the question of the flexibility of the system and make these benefits of lower cost and technological improvements available to the man on the street, we stop ending our vigilance at the factory door.

In many instances, where costs are lowered by these methods, these lowered costs are reflected in lower wholesale prices, but the consumer never sees them. They are lost somewhere between the factory door and the consumer and if you are going to increase mass production, the consumer must get the lower price.

If I might conclude, Mr. Chairman, I would like to say that at least as I see the picture, power, invention, machinery, and efficiency have been the basis of the progress of the United States. They have made possible a continuous rise in our standards of living, and we should welcome more and more the application of science to methods of production and distribution.

At the same time, however, we must recognize that the application of science to industry is accompanied by certain social costs, frequently rather temporary which in the past have been borne by innocent victims. Our problem is today to allocate these costs so that all of us who benefit from scientific progress shall bear our equitable share.

The CHAIRMAN. Any questions?

COOPERATION OF EMPLOYMENT AGENCIES

Dr. ANDERSON. Dr. Lubin, I am sure you meant to include in your proposals, along with retraining and mobility and a dismissal wage, an integration also of employment agencies. The employment-service programs would have to be greatly enlarged, would they not, and integrated to provide complete coverage for agricultural, industrial, and other workers?

Dr. LUBIN. You would have to, if you were going to get any effective administration; in other words, I always like to think of the function of an administrative agency to be that of working itself out of a job. It ought to be there to eliminate the reasons for its being there. I think that the employment service would come in very effectively under that point.

Mr. PIKE. Dr. Lubin, I think you have gathered the feeling around here.

Dr. LUBIN. Well, I think the interest of the people here in these problems shows their awareness of them.

Mr. PIKE. No doubt, but you are trying to work yourself out of a job when you eliminate the function.

Dr. LUBIN. Well, the better you do it, the closer you come to eliminating the reason for your being there. I always felt that the National Labor Relations Board, if it ever gets to the point where it can bring about collective agreements, collective bargaining, has no

longer any reason for existence. It is only because you do not have collective bargaining that they are there.

Mr. PIKE. Yes; when you have accomplished that, the initial rush of administrative necessity is over.

Dr. LUBIN. That is right.

Mr. O'CONNELL. Of course, that would be less apt to be so in an area such as that covered by the Federal Trade Commission, because you would really have to change human nature before you could do that job.

Dr. LUBIN. Well, I agree that there would be exceptions of that sort.

The CHAIRMAN. Now, what about the criticism which is sometimes made that legislation of this kind unduly increases costs and thereby penalizes production?

Dr. LUBIN. Well, Mr. Chairman, there are definite data—I am sorry I have none available with me—which show the relationship between some of these burdens and costs. In virtually all instances, they have been insignificant in any particular product.

I don't think I am exaggerating when I say that in every instance where protection of dismissed workers has increased cost, it has also brought about decreases in costs in other instances because of the changed morale, the changed efficiency of labor that rises out of security.

The CHAIRMAN. Yes, you testified earlier in the afternoon with respect to instances that have come to your attention, of industries paying—or at least of manufacturers paying—50 percent more than the prevailing rate of wages and still maintaining a high competitive standard because of increased productivity.

Dr. LUBIN. Yes.

The CHAIRMAN. But is it not a fact that there is also a sort of psychological resistance against their suggestions of this kind?

Dr. LUBIN. Oh, I agree with you.

The CHAIRMAN. And based on this very ground?

Dr. LUBIN. Oh, yes; I will agree fully with you, and as a matter of fact, my contention is that this charge is being borne today and somebody is paying the cost of taking care of these people. The wrong people are paying the cost.

The CHAIRMAN. Yes; of course; the cost of taking care of the people now is being borne by the National Government in increased debt. It is perfectly obvious that the more we increase the debt, the greater the burden we place upon the future to pay the debt.

National debt, like any other debt, can be paid only out of production; so that you would agree that we must stimulate production in order to pay off the debt?

Mr. LUBIN. I will say that there is no answer to any of our problems without increasing production; in other words, increased production is the basis of greater distribution of goods, which means a higher standard of living, which in itself increases productivity.

The CHAIRMAN. National production and national income are practically synonymous, are they not?

Dr. LUBIN. Yes, except for changes in the price level.

The CHAIRMAN. And anything that contributes toward a reduction of production necessarily contributes to a reduction of national income, whether that factor is a monopolistic practice by industry, or

increased national debt, for example, or inefficient application of relief, to the unemployment problem?

Dr. LUBIN. That is true.

The CHAIRMAN. Then I suppose you would agree that the measure of tax revenue is the measure of production?

Dr. LUBIN. Yes. If tax rates remain unchanged.

The CHAIRMAN. If we can stimulate production, we necessarily increase revenue.

Dr. LUBIN. With the same rates you automatically increase it.

The CHAIRMAN. That is right. Well, do you think there would be any virtue in attempting to stimulate employment and thereby increasing the available consuming power by tax rewards to those who employ labor?

Dr. LUBIN. Well, it depends entirely what sort of tax reward you have. Let me give you a concrete illustration of what I mean; I think there is some logic, although I have been told by those who know the tax system, that the administrative problem would be very difficult, in giving a tax reward to a man who increases both his production and his employment. You might increase employment by this device but you might not necessarily increase production. You might find yourself with no addition to the national income.

The CHAIRMAN (interposing). Well, the net addition might not be made by that particular producer or that particular employer, but the increased purchasing ability or capacity of the worker who is given the job would reflect itself in increased demand for the product of some other industry.

Dr. LUBIN. That assumes, however, that the funds used to take care of the worker who has been added to the staff would not have been used in some other way. In other words, if a man is receiving \$50 a month from W. P. A. and you take him off of W. P. A. and put him into a private job and you have not at the same time increased the net production of the country, you have made no increase in the national income.

In other words, what I am getting at is this, that all you may have is a shift from the Government supporting a displaced worker to the employer supporting him, so the net gain in purchasing power may not be changed. If, on the other hand, in the process of doing it, he produced more goods, so the country as a whole would be better off, I would say we would benefit.

The CHAIRMAN. Are there any other questions? Well, then this brings our hearing regretfully to a close.

Dr. ANDERSON. Mr. Chairman, what we have tried to do in the last 3 weeks, I think, has been well summarized by the two witnesses of the afternoon.

We started 3 weeks ago with a statement of a general character by Dr. Kreps, which took the positive position that this America of ours had an unlimited internal frontier, that we can do much more than we have done, that our present unemployment, involved and difficult as it is to solve, can and must be solved if our private economy is to continue. From that first statement we moved to an outline of the prospects of the immediate future, and gave the areas of technological change which might give us the expansion necessary to provide full employment of our labor force.

On successive days we presented industries which were in themselves large employers of labor, and in which technological changes

(using "technological" in a broad sense to encompass the five points that Mr. Lubin has enumerated) were large and paramount features of a substantial labor displacement.

Yesterday we began an analysis of what could be done about it. Educational people discussed the possibilities of vocational training and placement, and retraining and replacement of the displaced laborers, and today we have had a summary by Mr. Gill, of the National Research Project, which forms the largest, most comprehensive available analysis of the effect of technology upon labor. Now, finally, this brilliant statement of Dr. Lubin's summarizes and brings to a close the 3 weeks of hearings.

Following this, the technical staff will offer the committee certain analyses for its deliberations and conclusions.

The CHAIRMAN. I beg your pardon? I didn't get that last statement. I want to know what is in store for us.

Dr. ANDERSON. We have collected a body of material, much of which is before you and in your files. There is also much yet to come which must be summarized and brought to the committee's attention for its deliberations. That is what I meant by that last statement.

The CHAIRMAN. The interesting factor in this whole story to me has been the practical unanimity of all witnesses, whether they came from the employer side or the employee side, that there is an unemployment problem and that although the advance of science, invention, and technology does create new problems and new industries, there is a displacement of particular persons and a lack of opportunity for employment as a result.

It was also a striking thing to me that almost every person who testified protested that he was offering no panacea, no cure for it all, and even though Dr. Lubin has made a recommendation, he has also qualified that by saying that he does not believe that one solution will solve the whole problem. It is unquestionably a matter of the gravest importance, and one which not only the committee but all people in the country should give a little more thought to than, apparently, was given to the report of Senator Couzens' committee in 1929, when the problem was diagnosed. We are still waiting for a cure.

Dr. LUBIN. I am very sensitive about that, Mr. Chairman, because I was the economic adviser of that committee.

The CHAIRMAN. The States which were represented by the Committee on Education and Labor, which authorized this report, perhaps deserve mention, since they share part of the credit: Michigan, Idaho, Colorado, Rhode Island, Connecticut, Massachusetts, New York, Tennessee, Ohio, and Texas. It was a pretty broad representation of the country.

The committee is very much indebted to you, Dr. Lubin, for this statement this afternoon.

I cannot declare an adjournment without complimenting Dr. Anderson for the excellent manner in which the evidence has been presented, and Dr. Kreps for his participation.

Perhaps I should also mention that Mr. Pike and Mr. O'Connell were conspicuous for their consistent record of attendance.

(Whereupon, at 5:30 in the afternoon, the committee adjourned, subject to call of the Chair.)

APPENDIX

EXHIBIT No. 2428

[Submitted by the Temporary National Economic Committee Study Staff]

Below are listed only those innovations, mostly inventions, which have been of major direct importance for modern industry. For example, no medical discoveries are listed at all despite their undisputed significance.

The increase in the pace of invention appears clearly in this Exhibit. Note that some of the most important inventions were made in prehistoric time. Those unknown inventors who domesticated fire and found out how to treat metals who tamed the wild animals of the field and forest to draw their plows and transport their burdens rank among the greatest inventors of all human history. Nothing that we did from 1750 to 1930 in the improvement of the cereal grasses, for example, has approached the accomplishment of prehistoric man in increasing the amount of wheat and corn and the like yielded by the original grasses with which he began. Our debt to the unknown inventors of all ages can hardly be fully appreciated.

Moreover, many of the inventions most fundamental to human well-being came into being long before we had devised large corporations or patent systems or university and industrial research laboratories or technical schools and other paraphernalia often thought by those unacquainted with history to be fundamental prerequisites to the birth and development of a new idea. Leonardo da Vinci, for example, one of the greatest scientists as well as artists of his day, was instrumental in giving modern industry the centrifugal pump, the dredge for canal building, the anti-friction roller bearing, the universal joint, the conical screw, the rope-and-belt drive, link chains, bevel gears, spiral gears, proportional and paraboloid compasses.

Advances in medicine have been fully as rapid as those in industry, yet owe almost nothing to economic institutions or individual desire for wealth. Because inventions depend on science they are predictable. On this point a chapter written by Dr. S. C. Gilfillan entitled "The Prediction of Inventions" in the well-known study entitled *Technological Trends and National Policy* published by the National Resources Committee in June 1937 gives conclusive proof. Among the interesting examples cited is that published in the *Scientific American* of October 1920 when a long editorial article entitled "The Future as Suggested by the Developments of the Past 75 Years" made predictions concerning the inventions that would occur during the next 20 years. Of these 78 percent have been verified.

If one is familiar with what has happened in the world of science, one can predict what is going to happen in industry. For it takes time for that which has been found out by the scientists to be known and applied in industry. "Television began to be invented in 1877, picture telegraphy about 88 years before it attained important use, * * * radio telephony 23 years, the airplane 70 or more and the talking picture 40 years, before they had any importance."

Other notable examples are: the electric furnace, of arc and incandescent types, first working model in 1810, beginning of modern commercial practice, 1886; nitrogen fixation, 1785 and 1900-1903; calcium carbide, 1862 and 1895; petroleum cracking, 1860 and 1908-1914; mechanical firing of boilers, 1800 and 1845; the caterpillar tread, 1770 and 1904; the combined harvester and thresher, 1828 and 1886; the milking machine, 1819 and 1905; the moving picture, 1859 and 1892; the typewriter, 1714 and 1873.

Says Dr. Gilfillan on this point:

"Taking 19 inventions voted most useful, introduced in 1888-1913, the average intervals were: Between when the inventions was first merely thought of, and the first working model or patent, 176 years; thence to the first practical use, 24 years; to commercial success 14 years; to important use 12 years, or say 50 years from the first serious work on the invention. Again in the study of the most important inventions of the last generation before 1930, in *Recent Social Trends* (written

by President Hoover's Committee), a median lapse was found of 33 years between the 'conception date' * * * and the date of commercial success."

Inventions, in short, have causes. As Dr. Gilfillan says:

"They are not just accidents, nor the inscrutable products of sporadic genius, but have abundant and clear causes in prior scientific and technological development. And they have social causes and retarding factors, both new and constant, of changed needs and opportunities, growth of technical education, of buying power, of capital, patent and commercial systems, corporation laboratories, and what not."

The fact that scientific knowledge brings about invention after a period of time also accounts for the fact that the same invention is so frequently made at the same time by individuals unknown to each other and widely separated geographically and industrially. To cite one or two well-known examples: alizarin was discovered in the same year by Graebe and Liebermann in Germany, without benefit of patent system, and by Perkins in England, where a patent system had been in operation since 1634. Similar simultaneity characterized the invention of the process of extracting aluminum from bauxite by Hall in the United States and Heroult in France; the telephone in 1876 by Bell and Gray; and the telegraph in the period from 1831-1837 by Henry, Morse, Cooke, Wheatstone and Steinheil. In fact, in a book entitled "*Social Change with respect to Culture and Original Nature*," W. F. Ogburn gives a list comprising 13 pages of inventions made simultaneously. If additional evidence is required, one need only look at the voluminous court record of patent cases involving disputes over claims of priority.

LIST OF INVENTIONS

Summary of the existing technics before the tenth century.—Fire: its application in furnaces, ovens, kilns. The simple machines: inclined plane, screw, etc. Thread, cord, rope. Spinning and weaving. Advanced agriculture, including irrigation, terrace-cultivation, and soil regeneration (lapsed in Northern Europe). Cattle breeding and the use of the horse for transport. Glass-making, pottery-making, basket-making. Mining, metallurgy and smithing, including the working of iron. Power machines: water-mills, boats with sails, probably windmills. Machine-tools: bow-drills and lathes. Handicraft tools with tempered metal cutting edges. Paper. Water-clocks. Astronomy, mathematics, physics, and the tradition of science. In Northern Europe a scattered and somewhat decayed technological tradition based on Rome; but South and East, from Spain to China, an advanced and still active technology, whose ideas were filtering into the West and North through traders, scholars, and soldiers.

TENTH CENTURY

Use of water-clocks and water-mills. The iron horse-shoe and an effective harness for horses. Multiple yoke for oxen. Possible invention of the mechanical clock.
999: Painted glass windows in England.

ELEVENTH CENTURY

1041-49: Movable type (Pi Sheng).
1050: First real lenses (Alhazen).
1065: Oliver of Malmesbury attempts flight.
1080: Decimal system (Azachel).

TWELFTH CENTURY

Military use of gunpowder in China. The magnetic compass, known to the Chinese 1160 B. C., comes into Europe, via the Arabs.
1100: Bologna University.
1105: First recorded windmill in Europe (France).
1118: Cannon used by Moors.
1144: Paper (Spain).
1147: Use of wood cuts for Capital letters. (Benedictine monastery at Engelberg).
1180: Fixed steering rudder.
1188: Bridge at Avignon. 18 stone arches—3,000 ft. long.
1190: Paper mill (at Herault, France).
1195: Magnetic compass in Europe (English Citation).

THIRTEENTH CENTURY

- Mechanical clocks invented.
 1232: Hot-air balloons (in China).
 1247: Cannon used in defence of Seville.
 1269: Pivoted magnetic compass (Petrus Peregrinus).
 1270:
 Treatise on lenses (Vitellio).
 Compound lenses (Roger Bacon).
 1272: Silk reeling machine (Bologna).
 1280: Opus Ruralium Commodorum—Compendium of Agricultural Practice (Petrus de Crescentis).
 1285-1299: Spectacles.
 1289: Block printing (Ravenna).
 1290: Paper mill (Ravensburg).
 1298: Spinning wheel.

FOURTEENTH CENTURY

- Mechanical clock becomes common. Water-power used to create draft for blast furnace; makes cast-iron possible. Treadle loom (inventor unknown). Invention of rudder and beginning of canalization. Improved glass-making.
 1300: Wooden type (Turkestan).
 1315: Beginnings of Scientific Anatomy through dissection of human body (Raimondo de Luzzi of Bologna).
 1320: Water-driven iron works, near Dobilugk.
 1322: Sawmill at Augsburg.
 1324: Cannon (Gunpowder: 846 A. D. (Magnus Graecus)].
 1330: Crane at Luneburg.
 1338: Guns.
 1345: Division of hours and minutes into sixties.
 1350: Wire-pulling machine (Rudolph of Nurnberg).
 1370: Perfected mechanical clock (von Wyck).
 1382: Giant cannon—4.86 metres long.
 1390: Metal types (Korea).
 1390: Paper mill.

FIFTEENTH CENTURY

- Use of wind-mill for land drainage. Invention of turret windmill. Introduction of knitting. Iron drill for boring cannon. Trip-hammer. Two-masted and three-masted ship.
 1402: Oil painting (Bros. van Eyck).
 1405: Diving suit (Konrad Kyeser von Eichstadt).
 1405: Infernal machine (Konrad Kyeser von Eichstadt).
 1409: First book in movable type (Korea).
 1410: Paddle-wheel boat designed.
 1418: Authentic wood engraving.
 1420: Observatory at Samarkand.
 1420: Sawmill at Madeira.
 1420: Velocipede (Fontana).
 1420: War-wagon (Fontana).
 1423: First European woodcut
 1430: Turret windmill.
 1436: Scientific cartography (Banco).
 1438: Wind-turbine (Mariano).
 1440: Laws of perspective (Alberti).
 1446: Copperplate engraving.
 1440-1460: Modern printing (Gutenberg and Schoeffer).
 1457: Rediscovery of wagon on springs referred to by Homer.
 1470: Foundations of trigonometry (J. Muller Regiomontanus).
 1471: Iron cannon balls.
 1472: Observatory at Nurnberg by Bernard Walther.
 1472-1519: Leonardo da Vinci made the following inventions:
 Centrifugal pump.
 Dredge for canal-building.
 Polygonal fortress with outworks.
 Breech-loading cannon.
 Rifled firearms.
 Antifriction roller bearing.

There are two other psychiatrists, of whom I know something, who are interested in this point of view. One is Dr. Douglas C. Campbell, who is leaving Chicago to take up work in California. The other is Dr. Temple Burling, of R. H. Macy & Company, New York City.

Third, economics. I can illustrate an identical point of view by quoting briefly from a book entitled *An Essay on the Nature & Significance of Economic Science*, by Lionel Robbins, Professor of Economics in the University of London. On page 98 he says that from the point of view of pure Economics the demand for commodities is conditioned on the one side by individual valuations and on the other side by the technical facts of the given situation. He goes on to discuss whether one can scientifically investigate individual valuations, and in this regard he at once makes the statement, " * * * we are here entering upon a field of investigation where there is no reason to suppose that uniformities are to be discovered." The reply to this observation is twofold. In the first place, I do not suppose that any scientific investigation has ever been certain that there are uniformities to be discovered before the investigation begins. Science has always made the assumption that there are such uniformities if an inquiry is rightly conducted, and the assumption has not yet been disappointed. Second, these uniformities have been discovered, though not by the economists. It is these uniformities, imposed by the informal groups upon the members conditioned to a particular way of living, that we have been studying for fourteen years. It is true that Mr. Robbins and the economists have not discovered the uniformities which are actually there, but this fact implies nothing but neglect on their part.

II. EXECUTIVE AUTHORITY

This subject has been discussed admirably by Mr. Chester I. Barnard in his book *The Functions of the Executive* (Harvard University Press, 1938). This book is based upon his own experiences as President of the New Jersey Bell Telephone Company. But although I regard knowledge of Mr. Barnard's work as a necessary preparation for the research that is required, I do not regard his book as doing more than mapping out the country and indicating where exploration is gravely needed. In this connection I should like to point out that every department of government or political science in the universities of this country discusses the exercise of executive authority, whether politically or in industry, as if government were a one-phase system, capable of being set out thus as a blueprint plan. This inadequacy to the actual facts of democracy and executive control puts our political theorists into a very awkward position with respect to the exponents of authoritarian systems, such as Fascism and Communism, for it makes it seem that the only difference between democratic and Fascist authority is the inferiority in respect both of intelligence and action of democratic systems. In other words, there is no government department in the country which has even begun the appropriate research into, or is capable of explaining, the superiority of democracy to absolutist systems.

The fact is that democracy is a two-phase (perhaps multi-phase) system. In any society, authority originates mainly in the spontaneous co-operation of the people who constitute the society. That is to say, it originates in the informal group associations of which I have been speaking. In a complex society, no matter where, this spontaneous co-operation still originates in the informal associations at the working bench, but the formal, logical, and purposive authority, the organization plan and control, originates at the executive head. This, then, gives the two-phase aspect of democracy logical and critical control from above, spontaneous and co-operative control from below. Democracy, therefore, is at least a two-phase system. In ordinary times it is important that any authoritative reordering of the group should proceed from the lower level of spontaneous co-operation. In exceptional times, in times of emergency, it is necessary that the central authority should take over an almost absolute control for the period of the emergency. Democracy, then, is a two-phase system in that in times of emergency the central control is strengthened; when the emergency is past the control is automatically passed again in some degree to the peripheral organizations. This fact has not ever been adequately studied or documented. It is, nevertheless, crudely represented in the elective systems of the great democracies. The periodic election is at least symbolic of the passing of the control to the peripheral organizations. The period between elections is symbolic of the vesting of control in the logical and purposive executive.

I have two young men who have been trained and who wish to make this study. At present we lack funds to do it. I have no knowledge of any such study elsewhere.

III. UNEMPLOYMENT

The usual method of studying unemployment, which can be illustrated either here or in England, is first to find out and express statistically, as accurately as may be, the number of unemployed. Second, a study is made of so-called depressed areas and of the morale of individuals in them. Third, an attempt is made by means of civilian camps or resettlement or training in new trades to start some of the unemployed again in work. I should like to point out that, excellent as this is, it is no more than the intensive study of a symptom and includes no attempt whatever to diagnose the ill. Yet it is possible to take account of work done many years ago in France (and some work here) and to see, however dimly, the nature of the ill that so urgently demands diagnosis. First, one must study the people who are employed rather than merely the unemployed. Palliatives are excellent but the disease demands specific treatment. In the last century, Durkheim pointed out that during prosperity the informally organized ways of living that had developed historically in a society were apt to be adversely affected. And he showed that this is specially true of modern industrial societies. It is not only the rapid movement from place to place which disrupts the ordered way of living, it is also the rapid change in the type of house and the type of relationship between families in a neighborhood. Whereas in simpler times a neighborhood unit was a real entity, in the modern industrial center, on the contrary it is largely inhabited by a floating population which has no time or opportunity to develop a common and neighborhood way of living. The effect of this upon the standard of living is disastrous. Economists are accustomed to consider the phrase "standard of living" as if it were satisfactorily accounted for by examining the amount of money spent, or available for spending, by individuals. While this does give actual expenditures and may be of interest to those who study demand, it gives practically no information about *standard* of living. A standard of living is once again a group determination. There is stability of demand for those commodities which an informal group has decided are necessary to the social group life. Such a group, even when its income is gravely diminished, will not willingly abandon the purchase of those commodities which to them are necessary for the maintenance of social relationships with their acquaintances and friends. Now, as Durkheim has pointed out, in times of rapid social movement, in times of chaos and social disintegration, these standards suffer severe damage. If people cease to be members of a group, they no longer have actual need of those material possessions which are necessary to the group amenities. Consequently, those material goods which formerly were necessities for a people become merely luxuries, the purchase of which can be instantly abandoned in any period of "depression." For example, when we lived in small communities, a marriage at almost any level required of those marrying that they should possess household linen and household silverware of some kind. In these recent times of rapid movement (and social impoverishment of living) the demand for these goods has fallen rapidly. They have ceased to be necessities and have become luxuries that few people can afford. All that a marriage requires in these days is a single apartment and a few cocktail glasses. This is social impoverishment of the most serious kind and a definite degradation of the standard of living which infallibly shows itself in a diminished stability of demand for almost all civilized commodities.

If one reads such a book as Schumpeter's recently published *Business Cycles* one sees that a claim can be made for American capitalism. Only American capitalism can claim to be a system which has progressively raised the standard of living of [the working group; This is indeed the chief character of] North American civilization. It is, however, unfortunately true that in the process of continuously raising the standard of living American civilization has unwittingly destroyed all *standards* of living, i. e. social disintegration has converted necessities back to luxuries—the "ways of living" have deteriorated. The resulting ills are an incredible instability of demand for almost anything, with embarrassingly wide fluctuations according to the popular estimate of the present and future and, as a consequence very largely of this, unemployment.

So far as I know this study, which is cardinal to the diagnosis of the social disequilibrium which we call unemployment, is not actually in process anywhere. Here again it is perfectly obvious that the assumption made by psychologists, psychiatrists, and economists, that society is no more than a horde of individuals, must be thrown overboard, and as speedily as possible a direct study of informal group organization substituted for the gratuitous and unwarranted assumption.

This is the best that I can do for you by way of statement at short notice. You ask me at the end of your telegram not only where we badly need to institute and develop researches, but who in my opinion are the leading investigators in

- Universal joint.
- Conical screw.
- Rope-and-belt drive.
- Link chains.
- Submarine-boat.
- Bevel gears.
- Spiral gears.
- Proportional and paraboloid.
- Compasses.
- Silk doubling and winding apparatus.
- Spindle and flyer.
- Parachute.
- Lamp-chimney.
- Ship's log.
- Standardized mass-production house.
- 1481: Canal lock (Dionisio and Petro Domenico).
- 1483: Copper etching (Wenceslaus von Olnutz).
- 1492: First globe (Martin Behaim).

SIXTEENTH CENTURY

- Tinning for preservation of iron. Windmills of 10 H. P. become common. Much technical progress and mechanization in mining industries, spread of blast-furnaces and iron-moulding. Introduction of domestic clock.
- 1500: Mechanical farming drill (Cavallina).
 - 1518: Fire-engine (Platner).
 - 1530: Foot-driven spinning wheel (Jurgens).
 - 1534: Paddle-wheel boat (Blasco de Garay).
 - 1546: Railway in German mines.
 - 1548: Water supply by pumping works (Augsburg).
 - 1550: First known suspension bridge in Europe (Palladio).
 - 1558: Military tank.
 - 1558: Camera with lens and stop for diaphragm (Daniello Barbaro).
 - 1565: Lead pencil (Gesner).
 - 1578: Screw lathe (Jacques Besson).
 - 1579: Automatic ribbon loom at Dantzig.
 - 1589: Knitting frame (William Lee).
 - 1590: Compound microscope (Jansen).
 - 1595: Wind-turbine (Veranzio).

SEVENTEENTH CENTURY

- Water wheels of 20 H. P. introduced: transmission by means of reciprocating rods over distance of one-quarter mile. Glass hothouse comes into use. Foundations of modern scientific method. Rapid developments in physics.
- 1613: Gunpowder in mine blasting.
 - 1618: Machine for plowing, manuring and sowing (Ramsay and Wilgoose).
 - 1620: Adding machine (Napier).
 - 1624: Submarine (Cornelius Drebbel). Went two miles in test between Westminster and Greenwich.
 - 1624: First patent law protecting inventions (England).
 - 1628: Steam engine (described 1663 by Worcester).
 - 1636: Fountain pen (Schwenter).
 - 1636: Threshing machine (Van Berg).
 - 1650: Calculating machine (Pascal).
 - 1652: Air pump (v. Guericke).
 - 1665: Steam automobile model (Verbiest, S. J.).
 - 1669: Seed drill (Worlidge).
 - 1678: Power loom (De Gennea).
 - 1680: First power dredge (Cornelius Meyer).
 - 1688: Distillation of gas from coal (Clayton).

EIGHTEENTH CENTURY

- Rapid improvements in mining and textile machinery. Foundation of modern chemistry.
- 1700: Water power for mass-production (Polhem).
 - 1709: Coke used in blast furnace (Darby).
 - 1711: Sewing machine (De Camus).

- 1714: Mercury thermometer (Fahrenheit).
 1714: Typewriter (Henry Mill).
 1727: Light-images with silver nitrate (Schulze: see 1839).
 1730: Stereotyping process (Goldsmith).
 1733: Flying shuttle (Kay).
 1733: Roller spinning (Wyatt and Paul).
 1736: Commercial manufacture of sulphuric acid (Ward).
 1738: Cast-iron rail tramway (at Whitehaven, England).
 1755: Iron wheels for coal cars.
 1756: Cement manufacture (Smeaton).
 1763: Modern type chronometer (Le Roy).
 1765-1769: Improved steam pumping engine with separate condenser (Watt).
 1767: Spinning jenny (Hargreaves).
 1769: Steam carriage (Cugnot).
 1774: Boring machine (Wilkinson).
 1776: Reverberatory furnace (Brothers Cranege).
 1778: Modern water closet (Bramah).
 1778: Talking automaton (von Kempelen).
 1781-1786: Steam engine as prime mover (Watt).
 1781: Steamboat (Jouffroy).
 1782: Balloon (J. M. and J. E. Montgolfier). Original invention Chinese.
 1784: Puddling process—reverberatory furnace (Cort).
 1784: Spinning mule (Crompton).
 1785: Interchangeable parts for muskets (Le Blanc).
 1785: Power loom (Cartwright).
 1785: Chlorine as bleaching agent (Berthollet).
 1785: Screw propeller (Bramah).
 1787: Screw propeller steamboat (Fitch).
 1788: Threshing machine (Meikle).
 1790: Manufacture of soda from NaCl (Le Blanc).
 1790: Sewing machine first patented (M. Saint—England).
 1791: Gas engine (Barker).
 1792: Gas for domestic lighting (Murdock).
 1793: Cotton gin (Whitney).
 1793: Signal telegraph (Claude Chappe).
 1795-1809: Food-canning (Appert).
 1796: Lithography (Senefelder).
 1796: Hydraulic press (Bramah).
 1797: Screw-cutting lathe (Maudslay).
 Improved slide-rest metal lathe (Maudslay).
 1799: Manufactured bleaching powder (Tennant).

NINETEENTH CENTURY

- Enormous gains in power conversion. Mass-production of textiles, iron, steel, machinery. Railway building era. Foundations of modern biology and sociology.
- 1801: Public railroad with horsepower—Wandsworth to Croydon, England.
 1801: Steamboat *Charlotte Dundas* (Symington).
 1801-1802: Steam carriage (Trevithick).
 1802: Planing machine (Bramah).
 1804: Jacquard loom for figured fabrics.
 1805: Twin screw propeller (Stevens).
 1807: First patent for gas-driven automobile (Issac de Rivaz).
 1807: Kymograph—moving cylinder for recording continuous movement (Young).
 1813: Power loom (Horrocks).
 1820: Incandescent lamp (De la Rue).
 1822: Steel alloys (Faraday).
 1824: Portland cement (Aspdin).
 1825: Stockton and Darlington Railway.
 1826: Reaping machine (Bell). First used in Rome and described by Pliny.
 1827: High pressure steam boiler—1,400 lbs. (Jacob Perkins).
 1827: Chromo-lithography (Zahn).
 1828: Machine-made steel pen (Gillot).
 1829: Filtration plant for water (Chelsea Water Works, London).
 1830: Compressed air for sinking shafts and tunnels under water (Thomas Cochrane).

- 1830: Elevators (used in factories).
1831: Dynamo (Faraday).
1833: Magnetic telegraph (Gauss and Weber).
1834: Anilin dye in coal tar (Runge).
1834: Workable liquid refrigerating machine (Jacob Perkins).
1835: Electric automobile (Davenport).
1836: First application of electric telegraph to railroads (Robert Stephenson).
1837: Needle telegraph (Wheatstone).
1838: Electro-magnetic telegraph (Morse).
1838: Steam drop hammer (Nasmyth).
1838: Two-cycle double-acting gas engine (Barnett).
1838: Propeller steamship (Ericsson; see 1805).
1838: Boat driven by electric motor (Jacobi).
1839: Manganese steel (Heath).
1839: Daguerreotype (Niepce and Daguerre).
1839: Hot vulcanization of rubber (Goodyear).
1840: First steel cable suspension bridge, Pittsburgh (Roebing).
1843: Typewriter (Thurber).
1843: Gutta serena (Montgomery).
1844: Practical wood-pulp paper (Keller).
1844: Cork-and-rubber linoleum (Galloway).
1845: Modern high speed sewing machine (Elias Howe).
1845: Pneumatic tire (Thomson).
1845: Mechanical boiler-stoker.
1846: Nitroglycerine (Sobrero).
1848: Modern safety match (R. C. Bottger).
1851: Electro-magnetic clock (Shepherd).
1851: Reaper (McCormick).
1853: Great Eastern steamship—680 feet long—watertight compartments.
[1854: Automatic telegraph message recorder (Hughes)].
1855: Commercial production of aluminum (Deville).
1855: Television (Caselle).
1855: Safety lock (Yale).
1856: Open hearth furnace (Siemens).
1856: Bessemer converter (Bessemer).
1859: Oil mining by digging and drilling (Drake).
1860: Ammonia refrigeration (Carre).
1860: Asphalt paving.
1861-1864: Dynamo motor (Pacinotti).
1863: Ammonia soda process (Solvay).
1864: Motion picture (Ducos).
1865: The lead storage battery.
1866: Practical dynamo (Siemens).
1867: Dynamite (Nobel).
1867: Typewriter (Scholes).
1867: Two-wheeled bicycle (Michaux).
1868: Tungsten steel (Mushet).
1869-1872: Ball and roller bearings, the air brake.
1870: Electric steel furnace (Siemens).
1870: Artificial madder dye (Perkin).
1872: Automatic airbrake (Westinghouse).
1873: Ammonia compression refrigerator—Carle Linde (Munich).
1874: Steamed-lined locomotive.
1876: Electric telephone (Bell).
1876: The cigarette machine.
1877: Microphone (Edison).
1877: Phonograph (Edison).
1878: Centrifugal cream separator (De Laval).
1879: Carbon glow lamp (Edison).
1879: Cash register.
1880: Electric elevator (Siemens).
1880-1887: The automobile.
1882: First central power station (Edison).
1882: Motion picture camera (Marly).
1882: Steam turbine (De Laval).
1883: High speed gasoline engine (Daimler).
1884: Steel-frame skyscraper (Chicago).
1884: Linotype (Mergenthaler).

- 1884: Steam turbine (Parsons).
- 1886: Aluminum by electrolytic process (Hall).
- 1886: Hand camera (Eastman).
- 1886: Electric fan.
- 1887: Polyphase alternator (Tesla).
- 1888: Recording adding machine (Burroughs).
- 1888: Cyanide process for gold and silver.
- 1889: Artificial silk of cotton refuse (Chardonnet).
- 1889: Modern motion picture camera (Edison).
- 1890: Pneumatic tires on bicycles.
- 1891: Trinitrotoluol.
- 1892: Calcium carbide (Willson and Moissan).
- 1893-1898: Diesel motor.
- 1893: By-product coke oven (Hoffman).
- 1895: Motion picture projector (Edison).
- 1895: X-ray (Roentgen).
- 1895-1897: Liquid oxygen.
- 1896: Steam-driven aerodrome flight—one-half mile without passenger (Langley).
- 1896: Radio-telegraph (Marconi).
- 1898: Radium (Curie).
- 1899: Loading coil for long distance telegraphy and telephony (Pupin).

TWENTIETH CENTURY

General introduction of scientific and technical research laboratories.

- 1900: High speed tool steel (Taylor & White).
- 1900: Nernst lamp.
- 1902: Radial type airplane engine (Charles Manly).
- 1902: Hydrogenation of oils.
- 1903: First man-lifting airplane (Orville and Wilbur Wright).
- 1903: Arc process nitrogen fixation (Birkeland and Eyde).
- 1903: Oil-burning steamer.
- 1903: Tantalum lamp (von Bolton).
- 1903: Flotation process for non-ferrous metals.
- 1905: Cyanamide process for nitrogen fixation (Rothe).
- 1905: Domestic electric washing machine.
- 1906: Synthetic resins (Bakeland).
- 1906: Audion (De Forest).
- 1907: Automatic bottle machine (Owen).
- 1907: Tungsten lamp.
- 1907: Television-photograph (Korn).
- 1907: Multiple disk clutch.
- 1909: Duralumin (Wilm).
- 1910: Gyro-compass (Sperry).
- 1910: Synthetic ammonia process for nitrogen fixation (Haber).
- 1913: Tungsten filament light (Coolidge).
- 1917: Mechanical refrigerator.
- 1920: Radio broadcasting.
- 1922: Perfected color-organ (Wilfred).
- 1924: Quick drying, colorful varnishes.
- 1927: Radio television.

Compiled from *Technics and Civilization*, by Lewis Mumford, pp. 438-446; *Recent Social Trends*, pp. 185-188.

EXHIBIT No. 2429

[Submitted by The Temporary National Economic Committee Study Staff]

Proportion of hand and machine workers in selected industries; based on sample inspections in 1925

Industry	Machine workers	Hand workers	Super-visors	Team-sters
Total, all inspections.....	52	44	3	1
Cotton goods.....	86	12	2	(1)
Paper.....	54	42	4	(1)
Retail coal.....	49	46	1	4
Brick and tile.....	40	53	4	3
Other manufacturing ¹	50	45	4	1
Highway construction.....	35	42	6	17
Ferrous foundries.....	27	69	4	(1)
Construction, preponderately excavation.....	15	78	5	2
Bituminous coal mining.....	14	82	2	2
Stevedoring.....	12	80	8	(1)

¹ None, or less than one-half of 1 percent.² "Other manufacturing" includes the following factories: automobile (1); brass (6); cement (5); cotton bleachery (1); crushed stone (2); garment (22); glass (1); machine shop (3); meat packing (5); paper pulp (4); tire (1); silk and velvet (3); woolen and worsted (4).Source: *Mechanization in Industry*, by Harry Jerome, National Bureau of Economic Research, New York, 1934, p. 275.

EXHIBIT No. 2430

[Submitted by the Temporary National Economic Committee Study Staff]

EMPLOYMENT CREATED BY NEW MANUFACTURING INDUSTRIES

The importance of new industries, which are being constantly created and developed by advancement in science, invention, and technology as sources of new opportunities for employment of labor, is shown in the following table. There it appears that 18 new manufacturing industries alone, which came into existence since 1879, absorbed almost one-seventh of all the labor employed in manufacturing in 1929.

Wage earners in 18 new manufacturing industries since 1879

[Source: Census of Manufactures]

Industry	Average Number of Wage Earners 1929
Electrical machinery, apparatus, and supplies.....	328, 722
Motor vehicles, not including motorcycles.....	228, 116
Motor vehicle bodies and parts.....	221, 332
Rubber tires and inner tubes.....	83, 263
Manufacture of gasoline ¹	39, 411
Rayon and allied products.....	39, 106
Manufactured ice.....	32, 184
Aluminum manufactures.....	21, 210
Typewriters and parts.....	16, 945
Refrigerators, mechanical.....	16, 833
Cash registers and adding and computing machines.....	16, 840
Oil, cake and meal, cottonseed.....	15, 825
Aircraft and parts.....	14, 710
Phonographs.....	14, 416
Photographic apparatus and materials.....	12, 967
Motion pict. apparatus except for projection in theatres.....	10, 784
Asbestos products ²	8, 092
Fountain pens ³	4, 508
Total, 18 new industries.....	1, 123, 314
Total, all mfg. industries.....	8, 838, 743

¹ For the reason that gasoline is chiefly used as a source of power in another new invention—the internal combustion motor, around which has been built up one of our greatest industries—the number of employees engaged in the manufacture of gasoline has been estimated for this list.² Excluding steam packing and pipe and boiler covering.³ Estimated.Source: *Machinery, Employment and Purchasing Power*, National Industrial Conference Board, Inc., New York, 1935, p. 61.

CONCENTRATION OF ECONOMIC POWER

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"EXHIBIT No. 2431" APPEARS IN TEXT ON P. 16223

"EXHIBIT No. 2432" APPEARS IN TEXT ON P. 16227

"EXHIBIT No. 2433" APPEARS IN TEXT ON P. 16228

EXHIBIT No. 2434

[Submitted by the Temporary National Economic Committee Study Staff]

Productivity, Output, and Employment—Percentage Changes between Designated Years

I. IN MAJOR GROUPS OF INDUSTRIES

A. FROM 1923-24 TO 1936-37

Item	Manu- facturing	Mining	Rail- roads	Electric Light and Power
Productivity.....	+50	+89	+43	+111
Physical volume of output.....	+25	+12	-17	+141
Man-hours of employment.....	-16	-41	-42	+14
Number of wage earners.....	+3.5	-14	-39	+36

B. FROM 1923-24 TO 1928-29

Productivity.....	+25	+32	+16	+31
Physical volume of output.....	+27	+16	+5	+71
Man-hours of employment.....	+1.8	-13	-10	+31
Number of wage earners.....	+2.8	-5.8	-9	+41

II. IN SELECTED MANUFACTURING INDUSTRIES

A. FROM 1923-24 TO 1936-37

Item	Auto- mobiles and Parts	Iron and Steel	Paper and Pulp	Cotton Tex- tiles	Tobac- co
Productivity.....	+47	+56	+52	+39	+140
Physical volume of output.....	+46	+16	+50	+7	+17
Man-hours of employment.....	-0.7	-25	-1.5	-24	-51
Number of wage earners.....	+25	-1	+12	-7	-35

B. FROM 1923-24 TO 1928-29

Productivity.....	+31	+35	+22	+2.8	+32
Physical volume of output.....	+50	+30	+31	+5.3	+11
Man-hours of employment.....	+15	-3.5	+7	+2.4	-16
Number of wage earners.....	+13	-4.3	+5	-3.8	-15

Source: Spurgeon Bell, *Productivity, Wages and National Income* (Brookings Institution: 1940).

CONCENTRATION OF ECONOMIC POWER

EXHIBIT No. 2435

[Submitted by the Temporary National Economic Committee Study Staff]

Index of Productivity and Unit Wage Cost in Selected Groups of Industries, 1919-38.
(1923-25=100)

Year	Manufacturing ¹		Class I Railways ²		Mineral Industries ³		Electric Light & Power ⁴	
	Productivity	Unit Wage Cost	Productivity	Unit Wage Cost	Productivity	Unit Wage Cost	Productivity	Unit Wage and Salary Cost
1919	72.2	115.4	84.3	110.4	69.7	110.2	92.8	97.9
1920	79.9	130.9	85.5	130.2	71.0	135.0	92.4	98.4
1921	88.3	108.2	91.7	119.4	78.8	126.4	103.3	90.2
1922	97.8	92.5	94.4	104.7	88.4	106.6	98.3	98.6
1923	98.7	103.1	95.0	102.3	90.0	111.2	95.2	104.8
1924	100.6	101.0	99.5	100.6	100.3	99.4	106.6	96.7
1925	105.7	95.9	104.5	97.1	109.7	89.4	106.4	98.7
1926	107.5	94.3	106.8	94.8	101.3	96.6	118.1	92.8
1927	110.2	92.6	107.1	96.1	112.4	84.7	121.2	87.4
1928	120.3	86.5	111.8	93.4	123.6	74.8	132.8	80.0
1929	121.6	86.4	113.6	93.7	127.4	70.4	134.3	81.8
1930	125.0	83.0	115.0	93.7	127.2	68.5	145.4	75.5
1931	131.6	73.4	117.2	93.0	145.2	57.6	165.1	65.7
1932	129.3	65.8	116.8	86.0	158.7	47.4	162.8	67.2
1933	134.4	63.0	128.2	77.7	160.0	44.9	181.8	66.5
1934	135.0	74.6	128.6	78.5	159.9	55.4	193.2	64.6
1935	141.8	73.6	133.8	81.4	169.5	55.5	198.5	62.4
1936	147.3	71.5	140.8	78.4	174.6	55.9	208.1	62.5
1937	143.2	82.5	143.5	78.8	183.8	57.4	216.4	62.5
1938	148.8	82.5	144.4	82.6	190.1	54.0		

¹ P. 270² P. 273³ P. 274⁴ P. 277Source: Spurgeon Bell, *Productivity, Wages and National Income* (Brookings Institution: 1940).

Index of Productivity & Unit Labor Cost in Selected Industries, 1919-38.

(1923-25=100)

Year	Automobile & Parts Manufacture ¹		Blast Furnaces, Steel Works, & Rolling Mills ²		Paper & Pulp Manufacture ³		Cotton Textile Manufacture ⁴		Tobacco Products Manufacture ⁵	
	Productivity	Unit Wage Cost	Productivity	Unit Wage Cost	Productivity	Unit Wage Cost	Productivity	Unit Wage Cost	Productivity	Unit Wage Cost
1919	59.6	150.3	65.9	127.4	72.2	113.1	89.0	108.7	85.2	110.1
1920	64.8	160.5	84.0	120.9	78.0	139.9	93.8	139.7	88.0	123.9
1921	79.5	121.3	78.8	110.3	78.7	124.0	86.7	109.1	84.6	113.6
1922	85.5	103.8	98.0	81.2	90.1	95.7	99.4	91.6	89.6	104.0
1923	97.8	100.6	94.7	98.6	96.0	100.8	99.5	103.6	93.5	104.8
1924	98.8	101.2	96.1	108.7	99.2	102.7	99.7	101.6	100.5	100.0
1925	103.7	98.2	109.2	92.7	104.8	96.5	100.8	94.8	106.0	95.2
1926	109.8	89.4	112.4	90.0	106.9	94.3	96.3	93.0	115.3	88.1
1927	110.9	92.4	113.8	90.1	113.3	90.0	93.2	94.5	114.5	85.4
1928	117.2	88.3	128.4	81.4	119.1	86.5	100.2	88.2	119.7	79.8
1929	139.7	71.8	129.4	80.6	119.6	85.2	104.6	84.5	136.2	72.3
1930	148.0	64.9	122.9	87.7	118.4	86.8	101.3	87.6	139.5	66.8
1931	132.1	72.2	118.6	82.0	137.6	73.3	98.4	77.9	161.1	68.5
1932	115.2	83.2	123.7	76.1	136.2	64.7	107.6	60.7	158.3	67.2
1933	139.7	60.3	133.2	68.2	140.4	59.5	114.1	66.8	178.2	54.3
1934	127.5	77.9	130.5	82.9	135.0	71.9	118.2	87.4	185.6	54.5
1935	141.6	74.1	144.0	78.8	141.3	70.6	127.5	80.6	217.4	49.7
1936	141.7	77.5	149.4	76.8	144.8	69.9	138.2	72.7	229.8	48.2
1937	146.0	86.6	148.2	94.2	152.4	74.7	139.6	80.8	234.9	51.4
1938	140.8	93.5	151.7	94.1	154.7	75.5	138.1	78.4	252.8	49.6

¹ P. 289² P. 299³ P. 302⁴ P. 307⁵ P. 310Source: Spurgeon Bell, *Productivity, Wages and National Income* (Brookings Institution: 1940).

CONCENTRATION OF ECONOMIC POWER

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EXHIBIT No. 2436

[Submitted by the Temporary National Economic Committee Study Staff]

Production, employment, and productivity in 59 manufacturing industries in 1938

[1929=100]

Industry	Production	Employment	Man-Hours	Output per wage earner	Output per Man-hour
Agricultural implements.....	72.7	76.5	61.6	95.0	118.0
Beet sugar (1935).....	115.2		90.7		127.0
Boots and shoes.....	111.1	97.2	80.1	114.2	138.7
Bread and bakery.....	95.0	112.4	93.2	85.4	108.0
Biscuits and crackers.....	101.1	89.3		112.2	
Cane sugar refining.....	83.7	95.0	60.1	88.1	139.3
Canned and preserved fruits and vegetables.....	105.1	108.0	74.8	95.8	140.5
Canned and cured fish (1935).....	104.6	98.0	67.2	106.7	155.7
Cement.....	65.4	65.4	51.6	97.1	128.7
Chemicals.....	105.0	113.3	89.7	93.6	118.2
Clay products, other than pottery.....	54.1	60.0	55.1	90.2	98.2
Coke.....	74.0	101.9	77.5	72.6	98.6
Beehive coke.....	26.1	45.5	29.5	57.4	85.5
Byproduct coke.....	82.9	109.9	53.0	75.4	99.9
Confectionery.....	103.3	79.3	61.9	134.0	171.7
Cotton goods.....	95.6	92.0	72.1	103.9	132.6
Electric lamps (1931).....	78.8	83.2	73.1	94.7	108.2
Fertilizers.....	75.0	77.5	62.2	98.1	122.2
Flour, etc.....	85.1	99.7	85.3	90.0	100.9
Furniture.....	68.5	75.2	68.0	88.4	97.8
Glass (1935).....	105.7	94.5	67.2	107.1	148.5
Window glass (1935).....	84.5	80.5		121.0	
Plate glass (1935).....	110.8	54.6		202.9	
Glass containers (1935).....	118.4	113.2		104.6	
Pressed and blown glass.....	95.6	100.6		95.0	
Ice cream.....	99.0	78.5	67.4	126.1	145.9
Iron and steel.....	89.1	101.8	79.0	87.5	112.8
Blast furnaces.....	72.3	68.4		104.7	
Steel works and rolling mills.....	90.0	103.9		86.8	
Knit goods (1935).....	111.0	105.4	75.4	104.3	145.3
Hosiery (1935).....	110.0	106.5		103.3	
Underwear (1935).....	90.2	84.2		107.1	
Outerwear (1935).....	131.4	122.4		107.4	
Knit cloth (1935).....		138.6			
Leather industry.....	109.4	103.0	84.9	106.2	128.5
Sole and harness leather.....	110.5	107.4	90.1	102.0	122.6
Side and upholstery leather.....	133.0	140.7	112.5	94.5	118.2
Calfskin.....	91.1	57.3	54.7	159.0	160.5
Kid leather.....	91.8	96.7	74.6	94.9	123.1
Sheep and miscellaneous leather.....	104.2	90.6	74.9	115.0	139.1
Lumber and timber products.....	66.2	65.9	52.4	100.5	126.8
Logging camps.....	66.9	65.9	52.5	101.5	127.4
Sawmills and saw-planes mills.....	65.8	65.9	52.3	99.8	125.8
Manufactured ice.....	71.6	59.1	50.6	121.2	141.5
Motor vehicles.....	85.3	89.6	73.7	95.2	115.7
Newspaper and periodical printing and publishing.....	96.1	94.9	76.9	101.8	125.0
Nonferrous metals (1935).....	54.1	78.0	62.4	69.4	84.5
Primary smelters and refineries (1935).....	51.3	72.6	60.3	70.7	85.1
Secondary smelters and refineries (1935).....	86.7	91.0	72.0	95.3	120.4
Alloyers, rolling mills, and foundries (1935).....	63.0	79.5	62.8	67.8	85.8
Paints and varnishes.....	97.2	98.9	80.0	96.3	121.5
Paper and pulp manufacturing.....	104.8	100.9	87.0	103.9	120.5
Paper manufacturing.....	102.0	101.8	86.6	100.2	117.8
Pulp manufacturing.....	119.4	97.1	88.6	123.0	134.8
Petroleum refining.....	108.9	97.8	68.9	111.9	158.1
Planing mill products (1935).....	45.2	53.5	46.4	84.5	97.4
Rayon (1937).....	281.5	143.8	116.6	189.8	241.4
Rubber products (1935).....	78.4	77.0	55.8	101.8	140.3
Rubber tires and tubes (1935).....	80.8	59.4	43.6	134.0	185.3
Other rubber goods (1935).....	77.3	90.6	63.2	85.3	122.3
Silk and rayon goods (1935).....	107.8	94.5	70.3	111.7	153.3
Slaughtering and meat packing.....	92.6	103.2	86.1	89.7	107.5
Tobacco products.....	87.0	77.7	58.3	112.0	148.7
Cigars.....	77.6	60.5	49.6	116.7	154.5
Cigarettes.....	129.8	114.1	95.2	113.8	134.3
Chewing and smoking tobacco.....	91.8	100.3	73.4	91.0	124.4
Woolen and worsted goods.....	111.4	103.1	78.8	108.1	141.0

Source: National Research Project, Works Progress Administration, Philadelphia, Pa., 1939.

The National Research Project collected data from various sources showing the production, employment, and productivity in 59 industries, employing more than 50 per cent of all workers in manufacturing. Some of the series run from 1913 to 1937, others are complete for shorter time spans. In the summary table compiled from these data, 1929 is used as a base, and in all except a few cases the comparison is made between 1936 and that date. Thus, the series is three or more years old, a significant fact, in view of technological changes made since 1936. For example, the most abrupt changes in steel occurred after 1937, with the result that while in September, 1939, steel production was only 1.3 per cent below the comparable month in 1937, workers engaged in that production had decreased 16.0 per cent.

Production.—In the series 67 industries, or branches of industries, are represented. Of that number, 23 showed appreciable gains in production in 1936 as compared with 1929; 3 maintained production at approximately the same levels; and 40 had curtailed production below 1929 levels. The largest production increase was experienced in the rayon industry, which in 1937 had an index of 281.5. The greatest loss in production was shown in beehive coke, which had declined in 1935 to 26.1 per cent of 1929.

When the products of the 67 industries or branches are divided into durable and non-durable categories, it appears that 17 are producing durable goods and 48 non-durable. Only one of the durable goods industries showed an increase in output in 1936 over 1929, while 16 showed losses. Among non-durable goods industries, on the other hand, 24 made gains in production, 3 remained stationary, and 21 experienced declines. Of the ten food industries represented, 5 showed increases in production, 1 remained stationary, and 4 suffered actual declines. Of the 9 clothing industries, 7 had increased production, while 2 had fallen off in 1936 in comparison with 1929. Some industries suffered loss of production due to partial displacement by others, such as manufactured ice, which by 1936 had declined to 71.6 per cent of 1929 output. For the most part, however, the drop in production can be attributed to loss in consumer demand, which was especially noticeable in the durable goods and capital goods industries.

Employment.—The series of indices on employment records the average annual employment, as compiled from Bureau of Labor Statistics data. It is consequently not the total actual employment used in the production recorded in the table. It does represent, however, the best available data on average number of workers engaged in these several industries during the calendar year. Of the 67 industries and branches, 20 experienced increases in employment in 1936 as compared with 1929, 3 remained stationary, 43 suffered losses in numbers of workers, and there was one industry for which figures were not available.

Of the 15 large users of labor, each of whom employed more than 100,000 workers, and whose combined labor force was 36 per cent of all manufacturing workers in 1929, 6 had more workers in 1936, while 9 had fewer workers on their payrolls. The latter represented 23 per cent of all who were employed in manufacture in 1929. When workers are distributed by the type of product made, it appears that in the durable goods industries, which are the largest users of labor, only 1 increased employment from 1929 to 1936, while 4 employed fewer workers. Among the ten large labor users making non-durable goods, 6 employed more workers, and 4 fewer workers.

Man-hours.—The series on man-hours gives information concerning the actual quantity of labor used in production. It does not indicate the number of workers employed, but gives the number of hours of employment in particular industries. It is consequently a very significant measure of employment. Of the 66 industrial units represented in the table, data are available for 56. Only 2—side and upholstery leather, and rayon manufacture—actually used more man-hours of employment in 1936 than in 1929. All of the others required less man-hours, some of them showing declines of 50 per cent or more.

Output per wage-earner and per man-hour.—Significant comparisons are made in the table between output per worker and per man-hour of employment. In 35 industries, the output per wage-earner employed increased from 1929 to 1936, in 30 it actually declined. For 2 there were no figures. This is not a measure of technological efficiency or inefficiency, however, for it takes no account of the working time involved in production. Consequently, what is being measured may be either an increase or decrease in the number of hours of employment.

To measure technological change, it is necessary to use the last series in the table, which shows production per man-hour of employment. In 33 of the 56 industrial units represented in the series, man-hour productivity increased from 1929 to 1936, in 9 it remained approximately stationary, while in 4 it actually declined. The increases in man-hour productivity ranged upward to a peak of

241.1 in rayon manufacturing. Some of the gains made in the seven years under review have been startling. In 8 industries they exceeded 50 per cent, while in 22 others they ranged between 25 and 50 per cent.

Comparisons between series.—A helpful comparison can be made between the various series of indices given in the table. For example, the production of agricultural implements declined 27.3 per cent in 1936 as compared with 1929, the number of workers employed dropped off 23.5 per cent, the actual number of man-hours worked declined 38.2 per cent, but the output per employed worker fell off only 4 per cent, and the actual production per man-hour increased 18 per cent. Under these conditions, the industry might have regained its 1929 production level and still used 18 per cent less man-hours of labor than was employed at that time. This does not necessarily require a correspondingly reduced labor force, for the alternative is available of fewer hours of employment per worker.

Beet sugar production is an example of an expanding industry. In 1935 the quantity of beet sugar was 15.2 per cent more than in 1929. But this expanded production was achieved with 9.3 per cent less man hours of labor than was employed in 1929. The reason for such conditions is not far to seek, for the technological efficiency of the labor force had so increased in the six years that the output per man hour in 1935 was 27.0 per cent greater than in 1929.

Ice cream manufacture is an example of an industry whose production was practically the same in 1929 and 1936. Yet in the latter year it required 21.5 per cent fewer workers to make this same quantity of ice cream, and the man hours they worked declined 32.6 per cent. The output per wage earner employed, however, increased 26.1 per cent, and on a man-hour basis this output had grown 46.9 per cent since 1929.

EXHIBIT No. 2437

[Submitted by the Temporary National Economic Committee Study Staff]

Occupational distribution of gainful workers, 1880-1939—As a percentage of all gainful workers

	1880	1890	1900	1910	1920	1930	1939
All gainful workers.....	100.0	100.0	100.0	100.0	100.0	100.0	100.0
All employees.....	63.1	66.2	69.2	73.7	76.5	79.7	81.2
Wage earners.....	52.7	54.4	56.5	57.1	55.0	54.3	54.3
Clerical and sales employees.....	6.5	7.5	8.0	11.1	14.7	17.3	18.3
Professional employees.....	2.8	3.1	3.4	3.7	4.2	5.2	5.6
Managerial employees.....	1.1	1.2	1.3	1.8	2.6	2.9	3.0
All self-employed enterprises.....	36.9	33.8	30.8	26.3	23.5	20.3	18.8
Farmers.....	27.8	24.6	21.4	17.6	16.0	12.7	11.8
Non-farm business enterprises.....	8.0	8.0	8.2	7.7	6.5	6.6	6.1
Professional practitioners.....	1.1	1.2	1.2	1.0	1.0	1.0	0.9

Source: Spurgeon Bell, *Productivity, Wages and National Income*. (Brookings Institution: 1941), p. 10.

EXHIBIT No. 2438

[Submitted by the Temporary National Economic Committee Staff]

POPULATION AND EMPLOYMENT, 1870-1940

(1) Since the National labor force depends upon total population and its composition, all analyses must begin by seeing what has and what will happen to population. The facts are well known. Total population is growing but the per cent of increase per decade has steadily declined from 26 per cent for that ending in 1880 to 7.7 per cent for that ending in 1940. ("Exhibit 2438-A.")

(2) Young persons seeking a job for the first time (new entrants 20-24 years of age) are now numerically at a peak. No decade has had nor is it probable that any decade in the future will have so great a problem of putting unemployed youth to work as we have. ("Exhibit 2438-B.") On the other hand, the number of workers from 45 to 64 years of age is increasing rapidly. Finding jobs for men

over 40 will in the near future require every scrap of ingenuity that leaders in business and government can summon.

(3) Judging by past trends the percentage of persons who will report themselves gainfully employed will increase from present levels of 40 to 42 per cent of the total population to 50 per cent. The fact that it has risen markedly is due in part to the fact that families have fewer under-age children today than in 1870. ("Exhibit 2438-C.")

(4) Past trends show rapidly declining percentages of total population reporting gainful occupation in agriculture, small declines for manufacturing and mechanical industries and domestic and personal services, and significant increases for those in trade, transportation and communication, professional and public service, and clerical occupations. ("Exhibit 2438-D.")

(5) In terms of the absolute number reporting gainful occupation, agriculture has shown decreases since 1910, the figure dropping from about 12.4 millions at that time to 9.3 millions today. All the other occupational groups have shown increases in each decade. ("Exhibit 2438-E.")

(6) In terms of percentages the story is somewhat different. In agriculture the percentage declined from 47.3 of the grand total reporting gainful occupation in 1870 to 17.5 at the present time. And all the others show increases except those for the mineral industries (which reached a peak in 1920) and the manufacturing and mechanical industries and domestic and personal services (in 1930). The number during the last ten years reporting gainful occupation in these industries has not increased as fast as the total. ("Exhibit 2438-F.")

(7) In 1940 the per cent of absolute increase over 1870 of those reporting gainful employment has been largest in public service (over 2000 per cent), next in clerical service (1670 per cent), then in trade (1170 per cent), then in order, transportation and communication, professional service, mining, forestry and fishing, and domestic and personal service. Those reporting gainful employment in the manufacturing and mining industries have increased 300 per cent while the grand total increased more than 320 per cent. Agriculture has the poorest record. ("Exhibit 2438-G.")

(8) Detailed figures of those in occupational groups show manufacturing most important (27.9 per cent of the total in 1930 reporting gainful occupations there), agriculture next (21.4 per cent), trade (12.9 per cent), domestic service (10.8 per cent). These four accounted for about three-fourths of all employment. In manufacturing a third of all workers said that they belonged in administrative or service jobs, 43 per cent of all transportation and communication workers reported being occupied on the roads and streets (not street railways). Only 10 per cent of those reporting usual occupation in public service were public officials. ("Exhibit 2438-H to N.")

At the outset, it is extremely important to point out that these figures are taken from the Census of Occupations, obtained by census takers in their house-to-house canvass, for a given point of time spaced at ten-year intervals, usually obtained from housewives and not directly from the workers whose occupational status is recorded. They are strictly a record describing the "usual occupation" or "occupation in which customarily employed" of persons whose records are being taken, and under no circumstances must they be confused with a record of actual employment, for they tell nothing about the actual employment status or work record of "gainful workers."

Nor does the census offer data on specific occupations for the whole range of occupational endeavor. For example, the 1930 census divided the total of occupations into ten categories, containing 213 groups, and these groups contained 534 sub-groups, some of which were specific occupations, while others were small families of occupations.

"Exhibit No. 2438" may require some clarification. The upper half shows gainful workers as a proportion of the total population. Much has been made of the presumed fact that because each census has shown a larger proportion of the total population listed as gainful workers, the economy was healthy, always finding employment for a larger proportion of its people. But the Census of Occupations, as before stated, is a measure, at a given time, of the number of people customarily on the labor market, and not a measure of employment. While the percentage of "gainfully employed" increased in successive decades from 1870 to 1910, represents in large part a transition from a barter to a pecuniary economy. The unpaid housewife or spinster, for example, has become a woman in industry. She followed baking, laundering, etc., out of the home, but got money for it. Moreover, the number of children per family has decreased more than a third since 1870. The drop in gainfully employed from 41.5 per cent in 1910 to 39.8 per cent in 1930 may reflect changes in social policy with respect to child labor, and also increased

prosperity. If so, it seems likely that the percentage in 1940 may, if anything, be the same or higher. It is estimated that by 1960 the gainfully employed will constitute 50% of the total population.

In the lower half of Exhibit 2438-C, which shows such a marked change in occupational emphasis during the past 70 years, the ten familiar occupational categories are regrouped into three: agricultural, manufacturing and mechanical, forestry and fishing, and mining occupations are called "producing industries;" trade and service occupations are grouped together; and transportation and communication make up the third functional class. The producing industries, which included 77 per cent of all gainful workers in 1870, comprised only 46.5 per cent in 1940. Trade and service occupations, on the other hand, moved from 20 per cent of all gainful workers in 1870 to 44.3 per cent in 1940. Transportation and communication included 3.2 per cent of the gainful workers in 1870 and 9.2 per cent in 1940.

Accurate interpretation of the remaining charts is easy if the essential point is remembered that "gainfully occupied" does not mean "actually employed."

The wide dissemination of that fallacy is strikingly shown in an article entitled "Science, The Soul of Prosperity," by Dr. Karl T. Compton, President of the Massachusetts Institute of Technology, published in *Think*, Volume VI, No. 3, March, 1940, p. 10 et. seq. On page 34 he states:

"There has been so much misconception in regard to the effects of technological progress upon employment and standards of living that I am going to run the risk of boring you with a few facts. * * *

"Between 1900 and 1930, the greatest thirty-year period of technological development in history, employment in the U. S. increased by more than 20,000,000 jobs.

"Even during the recent depression a larger proportion of the population were wage earners than in periods which were considered prosperous seventy-five or one hundred years ago." (Emphasis is the author's.)

Such so-called facts are not boring. They are amazing. Presumably Dr. Compton bases his contention on reports of the Census of Occupations, which enumerated 29,073,233 persons reporting a usual gainful occupation in 1900 and 48,829,920 such in 1930, a difference rated at "more than 20,000,000 jobs." But even in the very year 1930 for which he uses occupational data, an employment census was taken (in April, so it happened; the average figure for the year must have been much higher), showing at least 3,138,000 actually unemployed of those Dr. Compton counts as in "employment" or "jobs." This ignores the part-time jobs and the economic and social changes which shifted many activities from reward in kind to payment in money, from an unpaid household status to a pecuniary basis.

The dross in the second and more emphatically stated of his "facts" is in part the same. The term "wage earners" does not seem to be meant in the careful, scholarly sense in which the Brookings Institution has used it, for example, in Exhibit 2437, where the percentage since 1880 is shown to have been about 52 or 54 per cent, falling somewhat after 1910. If Dr. Compton means to say that the percentage *actually employed* was larger in 1932 than, say, in 1830, he must possess information not elsewhere available, because no Census of Occupations was taken in 1830.

If he is making a comparison with 1870, and is referring to the percentage of the total population reporting customary occupations then, he is probably incorrect. The figure in 1870 was about 32.5 per cent. In 1932 the National Industrial Conference Board estimated total employment at 37.5 millions. Midyear estimates of population made by the Brookings Institution in its volume entitled *The Recovery Problem in the United States* are 125.0 millions for 1932 and 125.8 millions for 1933. The resulting percentage is 30 per cent.

The statements which Dr. Compton makes have appeared in almost identical form in many places. Thus, for example, the Machinery and Allied Products Institute, in their pamphlet entitled *Machinery and the American Standard of Living—An Illustrated Factual Story of the Contributions of Technology to American Civilization*, (Chicago, 1939) state on page 20:

"In 1870 about 32 out of every 100 persons in the United States were gainfully employed, according to the United States Census. In 1930, according to the last census, about 40 out of every 100 were gainfully employed. Back in 1830 only 27 out of every 100 persons in the United States were gainfully employed. Thus, there was an increase in 100 years of almost 50 per cent in the proportion of the population gainfully employed. Even in the years of most severe depression in the 1930's the percentage was higher than in periods considered prosperous prior to 1900."

Similarly the National Association of Manufacturers in a pamphlet entitled *Men and Machines*, one of the well known *You and Industry Series* which are given nation-wide free distribution to schools, women's clubs, study groups, and individual citizens, states:

"Even admitting the benefits of the machine to the consumer, these are serious charges (that the machine is responsible for unemployment) requiring factual evidence to bring out the truth.

"What are the facts?

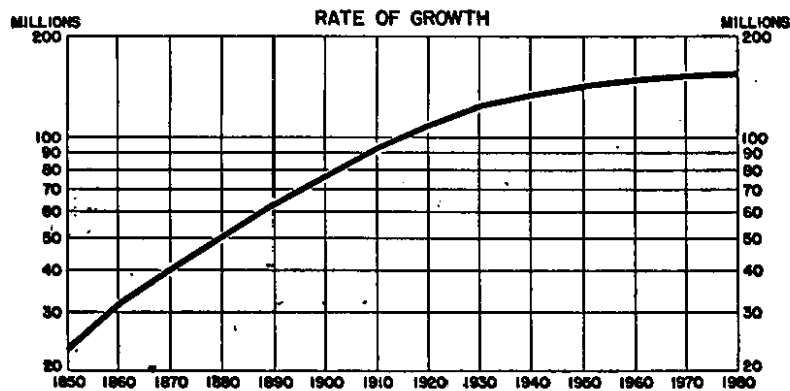
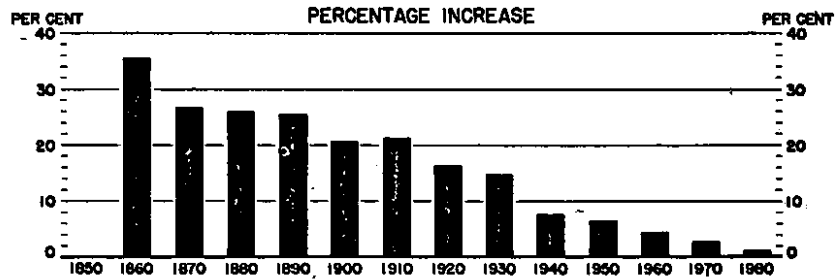
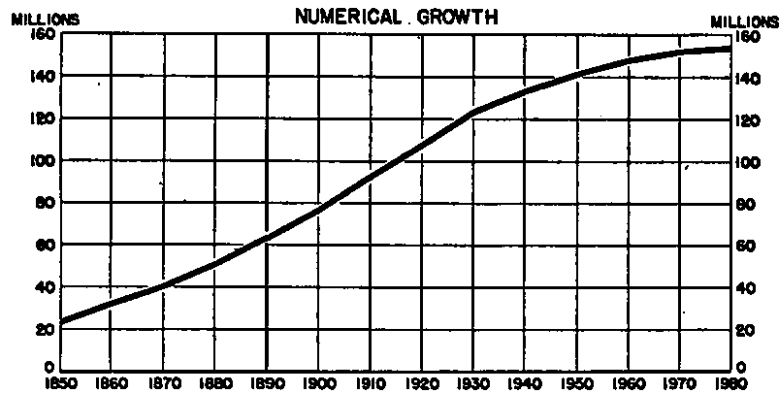
"* * * (The table) described how between 1870 and 1930, the last census year, while the population increased 218 per cent, those engaged in gainful occupations increased 290 per cent, and that is during the period of the most intensive development of the machine."

Quotations from other sources which have similarly fallen a victim to this fallacy could readily be multiplied.

EXHIBIT No. 2438-A

GROWTH OF POPULATION OF THE UNITED STATES

1850-1980



Address, H. Dewey, TAXATION AND RECOVERY, Temporary National Economic Committee, Washington, D.C., 1940.
SOURCE: Adapted from ENTERPRISE AND SOCIAL PROGRESS, National Industrial Conference Board, New York, 1936, p. 88.

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CONCENTRATION OF ECONOMIC POWER

EXHIBIT No. 2438-B

Growth of population in the United States, 1750-1980

[Population figures in thousands]

Year	Total Number	Percentage Increase	Domestic Count		Net Immigration	
			Number	% Increase	Number	% Increase
1750.....	1,207					
1850.....	23,290	1,827.1	22,070		290	
1860.....	31,502	35.4	31,351	26.5	151	-47.9
1870.....	39,904	26.7	39,517	26.0	387	158.8
1880.....	50,282	26.0	49,805	26.0	457	18.1
1890.....	63,056	25.5	62,601	25.7	455	-0.4
1900.....	76,129	20.7	75,662	20.9	567	2.8
1910.....	92,267	21.2	91,231	20.6	1,036	121.8
1920.....	107,190	16.2	106,763	17.0	427	-58.8
1930.....	123,091	14.8	122,949	16.1	242	-43.8
1940.....	132,630	7.7				
1950.....	141,213	6.5				
1960.....	147,612	4.5				
1970.....	151,783	-2.8				
1980.....	158,628	1.2				

Source: Adapted from *Enterprise and Social Progress*, National Industrial Conference Board, New York, 1939, p. 28.

EXHIBIT No. 2438-C

(Chart based on following statistical data appears opposite)

Estimated labor force of the future in the United States, 1940-1980

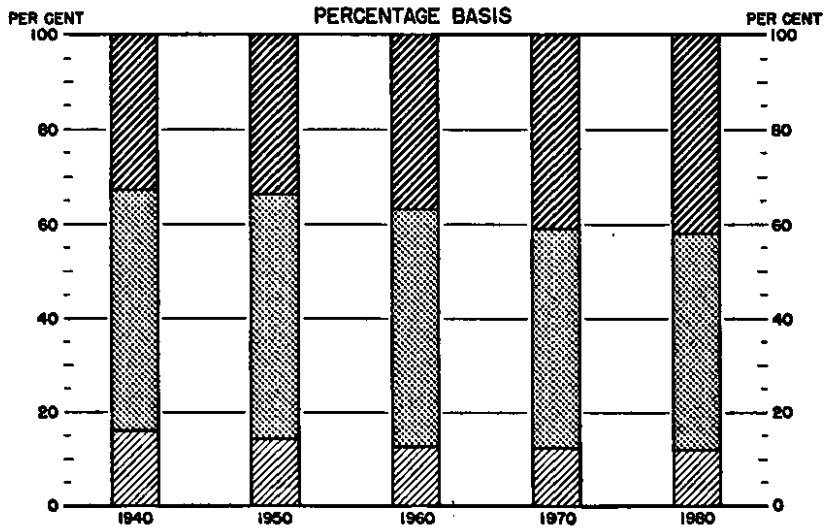
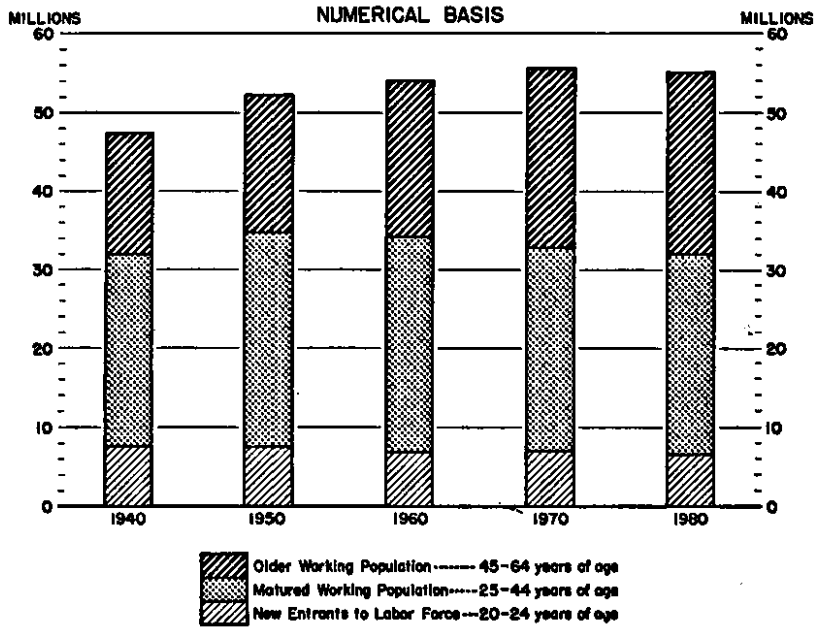
[Population figures in thousands]

Year	New Entrants to Labor Force, 20-24 years			Matured Working Population, 25-44 years			Older Working Population, 45-64 years			Totals 20-64 years		Percentage of total population (working)
	Number	% Inc.	% of total	Number	% Inc.	% of total	Number	% Inc.	% of total	Number	% Inc.	
1940.....	7,632		16.1	24,298		51.2	15,530		32.7	47,460		84.8
1950.....	7,561	0.9	14.4	27,204	12.0	52.0	17,580	13.2	33.6	52,345	10.3	85.8
1960.....	6,919	-8.5	12.8	27,302	0.4	50.4	19,949	13.5	36.8	54,170	3.5	84.4
1970.....	7,031	1.6	12.6	26,906	-5.1	48.5	22,834	14.5	40.9	55,771	3.0	83.6
1980.....	6,833	-5.7	12.0	25,498	-1.6	46.1	23,128	1.3	41.9	55,259	-9	82.1
1980 over 1940.....	-999	-13.1		1,200	4.9		7,598	48.9		7,799	16.4	

Source: Based on *Enterprise and Social Progress*, National Industrial Conference Board, New York, 1939, p. 34.

ESTIMATED LABOR FORCE OF THE FUTURE

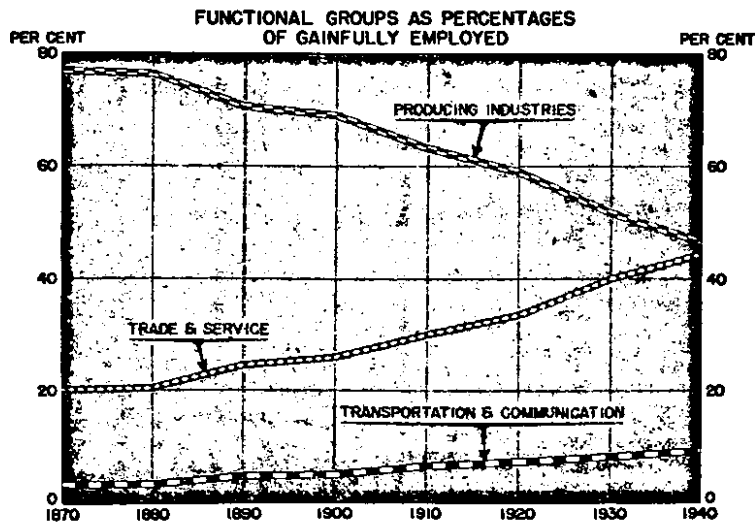
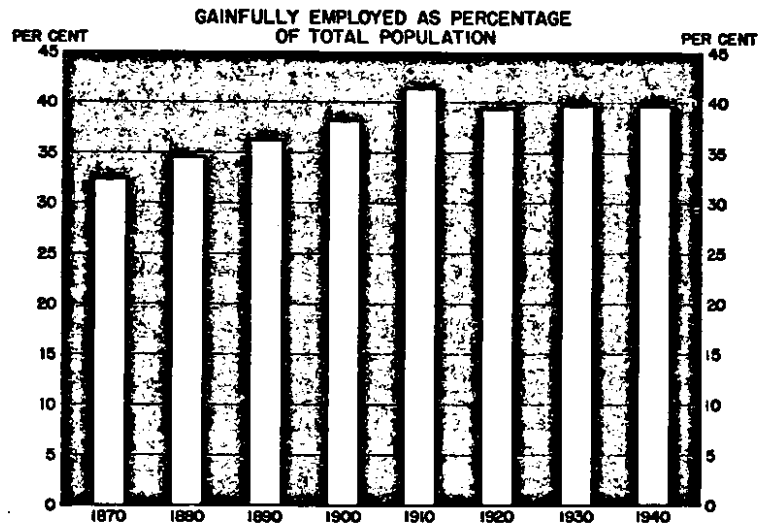
UNITED STATES, 1940-1980



Anderson, H. Dewey, TAXATION AND RECOVERY, Temporary National Economic Committee, Washington, D.C., 1940.
 SOURCE: Based on ENTERPRISE AND SOCIAL PROGRESS, National Industrial Conference Board, New York, 1938, p. 34.

EXHIBIT No. 2438-D

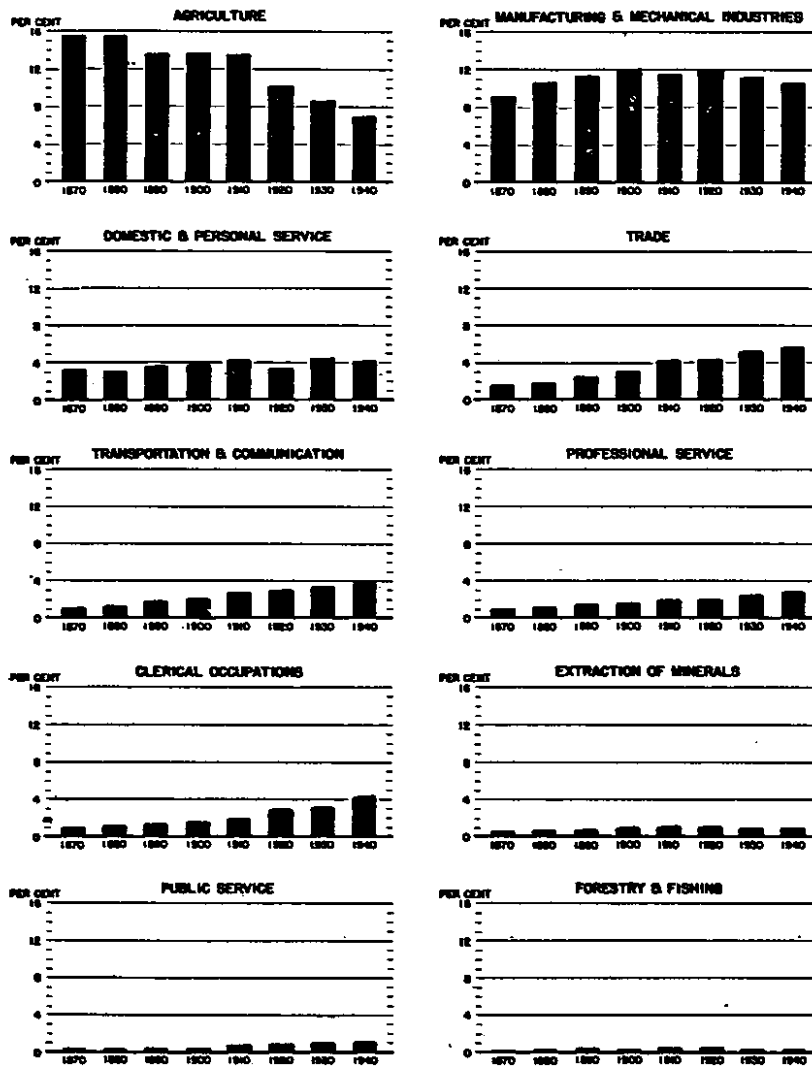
GAINFULLY EMPLOYED IN THE UNITED STATES
1870-1940



Anderson, H. Denny, TAXATION AND RECOVERY, Temporary National Economic Committee, Washington, D.C., 1940.
SOURCE: OCCUPATIONAL TRENDS, Anderson, H. Denny, and Carlsson, Percy E., Stanford University Press, 1940.

EXHIBIT No. 2438-E

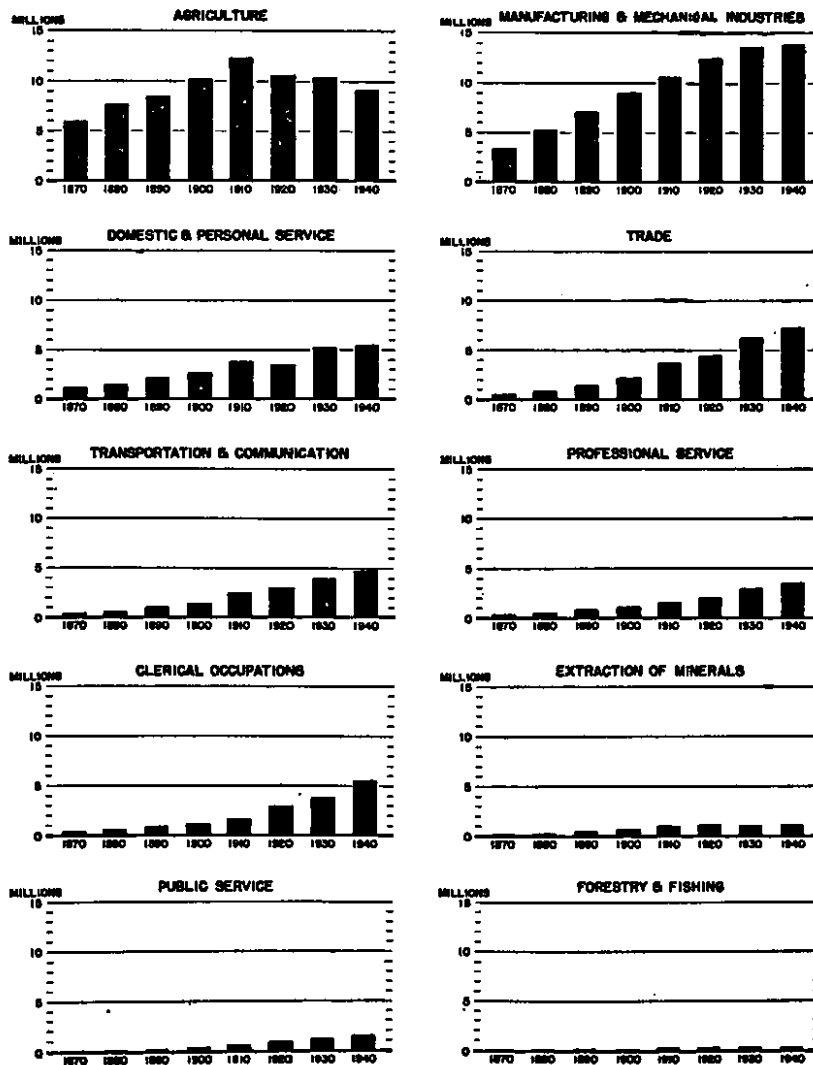
PERCENTAGE OF TOTAL POPULATION
GAINFULLY EMPLOYED
BY OCCUPATIONAL GROUPS
UNITED STATES, 1870-1940



Anderson, H. Dewey, TAXATION AND RECOVERY, Temporary National Economic Committee, Washington, D.C., 1940
 SOURCE: Adapted from Anderson, H.D., and Davidson, P.E., OCCUPATIONAL TRENDS, Stanford University Press, 1940.

EXHIBIT No. 2438-F

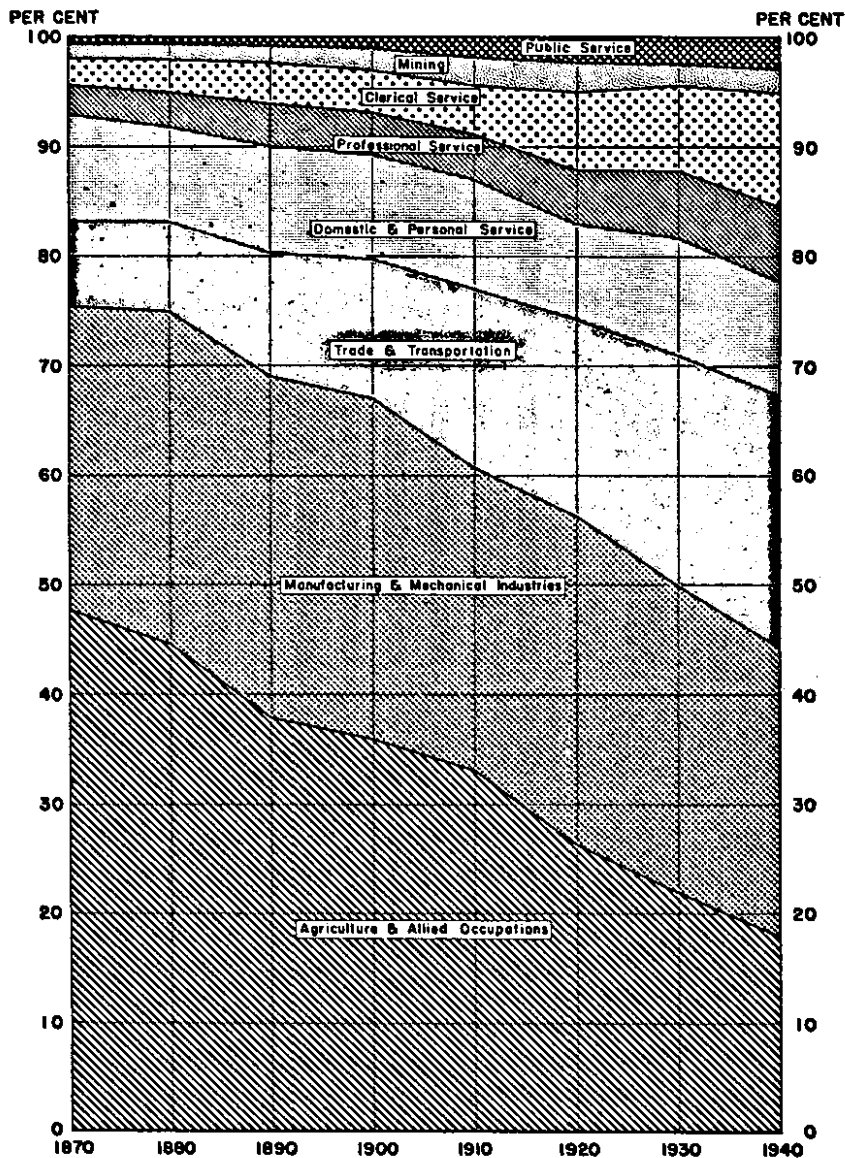
NUMBER OF WORKERS GAINFULLY EMPLOYED
BY OCCUPATIONAL GROUPS
UNITED STATES, 1870-1940



Anderson, H. Denis, TAXATION AND RECOVERY, Temporary National Economic Committee, Washington, D.C., 1940.
SOURCE: Adapted from Anderson, H. D., and Davidson, P. E., OCCUPATIONAL TRENDS, Stanford University Press, 1940.

EXHIBIT No. 2438-G

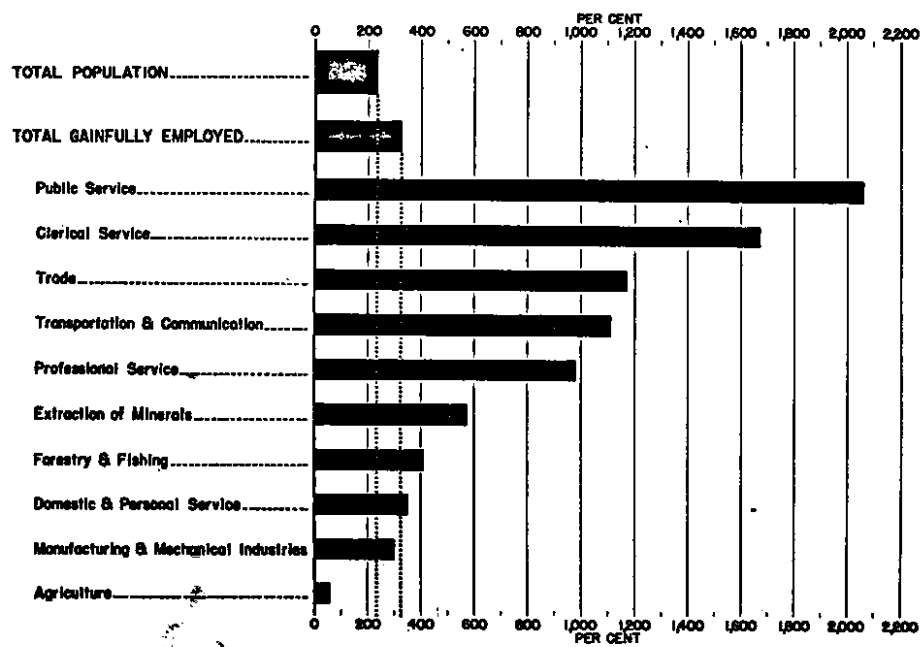
DISTRIBUTION OF GAINFULLY EMPLOYED BY OCCUPATIONAL CATEGORIES UNITED STATES, 1870-1940



Anderson, H. Dewey, TAXATION AND RECOVERY, Temporary National Economic Committee, Washington, D.C. 1940
SOURCE: OCCUPATIONAL TRENDS, Anderson, H. Dewey and Davidson, Percy E., Stanford University Press, 1940

EXHIBIT No. 2438-H

INCREASE IN POPULATION AND IN GAINFUL EMPLOYMENT
1940 OVER 1870 BY OCCUPATION
UNITED STATES



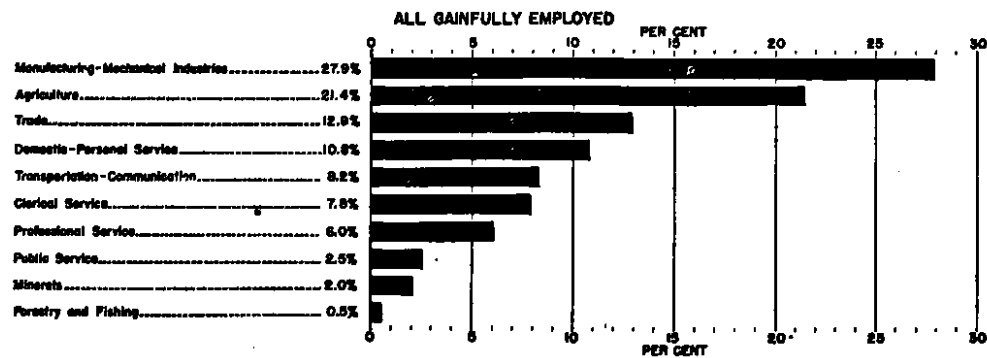
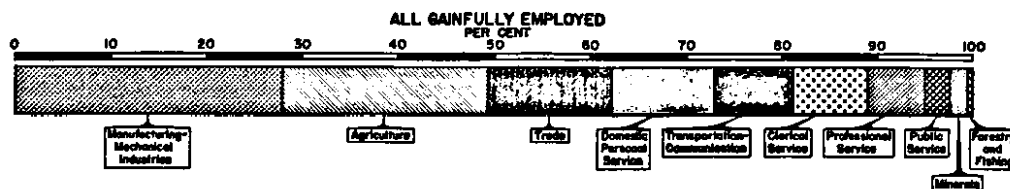
Andrew, K. Davis, *POPULATION AND ECONOMIC RECOVERY*, Temporary Relief Council Committee, Washington, D.C., 1940.
200907 Andrew, K. S., and Saitow, P. L., *OCCUPATIONAL TRENDS IN THE UNITED STATES*, Stanford University Press, 1940.

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CONCENTRATION OF ECONOMIC POWER

EXHIBIT No. 2438-I

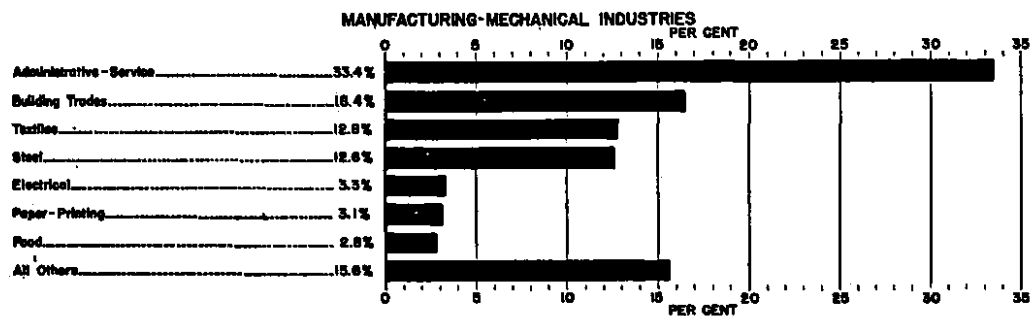
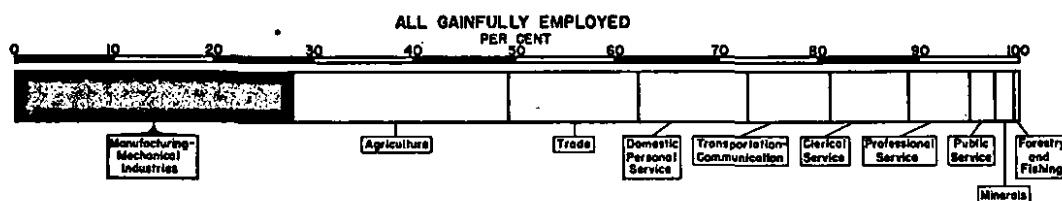
GAINFULLY EMPLOYED WORKERS IN THE UNITED STATES
BY OCCUPATIONAL GROUPS
1930



SOURCE: Anderson, H. D., and Davidson, P. E., OCCUPATIONAL TRENDS IN THE UNITED STATES, Stanford University Press, 1940

EXHIBIT No. 2438-J

GAINFULLY EMPLOYED WORKERS IN THE UNITED STATES BY OCCUPATIONAL GROUPS 1930



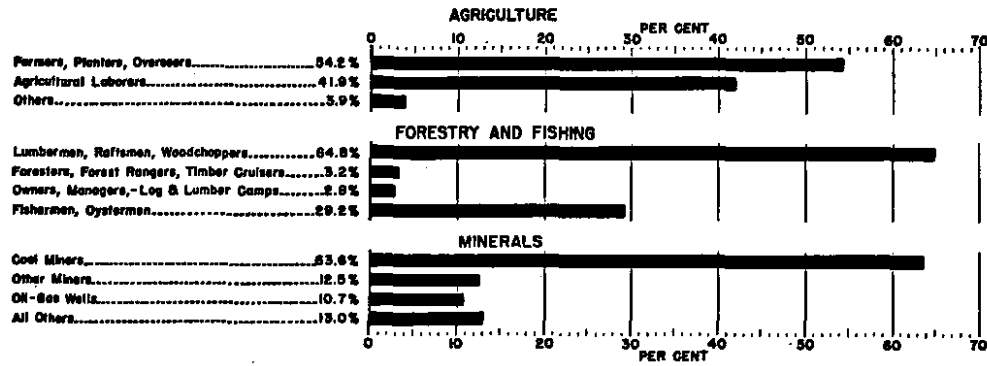
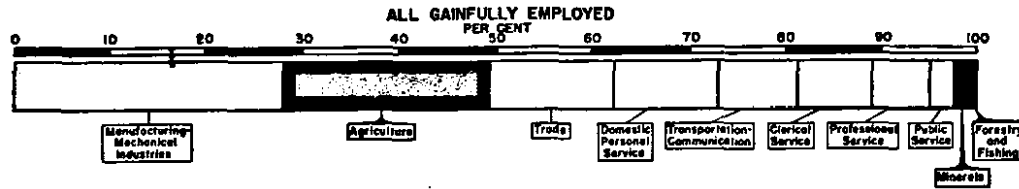
SOURCE: Anderson, H.D., and Gordon, P.E., OCCUPATIONAL TRENDS IN THE UNITED STATES, Stanford University Press, 1940

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CONCENTRATION OF ECONOMIC POWER

EXHIBIT No. 2438-K

GAINFULLY EMPLOYED WORKERS IN THE UNITED STATES
BY OCCUPATIONAL GROUPS
1930



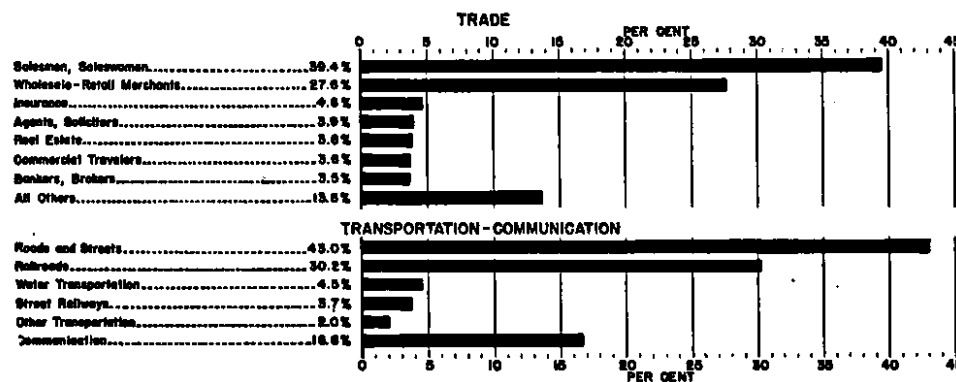
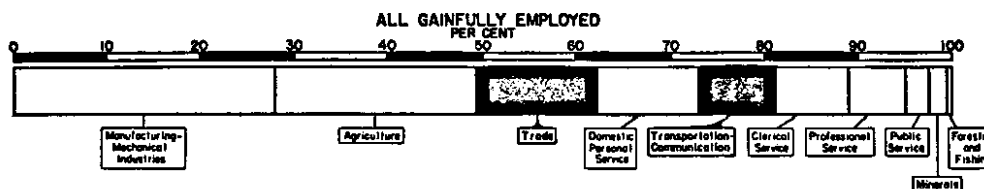
SOURCE: Anderson, H.D., and Davison, P.E., OCCUPATIONAL TRENDS IN THE UNITED STATES, Stanford University Press, 1940

EXHIBIT No. 2438-L

GAINFULLY EMPLOYED WORKERS IN THE UNITED STATES BY OCCUPATIONAL GROUPS 1930

17296

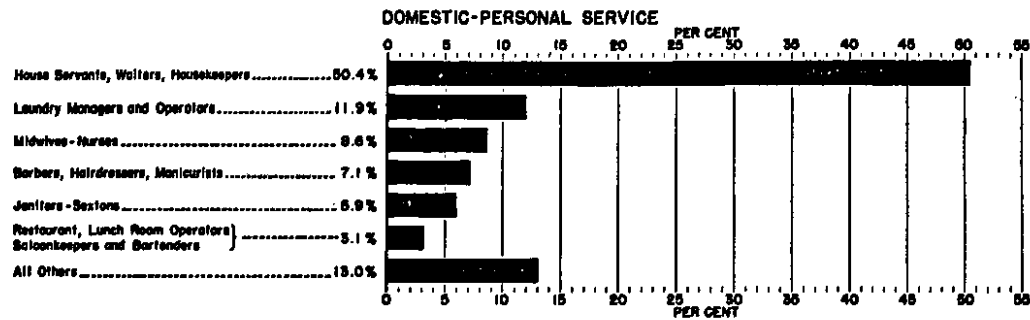
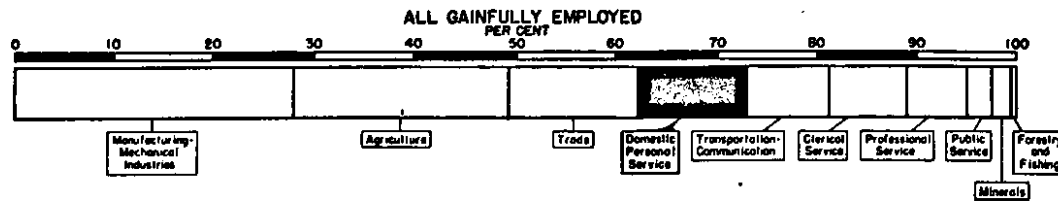
CONCENTRATION OF ECONOMIC POWER



SOURCE: Andrews, H. D., and Beckman, P. E., OCCUPATIONAL TRENDS IN THE UNITED STATES, Stanford University Press, 1940

EXHIBIT No. 2438-M

GAINFULLY EMPLOYED WORKERS IN THE UNITED STATES
BY OCCUPATIONAL GROUPS
1930



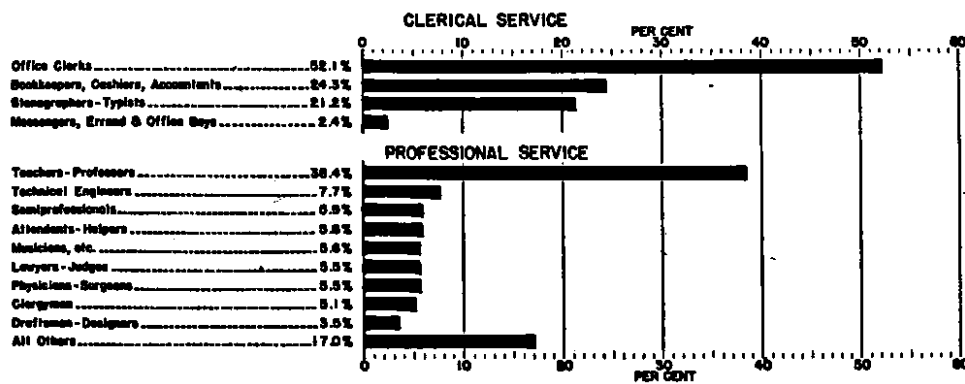
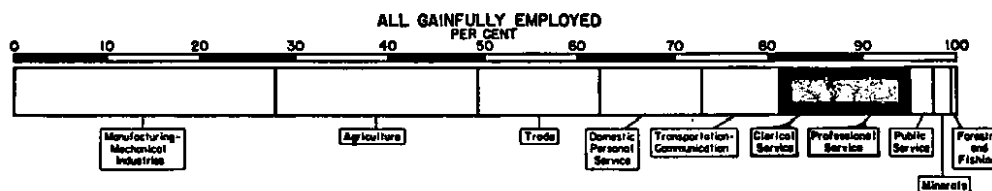
SOURCE: Anderson, H. D., and Davidson, P. E., OCCUPATIONAL TRENDS IN THE UNITED STATES, Stanford University Press, 1940

EXHIBIT No. 2438-N

GAINFULLY EMPLOYED WORKERS IN THE UNITED STATES
BY OCCUPATIONAL GROUPS
1930

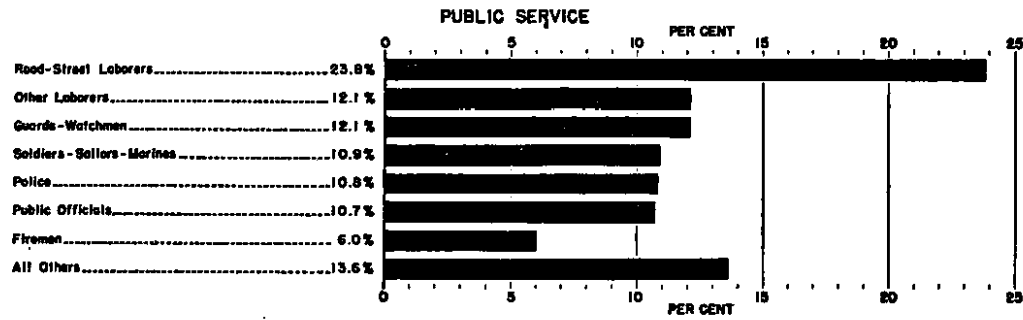
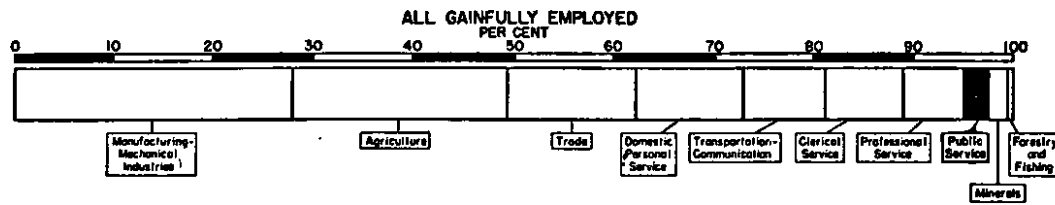
17298

CONCENTRATION OF ECONOMIC POWER



SOURCE: Andrew, H.S., and Schultz, P.E., OCCUPATIONAL TRENDS IN THE UNITED STATES, Stanford University Press, 1946

EXHIBIT No. 2438-0
GAINFULLY EMPLOYED WORKERS IN THE UNITED STATES
BY OCCUPATIONAL GROUPS
1930



SOURCE: Anderson, H.D., and Davidson, P.E., OCCUPATIONAL TRENDS IN THE UNITED STATES, Stanford University Press, 1940

CONCENTRATION OF ECONOMIC POWER 17299

EXHIBIT No. 2439

[Submitted by the Temporary National Economic Committee Study Staff]

CAPITAL-SAVINGS INNOVATIONS

The number of capital-savings innovations recently perfected is legion. A few examples will suffice, taken for the most part from a study of David Weintraub entitled "Effects of Current and Prospective Technological Developments upon Capital Formation." *American Economic Review*, Vol. XIX, No. 1, March 1939. The superior performance of modern steam hammers widely used for drop forging is such, that although the price of a current model is about the same as that of a 1905 model, a decline of more than 55 per cent has been brought about in the investment per unit of work accomplished.

In numerous ways large capacity equipment tends to operate at less cost per unit of capacity than small. A steam electric generating station operates at a cost from \$135 to \$150 per kilowatt for capacities of 2,000 kilowatts and only \$92 to \$115 for 200,000 kilowatts. Likewise in Diesel plants the investment per unit of capacity declines from \$230 for 100 kilowatts of capacity of \$106 for one of 10,000 kilowatts. Larger machinery usually requires smaller amounts of fuel and also of labor per unit of capacity or of output. Installation costs are likewise lower as is the amount of floor space required per unit of capacity.

Moreover, industrial measuring, recording and controlling devices bring about uniformity of operation and help to minimize the wear on machinery. In one test case, boilers under hand control had to be rebricked every three months while with instrument control no rebricking was required even once a year.

Furthermore, the "topping" technique in which exhaust steam from high pressure, high temperature turbines is utilized by being discharged into the steam headers of lower-pressure units, tends to increase the capacity of existing stations from 40 to 90 per cent without an increase in fuel requirements and without corresponding additions to plant and equipment, a fact sometimes ignored by those who state the capital investment needs of utilities. In the period from January 1936 to May 1937 topping units represented more than 75 per cent of the total turbine capacity installed in central stations using pressures of 1000 pounds or more.

Through chromium plating the life of various tools and parts has been extended from 3 to 20 times. By the use of tungsten carbide, carboloy tools have been formed which operate in some cases 300 to 400 times as efficiently as the old steel tools. On a brass-plug job the number of finished pieces produced by old tools was 200, through the substitution of carboloy tools this was increased to 15,000. Welding has been substituted for casting, roller bearings for old type friction bearings which has meant increased speed of operation, greater durability of machinery and reduction in total power requirements in recently installed machinery. Similarly, improvements in paints, varnishes, and lacquers, as well as erosion-resistant steel alloys and plated steels have meant huge savings on inventories and storage space for the automobile manufacturer in addition to lowering the drying time from 26 days to a few hours.

The improvement in the mineral industries due to the use of recent chemical concentration and flotation processes has been one of the most remarkable achievements of the last 10 years. Also noteworthy have been the mechanization of conveying operations and of the handling of bulk materials.

The story of the savings of fuel is also familiar. By the use of devices for retrieving the heat formerly lost in stack gases or hot products and using it for pre-heating raw materials and air for combustion or for generating steam; by reductions in heat and power requirements through adoption of speedier and more continuous methods of manufacture; by the prevention of heat losses through insulation, seals against cold-air leakage; by improved techniques for more efficient transfer of heat and power; and, in particular, by more exact controls through recording instruments, great fuel economies have been achieved on the railroads and by public utility stations and elsewhere.

Similarly in the rayon industry in the "thirties" costs of production have been cut about 50 per cent, most of the decrease in costs being due to refinements of detail in processing and spinning machinery, improvements in precipitating bath composition and in washing procedure, and the use of more uniform and purer materials. Even in the telephone industry, which has always been regarded as the classic example of an industry subject to diminishing returns where fixed capital requirements grew faster than increases in the number of telephones installed, recent and current technical changes such as the introduction of carrier

current systems or of the coaxial cable are increasing the capacity of the telephone plant with less than a proportional increase in fixed capital investment.

In the report of President Hoover's Committee on Recent Economic Changes in the United States, Volume 1, a table is given, excerpts from which (Exhibit No. 2438-A) show in dollars and cents the substantial savings and increases in output which were made possible by the utilization of new types of apparatus, standard conveyers, hoists, tractors, locomotive cranes, gravity chutes and the like. Processes have been made continuous with the result that savings are secured in floor space, in inventories, in storage room, in machinery and auxiliary equipment, and in costs of maintenance and repairs while wastes have been eliminated, spoilage reduced, and the whole process considerably speeded up.

EXHIBIT No. 2439-A

[Excerpts from Volume 1, First Edition (1929) of "Recent Economic Changes in the United States"]

[Report of the Committee on Recent Economic Changes of the President's Conference on Unemployment, pp. 14-16]

Industrial processes

Process	Process supplanted	Savings	Company
CHEMICAL			
Refining edible oils.....	Old processing tanks.....	1/4 cost of old process.....	American Linseed Co.
Eliminating corrosion in water circulating systems by use of sodium chromate.		\$25,000 per yr. in repair bills \$75,000 due to elimination of lost time in plant.	Midwest Refining Co.
Recovering borax.....		Present production costs are less than 10 percent of those of 1919.	American Potash & Chemical Corporation.
ELECTRICAL			
Filament material for radio tubes.	Using base metals in place of platinum for oxide coated filaments.	Annual saving of about \$3,000,000.	Westinghouse Electric & Manufacturing Co.
Automatic arc welding.....	Hand welding.....	Annual saving about \$60,000.	Cadillac Motor Car Co.
MECHANICAL			
Pressing linseed.....	Eliminates press cloths and about two-thirds labor.	Four cents per bushel of linseed crushed.	American Linseed Co.
Dry quenching.....	Cooling of hot substances by liquids.	In a water gas plant, fuel saving of 2.3 pounds per 1,000 cubic feet gas made.	Dry Quenching Equipment Corporation.
Utilization of powdered coal.	Stoker firing.....	Operating efficiency 6 to 8 percent higher than for stoker firing.	Combustion Engineering Corporation.
METALLURGICAL			
Leaching process.....		Recovery of approximately 20,000,000 pounds copper per year, previously wasted.	Calumet & Hecla Consolidated Copper Co.
Centrifugal cast pipe manufacture.	Sand-cast process.....	Reduction of equipment and labor. Great savings in time.	United States Cast Iron Pipe & Foundry Co.
Electric-thermic smelting.		Reduced selling price of ferro-vanadium about 25 percent.	Vanadium Corporation of America.
PETROLEUM REFINING			
Cracking of heavy petroleum hydro-carbons.	Old pressure distillation type of apparatus.	Reduction of fuel consumption about 80 percent.	Kansas City Testing Laboratory.
METAL WORKING			
Drilling long oil holes.....	Replaces method using two spindle horizontal machines.	\$6,000 per year.....	Cadillac Motor Car Co.
Utilizing diamond tools...	Old method of boring and reaming holes with steel tools.	Annual saving about \$15,000.	Cadillac Motor Car Co.
Roughing outforging billets.	Old swaging or fullering method.	Annual saving about \$20,000.	Cadillac Motor Car Co.
Arc welding.....	Riveting.....	Economies effected in time and labor.	Newport News Shipbuilding & Dry Dock Co.

Industrial processes—Continued

Process	Process supplanted	Savings	Company
RUBBER			
Automatic tube molding.....	-----	Manufacturing costs reduced about 40 percent and quality improved.	Fisk Rubber Co.
Development of age resisters.....	-----	Estimated savings to consumers about \$50,000,000 per annum.	B. F. Goodrich Co.
MISCELLANEOUS PROCESSES			
Elimination of crazing.....	Replaces process of dry pottery.	Fuel savings from 75 to 85 percent.	Homer Laughlin China Co.

EXHIBIT No. 2439--B

Fifty typical installations of material-handling equipment

Material or product handled	Equipment used	Plant	Savings and improvements
AUTOMOBILES AND ACCESSORIES			
Cylinder blocks.....	Standard conveyors.....	Nash Motor Co.....	\$8,600 per year.
Annealing pots.....	Tier-lift trucks.....	New Departure Mfg. Co.	\$10,800 per year.
BUILDING MATERIAL			
Materials.....	Overhead carrying system.	Architectural Tile Co....	\$5,000 per year.
Cement materials.....	2 hoists.....	Crex Patent Column Co.	\$6,000 per year.
Sand and gravel.....	Portable conveyor and loader.	Crume Brick Co.....	\$3,900 per year.
Lumber on trailers and switching cars.	Trutractor.....	M. B. Farrin Lumber Co.	\$4,650 per year, congestion eliminated; 15 horses eliminated; 70 percent return on investment.
Building material.....	Locomotive cranes.....	Dwight P. Robinson Co.	\$18,000 in six weeks.
Lumber.....	Locomotive cranes.....	St. Helena Dock & Terminal Co.	\$41,000 per year.
Crushed stone.....	Belt conveyor.....	Leatham D. Smith Stone Co.	Double capacity.
FOOD			
Sugar.....	Automatic packing and handling equipment.	American Sugar Refining Co.	One-half of labor.
Coal and ashes.....	Bucket conveyor.....	George Ehret Brewery Co.	Equipment handles 20,000 tons of coal per year at 9 cents per ton including maintenance and repair charges.
Coal.....	Conveyor.....	Freeman Dairy Co.....	\$0.98 per ton; \$2,500 per year.
Sugar packed in cartons.....	Conveyors.....	National Sugar Refining Co.	\$8,800 per year.
Candy in boxes and cartons.	Gravity conveyors and spiral chutes.	Samest Chocolate Co....	\$3,370 per year.
Materials.....	Overhead trackway connecting all departments.	Swift & Co.....	\$125,000 per year; \$0.60 per ton material handled.
FOUNDRY			
Cupola charges.....	Hoist.....	Davis & Thomas Co....	\$5,850.
Castings.....	Belt conveyors.....	Kelsey Wheel Co.....	\$10,000 per year.
Materials.....	3 trutractors.....	Southside Malleable Castings Co.	\$22,500 per year.
Castings.....	Trutractors.....	Standard Sanitary Mfg. Co.	Annual savings 17 times cost of equipment.

Fifty typical installations of material-handling equipment—Continued

Material or product handled	Equipment used	Plant	Savings and improvements
IRON AND STEEL			
Iron and steel.....	2 tractors.....	American Radiator Co..	\$22,000 per year; \$1,845 per ton
Steel, machinery, forgings..	2 locomotive cranes.....	E. W. Bliss Co.....	Equipment pays for itself each year.
Iron and steel.....	15-ton locomotive crane.	Delaware River Steel Co.	\$10,800 per year.
Rails.....	Locomotive crane.....	McKenna Process Co..	Doubles production.
Steel (on buggies).....	Tractor.....	Riter-Conley Mfg. Co..	\$2,960 per year; saves \$8,000 in increased production; labor turnover reduced; pays for itself in about 64 days.
Iron and steel scrap.....	Locomotive crane.....	Sonken-Galamba Iron and Metal Co.	\$30,000 to \$40,000 per year big saving in time.
LEATHER			
Flashings.....	Tractor.....	Joseph Eisendrath Co..	\$3,400 per year.
Patent leather in frames..	Overhead carrying system.	Gress-Pfleger Tanning Co.	\$5,000 per year.
MACHINERY			
Shipping cases.....	Gravity chute.....	General Electric Bloomfield plant.	\$6,000 per year; rapid loading of cars.
Castings and foundry supplies.	4 tractors and trailers.	Holt Mfg. Co.....	\$13,300 per year.
Materials.....	8 cranes.....	Reliance Electric & Engineering Co.	\$9,350 per year.
METAL WORKING			
Materials.....	Complete conveyor system.	Belden Mfg. Co.....	Yearly profit \$12,450 on investment of \$19,611.
Materials.....	2 tractors.....	Bullard Machine & Tool Co.	\$10,500 per year.
Assembling stoves.....	Conveyor.....	Detroit Vapor Stove Co.	Increases production; saves 50 percent of space.
Materials.....	Roller and belt conveyor	Hobart Bros. Co.....	Cut production cost 25 percent.
Dies.....	Tier-lift truck.....	Ireland & Matthews Drop Forging Co.	\$32,000 per year.
Materials and product....	3 elevating conveyors....	Tin Decorating Co.....	\$47,400 per year.
Materials.....	Overhead carrying system.	United Metal Co.....	\$7,500 per year.
Coal, coke, ores, and slag..	Locomotive crane.....	United States Metals Refining Co.	Increased production 100 percent.
Materials.....	Stationary roller conveyors and containers.	Walworth Co.....	\$80,000 per year.
PAPER			
Paper.....	Skids for loading box cars.	Champion Coated Paper Co.	Reduction in labor 63 percent.
Paper.....	Electric hoist.....	Paper Manufacturers Co., Inc.	Increased production on one process 66 percent.
Paper in rolls to cutting machines.	5 hoists.....	Paterson Parchment Paper Co.	\$4,100 per year.
Paper and paper stock....	Nailed wooden skids for shipping.	West Virginia Paper and Pulp Co.	Reduction in shipping material cost 77 percent; reduction in labor in handling shipments, 80 percent.
TEXTILES			
Materials.....	Complete conveyor system for mill.	Jackson Mills.....	\$16,250 per year; successful material control and improvement in machine operations.
Raw cotton.....	Pneumatic conveyor.....	Milstead Mfg. Co.....	\$1,500 per year.
MISCELLANEOUS			
Lumber and materials....	Miscellaneous handling equipment.	American Seating Co..	Reduced handling cost per man-hour from 17 to 6 cents; annual saving, \$95,000; additional saving over handling improvement about \$25,000 per year.

Fifty typical installations of material-handling equipment—Continued

Material or product handled	Equipment used	Plant	Savings and Improvements
TEXTILES—continued			
Materials.....	Conveyor system for entire plant.	B. T. Babbitt Co.....	Unloading costs \$0.02 per box for metal cans; \$0.02 per drum for caustic soda; \$0.04 per drum for lime; \$0.50 per thousand for fiber boxes; \$1.50 per thousand for wooden boxes; shipping cost \$0.0075 per package.
Flaxseed from ship to storage to mill.	Conveyor and elevating system.	Bisbee Linseed Co.....	\$15,000 per year.
Clay.....	Trutractor.....	Champion Porcelain Co.	\$8,400 per year.
Materials and products.....	Complete system of conveyors, elevators, lift trucks, spiral chutes, and gravity devices.	E. R. Squibb Co.....	Elimination of unnecessary travel of material in process and finished product.

EXHIBIT NO. 2439-C

Cable Address
"COCOMBS"
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THE MYTH OF A PROFITLESS PROSPERITY

By Clinton Davidson, Jr.

It is commonly believed that under the New Deal profits are subnormal even when production rises to a normal level, and years of good business activity like 1936, 1937, 1939 and so far in 1940 are called periods of "profitless prosperity".

As a consequence of this belief many investors are deterred from making investments in stocks when the business outlook is good, many economists are frequently too pessimistic in their business forecasts, and serious mistakes are made from attaching too much importance to political developments in appraising the *short term* outlook. For example, many people have recently ignored the unfavorable elements in the business picture today and have been buying stocks solely on the expectation that Roosevelt will not be reelected, that profit margins will improve under a Republican administration, and that business will boom as a result of large investment in plant and equipment induced by the higher profit margins.

Since so much emphasis is being placed by many economists and investment counsellors on the subject of profit margins in the manufacturing industry as affected by politics in making their forecasts for 1941, this subject should be examined thoroughly.

Profits are believed to be subnormal in relation to business activity because wage rates per hour have been rising while finished goods prices have declined. Note in line (4) on the Exhibit that wage rates per hour rose from 56¢ in 1925 to 72¢ per hour in 1939, while the index of prices shown in line (5) fell from 100 to 80. This is cited as evidence that labor is getting more and the entrepreneur less out of the total value of production. Investment in plant and equipment is believed to be stagnant because new capital security issues have diminished. For the reasons to be explained in a moment, I believe both of these commonly held beliefs are incorrect.

In the first place, wage rates per hour are not indicative of labor costs because they are modified by changes in labor productivity. It is the labor cost per unit of output that is important. As shown in line (4) on the Exhibit, wage rates rose from 52.4¢ an hour in 1921 to 59¢ in 1929, but the worker was paid 12% more in 1929 because he could produce with an hour's labor about 30% more than he could in 1921. The manufacturer consequently had lower labor costs in 1929 in spite

of higher wage rates per hour. If wage rates are considered as identical with labor costs, such costs, adjusted for price changes, have been rising steadily during the last 150 years, as wage rates have continuously risen in line with increasing labor productivity.

While some economists are aware that labor costs per unit of output have declined during the last ten years because of increased efficiency, they argue that finished goods prices have declined even more, and accordingly labor costs per dollar of output have risen. In fact, the national industrial conference board publishes an index of labor costs per dollar of output, and a stock exchange firm recently used this index in a "market letter" to demonstrate that high labor costs have wiped out the manufacturers profit. The fallacy of this argument is that it overlooks the simultaneous decline in raw material costs.

If this firm had made a similar analysis in 1929, it would have noticed that finished goods prices were 27.5% below 1919 while labor costs per unit of output were only 20% lower. Following this reasoning, it would have stated that labor costs were eating into profits, and that because of subnormal profits new investment in plant and equipment must be very small. Of course, profits in 1929 were high because raw material costs had declined more than finished goods prices.

How can we find a true measure of labor costs that takes into consideration changes in labor productivity and the spread between finished goods prices and raw material costs? It is necessary to consider these factors, if we wish to determine whether labor costs are squeezing profits or not. For profits are affected not by wage rates per hour alone but also by the amount of goods that can be turned out with one hour's labor and by the spread between finished goods prices and raw material costs.

To find a measure of labor costs that includes these important factors, the first step is to subtract raw material costs from the value of manufactured products, which gives us a gross profit called the "value added by manufacture". This is done in the Biennial Census of Manufactures, and the result is shown in line (1) of the Exhibit. The next step is to take all wages paid in manufacturing, which also appears in the Biennial Census of Manufactures and is shown in line (2). In calculating his expected profits the manufacturer is interested in the proportion of wages paid to the value added by manufacture or gross profit. This proportion is shown in line (3) in the Exhibit as a percentage. When this percentage rises, labor increases its share of gross income and profits are squeezed. When it falls, profits comprise a larger share of gross revenues.

Before commenting on these figures, I must point out that the "value added by manufacture" for 1939 has not yet been reported and accordingly had to be extrapolated with the aid of those production statistics available and certain wholesale commodity price indexes. Wages were extrapolated by the Bureau of Labor Statistics. The figures for 1940 are extrapolated on the basis of the last few months when industrial production was about the same as the 1929 average.

Note in line (3) on the Exhibit that the percent of labor costs to "value added" declined about 8 points from 1921 to 1929, in spite of the fact that wage rates per hour, shown in line (4), rose 12%, and finished goods prices, shown in line (5), declined 9%. This was due to the increasing productivity of labor. In 1935 under Roosevelt the percent of wages to "value added" was slightly lower than in 1925 under Coolidge, although wage rates per hour had risen 7% and finished goods prices had fallen 18% in the ten year period. Of course, this isn't Mr. Roosevelt's doing; the credit is due to the manufacturer who increased his efficiency enough to permit this rise in real wage rates.

In 1937, despite the activities of the C. I. O., the proportion of wages to value added was 39.3%, roughly the same as in 1925. I believe the estimate of 39.2% for 1939 errs on the high side, and we will be able to check this a year from now when the Census of Manufactures for 1939 is available. During the last few months labor costs have been lower than for any year in the 1920's except 1929. This is due to the fact that labor efficiency increases as production rises nearer to capacity.

Labor costs are not the only factor to be considered, however, in calculating profit margins. Changes in "overhead" production costs such as taxes, interest and depreciation must also be considered. We all know that corporation taxes have risen under the New Deal, but higher taxes have been offset by lower interest rates and lower depreciation charges per unit of output when production is at the current high level. While we all agree that overhead costs are relatively inflexible, and therefore on a per unit of output basis vary inversely with the level of production, the statement that depreciation charges today with the same volume of output do not need to be so large as in 1929 does require explanation.

But first let us make a rough check on the statement that these offsetting cost declines have made manufacturing as profitable today under the New Deal as in years of comparable business activity in the 1920's by referring to manufacturing corporations income tax returns. The Statistics of Income for all *manufacturing* corporations are analysed in lines (7), (8), (9) and (10) in the Exhibit. These figures have been computed by the National City Bank and appeared in their monthly bulletin of November 1939. Line (7) shows that gross revenues in 1937 were slightly below 1927. If allowance were made for price changes, they would be about \$4 Billion higher. The two years are particularly comparable because production and prices were declining throughout the year in both cases, and profits were somewhat reduced by inventory losses. As shown in line (9), the per cent of net profits after taxes to gross revenues was about 4% in both years.

The chief difference between the two years is that less capital was needed for the same volume of sales in 1937 than in 1929 so that net worth was about \$8 Billion lower. As a result of this greater turnover of capital, the per cent earned on net worth, shown in line (10), was 8% in 1937 against 6.6% in 1927. This is very important because the manufacturer looks at the per cent earned on net worth in determining whether a new investment in capital equipment is likely to be profitable enough to warrant the trouble he takes.

The reason why net worth is lower today than 10 years ago also explains why depreciation charges do not need to be as high, and why new capital security issues have apparently been subnormal. The reason is found in the increasing productivity of modern machinery.

While it is impossible to make an overall estimate of capital equipment productivity like our estimate of labor productivity, we can draw conclusions from individual industries in which such an analysis can be made.

The cotton textile industry, one of the largest and most important of our manufacturing industries, affords an excellent opportunity for capital equipment productivity analysis. Capital equipment in this industry is measured by spindles and looms in place. The number of spindles in place in 1937 was 19% less than in 1929, and average active spindles during the year were 21% less. But with less equipment cloth production was 12% higher in 1937 than in 1929. Each active spindle produced 392 square yards of cloth in 1937 against only 276 square yards per spindle in 1929. This was not due to more work shifts, for spindle hours run in 1937 were 4.4% below 1929. Cloth production per spindle hour run in 1937 was 17% higher than in 1929. This is a true measure of capital equipment productivity. Looms in place in 1937 were 28% less than in 1929, and average active looms were 26% less. In 1939 the number of spindles in place and average active spindles declined further to a new low but cloth production was 10% above 1929 and cloth produced per active spindle was 410 square yards, which was 49% above 1929.

It is interesting to note, incidentally, that new spindles installed in 1939 were 349,416, an increase of 9% over 1929, which indicates plenty of incentive to invest. Here then is an industry which has discarded more capital equipment each year than has been replaced with new equipment but can still produce more now than in 1929 when 27% more equipment was being used. Thus, the total capital invested in the industry has declined as the result of retirements from depreciation without any decline in actual productive capacity.

Capital equipment productivity in the cotton textile industry

	1929	1933	1937	1939
1. Spindles in place (000).....	85,267	31,442	37,700	25,967
2. Average Active Spindles (000).....	30,409	24,873	24,080	22,307
3. Spindles hours run (000,000).....	99,900	88,530	95,591	92,559
4. Cloth Production (000,000 sq. yds.).....	8,399	7,866	9,446	9,146
5. Cloth Production Per Spindle.....	238	282	241	352
6. Cloth Production Per Average Active Spindle.....	276	316	392	410
7. Cloth Production Per Spindle hour run.....	.084	.091	.099	.099
8. Index of Cloth Production Per Spindle Hour.....	100	108	117	117
9. New Spindles Installed (including replacements).....	320,784	848,568	772,724	349,416
10. Looms in place (000).....	848.4	-----	468.8	-----
11. Looms Active (000).....	610.9	-----	452.8	-----

* Estimated on basis of spindle hours run.

The American Woolen Company states in its report for 1939 that it has only about half as much plant and equipment today as in 1924 but nevertheless has the actual capacity to turn out the same amount of goods.

The electric light & power industry has also increased its actual capacity more than its investment in fixed capital. While the gross book value of fixed capital increased only 16% from 1929 to 1939, generating capacity increased 27% and energy output increased 36%.

The capital investment of the steel industry declined 18% from 1929 to 1939, but ingot capacity increased 17%. The American Iron & Steel Institute in its publication "Steel Facts" for March 1940 presents a study of capital equipment productivity in the steel industry, from which I have taken the following quotations:

"The design and operation of open hearth furnaces, which produce about nine-tenths of the total steel ingot output, have been greatly improved in recent years. These improvements account for most of the increase in steel capacity which has occurred as a result of technological progress over the past ten years.

"Effect of these improvements upon output is shown by the production records of four representative open hearth furnaces in two periods of peak operation—1929 and 1939. An average increase of 31 per cent in output is shown by records of the four furnaces.

"The average daily output of a typical 170-ton furnace increased from 302 tons per day in 1929 to 395 tons in 1939, a rise of 31 per cent. A smaller furnace, rated at 110 tons per heat, produced 186 tons per day in the peak month of 1929 and 265 tons, or 43 per cent more, in the best month of last year. Similarly the average daily output of an 85-ton furnace rose 35 per cent, from 133 tons to 179 tons, in the past decade.

"Among the principal reasons for the increase in productivity of open hearth furnaces are the increased use of steel scrap as a raw material, the redesign of furnaces to permit the charging of greater quantities of raw materials, and the introduction of improved auxiliary equipment."

Two significant observations can be drawn from this capital equipment productivity analysis. (1) Depreciation charges per unit of production are substantially lower when capital equipment is fully utilized today, than was the case in 1925-1929. For example, the annual depreciation at 10% on \$1 Million of machinery capable of producing \$1 Million of goods in 1929 was \$100,000 or 10¢ per dollar of production. If today \$1 Million of machinery can turn out \$1,200,000 of goods, or 20% more, the annual depreciation is still \$100,000, but this is at the rate of only 8.35¢ per dollar of production, a saving of 1.65% per unit of output. (2) Actual capacity can be increased today by replacing fully depreciated equipment with modern equipment without adding to the gross book value of the capital account, and no new securities need to be issued to finance this expansion of capacity. For example, using the illustration above, when the \$1 Million of machinery bought in 1929 is fully depreciated on the books in 1939, it is discarded and \$1 Million of new machinery is bought with the funds represented by the depreciation reserve. Since the new machinery can produce 20% more than the old, productive capacity is increased 20% without the need of raising any cash by the sale of securities.

This explains why capital expenditures by manufacturing corporations in the last 10 years have not entirely offset depreciation charges, while at the same time productive capacity has actually increased. New security issues, consequently, are largely sold to raise funds for new industries such as airplane manufacturing and transport companies, and chemical companies. Another explanation for the apparently subnormal volume of new capital issues referred to by economists is that they include issues for real estate other than factories, for financial institutions and for holding companies that intend to purchase operating companies. New capital issues for manufacturing corporations alone have averaged a little less than \$1 Billion per year in recent years against around \$1.5 Billion in the 1920's. At no time have new capital security issues represented a significant proportion of actual expenditures for capital equipment.

The proof of this statement is found in the statistics on expenditures for plant and equipment calculated by George Terborgh of the Federal Reserve Board, shown in line (11) in the Exhibit. In 1937 these expenditures in the mining and manufacturing industries were larger than in 1919, 1921, 1923, 1925, and 1927. If allowance is made for price changes, they were practically as large as in 1929.

In 1939 such capital expenditures were slightly lower than in 1925 and 1927

in current prices, but when allowance is made for price changes were \$3 Billion in 1925 prices or about 10% above 1925 and 1927 in physical volume. Since new capital security issues were substantially lower in 1937 and 1939 than in the 1920's while capital expenditures were just as large, there is obviously no correlation between the two.

In conclusion, wage rates have risen while finished goods prices have declined, *not* because of the activities of labor unions and the labor legislation of the New Deal, but rather because the use of modern machinery has increased labor productivity and capital equipment productivity enough to permit manufacturers to grant these wage increases without sacrificing any profits. Roosevelt can not claim the credit for wage rates today being 23% above 1929. The credit belongs to the manufacturers who have increased the productivity of labor about 30% during the last 10 years, which is only slightly less than the increase from 1919 to 1929.

This study also indicates that profits are good in the manufacturing industry whenever consumer demand for its products is normal, and that investment in plant and equipment in this industry is not lagging. Thus, if the *only* effect of throwing out the New Deal in the coming election is to change its labor and tax laws, our problems will not be solved and business is not likely to be stimulated by any large increase in capital outlays on the part of the manufacturing industry.

The problems to be solved lie rather in the field of housing, commercial building, durable consumer goods, foreign trade, and agricultural adjustment. In appraising the outlook for business activity and corporate profits in the future, it is accordingly preferable to consider the effects of political and other developments on these fields of economic activity which are currently subnormal and in need of important stimulation. Even in the boom years 1929 and 1937 investments in plant and equipment in the manufacturing and mining industry absorbed only one-fifth of the nation's gross savings. Gross investments in other fields of economic activity normally absorb four-fifths of the nation's savings, and are four times as important as investments in manufacturing and mining in stimulating the nation's purchasing power. In view of the fact that the manufacturing industry has solved its problems and has done more than its share toward bringing about economic recovery, it seems to me that we will make better progress if politicians and economists devote more of their energy toward solving the problems in these larger fields in which investment has been subnormal instead of spending most of their time in considering political policies in relation to the manufacturer.

EXHIBIT No. 2439-D

Exhibit

	1914	1919	1921	1923	1925	1927	1929	1931	1933	1935	1937	1939	1940
(1) Value Added by Manufacture (\$ Million).....	\$9,389	28,865	17,303	24,630	25,732	26,428	30,737	18,601	14,008	19,061	25,674	22,850	27,000
(2) Wages (\$ Million).....	\$3,783	9,678	7,468	10,167	9,994	10,119	10,909	6,689	4,940	7,311	10,113	8,950	9,950
(3) % Wages to Value Added.....	40.3	40.5	43.2	41.2	38.9	38.3	35.5	36	35.3	38.5	39.3	39.2	36.9
(4) Wages Per Hour (Cents).....	24.7	60.6	52.4	54.1	56.1	57.6	59.0	56.4	49.1	60.0	69.3	72.0	72.5
(5) Finished Goods Prices (1925=100).....	67.8	130.6	103.3	99.2	100.6	95	94.5	77	70.5	82.2	87.2	80.4	82
(6) Manufacturing Production (1923-25=100).....		84	67	101	105	106	119	80	75	90	109	105	121
(7) Gross Revenues Mfg. Corporations (\$ Billion).....						63.44	71.64	43.72	25.07	47.33	61.95		
(8) Net Income After Taxes (\$ Billion).....						2.67	3.95	-0.91	0.08	1.51	2.55		
(9) Profit Margin (%).....						4.2	5.5	-2.1	0.2	3.2	4.1		
(10) % Earned on Net Worth.....						6.6	9.1	-1.0	0.5	5.6	8.0		
(11) Expenditures for Plant & Equipment (\$ Million).....		3,121	2,034	2,680	2,726	2,854	3,596	1,435	992	1,807	3,122		
(12) Average Active Cotton Spindles (000).....							30,409	25,674	24,873	23,421	24,080	22,307	
(13) Spindle Hours Run (000,000).....							99,900	77,703	86,680	76,017	95,591	92,559	
(14) Cloth Production (000,000 sq. yds.).....							8,399	6,955	7,866	7,135	9,446	9,146	
(15) Cloth Production Per Active Spindle (sq. yds.).....							276	271	316	305	392	410	
(16) Cloth Production Per Spindle Hour Run (sq. yds.).....							.084	.089	.091	.094	.099	.099	
(17) Index of Cloth Production Per Spindle Hour.....							100	106	109	112	117	117	
(18) Average Active Looms (000).....							610.9				452.3		
(19) New Spindles Installed (000).....							321	205	349	215	778	849	

1 (est.)

"EXHIBIT No. 2440" appears in text on p. 16239

EXHIBIT No. 2441

[Submitted by the Temporary National Economic Study Staff]

Indexes of Fixed Capital, Output and Employment in Selected Industries, 1919-38

[1922-25=100]

	Manufacturing ¹			Class I Railroads ²			Electric Light & Power ³		
	Fixed Capital	Output	Employment	Fixed Capital	Volume of Traffic	Employment	Fixed Capital	Output	Total Wage Earners and Salaried Employees
1919.....	73.1	84.3	106.7	90.3	95.5	112.2	86.1	85.2	82.9
1920.....	86.2	89.5	107.1	92.2	105.3	118.4	89.0	85.6	85.0
1921.....	89.1	89.8	82.0	93.9	81.0	93.5	72.1	75.1	71.8
1922.....	93.6	87.7	90.7	92.3	85.8	89.5	87.1	89.2	94.0
1923.....	97.0	99.7	103.8	96.7	102.6	104.9	97.8	99.5	101.4
1924.....	99.9	95.0	96.4	100.8	96.3	97.8	113.4	111.9	104.6
1925.....	103.1	105.3	99.8	102.5	101.1	97.8	127.5	124.8	118.8
1926.....	107.6	110.4	101.7	105.0	107.0	99.6	144.5	138.3	124.1
1927.....	108.8	110.6	99.5	106.0	103.5	96.8	158.4	151.7	132.6
1928.....	112.7	119.5	99.7	108.2	102.8	92.1	172.7	170.6	143.7
1929.....	117.3	127.7	104.0	110.2	105.6	92.5	185.4	176.8	147.9
1930.....	120.1	107.6	92.4	106.4	90.6	81.8	197.0	174.7	137.3
1931.....	117.0	92.2	78.1	108.6	73.1	68.4	202.2	180.8	119.4
1932.....	105.9	70.9	66.3	107.3	55.8	55.6	200.1	161.0	126.8
1933.....	100.7	70.5	73.4	105.8	63.4	55.3	196.1	172.5	127.3
1934.....	98.3	83.4	85.7	107.0	66.3	54.6	192.8	188.6	126.2
1935.....	97.2	100.6	91.3	106.5	79.5	59.3	193.1	215.3	131.3
1936.....	95.3	119.5	99.0	103.7	84.9	62.0	198.7	237.8	134.7
1937.....	103.0	124.2	108.6	107.2	69.1	50.9	198.7	238.9	133.1
1938.....	104.1	94.3	89.7	106.9					

	Automobile & Part Manufacturing ⁴			Iron & Steel Manufacturing Industry ⁵			Cotton Textile Manufacturing ⁶		
	Fixed Capital	Output	Employment	Fixed Capital	Output	Employment	Fixed Capital	Output	Employment
1919.....	59.2	49.7	85.1	102.7	83.3	102.5	94.0	90.8	97.4
1920.....	70.1	56.2	88.1	103.4	103.4	105.9	95.0	89.9	97.7
1921.....	82.9	40.1	62.9	97.8	47.9	62.5	97.1	83.5	93.1
1922.....	84.9	63.2	71.9	99.8	94.0	81.8	98.0	96.8	93.8
1923.....	91.5	99.9	100.6	98.8	105.4	104.5	99.2	106.2	106.7
1924.....	96.8	89.4	93.6	99.2	88.2	97.1	100.2	90.1	92.5
1925.....	110.0	110.7	105.8	102.0	106.3	98.4	100.6	103.7	100.8
1926.....	121.7	117.1	104.8	101.2	113.8	101.0	99.6	105.9	101.9
1927.....	121.2	100.9	91.9	104.4	106.8	95.7	97.3	111.8	104.8
1928.....	114.5	128.9	106.1	103.4	123.0	96.2	94.3	100.2	95.5
1929.....	114.0	155.3	111.3	102.0	135.2	103.2	92.3	106.6	96.1
1930.....	106.9	101.1	80.3	106.7	99.5	90.3	90.2	79.2	80.7
1931.....	96.5	73.9	71.0	106.9	65.0	68.4	83.6	78.3	74.5
1932.....	87.0	46.6	60.5	107.2	35.8	57.8	79.8	72.3	67.1
1933.....	79.5	63.5	60.6	100.3	59.1	71.0	75.0	90.7	85.9
1934.....	74.5	87.4	94.5	97.0	66.0	86.2	74.4	78.0	80.3
1935.....	74.2	120.7	110.4	87.0	86.7	92.1	72.4	81.6	83.5
1936.....	78.2	132.5	113.9	83.0	120.5	106.9	71.6	101.7	88.6
1937.....	79.8	143.1	128.3	85.6	129.2	123.5	72.8	107.5	95.5
1938.....	75.8	74.0	75.9	78.0	71.9	90.3	70.6	85.2	81.6

¹ pp. 269, 270.² pp. 271-3.³ pp. 275, 277.⁴ pp. 282-289.⁵ pp. 296-299. Fixed capital is an all industry figure; Output and Employment data apply to Blast Furnaces, Steel Works and Rolling Mills.⁶ pp. 306-307.Source: Spurgeon Bell, *Productivity, Wages and National Income* (Brookings Institution: 1940).

EXHIBIT No. 2442

[Submitted by the Temporary National Economic Committee Study Staff]

EFFECTS OF THE RADIO TELEGRAPH AND TELEPHONE AND OF RADIO BROADCASTING

I. ON UNIFORMITY AND DIFFUSION

Regional differences in cultures become less pronounced.
The penetration of the musical and artistic city culture into villages and country.
Isolated regions are brought in contact with world events.
Illiterates find a new world opened to them.
Standardization of diction and discouragement of dialects.

II. ON RECREATION AND ENTERTAINMENT

The manufacture of better phonograph music records encouraged.
Establishment of the melodramatic playlet with few characters and contrasted voices.
Greater appreciation of the international nature of music.
Entertainment for invalids, blind, partly deaf, frontiersmen, etc.
Interest in sports increased, it is generally admitted.
Entertainment on trains, ships and automobiles.

III. ON TRANSPORTATION

Radio beams, enabling aviators to remain on course.
Aid furnished to ships in distress at sea.
Brokerage offices on ships made possible.
Receipt of communications en route by air passengers.
Communication between airplanes and ships.
Ships directed for better handling of cargoes.

IV. ON EDUCATION

Broadcasting has aided adult education by talks on political, economic, health, and other questions.

V. ON THE DISSEMINATION OF INFORMATION

Wider education of farmers on agricultural methods, parasites.
Prevention of loss in crops by broadcasting weather reports.
Market reports of produce permitting better sales.
Important telephone messages between continents.
Small newspapers, an experiment yet, by facsimile transmission.
Transmission of photographic likenesses, letters, etc., especially overseas where wire is not yet applicable.
Quicker detection of crime and criminals, through police automobile patrols equipped with radio.

VI. ON RELIGION

The urban type of sermon disseminated to rural regions.
Services possible where minister cannot be supported.
Invalids and others unable to attend church enabled to hear religious service.

VII. ON INDUSTRY AND BUSINESS

Better phonograph recording and reproducing now used.
Lowering of cable rates followed radio telegraph development.
The business of the lyceum bureaus, etc., suffered greatly.
Equipment cost of hotel and restaurant increased.
A new form of advertising has been created.
Led to creation of new magazines.
An increase in the consumption of electricity.
Provision of employment for 200,000 persons.
Aid to power and traction companies in discovering leaks, through the assistance of radio listeners.

VIII. ON OCCUPATIONS

A new employment for singers, vaudeville artists, etc.
 New occupations: announcer, engineer, advertising salesman.
 Dance orchestras perhaps not increased but given prominence.

IX. ON GOVERNMENT AND POLITICS

In government, a new regulatory function necessitated.
 Legal questions raised beginning with the right to the air.
 New specialisation in law; four air law journals existing.
 Executive pressure on legislatures, through radio appeals.
 Rumors and propaganda on nationalism have been spread.
 Constituencies are kept in touch with nominating conventions.
 Political campaigners reach larger audiences.
 High government officers who broadcast are said to appear to public less distant and more familiar.

X. ON OTHER INVENTIONS

The vacuum tube, a radio invention, is used in many fields, as for leveling elevators, automatic train controls, converting electric currents, applying the photoelectric cell, as hereinafter noted. A new science is being developed on the vacuum tube.
 Television was stimulated by the radio.
 Developments in use of the phonograph stimulated by radio.
 Amplifiers for radio and talking pictures improved.
 Geophysical prospecting aided by the radio.

XI. MISCELLANEOUS

Morning exercises encouraged a bit.
 Irritation against possible excesses of advertising.
 Development of fads of numerology and astrology encouraged.
 Wider celebration of anniversaries aids nationalism.
 Used in submarine detection.
 Home duties and isolation more pleasant.
 Creative outlet for youth in building sets.

More Detailed Effects.—For instance, the item of the foregoing list, "Interest in sports increased, it is generally admitted", when analyzed in further detail shows fifteen further social effects, which are as follows: The Broadcasting of boxing matches and football games tends (1) to emphasize the big matches to the neglect of the smaller and local ones, (2) increasing even more the reputation of the star athletes. In the case of football (3) the big coaches are glorified and (4) their salaries become augmented. (5) The attendance at colleges specializing in football whose football games are broadcast is increased. (6) Football practice in the springtime is thus encouraged and (7) the recruiting of prospective star players for college enrollment is fostered. (8) The smaller colleges or the ones with higher scholastic requirements tend to be differentiated as a class by contrast. (9) Boxing matches with big gates have accentuated trends in boxing promotion, notably the competition for large sums of money to the neglect of smaller matches. (10) Broadcasting of sports has led to a greater advertising of the climate of Florida and California, and (11) no doubt has aided a little the promotion of these two regions. (12) Broadcasting of sports has led to the developing of a special skill in announcing the movements of athletes not at times easy to see, a skill rather highly appreciated. (13) Athletic and social clubs with loud speakers have become popularized somewhat on the afternoons and evenings of the matches. (14) The broadcasting of baseball games is said to have bolstered the attendance, particularly by recapturing the interest of former attendants. (15) Another effect it is said has been the reduction in some cases of the number of sporting extras of newspapers.

(Selected from "The Influence of Invention and Discovery", by W. F. Ogburn, with the assistance of S. C. Gilfillan, Chapter III in *Recent Social Trends in the United States*, McGraw-Hill Book Company, Inc., New York, 1933, pp. 153-157.)

"EXHIBIT No. 2443" appears in text on p. 16259

"EXHIBIT No. 2444" appears in text on p. 16263

EXHIBIT No. 2445

[Submitted by the Temporary National Economic Committee Study Staff]

Real wages

[1913=100]

	Great Britain	U. S. A.		Great Britain	U. S. A.
1790-1799	37		1880-1889	63	53
1800-1809	41		1870-1879	74	77
1810-1819	41		1860-1869	84	85
1820-1829	47		1850-1859	98	103
1830-1839	47	48	1900-1909	102	103
1840-1849	49	56	1913	100	100
1850-1859	58	52			

Data for England: *Economic Journal*, September 1923; *Journal of Statistical Society*, March, 1909; *Review of Economic Statistics*, October 1923; Suppl. for U. S. A.: *American Economic Review*, March 1925.

The article of Rufus S. Tucker, "Real wages of artisans in London 1729-1935" (*Journal of the American Statistical Association*, March '36), published after the present book was written, fully corroborates my assumption. Taking the year 1900 as base with *real wages* in that year=100, Tucker gives for 1729-1739 an index of 67. (His index is very carefully constructed and takes into account the changes in habits of consumption.) This real wage (represented by 67 for 1729-1739) soon fell to 32.6 (1800) as a consequence of rising prices, while money wages remained the same. Later on real wages rose again, but it was not before 1870-1880, that they reached the level of 1729-1739, the next three decades brought an increase of about 50 per cent. (to 100:1900), but real wages decreased again during the war, but rose afterwards to 100 in 1927, and 112 (1935) with an accompanying decrease in working hours. The opinion that wages were quadrupled during the nineteenth century, must be considerably modified when we realise the very low level of wages at the beginning of the century, i. e. during the base year.

Source: Emil Lederer, *Technical Progress and Unemployment*, International Labour Office, Studies and Reports, Series C (Employment and Unemployment) No. 22, Geneva, 1938, p. 48.

EXHIBIT No. 2446

[From the files of Science Services]

THE MECHANISM OF PHOTOSYNTHESIS AND NATIONAL OR WORLD ECONOMY

A statement by Dr. O. L. Inman, Director of the C. F. Kettering Foundation for the Study of Chlorophyl and Photosynthesis at Antioch College, Yellow Springs, Ohio, prepared at the request of Watson Davis, Director of Science Service, for presentation to the Temporary National Economic Committee, April 8, 1940

Our chief source of available power or energy is fundamentally the sun. This comes chiefly through heat, electric power derived from taking advantage of evaporation of water and its condensation at higher levels or by use of water power, and through the absorption of visible light energy by green plants. The use of coal, oil, gas, wood, etc. is drawing on the capital of by-gone days and this capital will keep on diminishing. Note the struggle in Europe for stored hydrocarbon compounds.

In my opinion, we have two ways of approaching the solution of this long time power policy: (1) to learn more about plant growth and to grow several hundred times the amount of vegetation we now grow, transforming much of this to a more condensed charcoal from which gas, oil, etc. may be made. Obviously, the study of problems of plant growth is of vital importance. The use of hydroponics as a technique, the developing of mutations by means of X-rays, ultra-violet light, radium, fast neutrons, or molecules such as colchicine may in the future increase yields. Also, the application of further knowledge in the field of genetics is surely of importance. For example, the rapid advance in the use of hybrid corn through the corn growing areas is now affecting economic principles.

The study of plant growth hormones which apparently control growing rates to a large extent is of much significance. (2) Another way is to solve the mechanism of how to fix with the tools we now have available, the carbon of carbon dioxide and the hydrogen of water into chemical compounds similar to methane or marsh gas and gasoline, or, by the addition of oxygen, to get sugar, woods, or fats, and, by the further addition of nitrogen, to get proteins and so on to thousands of possible compounds or molecules with energy stored ready for our use. In order to learn as much as possible about this storing of radiant energy the green plant is being studied. It can do a large scale commercial job under many varying conditions of environment. The green plant is about the only place available to us where energy is not degraded or changed to a less available form. When we know more, the chances are that man will solve the problem and set up his method of storing radiant energy from the sun in some way that is not the exact duplicate of the green plant. It may, however, be more efficient.

A recent review of studies of chlorophyll alone listed 400 papers covering the last six years. The number published on the whole problem of photosynthesis would be much greater than this. Rather than attempt to give you the names of all the chief research workers in this field, I shall list the laboratories where there are several staff members engaged in this work:

1. The Carnegie Institution of Washington with Laboratories at Stanford University, under the direction of Dr. H. A. Spoehr.
2. The Smithsonian Institution. Division of Radiation and Organisms, under the direction of Dr. Earl Johnston.
3. The University of Chicago Physics Department, under the direction of Dr. James Franck.
4. The University of Wisconsin, Madison, Wisconsin, under the direction of Dr. B. M. Duggar and Dr. Farrington Daniels.
5. The University of Minnesota, Minneapolis, Minn. under the direction of Dr. George O. Burr.
6. At Antioch College, Yellow Springs, Ohio, The Charles F. Kettering Foundation, under the direction of Ondess L. Inman.
7. Recently a few men at Dr. E. O. Lawrence's Laboratories, University of California, Berkeley, California and at Massachusetts Institute of Technology have begun work in this field.

The above list does not include approximately a hundred or more investigators who have contributed one or more papers in this field in recent years.

In Europe Dr. Hans Fischer's Laboratories at Munich, Germany, and Dr. A. Stoll at Basel, Switzerland, are probably the most active now. Then there are laboratories in Russia, Japan, England, France, and Italy, which do some work in this field.

A rough estimate of the amount of money budgeted in 1940 for this work in the United States would be about \$250,000-\$300,000 annually. In 1930 I should estimate about \$150,000 was spent in this direction. If necessary, I could give you the names of almost every individual engaged in this research, but I felt this was too detailed for your purposes.

The committee might like to know just how large a problem this is. The best estimates are that the energy reaching the earth from solar radiation each year is equivalent to that received from burning 4×10^{22} tons of anthracite coal. From this source we could draw plenty of available energy for all our needs.

I believe one thing should be clear and that is the problem of photosynthesis is mainly a "power problem" on a large scale. If and when the energy of the atom is tapped, part of the power problem might be solved. There is, however, still use for the green plant to furnish food in forms suitable for man and the animal kingdom, and there are literally thousands of compounds found in green plants which still need to be synthesized in the laboratory. It is perhaps true that we can eventually duplicate all these things, but it will probably be several million years before we can hope to duplicate most of the work of green plants. As far as energy is concerned a knowledge of the mechanism of fixing radiant energy in hydrocarbon compounds would be good. When we have really solved this problem we may need to derive energy from water power to produce atomic hydrogen by decomposition of water or molecular hydrogen and then reduce CO_2 to some $(\text{CH})_n$, $(\text{CHO})_n$, $(\text{CHON})_n$, $(\text{CHONPS})_n$ or other similar compound with suitable available energy in compact form. In this manner, tremendous power might become immediately available without resort to green plants. At the present time we are mostly in the theoretical stages of producing available energy by this latter means, but the stakes are so high that it is of clear cut importance to undertake such work.

Further than all this, while working on all these problems by-products are showing up all along the line. For example, in trying to extract the green pigment chlorophyll from the plant in an unchanged condition the plants must be dried carefully. It is clear that this careful drying also preserves food values better and we now have dehydration applied to alfalfa for animal feeds. In other words better ways of preserving the food value found in fresh green plants is a by-product. Also in trying to synthesize chlorophyll many new chemical compounds have been developed and some of them may prove valuable in medicine or industry. The use of radiation in photosynthesis studies gives us more knowledge of the effects of radiation on plant and animal growth and on chemical molecules used commercially in hundreds of ways.

In final analysis man has been taking for granted that he can in some way keep on depending on deriving energy or power from our capital stores of coal, oil, and gas. If he waits until he no longer has these stores, he is likely to find it is a long time research program and he was several years too late in beginning his work.

O. L. INMAN.

3/28/1940

EXHIBIT No. 2447

[From the files of Science Service]

ATOMIC POWER

A statement by Dr. M. A. Tuve, Department of Terrestrial Magnetism, Carnegie Institution of Washington, Washington, D. C., prepared at the request of Watson Davis, Director of Science Service, for presentation to the Temporary National Economic Committee, April 8, 1940

Fifty years of research on the constitution of matter and the internal structure of the atom, supported and carried out for philosophical reasons quite unrelated to so-called practical objectives, has brought to light a great store of potential energy in every material body, tremendous in amount but until recently quite inaccessible. This discovery was only one of many unexpected by-products of atomic research. Another illustration occurred a year and a half ago when a special type of artificial transmutation reaction ("atom-smashing") was discovered in uranium and thorium, a reaction evidently possible only with the heaviest atoms in the atomic table. This very specialized reaction, for the first time, gives promise of making atomic energy available for use in the form of heat. Recent experiments indicate that the straightforward technical problem of separating two varieties of uranium atoms, increasing the concentration of one variety from two-thirds of a per cent to 10 or 20 per cent, is a remaining difficulty to be surmounted. This type of reaction at best will tap only an infinitesimal fraction of the total atomic energy around us, but it shows that another unexpected development in the future might put at our disposal a large amount of power derived from atomic energy. Two years ago "atomic power" of any kind seemed fantastic. Today it appears that the only hope for tapping large amounts of atomic energy lies in the possibility of discovering in the future a mechanism for atomic annihilation.

Atomic power from uranium gives us no promise at present of replacing coal and oil on a large scale, especially because of the scarcity of high-grade uranium deposits. Nevertheless it might have great future importance in specialized applications on not too small a scale, because a ton of the active component of uranium evidently will yield as much energy as 2,000,000 tons of coal. Plenty of uranium exists, as it amounts to one part in a million of the Earth's crust, or an energy equivalent of forty pounds of coal for every ton of rock. This is possibly a large reserve of energy for future use, but its wide dissemination means a very high cost to make it available.

Perhaps the chief point to emphasize in this connection is the importance of supporting fundamental research programs which have no immediate practical objectives, as a part of our social organization. In a democracy like ours it is encouraging to see that support can be obtained for long-range research, as exemplified by the National Cancer Institute and by some of the State Universities.

(Signed) M. A. TUVE.
M. A. Tuve.

EXHIBIT No. 2448

[From the files of Science Service]

HUNDRED-MILLION-VOLT, FORTY-NINE HUNDRED-TON ATOM SMASHER MADE POSSIBLE AT UNIVERSITY OF CALIFORNIA THROUGH \$1,150,000 GIFT FROM ROCKEFELLER FOUNDATION

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BERKELEY, CALIF.—The Rockefeller Foundation of New York City has given the University of California \$1,150,000 for the construction of a new and much larger cyclotron or atom smasher.

The plans for the new cyclotron call for a mechanism, or a fine integration of mechanisms, that will produce energies in excess of 100 million volts, as compared with the 33 million volts produced by the University's present 60-inch cyclotron.

The weight of the new cyclotron will be 4,900 tons, or more than 20 times heavier and bigger than the present instrument.

The new cyclotron will resemble the present medical cyclotron, but in details it is planned to be the most distinctive engine of its kind in the world. The designers in the University's radiation laboratory state that, because it is the first of its size ever planned or even contemplated, its actual operation may compel changes that cannot be predicted at present.

Technically, the new cyclotron is expected to show, in a quantity sufficient for observation, the types of phenomena observed in cosmic rays. More simply, its primary objective is to study new regions in the atom, which itself is an infinitesimal planetary system. More simply still, it will endeavor to wrest from the atomic substances that make up all matter the secrets of the energies that make plants and animals grow.

The initial operation of the new cyclotron will call at once into play some 50 million volts of energy, or 17 million more than the maximum noted thus far for the medical cyclotron. Nothing is known of the potentialities of cyclotron operation beyond this present maximum, and the scientific world is waiting to see what it will reveal.

EXHIBIT No. 2449

[From the files of Science Service]

SUMMARY OF U. S. WEATHER BUREAU WORK IN LONG-RANGE FORECASTING

A Statement by Dr. C. G. Rossby and L. F. Page, U. S. Weather Bureau, Washington, D. C., Prepared at the Request of Watson Davis, Director of Science Service, for Presentation to the Temporary National Economic Committee, April 8, 1940

(a) In the field of "short" long-range forecasting experimental five-day forecasts have been made during the last two years, based on a combination of statistical studies, synoptic techniques and physical theory of the general circulation of the atmosphere. These forecasts have been subjected to rigid verification tests and have lately become sufficiently successful to warrant a broader try-out. It is accordingly planned to organize a special group which will devote itself exclusively to the preparation of such experimental forecasts for distribution to the individual district forecast centers where they may be used as a guide by our district forecasters in the preparation of the so-called weekly outlooks.

In the field of "long" long-range forecasting a critical survey has been made for possible methods of approach, without discovering any method which can be adapted directly to forecasting in the United States. Statistical studies of seasonal weather in the U. S. as related to previous departures from normal in other parts of the world have been carried out with no more than slight indications of factors which might have forecasting value but considerable progress has been made in defining trends in temperature and precipitation for the different regions of the U. S. and other parts of the world.

(b) Further progress seems most hopeful through an increased understanding of the general circulation of the atmosphere—the maintenance of the semi-permanent centers of action, for example, which determine the paths of individual storms. A single index of the strength of this circulation has been tentatively related to local weather occurrences and it is hoped that this index will provide a means of integrating apparently conflicting trends and fluctuations in different parts of the world into a world-weather pattern. Although some statistical

methods may be available for the same purpose, much more reliance can be placed in results which are founded on a physical explanation of factors which may be used in forecasting.

(c) (1) Experimental five- and ten-day forecasts in cooperation with M. I. T. under the direction of Profs. Sverre Petterssen and H. C. Willett of that institution. (2) Studies in the mechanics of the general circulation under Dr. C. G. Rossby of the Weather Bureau, combined with statistical studies of the relation between circulation patterns and simultaneous weather conditions, under the direction of Mr. L. F. Page of the Weather Bureau. (3) Correlation of weather in the U. S. with preceding conditions in other parts of the world, by Mr. R. H. Weightman of the Weather Bureau. (4) Determination of trends in temperature and precipitation, under the direction of Mr. J. B. Kincer of the Weather Bureau.

(d) The Weather Bureau is spending approximately \$30,000 on research directly related to long-range forecasting during the present fiscal year.

PROSPECT OF LONG-RANGE WEATHER FORECASTING

A Statement by Dr. C. G. Abbot, Secretary, Smithsonian Institution, Washington, D. C. Prepared at the Request of Watson Davis, Director of Science Service, for Presentation to the Temporary National Economic Committee, April 8, 1940.

This subject may suggest two branches. First, the extension of present forecasts from 2 days to 2 weeks. Second, to accomplish forecasts of temperature and precipitation for seasons and even years in advance. Both projects I consider to be practicable.

First: In the year 1936 I discovered that when short sequences occur of increasing or decreasing emission of radiation by the sun, they are followed for as much as 2 weeks by definite patterns of weather departures. These patterns differ at different stations and in different months of the year, but they appear to be stable for many years at a given station for each month. These patterns are generally opposite, like the right and left hand, following respectively rising or falling intensity of solar emission. Though the solar variations are only of the order of 1 per cent, the differences in temperature brought about by rising radiation as compared to falling radiation are of the order of 10° or more Fahrenheit. These are in fact major changes of weather, and are evidently governed by the sun's variation. In order to use solar variation as a predicting element it would be necessary to increase the number of "solar constant" observing stations, now only 3 in the world, to perhaps 10, for it would be necessary to get excellent determinations of the sun's condition every day. This expansion of observing program would cost about \$200,000 per annum.

Second: In the year 1935 I discovered 12 long periods in solar variation, ranging from 7 to 273 months in length. Seven of these periods have lately been strongly confirmed by Dr. Sterne of Harvard through statistical methods according to the theory of Least Squares. Three others of them I regard as certain, or 10 in all.

Meteorologists have seldom been successful with studies of periodicity. A proposed period may go on very well for a few months or years and then change in phase.

In studying the connection between the 10 periods of solar variation and precipitation and temperature, changes of phase are encountered also. But it is believed that the cause of these changes of phase has been discovered. Predictions of both temperature and precipitation have been made for several stations for 5 years in advance, by a synthesis of the effects of these solar periods. These predictions come true approximately 70 per cent of the time, and appear to be as good after 5 years as in the first year. The method is not fully perfected, but these preliminary results give promise that very useful forecasts for at least 5 years in advance may in due time become practicable. The method involves no appreciable expense. At all events the work already done shows that the variation of the sun, always hitherto neglected, is the main cause of departures from normal temperatures and precipitation at all stations.

A Statement by Dr. Charles F. Brooks, Director of Harvard University's Blue Hill Meteorological Observatory, Milton, Mass., Prepared at the Request of Watson Davis, Director of Science Service, for Presentation to the Temporary National Economic Committee April 8, 1940

Progress in long-range forecasting research in the United States is exasperatingly slow at present, owing to lack of sufficient funds to permit an adequate attack on

this world-wide problem. For daily forecasting it is practically enough to know what the weather is over and near the United States; for forecasting a week in advance, conditions far outside the limits of the country must be known, while for seasonal forecasting a knowledge of world weather is required. Whether or not the causes of variations from week to week, month to month or season to season are understood, no long range forecasting can be successful without thorough knowledge of the manner in which the atmosphere interacts over wide areas or over the entire earth to produce the local abnormalities. Since your telegram refers to long-term agricultural and other planning, I shall confine my further remarks only to long-range forecasting embracing a season or a year or a term of years.

Slow progress is being made in studies of world weather, to learn how the seasonal weather in the United States follows marked abnormalities here or elsewhere in the previous season or seasons. It has been found that conditions in the southern hemisphere indicate subsequent abnormalities in the northern hemisphere more often than do antecedent conditions in the northern hemisphere itself. And it has been found that autumn weather conditions in the tropical Australasian region when markedly abnormal will indicate the general character of winter rainfall over the northwestern plains and northern Rockies and over Florida and the neighboring portion of the West Indies. A trial forecast of the winter precipitation for Montana, 1939-40, was made and proved successful.

Seasonal weather maps for the entire world should be made, to learn why there is such a relationship, which has been established beyond reasonable doubt on statistical grounds. The statistics of the relationship should be extended to a longer period of years and tested for areas about the centers already established. Other groupings of months than the standard seasons should also be compared.

Supplementary charts of the extent of polar ice, of snow-cover, and the distribution of the surface temperatures of the oceans are needed before the abnormalities on the seasonal weather maps can be explained.

The departure of solar radiation from normal is also required. Studies are in progress based primarily on variations in solar radiation from which certain periodicities are appearing that seem to have their counterparts in weather trends. Also certain weekly, monthly, and seasonal weather abnormalities seem to follow variations in the sun. If these apparent relations are real, others of the same sort should appear on world weather maps. Some studies seem already to have shown such.

Statistical studies of cycles or sequences at particular places have been made, and with results that encourage further investigation. They are perhaps sufficiently definite to permit long-term planning in a broad way; but their value and one's feeling that they could be depended on would be enhanced if they could be related to the general abnormalities and their causes revealed on seasonal world weather maps.

Leading (or lonely) U. S. investigators are (*alphabetically arranged*): C. G. Abbot, Dinsmore Alter, H. Arctowski, T. A. Blair, L. E. Blochman, H. H. Clayton, H. W. Clough, G. F. McEwen, L. F. Page, C. D. Reed, I. I. Schell, R. H. Weightman.

Annual expenditures for research on this problem should cover the following: (1) Funds for each of the above and others with ideas to develop his ideas and bring them to an adequate test. (2) A centrally directed fund for world weather mapping by months and sequential combinations of months, and for a study of these by dynamic and statistical meteorologists. (3) A fund for thorough study of all scientific attempts at long-range forecasting that have been made anywhere in the world. (4) A fund for the establishment of weather stations in the larger areas of the earth's surface that are currently unreported, esp. in the South Pacific and the Antarctic.

Item (1) should have \$20,000 at least; item (2) should have \$20,000 at least, and preferably \$50,000; item (3) would require \$5,000 to \$10,000; item (4) would take \$100,000 to \$1,000,000 a year, depending on the adequacy of coverage. The total would be at least \$200,000 annually for any adequate attack on the problem of long range forecasting; and such an appropriation should be continued annually and increased. The amount might settle down to about \$1,000,000 a year at the end of 20 years, by which time seasonal, annual, and term of years forecasts should be established on a routine basis for all parts of the United States.

I feel certain that long-range forecasts are possible for the United States. The problem is no easy one and would take much work at great expense to solve to a generally useful point. The value of such forecasts, however, would far exceed

the cost. Therefore, I think it would be true national economy to promote the necessary investigations with adequate appropriations.

Sincerely yours,

(Signed) CHARLES F. BROOKS,
Charles F. Brooks.
Professor of Meteorology, and Director.

EXHIBIT No. 2450

[From the files of Science Service]

**A PRACTICAL APPLICATION OF KNOWLEDGE DERIVED FROM THE STUDY OF PLANTS:
VITAMIN K CHEMOTHERAPEUTIC ATTACK ON DISEASE: PNEUMONIA, SYPHILIS,
MALARIA**

**A Statement From Dr. Walter Simpson, Miami Valley Hospital, Dayton, Ohio,
Forwarded by Dr. C. F. Kettering, to Watson Davis, Director of Science Service
for Presentation to the Temporary National Economic Committee, April 8, 1940**

In 1929, Doctor H. Dam, of Copenhagen, observed that chicks raised on certain artificial diets became anemic and suffered from hemorrhages. After extensive experimentation he discovered that the hemorrhages and prolonged clotting time of the blood were due to a lack of a new fat-soluble factor, which he named vitamin K. Doctor Dam and his associates found that this anti-hemorrhagic vitamin is widely distributed in green leaves and vegetables, with an abundance in alfalfa leaves. Doctors Almquist and Stokstad reported in *Nature* in 1935, that the addition of 0.5 percent of dry alfalfa to the diet prevented the hemorrhagic symptoms. Hence one of the chief sources of this vitamin has been alfalfa.

More recently, chemists at St. Louis University and the University of California have identified chemically the active principle of vitamin K contained in alfalfa and other green vegetables such as spinach and cabbage. This has resulted in a much more stable and reliable product which can be manufactured at relatively little cost. Now, in thirty minutes, a skilled medical technologist can tell whether or not a person is deficient in vitamin K by determining the prothrombin time of a tiny sample of blood taken from an arm vein. The prothrombin deficiency and hemorrhagic tendency is most common in jaundiced persons, particularly newly born infants and in those adults who become jaundiced because a gall stone is obstructing the flow of bile through the gall ducts. The old mosaic law, as revealed in the book of Genesis, forbade circumcision in infants during the first eight days after birth. Again modern science finds justification for another old belief based upon long observation, in the recent studies by Doctor Armand Quick, of Milwaukee, Doctor H. B. Smith, of Iowa City, and Doctor Albert N. Snell, of the Mayo Clinic. These medical researchers have found that two to three percent of newly born babies are bleeders because of vitamin K deficiency. This bleeding tendency is most prevalent during the second to the fourth day of the baby's life. The administration of vitamin K promptly eliminates this hazard.

No longer need the surgeon hesitate to operate upon the jaundiced patient because of the previously great danger of fatal hemorrhage following the operation. The bleeding tendency can now be abolished overnight by injections of the new synthetic vitamin K (2-methyl-1, 4 naphthoquinone).

CHEMOTHERAPEUTIC ATTACK ON DISEASES

Pneumonia is now regarded as the third great killer of mankind. The advents of new chemotherapeutic agents, such as sulfanilamide and sulfapyradine has already produced such remarkable results in curing both the pneumococcus and streptococcus forms of pneumonia that it seems very likely that pneumonia will soon occupy fourth or fifth place among the causes of death. The great physician, Sir William Osler, once referred to pneumonia as the friend of the aged. Pneumonia strikes particularly at children and old people. But pneumonia can no longer be called the friend of the aged, because the new chemical agents are just about as curative in old people and in children as they are in robust adults. In those cases of lobar pneumonia that do not respond promptly to sulfapyradine and similar chemical compounds thirty-three different types of anti-pneumonia serums are available as additional aids.

Since the discovery of Doctor Paul Ehrlich's magic bullet (606) many new types of organic arsenical compounds have been developed for the everlasting warfare against syphilis. Some of the newer arsenic and bismuth compounds are much more effective and much safer than Ehrlich's salvarsan. Experiments now under way indicate that by combining relatively large doses of arsenic compounds with artificial fever it may be possible to reduce the minimum time for the treatment of syphilis from eighteen months to a few days. When the treatment for syphilis becomes simpler and cheaper we will be well on our way towards the eradication of this great destroyer of mankind.

Ever since the Spanish conquerors of South America discovered that the Peruvian Indians had long used an effective remedy against malaria which they derived from the bark of cinchona trees, quinine has been the sovereign remedy for malaria. In the past few years quinine has been largely displaced by the new chemical compound known as atabrine. Now it appears that five days of treatment with atabrine is even more effective than weeks and months of treatment with quinine.

Many more new chemotherapeutic agents might be mentioned, but these three examples will suffice to demonstrate that while eighty percent of the people of the world are now engaged in a campaign of destruction, a small army of chemists and physicians is struggling incessantly to save the lives of men.

EXHIBIT No. 2451

[From the files of Science Service]

HARVARD UNIVERSITY

GRADUATE SCHOOL OF BUSINESS ADMINISTRATION

GEORGE F. BAKER FOUNDATION

ELTON MAYO
Professor of Industrial Research

SOLDIERS FIELD, BOSTON, MASSACHUSETTS, *March 28, 1940.*

Dr. WATSON DAVIS,
Director Science Service, Washington, D. C.

MY DEAR DR. DAVIS: There are three outstanding present and future problems of industry and general living. So far as I know the amount of research being done on these problems is so small as to be negligible. The three problems are:

I. The problem you name; the development of better human relations in industry and generally.

II. The problem of executive authority.

III. The problem of unemployment.

My statement that little or no research is being done on these important problems may seem at first surprising. I hope to show you that it is only the obvious aspects of these difficulties that are being studied and that the various inquiries deal only with palliative measures for the symptoms and are not concerned to diagnose the malady.

I. HUMAN RELATIONS IN INDUSTRY AND GENERALLY

For some fourteen years we have been directly interested in an investigation at the Hawthorne Plant of the Western Electric Company and throughout this period we have collaborated closely with the company officers in research. The course followed by the inquiry and the results obtained have been described in a book recently published by us, *Management and the Worker* (by F. J. Roethlisberger and W. J. Dickson, Harvard University Press, 1939). This book has not yet been reviewed by the more serious publications although we have been permitted to see certain reviews in proof. It is an interesting fact that we published an edition of one thousand copies, October last, at \$4.50 a copy and that by the end of February it was completely sold out. It is also interesting that the book has attracted the interest not only of management but also of Mr. Harold J. Ruttenberg and the intelligent organizers of the CIO. It would seem that both these groups, the management and the CIO groups, are willing to accept our findings as representative of the actual situation on the working line in industry.

In brief, the inquiry began with intensive studies of the individual worker—physiological, psychological, psychopathological. Step by step over a period of six years we were driven away from an intensive study of the individual worker

to a study of the individual as related to the informally ordered group of workers about him. The psychoanalytic method of digging deeper and deeper into the particular individual's condition, though exceedingly interesting and in a few cases relevant, proved entirely fruitless for the main inquiry. Nevertheless, the whole investigation and the manner of its conduct owe a heavy debt to Asklepios and to psychopathology.

The science of economics tends to adhere to assumptions made in eighteenth-century France and nineteenth-century United States, the assumptions being, first, that society consists of individuals and that their organization is predominantly economic; second, that the individual is motivated mainly by his material interests; third, that the individual thinks logically in the service of these interests. We have found that in industries it is generally and almost invariably true that the individual is actuated chiefly by a passionate desire for an intimate and routine relation with his fellows at work. It is our general finding that in the service of this passionate desire he will sacrifice not only what seems to be his own material interests but also his right to independent and logical thinking. It is, in other words, the chief character of the human scene that the individual adapts to his work by subordinating his own sentiments to the sentiments demanded by a routine association with his fellows and that, as adequately as may be, he adopts their ways of thinking and living as part of his own. This indeed is society as we find it in industry.

Now it is the habit of industry and economists and psychologists and psychiatrists to ignore this very real informal group organization and to behave as if one exercised control over the mass by relating the control directly to the separate individuals in it. This is not true and it leads to grave misdirection of research. It leads in fact to what I call a psychological "rat-hunt."

First, the psychologist is trained to search for I.Q.'s or for particular vocation "sets." I am not denying that such inquiries have their value but in effect it becomes a search for a "structure" (traceable possibly to the biological genes) which neglects completely to inquire into, or to take account of, the balanced relation between individuals in an organization. Yet it is this balanced relation which is the important fact for the administrator. In other words, the inquiry is directed at the structural and neglects the dynamic completely. Since at the moment our modern problems all relate to the dynamics of social control, these studies, however interesting in themselves, become in the main irrelevant.

Second, psychiatry. Here also is another instance of the same technical error. In his ordinary practice there are brought to the psychiatrist those persons who quite obviously have failed to establish a harmonious and happy relationship with other people about them in the society. Frequently, though not always, the failure is serious because if any ordinary adjustment will serve to aid the individual it is contrived for him before he drifts into the hands of the psychiatrist. By reason of the work he is required to do, the psychiatrist is therefore in part disqualified for actual social study. Indeed, the ordinary practitioner of medicine is in this respect better qualified because he is required to handle many such cases and does so admirably; he does this work so well that he stops many individuals on their way to the psychiatrist and contrives for them a happy solution of their troubles. The psychiatrist therefore is by his work conditioned to expect that behind the social ineptitude that he studies there will be a structural defect in which the unbalance originates. He therefore, when his attention is turned toward industrial or social inquiry, charges into action with this as a guiding idea—the idea, namely, that it is his business to discover those persons who do not easily adapt and to make special provision for them. One would have expected that psychoanalysis, with its close study of infancy and adolescence, would have effectively changed this point of view. Curiously enough, the psychoanalysts are no better in this respect than are the psychiatrists. For them, the structural defect is traceable to an infantile trauma or a distortion of attitude due to a defect of infantile environment. But once they have established this as their main tenet their attitude becomes in other respects identical with that of the ordinary psychiatrist. In other words, their main idea resembles far too closely the rat-hunt principle of looking for individuals with structural defects in order to throw them on the ash heap.

I am happy to say that I know one exception to this rule. Dr. J. S. Plant, in Essex County, New Jersey, has conducted for many years an inquiry into delinquent children which, if one makes allowances for differences in situations studied, moves step by step very closely with our studies of the actual balanced relation between persons organized in groups, which is the main character of our industrial and social life.

these fields. I have already mentioned, I think, two names. I have also described our own struggle to develop such inquiries. Beyond this it is a melancholy fact that neither here not in England or in France do I know of anyone who is actively engaged in developing research of the type I describe. For years here we have hoped that some one or other of the universities would undertake investigations distinct from our own, which would result in a valuable comment or critique of what we have been struggling to do. I cannot report anything even of the smallest of beginnings. Here we are hampered by lack of funds. We can pick up almost any number of exceedingly intelligent young men eagerly interested in this kind of inquiry. I then find that the funds we should need to hold them in the work for the five or six years that would be necessary are not available. We have done the best that we could do in the circumstances.

I should like to suggest that you consult certain other persons upon the statements I have made. First, my colleague, Dr. L. J. Henderson, Morgan Hall, Soldiers Field, Boston. Henderson is chairman of a special committee appointed by the National Academy of Science and the National Research Council, which is just completing a report on "work in industry." This report will cover very thoroughly the topics I have briefly mentioned in the first section of this letter.

Dr. Henderson has also conducted for some years here a sociological class, Sociology 23, which has endeavored to give to students some species of dynamic conceptual scheme in social or industrial study. Dr. Henderson has been the chief lecturer but has brought in physicians, administrators, investigators, of all types, the business of each one being to present to the class some actuality of social fact which he has himself studied and for which he has been, at least in part, responsible. This class, after some years of comparative neglect, is now beginning to attract the active intelligences amongst the undergraduates.

Mr. Chester I. Barnard (540 Broad Street, Newark, New Jersey), President of the New Jersey Bell Telephone Company, not only has a most unusual interest in some of the problems I have described but has also some knowledge of the work we have been doing.

Mr. Harold J. Ruttenberg (Research Director, Steel Workers Organizing Committee, 1500 Commonwealth Building, Pittsburgh, Pennsylvania) in the course of his work for the CIO has come to conclusions with respect to the human facts at the work bench which are capable of being closely related with the facts emerging from the Western Electric inquiry.

Professor John G. Jenkins (University of Maryland, College Park, Maryland) has become interested in the work we are doing. I believe that he is at present the Washington representative on the National Research Council of the Division of Psychology and Anthropology.

Your final question is that as to the cost of such researches. On the one hand my feeling is that in view of the present incapacity of psychologists and economists to provide any diagnosis of the ills we suffer no outlay could be too great, if the right type of inquiry can be instituted. Once again, however, I have to report a melancholy fact: It is clear that this work in its actual operation must be accomplished by young men. At the moment there are exceedingly few young men who have been given the right training, and the slipshod discussions of political and economic theories of the last century have so distorted the capacity for vision in many instances that a slogan is more the metier of a young man than genuine inquiry. There are a few who have been appropriately trained at the moment—I regret to say, very few. I believe that these inquiries should be begun wherever possible but that wherever they are begun the provision for appropriate training of intelligent youngsters should be considered to be almost as important as the inquiry itself.

Written in haste at your request—

Yours very sincerely,

EM/BB
Please pardon corrections.

(Signed) ELTON MAYO.
Elton Mayo

EM.

EXHIBIT No. 2452

[From the files of Science Service]

BACKGROUND OF CONFLICTS

Excerpts from a statement by Lawrence K. Frank, Josiah Macy, Jr., Foundation, New York, prepared for Science Service

The usual interpretation of wars and other international conflicts is in terms of urgent political and economic struggles for wealth, power or other similar motives. Suppose, instead, we look upon each nation as having a past history expressed in their memories and traditions and ideas and beliefs. Each nation, in its present state, is derived from a past, sometimes very remote. Each group of people has developed in that past specific ways of living, thinking, believing and feeling which still control their lives. These may be wholly inadequate or unsuitable to their situation today. This past experience of a people is transmitted from one generation to the next by parents, teachers, and others who instruct the young. While the people exist in today's world, nevertheless they are living primarily in the past.

We are governed to a large extent by tradition, by what our ancestors have done. Anthropologists and ethnologists who study they many different ways in which people have organized group living and regulated their lives call these persistent memories and traditions "culture."

They point out that in this prior history or the culture of peoples, one can usually find the source of their internal difficulties and perplexities as well as the clue to their external conflicts.

Let us look for a moment at the situation in the life of a single individual. Here we are beginning to realize that each person's conduct is an expression of what he experienced and felt in his past, usually long forgotten and buried beyond his recognition. We usually interpret his behavior in terms of various supposed motives, saying he does this because he is angry, or jealous, or ambitious. But we may look upon his conduct as arising from his past history, which makes him do just what we observe today under the direction of this long forgotten childhood.

What difference does that make? Suppose we stop thinking that society does something because of supposed causes or social forces, and that the individual does something because of specific motives. Suppose we say, instead, that a people, as well as each individual, are coerced and dominated by past history and traditions and memories. Suppose we recognize also that feelings have been created by those past experiences that are being expressed today? What then?

It would change the way we look at life. We are learning that as soon as a people or an individual discover that they are being ruled by this forgotten past, as soon as they realize that their prior experience and traditions and their feelings about the past are operating to control their lives today, this awareness or consciousness of their past may actually free them from such control. We have long been told that we cannot change human nature. But now we are discovering that what we call human nature is just an expression of what an individual has experienced and felt. It can be changed just to the extent that we change our cultural traditions and modify what individuals experience in their childhood.

"EXHIBIT No. 2453" is on file with the Committee

"EXHIBIT No. 2454" appears in text facing p. 16401

"EXHIBIT No. 2455" is on file with the Committee

"EXHIBIT No. 2456" is on file with the Committee

"EXHIBIT No. 2457" is on file with the Committee

17326

CONCENTRATION OF ECONOMIC POWER

"EXHIBIT No. 2458" is on file with the Committee

"EXHIBIT No. 2459" is on file with the Committee

EXHIBIT No. 2460

[Submitted by the American Rolling Mill Co.]

Continuous sheet & wide strip mill installations—Iron Age—January 6, 1938

Company	Location	Year Started	Size	Annual Capacity Gross Tons
The American Rolling Mill Co.	Ashland, Ky.	1924	58	432,000
The American Rolling Mill Co.	Butler, Pa.	1926	48	315,000
Republic Steel Corp.	Warren, O.	1927	36	302,000
Weirton Steel Co.	Weirton, W. Va.	1927	54	420,000
Carnegie-Illinois Steel Corp.	Gary, Ind.	1928	42	400,000
The American Rolling Mill Co.	Middletown, O.	1929	80	600,000
Wheeling Steel Corp.	Steubenville, O.	1929	60	540,000
Great Lakes Steel Corp.	Ecorse, Mich.	1930	38	400,000
Carnegie-Illinois Steel Corp. ¹	S. Chicago, Ill.	1931	96	720,000
Otis Steel Co.	Cleveland, O.	1932	72	375,000
Inland Steel Co.	Ind. Harbor, Ind.	1932	79	600,000
Allgheny Steel Co.	Brackenridge, Pa.	1932	38	275,000
Youngstown Sheet & Tube Co.	Ind. Harbor, Ind.	1934	72	214,000
Youngstown Sheet & Tube Co.	Campbell, O.	1935	79	600,000
Carnegie-Illinois Steel Co.	Gary, Ind.	1935	38	270,000
Ford Motor Co.	Detroit, Mich.	1935	56	500,000
Carnegie-Illinois Steel Corp.	MacDonald, O.	1935	43	300,000
Bethlehem Steel Co.	Lackawanna, N. Y.	1936	79	600,000
Carnegie-Illinois Steel Corp.	Gary, Ind.	1936	80	720,000
Great Lakes Steel Corp.	Ecorse, Mich.	1936	96	720,000
Granite City Steel Co.	Granite City, Ill.	1936	90	375,000
Carnegie-Illinois Steel Corp. ¹	Homestead, Pa.	1936	100	720,000
Jones & Laughlin Steel Corp.	Pittsburgh, Pa.	1936	96	720,000
Bethlehem Steel Corp.	Sparrows Pt., Md.	1937	56	600,000
Republic Steel Corp.	Cleveland, O.	1937	98	720,000
Tennessee Coal, Iron & R. R. Co.	Birmingham, Ala.	1937	48	300,000
Carnegie-Illinois Steel Corp.	Pittsburgh, Pa.	1937	80	600,000
Total				13,347,000

¹ Revised.² Continuous and semi-continuous plate mills capable of rolling heavier gauge sheets.

EXHIBIT No. 2461

[Submitted by the American Rolling Mill Co.]

EXHIBIT No. 5.—*Estimate of number of workers employed in industry in hand mill processes including preparatory, rolling and shearing operations*

1926:	Number of Old Style Hot Mills Listed	1,264
	Production:	
	Sheets	4,237,479 G. T.
	Black plate	2,090,395 G. T.
	Total	6,327,874 G. T.
	Estimated Annual Production Per Worker:	
	Sheets	165 G. T.
	Black Plate	125 G. T.
	Estimated Number of Workers:	
	Sheets (4,237,874 ÷ 165)	25,682
	Black Plate (2,090,395 ÷ 125)	16,723
	Total	42,405
1940:	Number of Hand Mills Listed	750
	Estimated Number of Workers	15,000
	Number of Workers Dislocated	27,405

CONCENTRATION OF ECONOMIC POWER

17327

EXHIBIT No. 2462

[Submitted by the American Rolling Mill Co.]

Armco production

TOTAL PARENT COMPANY

	1926	1937	% In-crease
Net Tons of All Products.....	431, 847	1, 203, 786	179. 1%
Net Tons of Sheets.....	428, 996	1, 110, 414	158. 8%
% Sheets of All Products.....	99. 3%	92. 2%	

EXCLUDING BUTLER PLANT (ADDED IN 1937)

	1926	1937	% In-crease
Net Tons of All Products.....	431, 847	894, 488	107. 4%
Net Tons of Sheets.....	428, 996	847, 753	97. 6%
% Sheets of All Products.....	99. 3%	94. 8%	

EXHIBIT No. 2463

[Submitted by the American Rolling Mill Co.]

Distribution of Armco sheet shipments between continuous and hand mills

	1926	1937
Total Sheet Shipments.....	428, 996 N. T.	1, 110, 414 N. T.
Rolled on Hand Mills.....	274, 835 N. T.	313, 136 N. T.
% of Total.....	64. 1%	28. 2%
Rolled on Continuous Mills.....	154, 161 N. T.	797, 278 N. T.
% of Total.....	35. 9%	71. 8%

EXHIBIT No. 2464

[Submitted by the American Rolling Mill Co.]

Armco parent company employment average number of employees

	Total Parent Company	Excluding Butler Plant
1926.....	6, 876	6, 876
1937.....	13, 253	10, 418
% Increase.....	92. 7%	51. 5%

CONCENTRATION OF ECONOMIC POWER

EXHIBIT No. 2465

[Submitted by the American Rolling Mill Co.]

Employment, wages, hours, and production, Armco Middletown plant

	1926	1937	% Change
Average Number of Employees.....	3,278	4,327	+32.0%
Payroll (Wages Only).....	\$5,125,208	\$7,234,256	+41.2%
Shipments (Net Tons).....	221,382	403,805	+82.4%
Man Hours Per Net Ton.....	32.5	19.1	-41.2%
Labor Cost per Net Ton.....	\$23.15	\$17.92	-22.6%

AVERAGE HOURS AND EARNINGS OF WAGE EARNERS

	1926	1937	% Change
Common Labor Rate.....	\$7.04	\$2.64	+68.9%
Average Earnings Per Hour.....	69.8	93.6	+34.1%
Average Hours Per Week.....	46.3	38.2	-21.8%
Average Actual Earnings Per Week.....	\$32.32	\$33.88	+4.8%
Cost of Living Index (N. I. C. B.).....	104.3	88.5	-15.1%
Average Real Weekly Earnings.....	\$30.99	\$38.28	+23.5%

EXHIBIT No. 2466

[Submitted by the American Rolling Mill Co.]

Expenditures for construction Armco Middletown plant

	1927 Thru 1937
Amount of Expenditures.....	\$20,492,778
Estimated Man-Days of Employment.....	2,342,031
Estimated Man-Years of Employment.....	9,008
Estimated Average Employment Over Period 1927 Thru 1937.....	819

EXHIBIT No. 2467

[Submitted by the American Rolling Mill Co.]

Armco average iron and steel sheet selling prices

Year	Price	Year	Price
1923.....	\$100.15	1933.....	\$45.91
1926.....	83.18	1937.....	64.50
1929.....	73.87	1939.....	57.31

EXHIBIT No. 2468

[Submitted by the American Rolling Mill Co.]

Iron and steel industry (blast furnaces steel works and rolling mills) employment, wages and production

	1925	1937	% Change
Average Number of Wage Earners.....	399,914	502,417	+25.6%
Payrolls (Wages Only).....	\$660,297,150	\$817,777,929	+22.8%
Steel Production (Gross Tons).....	45,119,113	51,668,785	+14.4%
Manhours Per G. T. of Steel.....	28.12	19.38	-30.2%
Labor Cost Per G. T. of Steel.....	\$14.68	\$15.85	+8.0%

AVERAGE HOURS AND EARNINGS

	1925	1937	% Change
Ave. Earnings Per Hour (N. I. C. B.).....	63.3	81.8	+29.2%
Ave. Hours Per Week.....	50.0	38.2	-23.6%
Ave. Actual Earnings Per Week.....	\$31.65	\$31.25	-1.3%
Cost of Living Index (N. I. C. B.).....	103.7	88.5	-14.6%
Ave. Real Weekly Earnings.....	\$30.52	\$35.31	+15.7%

CONCENTRATION OF ECONOMIC POWER

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EXHIBIT No. 2469

[Submitted by the American Rolling Mill Co.]

Iron and steel industry increase in sheet and tinplate production

	1926	1937	% Change
Total Hot Rolled Production.....	35,485,892	36,766,359	+3.6%
Hot Rolled Products other than Sheets and Tinplate.....	29,163,018	25,972,797	-11%
Sheets and Tinplate.....	6,327,874	10,793,562	+70.6%

Increase in Tinplate Production—4,465,718 G. T.

EXHIBIT No. 2470

[Submitted by the American Rolling Mill Co.]

Distribution of sheet & tinplate production to consuming industries

Industry	1927		1937		% Increase
	Gross Tons	%	Gross Tons	%	
Automotive.....	950,900	18.95	2,310,000	23.49	142.0
Agriculture.....	78,000	1.51	148,700	1.51	95.7
Construction.....	368,300	7.34	268,100	2.73	-27.2
Export.....	494,800	9.86	831,700	8.46	68.1
Jobbers and Warehouses.....	404,500	8.06	1,092,600	11.11	170.1
Machinery and Hand Tool.....	21,900	.44	85,900	.87	292.2
Metal Container.....	1,096,000	21.84	2,634,900	26.80	140.4
Oil, Gas and Water.....	148,200	2.95	103,800	1.05	-30.0
Railroads.....	185,800	3.70	237,300	2.41	27.7
Miscellaneous:					
Electrical.....			359,700	3.66	
Non-Elec. Household Equipment.....			413,900	4.21	
Furniture.....			134,500	1.37	
Pressed & Formed Products.....			201,100	2.05	
Other.....			1,011,200	10.28	
Total—Miscellaneous.....	853,600	17.01	2,120,400	21.57	148.4
Total—Distributed.....	4,600,000	91.66	9,838,400	100.00	
Undistributed.....	418,600	8.34			
Grand Total.....	5,018,600	100.00	9,838,400	100.00	95.0

Source: The Iron Age.

EXHIBIT No. 2471

[Submitted by the American Rolling Mill Co.]

Examples of increased use of sheet steel

	1926	1937	% Change
Electric Refrigerators: ¹			
Number Units Produced.....	203,000	2,310,000	+1,027%
Average Unit Price.....	\$390	\$173	-53%
Electric Washing Machines: ²			
Number Units Produced.....	843,685	1,465,405	+74%
Average Unit Price.....	\$147	\$72	-51%

¹ Source: "Air Conditioning & Refrigeration News" and "Electrical Merchandising."

² Source: "Compilation by American Washing Machine Mfgs. Ass'n." and "Electrical Merchandising."

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CONCENTRATION OF ECONOMIC POWER

EXHIBIT No. 2472

[Submitted by the American Rolling Mill Co.]

Industry expenditures for continuous mill construction

Estimated Amount of Expenditures.....	\$500,000,000
Estimated Man-Days of Employment.....	57,142,857
Estimated Man-Years of Employment.....	219,780
Estimated Average Number of Workers Employed from 1923 Through 1937.....	14,652

“EXHIBIT No. 2473” appears in text on p. 16433

“EXHIBIT No. 2474” appears in text on p. 16434

“EXHIBIT No. 2475” appears in text on p. 16439

EXHIBIT No. 2476

[Submitted by the American Rolling Mill Co.]

THE AMERICAN ROLLING MILL COMPANY, MIDDLETOWN, OHIO

Subject: Plan for handling hot mill employees in connection with new finishing mills.

1. We do not expect to be able to find jobs for employees who have been with the company for less than one year.
2. Jobs will be found on new finishing mills for as many men as are necessary for their operation and every effort will be made to place as many as possible in other positions in our various plants.
The employment department will have charge of placing men.
3. Men who are not placed will be given half pay for as many months as they have years of service but not more than six months and with a minimum of \$50.00 per month.
4. No special payment as outlined in Paragraph Three will be given to men who are placed in any of our plants.
5. Any man who accepts a position in our plants, but decides within a period of 30 days that for some reason he is not able to go on, will receive the payments as outlined above.
6. Continuous service with full insurance will be carried for the period mentioned in Paragraph Three on all men who are not placed in our plants.
7. If an employee gives up a job and received payment as above and then starts with the company later his special payments will cease and he will not receive them again if he should leave the company's employ a second time.
8. If requested, the company will be glad to assist in placing men with other companies if positions cannot be found in our plants.

	No. Men	Amount	Ave. Per Man
Middletown.....	303	\$208,233.00	\$530.00
Ashland.....	199	\$76,660.00	\$385.00
	502	\$284,893.00	\$481.00

JUNE, 1929

EXHIBIT No. 2477

(Submitted by the Steel Workers' Organizing Committee)

OCTOBER 8, 1938.

Continuous hot strip mills in the United States and cold reduction strip mills

No.	Operated by	Location	Hot Mill Size	Hot Mill Annual Capacity	Year First Operated	3-Stand Cold Mill	4- or 5-Stand Tandem Tin Mill
1	American Rolling Mill Co.	Ashland, Ky.	58"	432,000	1924	1-5 Stand for sheets	
2	American Rolling Mill Co.	Butler, Pa.	48"	312,500	1926	2-3 Stand	
3	Republic Steel Corporation	Warren, Ohio	36"	302,000	1927		
4	Weirton Steel Company	Weirton, W. Va.	54"	420,000	1927	2-3 Stand	
5	Carnegie-Illinois Steel Corp.	Gary, Indiana	42"	400,000	1927	0	2 Rev. & 2-5 St.
6	American Rolling Mill Co.	Middletown, Ohio	30"	372,000	1928	1-3 Stand	
7	Wheeling Steel Corporation	Steubenville, Ohio	30"	340,000	1929	2-3 Stand	
8	Great Lakes Steel Corp.	Ecorse, Michigan	38"	400,000	1930	0	0
9	Carnegie-Illinois Steel Corp.	So. Chicago, Ill.	36"	720,000	1931	0	0
10	Otis Steel Company	Cleveland, Ohio	72"	375,000	1932	1-3 Stand	0
11	Inland Steel Co.	Indiana Harbor, Ind.	79"	600,000	1932	2-3 Stand	1-5 Stand
12	Allegheny Steel Co.	Brackenridge, Pa.	38"	275,000	1932	(?)	0
13	Youngstown Sheet & Tube Co.	Indiana Harbor, Ind.	72"	214,000	1934	0	0
14	Youngstown Sheet & Tube Co.	Campbell, Ohio	79"	535,000	1935	1-3 Stand	1-4 Stand
15	Carnegie-Illinois Steel Corp.	Gary, Indiana	38"	270,000	1935	0	0
16	Ford Motor Company	Dearborn, Michigan	56"	500,000	1935	1-3 Stand	0
17	Carnegie-Illinois Steel Corp.	McDonald, Ohio	43"	300,000	1935	0	0
18	Bothlehem Steel Company	Lackawanna, N. Y.	75"	600,000	1935	2-3 Stand	
19	Carnegie-Illinois Steel Corp.	Gary, Ind.	80"	720,000	1936	1-3 Stand	
20	Great Lakes Steel Corp.	Ecorse, Mich.	36"	720,000	1936	2-3 Stand	
21	Granite City Steel Co.	Granite City, Ill.	90"	320,000	1936	0	1 Reversing
22	Carnegie-Illinois Steel Corp.	Homestead, Pa.	100"	720,000	1936	0	0
23	Jones & Laughlin Steel Corp.	Pittsburgh, Pa.	90"	720,000	1937	1-3 Stand	1-4 Stand
24	Tennessee O. I. & R. R. Co.	Fairfield, Ala.	48"	300,000	1937	0	2-5 Stand
25	Republic Steel Corp.	Cleveland, Ohio	36"	720,000	1937	1-3 Stand	0
26	Bethlehem Steel Company	Sparrows Point, Md.	56"	600,000	1937	0	0
27	Carnegie-Illinois Steel Corp.	Clairton, Pa.	34"	600,000	1938	1-3 Stand	1-5 Stand
28	Republic Steel Corporation	Niles, Ohio	0			0	1-4 Stand
29	Youngstown Sheet & Tube	Indiana Harbor, Ind.	0			0	2 Reversing
30	Crown Cork & Seal Company	Baltimore, Md.	0			0	1-5 Stand

CONCENTRATION OF ECONOMIC POWER

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EXHIBIT No. 2478

[Submitted by the Steel Workers' Organizing Committee]

WAR AND THE STEEL GHOST TOWNS

By Harold J. and Stanley Ruttenberg

Compliments of C. U. O.

(Taken from Harper's Magazine, January, 1940)

"It's started," a lean-faced, bedraggled, unemployed steel worker announced excitedly. "I mean the war. Hitler's marching into Poland. I just heard it on the radio," he explained further to a group of sullen men loafing on South Mill Street, across from the relief headquarters in New Castle, Pennsylvania. The dead silence broke. One man whittling a stick dropped it. Another sitting on the curb got up and walked to the middle of the group. Someone asked hopefully, "Do you think the mills'll start up?" Everyone began to speculate on this possibility.

Within an hour news of the outbreak of war in Europe was all over town. Rumors of good things to come began to fly fast and furiously. This is going to be a long war. There's going to be a big boom all over. The mills, factories, and mines everywhere will soon be needin' men. There'll be work and plenty of jobs. A few days later the Mayor of New Castle solemnly told us that U. S. Steel had received a large order from Japan and that the obsolete hand-mills would soon be reopened because the modern strip mills were being taxed to capacity. We heard about "the order from Japan" from a newsboy, a waitress, from conversations in the street, and from almost everyone we met.

More hopes were being built on equally plausible rumors. Someone heard from some official at the mill that the war had caught the strip mills unprepared. Canadian tinplate supplies were low. The German submarines had cut off Canadian can manufacturers from their regular supply of Welsh tinplate, at least for six months until England could organize its convoy transportation. Oldtimers in the tinplate trade were saying that the food packers would rush to buy up one hundred per cent of the 1939 vegetable and fruit crops, pack them in every tin can they could lay hands on, and store from twenty to ninety per cent of the several food packs until prices went up. Before the war was two weeks old everyone in town had convinced himself that U. S. Steel would have to reopen the hand-style tinplate mills, which had been abandoned for good, to meet these multitudinous demands for tinplate, despite the fact that hand-rolled tinplate costs were five to twenty dollars a ton higher than on the automatic strip mills.

Dreams began to be dreamed—not by workers alone, but by everyone in town. We'll get the gas turned back on. We'll pay the back rent and won't be kicked out. The kids can get new school clothes. I'll buy the wife a new dress. Dad won't have to wear that sloppy old hat no more. We'll fix the car and buy a license for it. The milk bill can be paid and we'll start to get milk again each morning. Our rent collections will go up. Business will be better. The workers will start buying all the things they need and have been without. New Castle will be back on its feet in no time.

"Glory hallelujah!"—in brief, that is how World War II was greeted in New Castle. And understandingly so, because private industry had deserted the town; new machines had thrown 5,700 of its workers on the ash heap; its industrial employment had declined sixty-four per cent since 1927; fifty-two per cent of its fifty thousand people were dependent upon government aid for subsistence (with another twelve per cent trying to get relief or WPA jobs); the State and Federal governments had turned a deaf ear to the workers' call for real help, and the 76th Congress had limited their last hope for employment by cutting WPA. With its future hopeless, despairing of any aid from private industry or government (except meager relief or WPA grants), New Castle succumbed to the war fever. And not in vain.

"M' added to 'Boo'— Thus the *Pittsburgh Press's* headline writer, twenty-six days after the war started, prefaced a front-page headline:

"GHOST' TOWNS IN DISTRICT STIR AS MILLS, MINES OPEN"

The story under the headline announced that one of New Castle's obsolete tinplate mills would resume operations, and 2,500 of its technologically displaced workers would be reemployed. Like the stranded people in other "ghost" steel

and coal towns, the people of New Castle cheered—though they must have guessed that the mill was being reopened for a limited and final time.

"Ghost" towns in coal have been chronic since the end of World War I, but in steel they are something new. In the past two years the steel strip mills, "a moving picture director's dream of the future of technology," had displaced 25,000 hand-mill workers and turned more than a dozen thriving communities into "ghost" steel towns. Overnight the "war boom" put new life into several of these, like New Castle and Martins Ferry, Ohio. Other steel towns that are still dead, their obsolete mills idle, their displaced workers unemployed, symbolize the nation's pressing economic problems that have cried out in vain for a domestic solution. The ghost towns that have been revived since the outbreak of war symbolize the way in which bombs over Warsaw can bring joy to workers, farmers, and industry starving respectively for work, higher prices and profits. The deadly parallel between these ghost steel towns and the country as a whole, afflicted with common economic ills that have not responded to domestic forces, both resuscitated for the time being by war in Europe, raises the question: "After the war boom, what then?"

When the extraordinary tinplate and other steel demands cease, the skilled hand-mill workers will be through, this time for good. Revived steel towns will revert to ghost towns. More steel communities will be added to the "ghost" category. In all the horrors of a post-war depression the country's pressing economic problems will be more acute, the plight of New Castle and the other ghost towns more tragic, and the necessity for domestic solutions inescapable. The war boom can only postpone the day when we shall have to come to grips with the economic ills it is temporarily solving. These ills are deep-rooted indeed. Distressed communities with stranded populations in the coal fields, depleted timber lands, copper, lead, zinc, oil, and gas districts, and textile centers have been the by-products of the exploitation of natural resources and the shifting of production centers. But in the steel industry ghost towns are the result of economic ills that permeate our national economy. Technological unemployment has reduced these steel towns to economic ruin.

II

The story of New Castle gives the picture of all the ghost steel towns, because their rise and fall resembles one another as closely as the play-by-play description of one football game resembles another. New Castle lies sixty miles north of Pittsburgh, midway between Lake Erie and the Ohio River, in the middle of the Shenango Valley. It was founded in 1798 by a small band of Swedish pioneers, who became prosperous farming the fertile fields of the valley.

At the time of the Civil War ugly coal tipples began to dot the landscape of the beautiful valley, rich meadow lands were torn up to uncover limestone, and the iron ore openings spit forth huge chunks of red earth. "Billy" Patterson, a farm boy risen to banker, transformed the peaceful Shenango Valley into a seething industrial district, put its coal, ore, and limestone—the main ingredients of iron and steel—together, and sold his outside interests to concentrate on expanding New Castle. By 1890 he gave the town one of the country's first integrated steel firms with a continuous chain from iron ore to finished products. Billy Patterson, having become an iron master and steel magnate, sported a walrus mustache in keeping with his reputation as "the father of New Castle."

The rise of New Castle was phenomenal. Despite the panics and depressions of the eighteen nineties, its population increased 144 per cent to 28,339, faster than that of any other town in the country. At the turn of the century over six thousand workers were employed in its steel and iron works and rod, wire, nail, and tinplate mills. The town proudly boasted having the largest tinplate mills in the world, and its rapid growth attracted several consumers' goods industries. Youngstown, Ohio, to-day's number three steel town, was then only a flyspeck on the economic map of the industry, and Gary, Indiana, to-day's number two steel town, still a swampy marsh along Lake Michigan. New Castle seemed destined to become the very center of the new steel world, until Billy Patterson retired and the town fell into the hands of a stepfather.

In 1898 J. P. Morgan & Company bought every important New Castle steel works, and apparently obtained from their previous owners an agreement not to reinvest their profits in steel works in New Castle that would compete with the billion-dollar Steel Trust—at least, such were the results. Seventy-four years old, Billy Patterson gracefully retired. All the other important steel men in town, except George Greer, moved away or invested their money elsewhere. Even Green, whom U. S. Steel put in charge of the tinplate mills, invested his

money in the LaBelle Iron Works at Stubenville, Ohio, and in other firms throughout the country. Thus ended the expansion of the steel industry in New Castle. For a while a few enterprising local business men tried to carry on the tradition of an ever-growing industrial community. But the people soon learned that their town was no longer run by local men; New Castle's new boss was an absentee owner.

That boss was Judge Elbert H. Gary. His first act was to throw fifteen hundred rod, wire, and nail mill workers on the streets, blame it on "labor trouble," and merge the rod, wire, and nail mills with similar operations elsewhere. It was soon evident that New Castle's absentee owner was not interested in developing the town but only in U. S. Steel's interests as a whole. Ruinous competition of Welsh tinplate having eliminated by the McKinley Protective Tariff on tinplate, that to this day gives American tinplate producers a monopoly in the United States, U. S. Steel, then settled down to making handsome profits from the New Castle tinplate mills until 1937, when technology made them obsolete. Gary acted on the idea that ownership of the steel and tinplate works entitled U. S. Steel to control the town. The results were soon evident. A glass company, founded in New Castle in 1849, moved to West Virginia. John Stevenson, Jr., who had played an important role in developing New Castle's tinplate works, dismantled his stately stone mansion on Lincoln Avenue overlooking New Castle; piece by piece he moved it twenty miles up the Shenango Valley to Sharon, where the mansion was reconstructed. In south Sharon Stevenson erected a large tinplate works, but as soon as it was completed the powerful U. S. Steel combine bought it, built a company town round the works, and named them the Farrell Works and Farrell, Pennsylvania, in honor of James A. Farrell, one of U. S. Steel's ranking officers.

Now only one force—the labor unions—stood between Judge Gary and complete domination of New Castle. His efforts to exterminate the trade unions in the tinplate mills failed in 1901 because of an esprit de corps pervading the workers and management. Behind this harmonious condition was a long tradition of collective bargaining that the skilled Welsh and English workers brought with them and that had been in practice in the New Castle mills from their beginning. George Greer, the manager of the tinplate mills, refused to round up a gang of strikebreakers. With head always erect, sharp eyes, and a distinguished goatee, Greer was a man of forceful independence and did not fit into Gary's military type of organization. But he was such an indispensable operating man that Gary was not free to oust him until July, 1908. The following July, 1909, Gary handed the tinplate workers' union an ultimatum to disband. Having seen the pottery workers' union shattered to bits three years earlier, the tinplate workers received the Judge's ultimatum stoically and closed down the mills. The pottery strike had shaken up New Castle, which had been a union town for years, because it was plainly observable to the townsfolk that U. S. Steel was behind the pottery firm. With Greer safely retired to his farm where he raised Shorthorn Durham cattle, Judge Gary imported strikebreakers and broke the strike in six months. Not until the rise of the C. I. O. in 1937 were New Castle's tinplate workers organized again.

Anger, especially among the workers, turned into a spirit of revenge. In 1911 the town elected a Socialist Mayor, Walter V. Tyler, who was a railroad brakeman. A split between the "wets" and "drys" facilitated the Socialist victory, but their capture of the city council was clean cut. Judge Gary's followers lost no time in getting the Republican legislature in Harrisburg to rip out the council of fifteen members elected on a ward basis that proved hard to control, and to install a commission form of government, with only four councilmen. The local paper editorialized:

"* * * the bitterness and *desire for revenge* that led up to the election of a minority mayor have been gathering volume for years. Petty jealousies, *lack of tolerance for the views of others* * * * found expression in this election."

The humble editor of the town's paper was telling Judge Gary that the workers had elected a Socialist Mayor to get even with him for taking their union from them. Mayor Tyler did a valiant job while his term lasted. Judge Gary saw that he never got another one. And when Walter V. Tyler was elected to city council in 1928 as a Republican he symbolized U. S. Steel's domination of every phase of New Castle's life.

III

Before World War I intervened, there were omens of New Castle's economic decline. In 1912 a stamping and enameling company failed. The next year, Youngstown, Ohio, already overshadowing its rival as a steel town, gleefully reported in the *Youngstown Vindicator*:

"With * * * the wealth of the city tied up principally in banking and other private financial interests, New Castle gradually commenced to feel the effects of its wealthy men's inactivity. Merchants * * * interested in the prosperity of New Castle pointed longingly to the vastly different spirit shown by the home capitalists of Youngstown who on selling their stock to the combine (U. S. Steel) * * * organized * * * independent companies. But * * * New Castle dollars went * * * to promote gold mines in the west, to build oil refineries in other parts * * * with little concern for the industrial advancements at home. The effects of this spirit were bound to bring bad results."

The bad results were postponed by the War, throughout which New Castle prospered. U. S. Steel added seven hundred and fifty more tinplate workers to its rolls, restoring half the number of jobs it had eliminated a decade earlier. The wheels of industry hummed until the advent of the post-war depression, from which New Castle has never recovered.

Like its rise, New Castle's fall has been phenomenal. During the prosperous twenties its population increased only eight percent while the nation's population rose sixteen percent. The Chamber of Commerce became alarmed about the loss of industries and jobs by 1927 and hired experts to make an industrial survey of New Castle, which showed:

"* * * You have * * * lost a number of plants * * * The time has come for * * * a program that will cover a period of the next few years. You are in real competition when you land an industry these days. * * * The program we recommend is:

"REPLACE LOST INDUSTRIES * * * the Car Works, the Rubber Plant, the Baking Company, the Knitting Mill, the Brewery, and the Stove Works (all left town). The Engineering Works in 1920 * * * had 452 employees * * * During the summer of 1927 they had 66 * * * It does seem as though there would be some way to save this important industry for New Castle * * *"

Spurred on by the loss of these firms that employed 3,340 workers the Chamber started a campaign late in 1927 to replace them. Not a single new firm was brought to town by 1930 when the depression set in. Gone was Billy Patterson and the spirit of local initiative. When a firm failed in Patterson's days he would solicit New Castle business men to subscribe for stock in a new firm to take over the bankrupt one, and loaned the money to those subscribers who could not raise it on the spot. New Castle's absentee overlord had long since snuffed out this enterprising spirit. When the car works closed early in the twenties and threw two thousand men on the streets, for instance, U. S. Steel did nothing.

But the Chamber's drive to replace New Castle's lost industries failed ignominiously because the townfolk expected that U. S. Steel was going to expand its New Castle operations and employ more workers. An officer of one of the pottery firms in town told us:

"In the twenties U. S. Steel bought a large tract of land adjacent to its property, and built a modern power plant with a much greater capacity than its operations required. Everyone assumed that the land was purchased and the enlarged power plant erected to take care of the open hearth furnaces and coke plant the Corporation was going to build."

Talk of this expansion created a wide-spread feeling that the Chamber was unduly alarmed about the loss of jobs, and that U. S. Steel "would take care of New Castle." As a consequence, the Chamber's drive fell flat because the townfolk did not get behind it.

Not until 1931, when U. S. Steel abandoned its Bessemer steel works, throwing twelve hundred workers on the streets, did the townfolk suspect that the company would not take care of New Castle. Some clung to the hope that the Bessemer steel works would reopen after the depression, although informed steel men knew that it was the victim of technological advances in the use of open-hearth steel where Bessemer was formerly used. In 1935 the works was dismantled; Bessemer steel had declined from sixty-seven per cent of the steel produced in 1900 to less than ten per cent. Technology dealt New Castle a body blow. The Chamber's ill-fated program was revived. By 1937 ten new industries employing 950 workers were brought to New Castle, and its future seemed less hopeless. But only for a brief period. In the fall of 1937 there came a second blow: U. S. Steel permanently abandoned the Greer tinplate works, displacing fifteen hundred workers.

Thoroughly alarmed now, the townfolk suddenly got visions of a "ghost" town. The Mayor led a committee of leading citizens to the Pittsburgh office of U. S. Steel. "Why didn't you build your continuous strip mill in New Castle, which

has the workers to man it and the community facilities to serve the workers, instead of building it in the wilderness of Irvin, Pa.?" the committee asked.

The reply, in effect, was: "We would have liked to honor New Castle with the Irvin strip mill, but we had to protect the interests of our stockholders. We can produce at Irvin anywhere from five to ten dollars a ton cheaper than we could in New Castle. Irvin is on the Monongahela River, interconnected by our own railroad with the Edgar Thompson works that supplies it with semifinished steel. Our Clairton by-product coke ovens are nearby and they supply Irvin with gas. Finally, we of course have the advantage of cheap water transportation down the Ohio River, as well as of our own railroad, to ship our finished products from Irvin. You understand, gentlemen, that building in New Castle was out of the question because of its disadvantageous geographic location. It is an inland town. Transportation costs in and out of New Castle are prohibitive."

All hope of U. S. Steel expansion in New Castle was gone. The committee returned home disheartened. The townfolk agitated for a canal from Lake Erie to the Ohio River, but their hopes for cheap transportation were soon drowned in the failure of the canal project. Geography had dealt New Castle another blow as a heavy industry town.

IV

Merritt Reynolds, a handsome, trim boy in his late teens, graduated as president of the 1939 New Castle High School class of 601 young men and women. Chosen with the other officers of the class as the most likely to succeed, he hunted for a job, any kind of work, put his application in at "a dozen places but they all drew blank." The auto repair shop located in the stables of Billy Patterson's old mansion didn't need any help. "Can't use anybody," he heard at the bronze plant, the potteries, the chemical works, everywhere he went. There was no use trying at the lone remaining tinplate mill, "'cause there's hundreds of tinplate men from the old Greer mills walkin' the streets." All Merritt Reynolds could find was a job as an extra usher in a movie house. Unable to make out on his part-time earnings, he went to the Knitting Mills building, now occupied by the relief offices. Here Merritt got his first opportunity, a chance to go to a CCC camp in Arizona. He took it, gladly.

Only one officer of the 1939 class got a job—as a bell hop at a hotel on strike by the A. F. of L. A year after graduating, the president of the 1938 class was still unemployed. The rank and file of the graduates found the going just as tough. Of the 513 graduates in 1937 three out of ten went on to school, two got jobs, while five out of ten could not find work. 554 graduated in 1938. Six out of ten joined the unemployed, two went on to school, and two got jobs. High School authorities will not know what happened to the 1939 class until next year, but one school official said "The 1939 graduates are not competing for private jobs, there are none to compete for, but fighting to get into the CCC."

Among the workers who once had a job despair is ghastly, hope more forlorn. "I'm whipped" a \$15 a day tinplate worker told us a few days after he was furloughed from a \$3.20 a day WPA job in August. "I can't make a livin' any more. The hand-mills are through. They're turnin' out more tinplate pushin' buttons in these strip mills than the whole lot of us could roll. I use' to make good money, and I saved some. Ma and I bought our home when we were married, got it all paid for, and now can't meet the taxes. We can't even get on relief 'cause my oldest boy and his family are livin' with us and he has a job drivin' a truck. A fellow can't get a job in town, everything is dead, and he can't go nowhere lookin' 'cause he's busted. I bummed a few bucks and traveled for two weeks huntin' work. It was no use. My youngest boy can't get in the CCC camp 'cause we ain't on relief, and can't get on. What's the use o' talkin'! How about settin' a fellow up to a glass of beer?"

Seven thousand families, sixty-four per cent of New Castle's population, are in the same boat. Few have the money to go elsewhere to seek a job, and those who do only discover that private industry is not expanding to take up the slack in jobs created by technology.

"SHAVE AND HAIRCUT—TWO BITS" is painted on the window of a barber shop in the workers' section of town. The barber explained: "I charged the regular price until a few months ago, but I couldn't make out. My good customers didn't have the cash and charged it. I did their work because I had nothing else to do and to keep them as customers if things ever pick up around this place. I was about forced to close the shop when my wife gave me an idea. She said, 'Nobody has any money, but they can always scrape up fifteen cents to go to a show. Why don't you cut out the charge accounts and make everyone pay ten cents for

a shave and fifteen cents for a haircut? That's just what I did, and I've taken in enough cash the last two months to keep the wolf from the door."

A Main Street dentist told us that his paying practice has almost vanished, that he had had to take his boy out of medical school and didn't know whether he would ever be able to send him back. "There isn't any question about it," an official of the Retail Merchants' Association said: "government money—WPA Relief, Unemployment Compensation, CCC, and the rest—is keeping most of our merchants out of the bankruptcy courts to-day. Last week (this was in July) WPA laid off a lot of men, and all the merchants complained immediately that their sales dropped off."

Indeed, the main spigot of cash in New Castle is no longer private payrolls, but government money. At the rate of expenditures for the first eight months of this year, the Federal and State governments were pouring \$3,246,000 yearly into town. On September 1, 1939, 28 per cent of New Castle's population,* listed as 3,146 cases, were drawing State relief; 8 per cent, 952 cases, unemployment compensation; another 8 per cent, 900 cases, on WPA rolls; and still another 8 per cent, 864 cases, had applied for State relief and were waiting to be accepted. Fifty-two per cent of New Castle is dependent upon government aid for subsistence, or on the verge of it. Another 12 per cent, 1,338 cases, consisting in the main of recently displaced tinplate workers who were high wage earners, are registered at the State Employment Office as unemployed. Before being eligible for relief a worker must prove himself a pauper, and these workers will eventually join the relief rolls when their savings are exhausted.

"Let your Castle and my Castle be New Castle!" With this slogan officers of the Pennsylvania Power Company, subsidiary of the Commonwealth & Southern utility empire, appealed to the workers, business men, and professional people to pull New Castle out of the mire. Thus the Greater New Castle Association was born last winter. For political reasons—certainly not for economic ones—the utility company built a three and one-half million dollar power plant in town, completed this year. The utility company officers frankly admitted that their interest in the Association was to bring payrolls and jobs to town to offset their large losses of industrial and home power customers and to protect their new investment; and they were quick to emphasize that the welfare of the townsfolk coincided with the utility company's interests. Everyone, no matter what his station in life, was invited to join the Association, which raised thirty thousand dollars and hired an executive director and economic experts within a few weeks.

The Association's first circular explained:

"* * * We lost between 1920 and 1939 eleven industries, employing 5,340 workers; we lost through decline in operations 700 workers, or a total of 6,040. We gained in new industries ten. * * * These placed 950 back on employment payrolls, and the expansion of existing industries * * * added 920 more, so we have gained 1,870 employees, but our net loss is 4,170 employees. * * *

"* * * the payroll loss due to industrial decline is conservatively estimated at \$5,000,000 or 28½ percent. * * * What we need is jobs at supportable wages. * * *

But before the Association could bring any new jobs to New Castle it had to obligate itself to pay one per cent of the \$250,000 annual payroll of the pants company that threatened to leave town and throw four hundred workers out of work. This subsidy saved the four hundred jobs, for the moment, and in hailing its victory the Association announced hopes of "increasing (New Castle's) payroll in 1939" by a quarter of a million dollars. Then a bombshell burst. In mid-July U. S. Steel closed the Shenango tinplate works, its sole remaining New Castle operation. Three thousand workers were thrown on the streets. A yearly payroll of five million dollars was lost. New Castle's loss in private employment since 1920 climbed to 7,170, and its annual payroll for the same period fell another five million to seven and one-half million dollars, a fifty-seven per cent drop. Technology dealt the town a third and, this time devastating blow.

Private industry that once employed 11,259 workers now takes care of only 4,071, a drop of sixty-four per cent. Just as the Shenango works closed, the 76th Congress hurt New Castle by cutting WPA wages five dollars a month and reducing WPA jobs from 1,900 in May to 900 in September. Certainly the Association's goal to increase the industrial payroll in 1939 by one-twentieth of the loss of the Shenango works payroll demonstrates its helplessness to cope with the combination of forces that have wrecked the economic life of the town.

*1930 census 48,674; present population not estimated any higher.

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Unable to help itself, forgotten by private industry, fed meager relief by the State government, ignored by the Roosevelt Administration, and abused by the 76th Congress, New Castle has been revived by World War II. Its revival, however, is partial and temporary. On October 2, 1939, the huge Shenango tinplate works swung open its doors and 2,500 workers rushed in, eager to get back to work. The war-born prosperity is bringing joy into twenty-five hundred homes; eventually there will be another five hundred when the full contingent of Shenango workers returns. But the hopes of four thousand other New Castle families have not yet turned into joy, nor are they likely to. Although much of the town's retail business will be aided, and the potteries, the bronze plant, and other firms will pick up, the war boom will still leave at least one-third of New Castle's population dependent upon government aid.

Furthermore, Shenango's reopening is to be brief. "This is the last lap for the hand-mills," an official of U. S. Steel told us. Strip mills, on the average, produce tinplate fifteen dollars a ton lower than the hand-mills. Under ordinary conditions the capacity of the strip mills is more than enough to meet demands, and if the extraordinary demands are sustained, strip capacity will be increased instead of high-cost obsolete mills being operated indefinitely. In either case, Shenango will be closed as quickly as it has been reopened, and for the last time. Ghost town is New Castle's destiny.

A similar fate awaits more than a score of other steel towns. Technologically displaced workers who have been idle for almost two years—1,500 in Yorkville, Ohio; 1,100 in Elwood, Indiana; 1,000 in Cambridge, Ohio; and thousands more elsewhere—are breathlessly awaiting an announcement that their abandoned mills will reopen. The announcement may come, but the odds are that the war boom will leave these ghost towns untouched. Obsolete mills in a dozen more steel towns—employing 900 in Apollo, Pennsylvania; 1,000 in Follansbee, West Virginia; 2,500 in Newport, Kentucky; and thousands more elsewhere—have taken a new lease on life; their workers new hopes and aspirations. When the war boom collapses these mills will fold up with a terrific crash. And the post-war depression will shake the foundations of another score of steel towns, like Farrell and Vandergrift, Pennsylvania, each employing twenty-five hundred workers, and Massillon, Ohio, with three thousand steel workers, to such an extent that their only destiny can be that of New Castle. Technology takes its toll not only of workers, but of entire mills and complete towns.

The new steel technology means more than a slow elimination of workers; it is wholesale displacement. A hand-mill is a hot, noisy place, crowded with old-style equipment with squads of workers waiting about while others relieve them for short periods at the furnaces. In one such mill of this character the "iron" is handled more than fifty times by tongs and hands before the process is finished.

In a modern strip mill all this vanishes. The place is cool and spacious. A few workers, some scattered about in over-head control booths pushing buttons, handle the "iron" in one operation. Here a huge slab as big as a mattress but weighing several thousand pounds is automatically released from a furnace, rolled into a coil a thousand feet long like a thread on a spool, placed on a conveyor and put through more continuous operations until it is cut into sheets for your automobiles or plates (later tinned) for your canned soup. All the horde of men who once were employed in the making of steel are swept away, leaving a few watchful men guarding controls. And all those swept away are piled up in the scattered steel towns, wondering what next.

Certainly the war boom is no answer to technological unemployment. The unsound social and economic structure of the steel towns remains unchanged. Absentee overlords continue free to legislate their economic future, and that of other basic industry towns, without any responsibility for the social and political effects of such legislation. Throughout the nation there are scores of industrial towns dominated by one industry or large corporation that are now prosperous, but doomed to economic destruction by the same forces that have raised the economic life of New Castle. These forces like mass unemployment and the country's other more obvious economic ills, will be more ugly and difficult of solution when the boom and its allaying effects are over. In addition, the maladjustments in our economic machinery, as during World War I, are being aggravated by the war-boom recovery, after which our task of domestic reconstruction will be the same as in March, 1933, only ten times greater.

Gradually the American people as a whole will recover from the suddenness, enormity, and intellectual shock of World War II, and the immediate prospects of personal economic gain from the prosperity it has provoked, to realize with

Carl Sandburg, poet and biographer of Abraham Lincoln, "that in this hour mankind's greatest need is a common agreement on the causes and conditions that have produced idlers at the top and bottom of society." And that such an agreement will

"* * * have to consider the vast mass of unspeakable, inarticulate, woe-begone human tragedy gathered under the head of that hideous but accurate phrase from the science of economics, 'the technologically disemployed'—the people whose jobs have been abolished and destroyed by machines and new industrial processes and transitions. * * *"

The purpose of the agreement will be to provide the basis for an "arrangement by which the idle rich and the idle poor could make a two-power pact to take care of each other" in a way that no war boom can possibly do.

EXHIBIT No. 2479

[Submitted by the Steel Workers' Organizing Committee]

DISPLACEMENT OF MEN BY AUTOMATIC STRIP MILLS

Summary

Already Displaced (Names of Plants Attached).....	38,470 workers
To Be Displaced In Integrated Companies (Names of Plants Held in Confidence).....	22,950 workers
To Be Displaced in Small Independent Companies (Names of Companies Held in Confidence).....	23,350 workers
Total Displacement By Automatic Strip Mills.....	84,770 workers

EXPLANATION

Of the 84,770 hand mill workers adversely affected by the automatic strip mills, 88,470 have already been displaced. The mills in which they have been displaced are attached hereto, indicating the year in which the displacement took place. In this compilation an effort has been made to place each abandoned mill in that year in which it last operated substantially. This rule could not be followed in all cases; and some are listed in the year in which they were abandoned, which is usually later than the year last operated.

Of necessity the number of hand mill workers displaced in each abandoned mill is estimated, and most estimates are conservative. The number of workers affected in mills of equal size but abandoned in different years is not strictly comparable because of the difference in maximum weekly hours prevailing in different years. Hand mill workers displaced as a result of the installation of semi-automatic reversing mills are also included in this list. This list is not complete, but includes the major hand mills abandoned during the 1930's as a result of the introduction of the automatic strip mills.

Company	Location	Product	No. of men displaced
1929 and 1930			
American Rolling Mill Company.....	Middletown, O.....	Sheets, Tin Plate	700
Empire Sheet & Tin Plate Company (Then the Empire Steel Corp.).....	Ashtabula, O.....	Sheets	450
Empire Sheet & Tin Plate Company (Then the Empire Steel Corp.).....	Niles, O.....	Sheets	1,150
Republic Steel Corporation.....	Warren, O.....	Tin Plate	650
Republic Steel Corporation.....	Warren, O.....	Sheets	400
Youngstown Sheet & Tube Company.....	Warren, O.....	Sheets	450
Total Workers Displaced.....			3,800
1931			
Allegheny-Ludlum Steel Corporation (Then the Allegheny Steel Co.).....	Braekensridge, Pa.....	Sheets	400
Canonsburg Steel & Iron Works.....	Canonsburg, Pa.....	Sheets	500
Carnegie-Illinois Steel Corporation (Then the American Sheet & Tin Plate Co.).....	Lechburg, Pa.....	Sheets	500

Company	Location	Product	No. of men displaced
1931			
Carnegie-Illinois Steel Corporation (Then the American Sheet & Tin Plate Co.).	Scottdale, Pa.	Sheets	850
Empire Sheet & Tin Plate Company (Then the Empire Steel Corporation).	Niles, O.	Sheets	350
Sharon Steel Corporation (Then the Sharon Steel Hoop Co.).	Youngstown, O.	Sheets	450
Total Workers Displaced			3,050
1932			
None Reported.			
1933			
Continental Steel Corporation	Kokomo, Ind.	Sheets	100
Wheeling Steel Corporation	Martins Ferry, O.	Sheets	500
Total Workers Displaced			600
1934			
Carnegie-Illinois Steel Corporation (Then the American Sheet & Tin Plate Co.).	Morgantown, W. Va.	Sheets, Tin Plate	700
Inland Steel Company	Milwaukee, Wisc.	Sheets	500
Republic Steel Corporation (Then The Newton Steel Co.).	Newton Falls, O.	Sheets	1,200
Wheeling Steel Corporation	Wheeling, W. Va.	Sheets, Tin Plate	700
Youngstown Sheet & Tube Company (Operated a brief time in 1937, then abandoned).	Youngstown, O.	Sheets	800
Total Workers Displaced			3,900
1935			
Great Lakes Steel Corporation	Ecorse, Detroit, Mich.	Sheets	1,000
Weirton Steel Company	Steubenville, O.	Tin Plate	400
Total Workers Displaced			1,400
1936			
Carnegie-Illinois Steel Corporation	Gary, Ind.	Sheets, Tin Plate	1,000
Carnegie-Illinois Steel Corporation	McKeesport, Pa.	Sheets	650
Columbia Steel Company	Pittsburg, Cal.	Tin Plate	100
Columbia Steel Company	Torrance, Cal.	Sheets	100
Continental Steel Corporation (Operated a few months in 1939, then abandoned).	Canton, O.	Sheets	260
Continental Steel Corporation	Indianapolis, Ind.	Sheets	100
Inland Steel Company	Indiana Harbor, Ind.	Sheets	510
Weirton Steel Company	Clarksburg, W. Va.	Tin Plate	1,000
Weirton Steel Company	Weirton, W. Va.	Tin Plate	500
Total Workers Displaced			4,210
1937			
Bathlehem Steel Corporation	Blasdell, N. Y.	Sheets	800
Carnegie-Illinois Steel Corporation	Cambridge, O.	Sheets, Tin Plate	1,400
Carnegie-Illinois Steel Corporation	Elwood City, Ind.	Tin Plate	1,500
Carnegie-Illinois Steel Corporation	Farrell, Pa.	Sheets	750
Carnegie-Illinois Steel Corporation	Monessen, Pa.	Tin Plate	1,600
Carnegie-Illinois Steel Corporation	New Castle, Pa.	Tin Plate	1,500
Empire Sheet & Tin Plate Company	Mansfield, O.	Tin Plate	535
Follansbee Brothers Company	Toronto, O.	Sheets	1,350
Jones & Laughlin Steel Corporation (Displacement begun in 1933, completed in 1937).	Aliquippa, Pa.	Tin Plate	1,500
Otis Steel Company	Cleveland, O.	Sheets	325
Republic Steel Corporation	Canton, O.	Tin Plate	700
Republic Steel Corporation	Cumberland, Md.	Tin Plate	450
Republic Steel Corporation	Warren, O.	Tin Plate	350
Wheeling Steel Corporation	Portsmouth, O.	Sheets	1,500
Wheeling Steel Corporation	Yorkville, O.	Tin Plate	1,500
Youngstown Sheet & Tube Company (Abandonment begun in 1932).	Campbell, O.	Sheets	850
Total Workers Displaced			16,610

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Company	Location	Product	No. of men displaced.
1938			
Bethlehem Steel Company.....	Sparrows Point, Md.....	Tin Plate...	1,000
Empire Sheet & Tin Plate Company.....	Mansfield, O.....	Sheets.....	200
Granite City Steel Company.....	Granite City, Ill.....	Sheets, Tin Plate.....	550
Republic Steel Corporation (Mills were eliminated in 1930 and 1935, with 1938 being the last year).	Canton, O.....	Sheets.....	800
Republic Steel Corporation (Displacement begun in in 1937).	Monroe, Mich.....	Sheets.....	700
Youngstown Sheet & Tube Company.....	Indiana Harbor, Ind....	Tin Plate...	1,200
Total Workers Displaced.....			4,450
1939			
Republic Steel Corporation.....	Niles, O.....	Sheets.....	450
Total Workers Displaced.....			450
Total Workers Displaced 1929-1939.....			38,470

EXHIBIT No. 2480

[Submitted by the Steel Workers' Organizing Committee]

Cost of production of tin plate on hand mills

[Average Cost of Base Boxes on 30 Gauge Value for the First Eleven Months of 1939]

Department	Steel	Labor	Tin	Materials Supplies Etc.	Deprecia- tion	Overhead	Total
Hot Mill.....	1.7142	.9456		.1672	.0591	.1513	3.0274
Pickling.....		.0471		.0455	.0104	.0220	.1250
Annealing.....		.1015		.0609	.0103	.0239	.1966
Cold Rolling.....		.0894		.0184	.0105	.0245	.1428
Tinning.....		.3350	.6185	.1726	.0304	.0717	1.2282
Total per Base Box.....	1.7142	1.5186	.6185	.4546	.1207	.2934	4.7200

"EXHIBIT No. 2481", introduced on p. 16477, is on file with the Committee.

EXHIBIT No. 2481-A

[Submitted by the Steel Workers' Organizing Committee]

A SUMMARY OF "EMPLOYMENT AND PRODUCTIVITY IN A SHEET STEEL MILL" BY
DR. JENNETTE R. GRUENER

(The complete 85-page study was submitted to the Temporary National Economic
Committee)

This study deals with labor displacement from 1919 to 1933 in a single eastern sheet steel mill. Although certain desired material is lacking, the author establishes a number of significant points.

This sheet mill employed an average of 754 men and produced 64,449 tons of sheets in 1919. In 1929 it employed 372 men, but produced 84,756 tons of sheets. In other words, total production was 32% greater, but the working force 51% smaller.

From 1919 to 1925 both production and the size of the force fluctuated much in a similar manner; but from 1926 on the two took different trends—employ-

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ment decreasing in spite of sustained or increased production. The source of this difference is found in the company's program of increasing productivity through improved technology. The concern embarked upon a comprehensive program of this nature in 1924 and continued it until 1928, although it was practically completed by 1927. The following table shows the results:

Year	Output Mo. Avg. (tons)	Man-Hours Worked (Monthly Average)	Total Labor Costs (Monthly Average)	Avg. No. Men Employed
1925	6,212	154,624	\$100,657	684
1926	7,325	162,118	107,848	784
1927	5,453	102,992	72,597	506
1928	6,002	77,239	59,767	354
1929	7,053	81,135	65,841	372

Production in 1928 was about 3.4% less than in 1925. Man-hours per month declined 50% and the working force declined 48%. In 1929 production was about 3.7% less than in 1926. Man-hours declined 50% and the working force dropped 52.5%.

To the workers the program meant the following: In 1929 they produced 13.5% more per month than in 1925, for which they received a 45.6% decreased working force, a decrease of 47.5% in the man-hours they worked, and an overall wage decrease amounting to \$34,816, or 34.6%.

The author of the study made an estimate of the technological displacement of workers based on a comparison of man-hours and production for 1925 and 1929. The resultant figure was about 83,167 technologically displaced man-hours per month. Allowing 48 hours per week and 208 hours per month for each man, we find that in 1929 about 400 men who would otherwise have been employed were out of jobs as a result of technological improvements in this mill alone.

EXHIBIT No. 2482

[Submitted by the Steel Workers Organizing Committee]

Mergers and consolidations by major steel producers

UNITED STATES STEEL CORPORATION

Year	Merger	Consolidation
1930	Columbia Steel Corporation merged into U. S. Steel Corporation.	
1936	Virginia Bridge & Iron Company merged into Tennessee Coal & Iron and then consolidated. (Became the Virginia Bridge Company, a subsidiary of T. C. I.)	
1935-6		Consolidated Carnegie Steel Company, Illinois Steel, and the Lorain Steel Company into the Carnegie-Illinois Steel Corporation.
1936		American Sheet & Tin Plate consolidated into Carnegie-Illinois Steel Corp. structure.

BETHLEHEM STEEL CORPORATION

1930	Pacific Coast Steel Company and Southern California Iron & Steel Co. merged.	Consolidated foregoing companies into the Pacific Coast Steel Corporation.
1936		Pacific Coast Steel Corporation consolidated into Bethlehem Steel Corporation.
1930	Danville (Pa.) Structural Steel Co., Inc.	
1931	McClintic-Marshall Construction Company merged and then consolidated into the structure.	
1932	Seneca Iron & Steel Co., Bladell, N. Y., merged and then consolidated into the structure.	
1937	Williamsport Wire Rope Company, Williamsport, Pa., Sparrows Point, Maryland.	

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Mergers and consolidations by major steel producers—Continued

REPUBLIC STEEL CORPORATION

Year	Merger	Consolidation
1930	Central Alloy Steel Corporation and Donner Steel Company, Inc., merged and consolidated into Republic.	
1935	Corrigan, McKinney Steel Company merged and then consolidated into Republic structure.	
1935	Newton Steel Company (acquired by acquiring above) merged and consolidated into Republic structure.	
1935	Truscon Steel Company.....	
1936	Niles Steel Products Company.....	
1936	Canton Tin Plate Corporation merged and then consolidated into Republic structure.	
1937	Gulf States Steel Corporation.....	
1937	Union Drawn Steel Corporation.....	

NATIONAL STEEL CORPORATION

1931	Michigan Steel Corporation merged and then consolidated into National Steel structure.	
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AMERICAN ROLLING MILL COMPANY

1930	Sheffield Steel Corporation.....	
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ALLEGHENY-LUDLUM STEEL CORPORATION

1936	West Leechburg Steel Company merged and then consolidated into Allegheny Steel Co. structure.	
1938	Allegheny Steel Company and Ludlum Steel Company merged into Allegheny-Ludlum.	

Summary: Eighteen companies went out of existence, eight merged companies have kept their separate identities and only two new companies were formed.

"EXHIBIT No. 2483" appears in text on p. 16483

EXHIBIT No. 2484

[Submitted by the Steel Workers Organizing Committee]

Explanation of material submitted in the following charts:

Exhibit 2485—Man-Hours Per Ton of Ingots Produced

Exhibit 2486—Wages Per Ton of Ingots Produced

Exhibit 2487—Relation of Production to Payrolls (at 72% to 76% of Ingot Capacity)

Exhibit 2488—Relation of Production to Employment (at 72% to 76% of Ingot Capacity)

Source of material:

American Iron & Steel Institute, New York City, Statistical Sheets 1 and 2 which are distributed to companies in the steel industry which supply data to the American Iron & Steel Institute.

Periods of comparison:

Three representative months are used for the basis of comparison. They are August, 1936, September, 1937, and September, 1939.

Actual ingot production in each of these three months was virtually the same, varying not more than 1% to 2% either way. The rate of operations in these months varied from 72% to 76% of ingot capacity. This rate of operations is truly representative of profitable operations in the steel industry. 90% of capacity or more is not representative of steel operations

because in the past seven years in only three months has the industry operated at 90% of capacity or better.

Employees covered:

The total monthly hours worked, average hourly earnings, and total monthly wages are for employees who are paid on an hourly, piece work, or tonnage basis.

The figures illustrated in these charts are not adjusted for the entire steel industry. These figures cover more than 90% of the industry and are used for the purpose of showing relationships. When adjusted for the entire industry, the relationships between production, employment, and payrolls do not change because the adjustment of all factors would be made on the same basis.

EXHIBIT 2485—MAN-HOURS PER TON OF INGOTS PRODUCED

This chart shows the changing relationship of total monthly hours worked to ingot production.

Man-hours per ton of ingots produced was computed by dividing total monthly hours worked by hourly, piece work, and tonnage employees by the monthly open hearth and Bessemer steel ingots produced. The total monthly hours worked cover all operations in the steel industry. These hours are related to ingot production because the latter is the accepted measurement of production.

In August, 1936, the man-hours per ton of ingots produced was 18.7. In September, 1937, this declined to 18.5; and by September, 1939, it had declined to 14.7. In the following month, October, 1939, it had declined to 14.5. It returned to 14.7 in November, 1939, and to 14.9 in December, 1939.

A 21.4% decline in man-hours took place from August, 1936, to September, 1939, or a drop from 18.7 man-hours to 14.7.

EXHIBIT 2486—WAGES PER TON OF INGOTS PRODUCED

This chart shows the relationship between monthly wages and monthly ingot production.

Wages per ton of ingots produced was computed by dividing the total monthly wages received by hourly, piece work, and tonnage employees by the monthly open hearth and Bessemer steel ingots produced. The total monthly wages paid are for all operations in the steel industry.

The wages paid per ton of ingots produced in August, 1936, was \$12.50. In September, 1937, it had risen to \$15.61, primarily as a result of an increase in average hourly earnings. By September, 1939, wages per ton of ingots produced had returned to \$12.51 a ton. In October, 1939, wages per ton of ingots declined to \$12.32. In November, 1939, they rose to \$12.52 and in December, 1939, to \$12.77.

Despite an increase in average hourly earnings from August, 1936, to September, 1939, wages per ton of ingots produced in these two months were virtually the same.

EXHIBIT 2487—RELATION OF PRODUCTION TO PAYROLLS

In this chart payrolls are set forth in two terms: average hourly earnings, and total monthly wages.

From August, 1936, to September, 1937, average hourly earnings increased from 66.8 cents to 84.3 cents per hour, or 26%. From September, 1937, to September, 1939, average hourly earnings increased from 84.3 cents to 85.1 cents per hour, or 1%. The increase in average hourly earnings from August, 1936, to September, 1939, was 27.3%.

Total monthly wages increased 27.7% from August, 1936, to September, 1937, or a little more than \$14,500,000 (From \$52,278,846 to \$66,800,712). By September, 1939, total monthly wages had declined to \$52,921,352.

The increase in total monthly wages from August, 1936, to September, 1939, was 1.2%, and the increase in production from August, 1936, to September, 1939, was 1%.

EXHIBIT 2488—RELATION OF PRODUCTION TO EMPLOYMENT

This chart shows the relation of production to employment in terms of wage earners and man-hours.

As a result of the reduction in maximum hours of work per week from 48 to 40 in 1937, the number of wage earners rose by 58,690 from August, 1936, to September, 1937, or 13%. In September, 1939, the number of wage earners was 415,171. Compared to September, 1937, when maximum weekly hours were the

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same, this represents a drop of 88,472 wage earners, or 17.5%. Compared to August, 1936, when maximum weekly hours were eight per week higher, this represents a drop of 29,782 workers, or about 7%.

Total man-hours worked per month rose from 78,208,172 in August, 1936, to 79,230,977 in September, 1937, an increase of 1%. By September, 1939, the man-hours worked per month declined by 17,059,554 from September, 1937, or a decrease of 21.5%. Although production in September, 1939, was 1% greater than in August, 1936, the total man-hours worked had decreased 20.4%.

“EXHIBIT No. 2485” appears in text on p. 16485

“EXHIBIT No. 2486” appears in text on p. 16486

“EXHIBIT No. 2487” appears in text on p. 16487

“EXHIBIT No. 2488” appears in text on p. 16488

EXHIBIT No. 2489

[Submitted by the Steel Workers' Organizing Committee]

Comparison of working force, wages, and production in continuous butt-weld pipe mills and in hand style butt-weld pipe mills

HAND STYLE BUTT-WELD PIPE MILLS

Position	Hourly Rate	Hourly Bonus	Daily Earnings 8-Hour Day	Position	Hourly Rate	Hourly Bonus	Daily Earnings 8-Hour Day
Welder.....	\$1.25	\$.30	\$12.40	Rollsetter.....	\$0.85	\$0.21	\$8.48
Welder.....	1.25	.30	12.40	Rollsetter.....	.85	.21	8.48
Picker.....	.75	.20	7.60	Full Down.....	.655	.15	6.44
Picker.....	.75	.20	7.60	Craneman.....	.75	.20	7.60
Charger.....	.75	.20	7.60	Craneman.....	.75	.20	7.60
Yard Boss.....	.75	.20	7.60	Bench Runner.....	.75	.20	7.60
Hook Runner.....	.67	.16	6.64	Straightener.....	.655	.15	6.44
Hook Runner.....	.67	.16	6.64	Millwright.....	.89	.09	7.84
Hook Runner.....	.67	.16	6.64	Electrician.....	.89	.09	7.84
Tongs.....	.655	.15	6.44	Pipefitter.....	.89	.09	7.84
Tongs.....	.655	.15	6.44	Millwright.....	.89	.09	7.84
Tongs.....	.655	.15	6.44	Laborer.....	.625	.15	6.20
Tongs.....	.655	.15	6.44	Laborer.....	.625	.15	6.20
Roller.....	.69	.17	6.88	Laborer.....	.625	.15	6.20
Roller.....	.69	.17	6.88	Shearman.....	.69	.17	6.88
Roller.....	.69	.17	6.88	Shear Helper.....	.655	.15	6.44
Rack.....	.655	.15	6.44				
Rack.....	.655	.15	6.44		\$25.55	\$5.74	\$250.32

CONTINUOUS BUTT-WELD PIPE MILLS

Welder.....	\$1.03	None	\$8.24	Millwright.....	\$0.89	None	\$7.12
Rollsetter.....	.94	None	7.52	Electrician.....	.89	None	7.12
End Welder.....	.94	None	7.52	Pipefitter.....	.89	None	7.12
End Welder Helper.....	.87	None	6.96				
Skelpman.....	.64	None	5.12		\$7.84	None	\$62.72
Craneman.....	.75	None	6.00				

Production per 8-hour period on the continuous butt-weld pipe mills, on the average, is 73 tons of ½" pipe, as compared to 65 tons of ½" pipe on the hand style butt-weld pipe mills, or an increase of 12%.

Production of 3" pipe per 8-hour period on the continuous butt-weld pipe mills is 135 tons, as compared to 84 tons of 3" pipe on the hand style butt-weld pipe mills, or an increase of 60%.

EXHIBIT No. 2490

[Submitted by the Temporary National Economic Committee Study Staff]

TECHNOLOGY AND EMPLOYMENT

Hearings before the Temporary National Economic Committee

By H. DEWEY ANDERSON

DESCRIPTION OF TERMS

The following descriptions have been compiled to present the most commonly used and accepted meanings of certain terms appearing frequently in the literature and statistics dealing with employment and production. Unfortunately, there is no universal agreement in the use of these terms nor in the methods of compiling the statistics. In other words, in individual studies and particular statistical series the definitions may vary from those given here because of the special nature of the problem under consideration or the limitations of the statistics. The principal limitation of the statistical measures described here, as well as some of the most frequent misuses of the data, are also indicated.

Gainfully employed.—The "gainfully employed" or "gainful workers" is a term used in the decennial census reports on occupations. "The term 'gainful workers' [in census usage], includes all persons 10 years old and over who usually follow a gainful occupation, even though they may not have been actually employed at the time the census was taken. It does not include women doing housework in their own homes, without wages, and having no other employment, nor children working at home, merely on general household work, on chores, or at odd times on other work."¹

It is not a count of the number of persons employed nor of the number of jobs available. The number of gainful workers is a much more stable series than the number employed and responds much more slowly than employment to changes in the volume of production. In fact, it is conceivable that during an extended depression the number of gainful workers would increase. For example, married women may seek jobs in depression to supplement the family income, whereas in more prosperous times they would remain at home and would not be counted as gainful workers. Extension of child labor laws, on the other hand, automatically decreases the number of gainful workers, irrespective of the trend in production.

Changes in the methods of compilation and in the census definition of "gainful workers" limit the comparability of the census figures over a long period. Beginning with the census of 1870, the occupation inquiry applied to all persons in the population. The possible discrepancies in the total number of gainful workers in various censuses since then, caused by such factors as changes in instructions to enumerators and changes in the census date, are evaluated in the census. Comparisons of shifts of workers among occupations and among industries are subject to even greater limitations than changes in the totals.²

This term has been discussed at length because throughout the current literature on technological change there is a tendency to use the number of "gainful workers" and "gainfully employed" to indicate the number of jobs or the number of persons at work. The terms are not synonymous, and in periods of depression the difference between the number of gainful workers and those actually at work is very important. Unfortunately, comprehensive figures on the total number of people actually at work cover only the period since 1929, and even these figures are only approximations. For many industrial subdivisions the estimates are less reliable than the over-all figures. Consequently, historical comparisons are dependent on the figures in the occupational census. The point to be stressed is that although these are the best figures available, they cannot be used to measure the relationship between technology and employment except in a very rough way in view of the numerous limitations which have been pointed out.

Employed person.—An "employed person" is one who is currently engaged in a gainful occupation, i. e., actively engaged for a return in cash or kind. This includes both those working for others and the self-employed. All farm family labor (employables in the farm family who work on the farm without receiving a stated wage) and farm operators are counted as employed persons. Women doing housework in their own homes, without wages, and having no other employment, are not counted as employed. Persons enrolled in the Civilian Conservation Corps or engaged on W. P. A. and N. Y. A. work projects or C. W. A. and

¹ Fifteenth Census of the United States: 1930, "Population", Vol. V, p. 59.

² For discussion of these changes, see *ibid.*, pp. 4-5 and 38-39.

F. E. R. A. work programs are not counted as employed. Persons employed on Public Works Administration projects, on the other hand, are counted as employed. Most P. W. A. projects involve construction and are carried on largely under contract and are thus closely related to private activity.

Most employment indexes reflect the number of persons who worked during the week ending nearest the middle of the month represented by the index. These indexes include part-time as well as full-time workers; consequently, the estimated number of persons employed also includes both full time and part-time workers.

Unemployed person.—In current estimates the number of "unemployed" represents the difference between the number of "gainful workers" and the number employed. An "unemployed person" may thus be defined as one of working age who is able and willing to work and who normally would be employed, but who is not currently engaged in a gainful occupation.

Separations.—Separation refers to the termination of employment of an individual, whether voluntary or involuntary, at either the instance of the employer or the employee.

Wage earners and salaried employees.—The distinction between salaried officers and employees, on the one hand, and wage earners, on the other, depends primarily on the character of the work done. The first group includes, in general, supervisory and office employees, and the second group, manual workers. The Census of Manufactures makes the following distinction:

"In the salaried group are included principal officers of corporations; managers, superintendents, and other responsible administrative employees; foremen and overseers who devote all or the greater part of their time to supervisory duties; and clerks, stenographers, bookkeepers, and other clerical employees on salary. Wage earners are defined as skilled and unskilled workers of all classes, including piece-workers employed at the plant, and foremen and overseers in minor positions who perform work similar to that done by the employees under their supervision."²

The statistics for these two groups are collected on a somewhat different basis. The number of salaried employees is reported to the Census of Manufactures for December 14, or the nearest representative day. As a rule, there is little variation from month to month in the number of employees of this class, and this number is treated as equivalent to the average for the year.

For wage earners, the number shown by the payroll for the week which included the 15th day of each month, or for some other representative week, is reported. The *average number of wage earners employed* is calculated by dividing the sum of the numbers reported for each month by 12. The average number of wage earners in any industry, thus calculated, is necessarily somewhat in excess of the number that would be required to perform the work if all were employed continuously during the year. The reason is that the payroll for any week is likely to contain the names of employees who have been temporarily laid off and of persons whose services had terminated before the close of the week covered by the payroll. Also, if a manufacturer operated his plant only part of a month, he would select an active week as a representative week and would report the total number of wage earners whose names were on the rolls for that week. In other words, these figures indicate outright reductions in the number of wage earners, but they do not reflect part-time employment.

Indexes of factory employment and payrolls.—The Census data on employment and payrolls are collected at intervals of two or more years, and to supplement these data various indexes of employment and payrolls have been compiled to indicate current trends. The most comprehensive figures of this type are the indexes of factory employment and payrolls computed monthly by the U. S. Bureau of Labor Statistics. These indexes are based on monthly reports of a carefully selected sample of manufacturers who report the number of wage earners and their total wages for the week ending nearest the 15th of the month. The number of wage earners reported each month and their weekly wages are expressed as percentages of the average number on the payrolls and the average weekly wages in the years 1923, 1924, and 1925.

Indexes which are based on samples may tend to deviate from the true trend for an industry over an extended period. To overcome this tendency, the Bureau of Labor Statistics has adjusted most of its indexes to factory employment and payrolls to conform with the averages shown in the biennial Census of Manufactures. The Bureau of Labor Statistics indexes of factory employment and payrolls thus describe, in percentages, essentially the same class of employees included in the Census figure of average wage earners for the year.

² Fifteenth Census of the United States, "Manufactures: 1929," Vol. II, p. 5.

Man-hours.—The number of man-hours is a measure of employment which takes into consideration the length of time worked. In other words, total man-hours per year reflects not only the number of wage earners employed, but also the number of weeks they worked and the length of the working week.

Production.—Production refers to the volume of commodities and services made available for consumption. A production series measures the changes in the quantity of goods made or services rendered over a specified period of time. Production in agriculture refers to bushels of wheat, gallons of milk, dozens of eggs, bales of cotton, and so forth; in the motor vehicle industry, to the number of cars and parts; in the telephone industry, to the number of local and toll calls; in steam railroads, to the number of freight-ton miles and passenger miles. The complexity of our industrial organization and the variety of products result in numerous statistical difficulties in any attempt to measure the output of a single plant or industry, and the difficulties increase as the industrial area included is extended. Consequently, most measures of production are based on selected products or services which are considered representative and typical. In all comparisons of production with employment and payrolls, it is therefore essential to determine whether all of the series cover the same group of products. In other words, did the employees devote their full time to producing the goods included in the production index?

Productivity.—Measures of productivity relate physical volume of output to the amount of labor expended in producing it. In other words, productivity is the ratio of output of product to input of labor. There are several ways of expressing this ratio, two of the most common being output per wage earner and output per man-hour. The difference between the two is obvious: in one case output for a given period is divided by the number of wage earners employed, while in the other output is divided by total man-hours of employment during the production period.

The trends in output per wage earner and output per man-hour may not be the same. Output per wage earner may decline while output per man-hour increases, if the hours of work have been reduced. For this reason output per wage earner is less reliable than output per man-hour as an indication of the effects of technological change on productivity.

It should also be borne in mind that changes in output per wage earner or per man-hour in an industry arise from causes other than technological change. In coal mining for example, output per man-hour may rise because some of the poorer mines have been closed. On the other hand, it may decrease over a long period because the richer veins have been exhausted and it requires more effort to get the same amount of coal from the thinner veins. For some industries, the quality of the product has been improved, but the improvement in quality is not reflected in the production index. If the improvements require additional man-hours, output per man-hour may appear to be decreasing simply because the production index is too crude to reflect the changes in quality.

Seasonal variation.—Seasonal variation is a term applied to recurrent seasonal movements, such as the recession in midsummer and midwinter and increased activity in spring and autumn, that are frequently apparent in monthly or weekly statistical series. Some series are adjusted for seasonal variation. The Federal Reserve Board indexes of industrial production, for example, are published "Adjusted for Seasonal Variation" and "Without Seasonal Adjustment." The purpose of the adjustment is to eliminate insofar as possible the changes which are due primarily to seasonal factors and to focus attention on variations arising from other causes.

Calendar year.—Calendar year refers to an annual period beginning in January and ending in the following December. Most statistical series relating to employment and production are reported on a calendar-year basis.

Production year.—Production year is a general term used in contrast with calendar year. It is applied in industries in which measures of production are more significant when reported from the normal period of operations rather than for a calendar year which imposes artificial limits and may result in a meaningless statistical series. There are numerous terms used in particular industries to express this idea. For example, in agriculture and in industries processing agricultural products, annual series are compiled for the crop year, harvest year, and growth year. The terminal months for such series are determined by the customary harvesting and marketing periods. Sometimes statistics for the automobile industry are presented for the model year, beginning in September and ending with the following August.

Campaign period.—"Campaign" is a term used in some highly seasonal industries which do not operate continuously throughout the year. In the beet sugar industry, for example, seasonality is caused by the perishability of the beets, which cannot be stored. Hence the factory must operate when new crops of sugar beets are harvested. The period of operation is known as the campaign. Once the campaign has begun, the factory may operate 24 hours a day until the supply of harvested beets is exhausted. In this industry, the campaign period has varied from 15 to over 100 days, averaging about 70 days for the past few years. The campaign in beet sugar often runs into January of the next year; hence, in this industry the "campaign year" is usually defined as the year extending from March 1 to February 28.

National income.—The phrase "national income" has been loosely applied to a variety of concepts and statistical measurements. The estimates of "national income" vary according to the statistical concept or measure selected, and this accounts for a great deal of the misunderstanding and apparent contradictions in discussions of income. In the usage of the U. S. Department of Commerce, in its official estimates of income in the United States, "national income" is an abbreviation for "national income produced."

National income produced is the most inclusive of the concepts used by the Department of Commerce, and is a measure of "the net value of all commodities produced and all services rendered in the country. This total can be described as representing the gross value of all goods and services produced, minus the value of all raw materials and capital equipment consumed in the processes of production. It may also be designated as the value of goods and services consumed plus the value of additions to the national wealth during the year."⁴ This definition must be further qualified to the effect that it covers primarily only efforts whose results appear on the market-place of the economy. In other words, such services as are performed by housewives do not appear on the market, and are therefore not included in the estimate.⁵ This is important to bear in mind in comparisons of income over a long period of time, for the fact that many activities such as baking, sewing, canning, and gardening have to a large extent been transferred from the home to the market-place tends to increase the estimates of national income, without commensurately increasing the quantity of goods and services available for consumption.

The Department of Commerce also publishes estimates of "income paid out," which may be described as "the compensation paid to individuals for personal and capital services rendered."⁶

In any one year the income produced may be larger or smaller than the total income paid out by all business enterprises. When it is larger the difference is called "positive business savings" and represents the proportion of the year's net product retained by business enterprises. When income produced is smaller than income paid out, the difference is labeled "negative business savings" and represents a decrease in the net worth of business enterprises as a result of the current year's operations.

These two measures have been selected for definition because they describe the official income statistics. The National Industrial Conference Board also publishes estimates of national income, using definitions which differ from those given here. Space does not permit a description of the numerous statistical measures of income. It should be emphasized, however, that since there is such a variety of measures loosely referred to as "national income," it is essential to know what each includes before any use is made of the statistics. Otherwise, the conclusions may be misleading.

Purchasing power.—Purchasing power is a measure of the quantity of goods and services a given amount of money will buy. The distinction between purchasing power and income arises because prices fluctuate. A measure of income is converted into a measure of purchasing power by dividing income by an index representing the average prices of goods and services purchased. Various cost-of-living indexes are used to convert income figures into purchasing power series.

⁴ Robert R. Nathan, *Income in the United States, 1929-1937*, U. S. Department of Commerce, p. 3.

⁵ For the items not included in the estimates, see *ibid.*, pp. 6-7.

⁶ *Ibid.*, p. 4.

CONCENTRATION OF ECONOMIC POWER

EXHIBIT No. 2491

[Submitted by the Association of American Railroads]

Mileage of railway tracks operated

All railways—United States

Dec. 31	Miles of road	Other main tracks	Yard tracks & sidings	Total all tracks
1916	259,705	34,325	102,984	397,014
1921	258,382	37,614	111,555	407,551
1922	257,425	37,888	114,046	409,359
1923	258,064	38,697	116,212	412,973
1924	258,238	39,916	118,874	417,028
1925	258,631	40,962	118,261	417,854
1926	258,615	41,636	120,840	421,091
1927	259,539	42,071	123,077	424,687
1928	260,546	42,432	124,772	427,750
1929	260,570	42,711	125,773	429,054
1930	260,440	42,742	126,701	429,883
1931	259,959	42,780	127,044	429,822
1932	258,869	42,556	126,977	428,402
1933	256,741	42,397	126,526	425,664
1934	254,882	42,109	125,410	422,401
1935	252,030	41,910	124,382	418,322
1936	251,542	41,731	123,108	416,381
1937	250,582	41,579	122,411	414,572
1938	248,474	41,589	121,261	411,324
1939 ¹	246,300	41,500	121,000	408,800

EXHIBIT No. 2492

[Submitted by the Association of American Railroads]

Miles of road constructed or abandoned

All railways—United States

Year	Miles of road		Year	Miles of road	
	Con-structed	Abandoned		Con-structed	Abandoned
1921	331	687	1932	321	1,370
1922	318	1,188	1933	122	2,016
1923	441	537	1934	38	1,764
1924	635	617	1935	25	1,974
1925	595	753	1936	28	1,577
1926	891	892	1937	149	1,642
1927	819	797	1938	35	1,621
1928	946	710	1939 ¹	55	1,500
1929	671	782			
1930	460	954			
1931	502	770			
			Total	7,377	22,180

¹ Partially estimated.

NOTE.—Does not include adjustments, reclassifications, relocations, and tracks laid to shorten the distance between two points without serving any new territory.

CONCENTRATION OF ECONOMIC POWER

17351

EXHIBIT No. 2493

[Chart based on following statistical data appears in text on p. 16557]

Locomotives

Railways of Class I

Dec. 31	Number steam & other	Average tractive power (steam, pounds)	Dec. 31	Number steam & other	Average tractive power (steam, pounds)
1916.....	61,332	33,188	1930.....	56,582	45,225
1921.....	64,949	36,935	1931.....	55,149	45,764
1922.....	64,512	37,441	1932.....	53,316	46,299
1923.....	65,327	39,177	1933.....	50,903	46,916
1924.....	65,358	39,891	1934.....	48,304	47,712
1925.....	63,974	40,666	1935.....	46,594	48,367
1926.....	62,776	41,886	1936.....	45,146	48,972
1927.....	61,363	42,798	1937.....	44,683	49,412
1928.....	59,470	43,838	1938.....	43,810	49,803
1929.....	57,571	44,801	1939 ¹	42,500	50,659

¹ 1939 preliminary.

EXHIBIT No. 2494

[Chart based on following statistical data appears in text on p. 16559]

Freight-carrying cars

Railways of Class I

Dec. 31:	Number	Average capacity (tons)	Year	Number	Average capacity (tons)
1916.....	2,253,233	41.0	1930.....	2,276,867	46.6
1921.....	2,315,692	42.5	1931.....	2,201,510	47.0
1922.....	2,293,392	43.1	1932.....	2,144,730	47.0
1923.....	2,315,612	43.8	1933.....	2,034,886	47.5
1924.....	2,348,725	44.3	1934.....	1,938,352	48.0
1925.....	2,357,234	44.8	1935.....	1,835,736	48.3
1926.....	2,348,679	45.1	1936.....	1,758,192	48.8
1927.....	2,324,834	45.5	1937.....	1,742,834	49.2
1928.....	2,297,589	45.8	1938.....	1,699,689	49.4
1929.....	2,277,605	46.3	1939 ¹	1,655,000	49.8

¹ 1939 Preliminary.

NOTE.—Excludes freight-carrying cars not directly owned or leased by steam railways, totaling 235,069 on January 1, 1939.

CONCENTRATION OF ECONOMIC POWER

EXHIBIT No. 2495

[Submitted by the Association of American Railroads]

Installation of new equipment

Railways of Class I

Year	Locomotives		Freight carrying cars		Year	Locomotives		Freight carrying cars	
	Steam	Electric, oil-electric, gas-electric, etc.	Exclusively railway owned	Railway owned private refrigerators (not included in prior column)		Steam	Electric, oil-electric, gas-electric, etc.	Exclusively railway owned	Railway owned private refrigerators (not included in prior column)
1927.....	1,955	(1)	71,040	4,246	1934.....	59	31	24,076	27
1928.....	1,390	(1)	54,778	3,617	1935.....	40	102	8,081	222
1929.....	782	(1)	82,110	2,784	1936.....	87	24	39,350	4,591
1930.....	782	(1)	78,466	3,443	1937.....	373	77	71,849	3,209
1931.....	124	(1)	10,817	1,845	1938.....	164	118	18,474	43
1932.....	37	59	2,843	125	1939.....	100	220	24,396	132
1933.....	1	13	1,868	11					

¹ Not reported.

EXHIBIT No. 2496

[Submitted by the Association of American Railroads]

Passenger-train cars

Railways of Class I

Dec. 31:	Number of units	Dec. 31:	Number of units	Dec. 31:	Number of units
1916.....	52,179	1927.....	53,822	1934.....	43,945
1921.....	54,331	1928.....	53,097	1935.....	41,584
1922.....	54,354	1929.....	52,259	1936.....	40,609
1923.....	54,718	1930.....	52,130	1937.....	40,259
1924.....	55,040	1931.....	50,747	1938.....	39,309
1925.....	54,822	1932.....	49,353	1939 ¹	38,100
1926.....	54,773	1933.....	46,510		

¹ Preliminary.

NOTE.—Passenger-train cars include both passenger carrying cars and those that do not carry passengers, such as mail, baggage, and express. Pullman Company equipment (7,578 units on January 1, 1939) not included.

CONCENTRATION OF ECONOMIC POWER

17353

EXHIBIT No. 2497

(Chart based on following statistical data appears in text on p. 16563.)

Rails laid in replacement and wooden ties laid in previously constructed tracks

RAILWAYS OF CLASS I

Year	Rails (Long tons)		Wooden ties (Number)	
	New	Secondhand	Treated	Untreated
1921	1,464,104	1,124,119	34,071,989	49,238,666
1922	1,390,280	1,228,276	40,629,943	45,212,085
1923	1,729,696	1,409,276	41,655,616	42,072,140
1924	1,791,162	1,393,374	44,489,687	38,317,244
1925	1,930,146	1,534,495	50,089,966	22,623,486
1926	2,208,573	1,608,254	55,557,706	25,184,666
1927	2,124,765	1,694,350	57,082,993	21,240,053
1928	2,080,277	1,725,374	59,157,540	18,191,677
1929	1,958,489	1,651,966	59,047,380	15,614,898
1930	1,517,002	1,156,672	49,720,080	13,618,718
1931	984,900	730,006	30,827,791	11,658,836
1932	394,536	402,784	29,435,065	9,740,666
1933	403,254	459,044	26,339,516	10,947,221
1934	631,093	534,211	31,808,339	11,481,548
1935	582,794	576,245	33,281,314	11,028,740
1936	921,298	780,052	36,771,977	10,572,700
1937	1,029,861	944,736	38,074,542	9,638,791
1938	699,752	603,191	33,763,225	7,599,601

EXHIBIT No. 2498

(Chart based on following statistical data appears in text on p. 16564.)

Gross expenditures for additions and betterments

RAILWAYS OF CLASS I

Year	Equipment	Roadway and structures	Total
1923	\$681,724,000	\$377,425,000	\$1,059,149,000
1924	493,609,000	381,135,000	874,744,000
1925	338,114,000	410,077,000	748,191,000
1926	371,922,000	513,164,000	885,086,000
1927	288,701,000	482,851,000	771,552,000
1928	224,301,000	452,364,000	676,665,000
1929	321,306,000	532,415,000	853,721,000
1930	328,269,000	544,339,000	872,608,000
1931	73,105,000	268,807,000	341,912,000
1932	36,371,000	130,823,000	167,194,000
1933	15,454,000	88,493,000	103,947,000
1934	92,005,000	120,707,000	212,712,000
1935	79,335,000	106,967,000	186,302,000
1936	159,104,000	139,887,000	298,991,000
1937	322,877,000	186,916,000	509,793,000
1938	115,408,000	111,529,000	226,937,000
1939	133,388,000	128,641,000	262,029,000
Total—1923-39	\$4,074,993,000	\$4,998,540,000	\$9,073,533,000

NOTE.—Represents actual money outlay. No allowance is made for retirements.

CONCENTRATION OF ECONOMIC POWER

EXHIBIT No. 2499

(Chart based on following statistical data appears in text on p. 16508.)

Purchases of fuel, material and supplies

RAILWAYS OF CLASS I

[Figures expressed in thousands of dollars]

Year	Fuel	Forest products	Iron & steel products	Miscellaneous	Total
1923	\$617,800	\$232,511	\$464,955	\$423,437	\$1,738,703
1924	471,656	180,872	365,610	324,017	1,343,055
1925	459,465	170,305	419,255	343,018	1,392,043
1926	473,354	186,291	507,302	392,085	1,559,032
1927	438,821	175,739	432,604	348,774	1,395,928
1928	384,608	160,794	397,544	326,395	1,271,341
1929	364,392	157,551	437,840	369,752	1,329,535
1930	306,500	134,600	329,700	267,700	1,038,500
1931	244,500	76,250	202,100	174,150	696,000
1932	178,250	52,200	100,550	114,000	445,000
1933	180,526	42,442	110,720	123,162	456,850
1934	217,294	64,271	159,758	158,901	599,224
1935	232,723	57,367	156,014	146,021	592,125
1936	272,270	76,683	273,753	180,715	803,421
1937	264,283	104,707	359,409	207,974	936,373
1938	243,783	56,968	152,176	120,356	583,283
1939	257,273	69,971	273,908	168,102	769,254
Total	5,637,508	1,999,512	5,144,158	4,208,458	16,989,636

EXHIBIT No. 2500

[Submitted by the Association of American Railroads]

Tons of revenue freight originated

RAILWAYS OF CLASS I

Year	Total all commodities	Products of agriculture	Animals and products	Products of mines	Products of forests	Manufactures and miscellaneous	L. C. L. freight
1921	940,182,560	114,068,706	24,263,008	511,270,449	76,419,241	172,169,145	41,992,011
1922	1,023,745,007	111,787,032	26,230,230	532,907,597	89,059,248	220,441,687	43,225,213
1923	1,379,030,222	109,317,655	28,254,446	713,734,824	115,617,993	267,766,748	44,388,656
1924	1,187,295,744	116,586,794	27,747,010	637,582,265	108,094,065	256,736,587	40,549,023
1925	1,247,241,615	109,313,068	26,323,842	678,336,071	107,391,084	285,290,606	40,586,944
1926	1,336,142,323	111,787,387	26,243,489	757,703,136	104,850,837	296,066,483	39,490,989
1927	1,281,611,186	113,342,557	26,002,990	713,401,947	99,350,605	291,072,768	38,440,319
1928	1,285,942,976	116,021,911	25,633,848	696,583,097	96,736,937	312,013,252	36,953,931
1929	1,339,091,007	115,343,285	24,906,519	737,878,712	94,855,141	330,064,079	36,043,271
1930	1,153,196,636	110,728,446	23,128,633	642,536,854	69,370,554	277,765,429	29,666,721
1931	894,185,637	97,486,977	21,632,146	501,902,964	43,024,204	207,365,992	22,773,354
1932	646,222,818	80,916,911	18,054,801	362,235,695	26,109,128	143,682,492	15,233,791
1933	698,943,511	81,702,027	17,650,825	395,064,780	33,164,630	157,009,486	14,390,763
1934	765,295,920	79,304,641	20,362,664	436,379,901	35,650,352	179,253,134	14,345,228
1935	789,629,714	76,337,662	18,125,428	445,136,273	42,482,832	196,505,866	14,036,753
1936	958,830,389	86,647,796	16,209,122	541,488,439	53,155,912	245,036,941	16,292,179
1937	1,018,586,028	89,459,863	15,232,968	569,745,359	58,667,773	265,301,846	17,188,219
1938	771,862,020	95,389,713	14,780,144	408,834,921	43,973,197	194,511,738	14,392,307
1939	901,752,463	91,664,116	13,044,076	496,938,982	50,155,775	233,065,949	14,963,565

CONCENTRATION OF ECONOMIC POWER

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EXHIBIT No. 2501

(Chart based on following statistical data appears in text on p. 16570)

Freight traffic

RAILWAYS OF CLASS I

Year	Tons of revenue freight originated (thousands)	Revenue ton-miles (thousands)	Year	Tons of revenue freight originated (thousands)	Revenue ton-miles (thousands)
1916	1,203,307	362,444,397	1930	1,163,197	383,449,588
1921	940,183	306,840,204	1931	894,186	309,224,879
1922	1,023,745	339,285,348	1932	646,223	233,977,009
1923	1,279,030	412,727,228	1933	698,943	249,223,180
1924	1,187,296	388,415,312	1934	765,296	268,710,507
1925	1,247,242	413,814,261	1935	789,627	282,036,932
1926	1,336,142	443,746,487	1936	968,830	339,246,826
1927	1,281,611	428,736,962	1937	1,015,686	360,620,269
1928	1,285,943	432,916,185	1938	771,862	290,084,371
1929	1,339,091	447,821,661	1939	901,752	333,444,190

EXHIBIT No. 2502

(Chart based on following statistical data appears in text on p. 16571)

Passenger traffic

RAILWAYS OF CLASS I

Year	Revenue passengers carried (thousands)	Revenue passenger-miles (thousands)	Year	Revenue passengers carried (thousands)	Revenue passenger-miles (thousands)
1916	1,005,955	34,585,952	1930	703,598	26,814,825
1921	1,035,496	37,312,586	1931	596,391	21,894,421
1922	987,409	35,469,962	1932	478,800	16,971,044
1923	986,913	37,956,595	1933	432,980	16,340,510
1924	932,678	36,090,866	1934	449,775	18,033,309
1925	898,267	35,950,223	1935	445,872	18,475,572
1926	862,361	35,477,525	1936	490,091	22,421,009
1927	829,918	33,649,700	1937	497,286	24,655,414
1928	790,327	31,601,342	1938	452,731	21,628,718
1929	780,468	31,074,135	1939	451,039	22,657,464

EXHIBIT No. 2503

(Chart based on following statistical data appears in text on p. 16572)

Average revenue per ton-mile

RAILWAYS OF CLASS I

Year	Average revenue per ton-mile (cents)	Year	Average revenue per ton-mile (cents)	Year	Average revenue per ton-mile (cents)
1921	1.275	1927	1.090	1933	0.999
1922	1.177	1928	1.081	1934	0.978
1923	1.116	1929	1.076	1935	0.988
1924	1.116	1930	1.063	1936	0.974
1925	1.097	1931	1.051	1937	0.935
1926	1.081	1932	1.046	1938	0.983
				1939	0.974

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CONCENTRATION OF ECONOMIC POWER

EXHIBIT No. 2504

(Chart based on following statistical data appears in text on p. 16573)

Average revenue per passenger-mile

RAILWAYS OF CLASS I

Year	Average revenue per passenger-mile (cents)	Year	Average revenue per passenger-mile (cents)	Year	Average revenue per passenger-mile (cents)
1921.....	3.086	1927.....	2.896	1933.....	2.013
1922.....	3.027	1928.....	2.850	1934.....	1.918
1923.....	3.018	1929.....	2.908	1935.....	1.935
1924.....	2.978	1930.....	2.717	1936.....	1.838
1925.....	2.938	1931.....	2.613	1937.....	1.794
1926.....	2.936	1932.....	2.219	1938.....	1.874
				1939.....	1.839

EXHIBIT No. 2505

(Chart based on following statistical data appears in text on p. 16574)

Indexes of distribution and rail shipments

[1928=100]

Year	Distribution (potential traffic)	Rail shipments (actual traffic)	Ratio rail shipments to potential traffic	Per cent diversion of traffic from the rails	Year	Distribution (potential traffic)	Rail shipments (actual traffic)	Ratio rail shipments to potential traffic	Per cent diversion of traffic from the rails
1928.....	100	100	100		1934.....	66	59	89	11
1929.....	105	104	99	1	1935.....	71	62	87	13
1930.....	90	89	99	1	1936.....	85	74	87	13
1931.....	72	69	96	4	1937.....	92	79	86	14
1932.....	54	50	93	7	1938.....	71	60	85	16
1933.....	68	65	87	13	1939.....	85	70	82	18

EXHIBIT No. 2506

[Submitted by the Association of American Railroads]

Income account—class I railways—United States

CALENDAR YEARS 1929 TO 1939

[Figures in millions of dollars]

Item	1929	1930	1931	1932	1933	1934	1935	1936	1937	1938	1939
1. Total operating revenues.....	6,379.5	5,281.2	4,188.3	3,126.7	3,095.4	3,271.6	3,451.9	4,052.7	4,166.1	3,565.5	3,995.1
2. Freight revenue.....	4,825.6	4,083.2	3,254.7	2,450.8	2,492.7	2,633.4	2,790.6	3,306.5	3,377.9	2,858.1	3,251.1
3. Passenger revenue.....	873.6	729.5	551.0	377.1	329.3	346.3	357.9	412.4	422.8	405.9	416.9
4. All other revenue.....	680.3	468.5	382.6	298.8	273.4	291.9	303.4	333.8	365.4	301.5	327.1
5. Total operating expenses.....	4,606.0	3,930.9	3,223.6	2,403.4	2,249.2	2,441.8	2,592.7	2,931.4	3,119.1	2,722.2	2,918.2
6. Operating ratio—per cent.....	71.76	74.43	76.97	76.87	72.66	74.64	75.11	72.33	74.87	76.35	73.05
7. Net operating revenue.....	1,773.5	1,350.3	964.7	723.3	846.2	829.8	859.2	1,121.3	1,047.0	843.3	1,076.9
8. Railway tax accruals.....	396.7	348.6	303.5	275.1	249.6	239.6	236.9	319.8	325.7	340.8	355.8
9. Operating rents.....	125.1	132.8	135.6	121.9	122.3	127.5	122.5	134.2	131.1	129.6	132.3
10. Net railway operating income.....	1,251.7	868.9	525.6	326.3	474.3	462.7	499.8	667.3	590.2	372.9	588.8
11. Rate of return on property investment—%.....	4.81	3.28	1.99	1.24	1.82	1.78	1.93	2.57	2.27	1.43	1.26
12. Other income.....	359.7	358.9	305.6	224.5	211.0	203.2	187.7	184.5	174.6	155.2	160.8
13. Total income.....	1,611.4	1,227.8	831.2	550.8	685.3	665.9	687.5	851.8	764.8	528.1	749.6
14. Interest (Fixed and contingent).....	523.5	520.8	530.0	536.6	536.6	523.0	521.0	506.4	504.0	501.1	498.7
15. Rent for leased roads.....	177.4	170.6	150.7	138.0	150.2	151.2	149.3	169.7	147.8	135.1	142.1
16. Other deductions.....	18.7	12.5	15.8	15.4	4.5	8.6	9.7	11.1	14.9	14.4	14.2
17. Total charges.....	714.6	703.9	696.5	690.0	691.2	682.8	680.0	687.2	666.7	651.6	655.0
18. Net income.....	896.8	523.9	134.7	Def 139.2	Def 5.9	Def 16.9	7.5	164.6	98.1	Def 123.5	94.6

¹ Rate of return computed on property investment for prior year.

CONCENTRATION OF ECONOMIC POWER

"Exhibit No. 2507", introduced on p. 16575, is on file with the Committee

EXHIBIT No. 2508

(Chart based on following statistical data appears on p. 16577)

Condensed income account

RAILWAYS OF CLASS I

[Figures expressed in thousands of dollars]

Year	Total operating revenues	Total operating expenses and taxes	Net railway operating income	Net income or deficit after fixed chgs.
1916	3,896,866	2,556,781	1,040,085	646,881
1921	5,518,598	4,915,661	600,937	313,563
1922	5,559,953	4,798,906	760,187	369,573
1923	6,269,680	5,327,626	961,956	554,995
1924	5,921,496	4,947,669	973,827	558,466
1925	6,122,510	5,001,434	1,121,076	700,831
1926	6,282,940	5,169,860	1,213,080	809,064
1927	6,136,800	5,068,315	1,067,985	672,900
1928	6,111,736	4,938,872	1,172,864	786,824
1929	6,279,621	5,027,823	1,251,698	806,807
1930	5,281,197	4,412,318	868,879	523,908
1931	4,188,243	3,662,716	525,628	134,762
1932	3,128,760	2,800,462	326,298	Def 136,804
1933	3,095,404	2,621,108	474,296	Def 3,863
1934	3,271,667	2,808,915	462,652	Def 16,587
1935	3,461,929	2,962,110	499,819	7,539
1936	4,052,734	3,335,387	667,247	164,630
1937	4,166,069	3,575,865	590,204	98,056
1938	3,565,491	3,192,617	372,874	Def 183,471
1939	3,995,070	3,406,269	588,801	94,639

"EXHIBIT No. 2509" appears in text on p. 16578

[There is no statistical data supporting this chart]

EXHIBIT No. 2510

(Chart based on following statistical data appears on p. 16579)

Property investment, net railway operating income and rate of return

RAILWAYS OF CLASS I

Year	Total property investment ¹	Net railway operating income	
		Amount	Rate of return
1916	\$17,636,722,230	\$1,040,084,517	5.90
1921	21,370,946,298	600,937,356	2.81
1922	21,613,263,367	760,187,319	3.52
1923	22,478,637,191	961,955,457	4.26
1924	23,202,917,525	973,827,202	4.20
1925	23,779,460,493	1,121,076,341	4.71
1926	24,460,100,367	1,213,089,966	4.96
1927	24,967,623,689	1,067,985,495	4.28
1928	25,441,508,203	1,172,864,100	4.61
1929	26,039,558,344	1,251,697,638	4.81
1930	26,526,742,889	868,878,773	3.26
1931	26,405,685,824	525,627,852	1.99
1932	26,324,022,378	326,298,008	1.24
1933	26,124,836,882	474,295,613	1.82
1934	25,978,114,445	462,652,379	1.78
1935	25,919,335,950	499,819,118	1.93
1936	25,988,780,704	667,347,115	2.57
1937	26,050,829,724	590,203,925	2.27
1938	26,055,536,905	372,878,771	1.43
1939	(²)	588,800,803	² 2.26

¹ Represents carriers' investment in road and equipment, including investment of non-operating common carrier subsidiaries and including working capital.

² Not yet available. Rate of return computed on property investment of 1938.

CONCENTRATION OF ECONOMIC POWER

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EXHIBIT No. 2511

(Chart based on following statistical data appears on p. 16579)

How the railway dollar is spent

RAILWAYS OF CLASS I

Year	Cents per dollar of revenue				
	Labor	Fuel, material & supplies & miscal.	All other operating expenses ¹	Taxes	Net railway operating income
1916.....	38.0	22.2	6.5	4.4	28.9
1921.....	46.9	29.9	7.3	5.0	10.9
1922.....	44.4	29.8	6.7	5.4	13.7
1923.....	44.3	28.3	6.8	5.3	15.3
1924.....	44.3	26.3	7.2	5.8	16.4
1925.....	43.2	25.2	7.4	5.9	18.3
1926.....	42.6	25.0	7.3	6.1	19.0
1927.....	43.9	24.8	7.8	6.1	17.4
1928.....	43.0	23.5	7.9	6.4	19.2
1929.....	42.6	23.1	8.1	6.3	19.9
1930.....	44.8	22.8	9.3	6.6	16.5
1931.....	46.9	22.3	11.0	7.3	12.5
1932.....	46.0	21.6	13.2	8.8	10.4
1933.....	43.2	20.5	12.9	8.1	15.3
1934.....	44.1	21.7	12.8	7.3	14.1
1935.....	45.0	22.2	11.4	6.9	14.5
1936.....	42.9	22.3	10.4	7.9	16.5
1937.....	44.8	23.5	9.7	7.8	14.2
1938.....	46.5	22.6	10.9	9.5	10.5
1939 ²	44.3	22.4	9.7	8.9	14.7

¹ Loss and damage, depreciation, insurance, pensions, and equipment and joint facility net rentals.
² Partially estimated.

EXHIBIT No. 2512

[Submitted by the Association of American Railroads]

Railway operating expenses

RAILWAYS OF CLASS I

[Figures expressed in thousands of dollars]

Year	Total operating expenses	Maint. of way and struct.	Maint. of equipment	Total maintenance expenses	Transportation	All other
1916.....	2,357,398	421,776	595,566	1,017,342	1,173,988	166,068
1921.....	4,562,668	756,414	1,251,479	2,007,893	2,262,472	292,303
1922.....	4,414,522	728,664	1,252,517	1,981,181	2,149,704	285,577
1923.....	4,895,157	813,689	1,465,156	2,278,845	2,321,283	295,039
1924.....	4,507,855	792,678	1,260,020	2,052,698	2,151,979	303,208
1925.....	4,536,850	815,443	1,259,335	2,074,778	2,138,310	322,292
1926.....	4,669,337	866,819	1,283,091	2,149,910	2,181,517	337,910
1927.....	4,574,178	868,581	1,219,052	2,087,633	2,136,987	349,558
1928.....	4,427,995	837,906	1,165,942	2,004,848	2,069,927	353,220
1929.....	4,506,056	855,355	1,202,912	2,058,267	2,079,954	367,535
1930.....	3,930,929	705,471	1,019,285	1,724,756	1,848,184	358,009
1931.....	3,223,575	530,613	816,953	1,347,566	1,543,744	332,265
1932.....	2,403,445	351,179	618,941	970,120	1,157,774	275,551
1933.....	2,249,232	322,286	598,709	920,995	1,077,982	250,255
1934.....	2,441,823	365,300	637,906	1,003,206	1,164,060	274,551
1935.....	2,592,741	393,967	681,587	1,075,554	1,253,113	263,774
1936.....	2,931,425	454,810	783,000	1,237,810	1,405,467	288,158
1937.....	3,119,065	495,594	826,709	1,322,303	1,510,275	296,487
1938.....	2,722,199	420,147	676,607	1,096,654	1,361,533	264,012
1939.....	2,918,216	466,833	765,943	1,232,776	1,417,789	267,551

CONCENTRATION OF ECONOMIC POWER

"EXHIBIT No. 2513" appears in text on p. 16580

[There is no statistical data supporting this chart]

EXHIBIT No. 2514

(Chart based on following statistical data appears on p. 16580)

Railway taxes per dollar of earnings

RAILWAYS OF CLASS I

Year	Railway taxes	Taxes per dollar of—	
		Total operating revenues (cents)	Net railway operating income before taxes (cents)
1916.....	\$157, 113, 372	4.4	13.1
1921.....	275, 875, 990	5.0	31.5
1922.....	301, 034, 923	5.4	28.4
1923.....	331, 915, 459	5.3	25.7
1924.....	340, 336, 686	5.8	25.9
1925.....	358, 518, 046	5.9	24.2
1926.....	388, 922, 856	6.1	24.3
1927.....	376, 110, 250	6.1	26.0
1928.....	389, 432, 415	6.4	24.9
1929.....	396, 682, 634	6.3	24.1
1930.....	348, 553, 953	6.8	28.6
1931.....	303, 528, 099	7.3	29.6
1932.....	275, 135, 399	6.8	45.7
1933.....	249, 623, 190	8.1	24.5
1934.....	239, 624, 802	7.3	24.1
1935.....	226, 944, 965	6.9	32.2
1936.....	319, 752, 721	7.9	32.4
1937.....	325, 635, 165	7.8	35.6
1938.....	340, 781, 954	9.5	47.3
1939.....	365, 766, 155	8.9	37.7

EXHIBIT No. 2515

(Chart based on following statistical data appears on p. 16581)

Railway receiverships and trusteeships at close of each year—1921 to 1939

As of:	Number of roads operated by receivers or trustees	Miles of road operated by receivers or trustees	Per cent of total railroad mileage operated by receivers or trustees
Dec. 31, 1921.....	68	13, 512.25	5.29
1922.....	64	15, 259.11	5.03
1923.....	64	12, 623.24	4.89
1924.....	61	8, 105.24	3.14
1925.....	53	18, 686.99	7.23
1926.....	45	17, 631.55	6.81
1927.....	30	16, 752.00	6.45
1928.....	33	5, 256.00	2.02
1929.....	29	5, 703.00	2.19
1930.....	30	9, 486.00	3.64
1931.....	45	12, 970.00	4.99
1932.....	55	22, 545.00	8.71
1933.....	78	41, 698.00	16.24
1934.....	80	42, 168.00	16.54
1935.....	87	68, 345.00	26.87
1936.....	91	69, 712.00	27.37
1937.....	109	70, 884.00	28.15
1938.....	109	75, 038.00	30.60
1939.....	109	77, 414.00	30.99

1 Computed on mileage as of December 31, 1938.

CONCENTRATION OF ECONOMIC POWER

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EXHIBIT No. 2516

(Chart based on following statistical data appears on p. 16581)

Index of railway material and supply costs

[May, 1933=100]

Prices as of:	Material and supplies (other than fuel)	Fuel (coal and oil)	Total all materials	Prices as of:	Material and supplies (other than fuel)	Fuel (coal and oil)	Total all materials
Dec. 1936.....	140.0	166.9	149.1	Dec. 1937.....	136.7	141.5	138.3
May, 1933.....	100.0	100.0	100.0	June, 1938.....	131.0	141.4	134.5
Feb. 1934.....	116.0	112.7	114.9	Dec. 1938.....	127.8	133.8	129.9
Dec. 1935.....	118.5	127.7	121.7	June, 1939.....	126.7	135.2	129.6
Oct. 1936.....	121.5	133.4	126.5	Dec. 1939.....	132.7	134.0	132.1

EXHIBIT No. 2517

(Chart based on following statistical data appears in text on p. 16582)

Employees, hours and compensation

RAILWAYS OF CLASS I

Year	Average number of employees	Total hours (000 omitted)	Total compensation (000 omitted)	Average number of hours per employee	Average compensation	
					Per hour (cents)	Per employee
1916.....	1,647,097	5,189,701	\$1,468,576	3,180.9	28.8	\$692
1921.....	1,859,513	4,147,319	2,765,218	2,499.1	66.7	1,666
1922.....	1,826,834	4,311,097	2,640,817	2,650.0	61.3	1,623
1923.....	1,857,674	4,928,651	3,004,072	2,653.1	61.0	1,617
1924.....	1,751,362	4,534,879	2,825,775	2,589.8	62.3	1,613
1925.....	1,744,311	4,531,361	2,800,600	2,597.8	63.1	1,640
1926.....	1,779,275	4,671,736	2,846,114	2,625.6	63.1	1,656
1927.....	1,735,105	4,519,281	2,610,183	2,604.6	64.4	1,677
1928.....	1,656,411	4,313,574	2,826,590	2,604.2	65.5	1,706
1929.....	1,660,850	4,346,822	2,896,566	2,617.2	66.6	1,744
1930.....	1,487,839	3,759,772	2,650,789	2,527.0	67.8	1,714
1931.....	1,258,719	3,039,110	2,094,994	2,414.4	68.9	1,684
1932.....	1,031,703	2,378,306	1,612,816	2,305.1	63.6	1,466
1933.....	871,196	2,233,045	1,403,481	2,299.3	62.9	1,445
1934.....	1,007,702	2,393,899	1,619,352	2,375.6	63.5	1,508
1935.....	994,371	2,397,353	1,643,879	2,410.9	68.6	1,633
1936.....	1,065,624	2,675,345	1,848,636	2,510.6	69.1	1,736
1937.....	1,114,663	2,799,539	1,986,447	2,511.6	70.9	1,781
1938.....	939,171	2,329,606	1,746,141	2,480.5	75.0	1,859
1939.....	987,943	2,489,689	1,863,603	2,520.1	74.8	1,886

NOTE: Foregoing data covers railways of Class I only. Number of employees for all steam railways including express and sleeping car companies, totaled 1,841,176 in 1929, and approximately 1,114,000 in 1939.

CONCENTRATION OF ECONOMIC POWER

EXHIBIT No. 2518

(Chart based on following statistical data appears in text on p. 16586.)

Unit cost of operation
RAILWAYS OF CLASS I

Year	Freight expense per 1,000 revenue ton-miles		Passenger expense per passenger train car-mile		Year	Freight expense per 1,000 revenue ton-miles		Passenger expense per passenger train car-mile	
	Total	Transportation	Total	Transportation		Total	Transportation	Total	Transportation
1921	\$10.78	\$5.30	\$.355	\$.178	1930	\$7.43	\$3.82	\$.260	\$.132
1922	9.50	4.62	.342	.166	1931	7.45	3.67	.276	.131
1923	8.88	4.22	.336	.157	1932	7.24	3.48	.262	.122
1924	8.53	4.06	.322	.150	1933	6.48	3.10	.245	.118
1925	8.07	3.82	.313	.144	1934	6.57	3.14	.254	.120
1926	7.79	3.66	.311	.141	1935	6.63	3.22	.265	.126
1927	7.84	3.69	.311	.141	1936	6.40	3.09	.267	.121
1928	7.52	3.54	.303	.137	1937	6.41	3.13	.269	.122
1929	7.44	3.47	.300	.123	1938	6.78	3.40	.254	.126

"EXHIBIT No. 2519" appears in text on p. 16587.

"EXHIBIT No. 2520" appears in text on p. 16587.

"EXHIBIT No. 2521" appears in text on p. 16588.

EXHIBIT No. 2521-A

(Charts based on following statistical data, "Exhibits Nos. 2519 to 2521" appear in text on pp. 16587-16588.)

Freight operating averages
RAILWAYS OF CLASS I

Year	Freight train speed (M. P. H. between terminals)	Freight cars per train (excl. cabooses)	Net tons per train	Gross ton-miles ¹ (excl. loco. & tender) per freight train-hour	Net ton-miles ² per freight train-hour
1921	11.5	37.4	651	18,555	7,506
1922	11.1	37.5	676	16,188	7,479
1923	10.9	38.0	713	16,764	7,770
1924	11.5	40.7	715	18,257	8,222
1925	11.8	42.8	744	19,685	8,773
1926	11.9	44.2	772	20,692	9,201
1927	12.3	45.5	777	21,940	9,583
1928	12.9	47.1	792	23,630	10,183
1929	13.2	47.6	804	24,539	10,590
1930	13.8	47.9	784	25,837	10,836
1931	14.8	46.0	783	26,721	10,825
1932	15.5	43.8	663	26,046	10,265
1933	15.7	44.8	699	27,844	10,974
1934	15.9	45.3	706	28,040	11,325
1935	16.0	45.4	734	28,674	11,718
1936	15.8	45.8	774	29,200	12,146
1937	16.1	46.6	796	30,349	12,695
1938	16.6	47.1	759	31,141	12,473
1939	16.7	46.5	813	32,808	13,449

¹ Includes weight of freight cars and contents.² Includes contents of freight cars only.

CONCENTRATION OF ECONOMIC POWER

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EXHIBIT No. 2522

(Chart based on following statistical data appears in text on p. 16592.)

Fuel conservation

RAILWAYS OF CLASS I

Year	Gross ton-miles ¹ per ton of fuel	Passenger-train car-miles per ton of fuel	Year	Gross ton-miles ¹ per ton of fuel	Passenger-train car-miles per ton of fuel
1921.....	12,367	113	1931.....	16,740	² 138
1922.....	12,273	112	1932.....	16,245	² 134
1923.....	12,452	111	1933.....	16,479	² 131
1924.....	13,402	118	1934.....	16,451	² 132
1925.....	14,292	124	1935.....	16,639	² 129
1926.....	14,649	126	1936.....	16,748	130
1927.....	15,321	130	1937.....	17,133	133
1928.....	16,787	133	1938.....	17,462	134
1929.....	16,007	134	1939.....	17,770	135
1930.....	16,497	² 136			

¹ Including locomotive and tender.

² Represents fuel consumed by steam locomotives only, and excludes current consumed by electric locomotives.

EXHIBIT No. 2523

(Chart based on following statistical data appears in text on p. 16593.)

Loss and damage expenses

RAILWAYS OF CLASS I

Year	Loss & Damage—Freight		Damage to property, live stock on right-of-way and loss & damage baggage	Total loss & damage
	Amount	Cents per dollar of freight revenue		
1921.....	\$92,316,196	2.35	\$11,088,233	\$103,404,429
1922.....	45,966,711	1.15	9,236,145	55,202,856
1923.....	42,476,597	0.92	9,679,620	52,156,217
1924.....	41,251,243	0.95	8,922,740	50,173,983
1925.....	36,915,439	0.81	8,259,663	45,175,102
1926.....	34,267,628	0.71	8,492,017	42,759,645
1927.....	33,976,470	0.73	7,684,541	41,661,011
1928.....	33,153,973	0.71	7,071,820	40,225,793
1929.....	35,563,813	0.74	7,320,659	42,884,472
1930.....	31,215,286	0.75	6,858,543	38,073,829
1931.....	23,882,071	0.73	4,838,852	28,720,923
1932.....	17,303,233	0.71	3,486,552	20,789,785
1933.....	14,308,088	0.57	2,999,842	17,307,930
1934.....	16,213,772	0.62	3,442,009	19,655,781
1935.....	18,285,097	0.66	3,524,542	21,809,639
1936.....	21,259,611	0.64	4,289,123	25,548,734
1937.....	22,958,480	0.68	4,218,463	27,176,943
1938.....	20,411,474	0.71	3,523,716	23,935,190
1939.....	¹ 17,942,000	¹ 0.55	(²)	(²)

¹ Partially estimated.

² Not yet available.

EXHIBIT No. 2524

(Chart based on following statistical data appears in text on p. 16594.)

Casualties to employees in train, train-service and nontrain accidents

RAILWAYS OF CLASS I

Year	Fatalities	Nonfatal injuries	Total casualties	Casualty rate per million man-hours
1921.....	1,311	99,665	100,976	24.84
1922.....	1,514	112,036	113,550	27.08
1923.....	1,836	145,761	147,597	30.74
1924.....	1,367	118,639	120,006	27.17
1925.....	1,437	112,716	114,153	26.91
1926.....	1,502	105,456	106,958	26.73
1927.....	1,395	82,399	83,794	19.24
1928.....	1,166	65,358	66,524	16.06
1929.....	1,209	55,824	57,033	13.67
1930.....	882	32,379	33,261	9.25
1931.....	615	20,844	21,459	7.41
1932.....	525	15,909	16,434	7.28
1933.....	468	14,126	14,594	6.89
1934.....	481	15,373	15,854	6.99
1935.....	525	14,728	15,253	6.73
1936.....	636	19,740	20,376	8.05
1937.....	617	21,157	21,774	8.22
1938.....	455	14,397	14,852	6.79
1939.....	462	15,103	15,565	6.66

Decrease in frequency, 1939 under 1921, 73.2%.

EXHIBIT No. 2525

(Chart based on following statistical data appears in text on p. 16594.)

Casualties to passengers on trains in train and train-service accidents

RAILWAYS OF CLASS I

Year	Fatalities	Nonfatal injuries	Total casualties	Casualty rate per ten million pass.-miles
1921.....	150	5,268	5,418	1.45
1922.....	158	5,882	6,040	1.70
1923.....	102	5,538	5,640	1.49
1924.....	121	5,129	5,250	1.45
1925.....	139	4,752	4,891	1.36
1926.....	130	4,275	4,405	1.24
1927.....	56	3,658	3,714	1.10
1928.....	59	3,262	3,321	1.05
1929.....	72	3,625	3,697	1.19
1930.....	38	2,522	2,560	.95
1931.....	30	2,006	2,036	.93
1932.....	17	1,818	1,835	1.08
1933.....	37	1,960	1,997	1.22
1934.....	27	1,860	1,887	1.05
1935.....	18	1,862	1,880	1.02
1936.....	16	2,423	2,439	1.09
1937.....	18	2,494	2,512	1.02
1938.....	69	2,266	2,335	1.08
1939.....	27	2,489	2,516	1.11

Decrease in frequency, 1939 under 1921, 23.4%.

CONCENTRATION OF ECONOMIC POWER

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EXHIBIT No. 2526

(Chart based on following statistical data appears in text on p. 16596.)

Loss and damage and injuries to persons expense

RAILWAYS OF CLASS I

Year	Total loss and damage	Total injuries to persons	Grand total loss & damage and injuries to persons
1921	\$103,404,429	\$31,035,434	\$135,339,863
1922	55,202,856	33,417,497	88,620,353
1923	52,156,217	40,535,177	92,691,394
1924	50,173,983	39,533,860	89,707,843
1925	45,175,102	44,940,511	90,115,613
1926	42,759,645	46,540,722	89,300,367
1927	41,661,011	44,883,592	86,544,603
1928	40,225,798	41,031,791	81,257,584
1929	42,884,472	41,828,966	84,713,438
1930	38,073,829	36,743,105	74,816,934
1931	28,720,923	29,314,297	58,035,220
1932	20,759,785	20,947,799	41,707,584
1933	17,307,930	18,628,564	35,936,494
1934	19,655,781	20,944,149	40,599,930
1935	21,809,639	21,321,416	43,131,055
1936	25,548,734	24,218,507	49,767,241
1937	27,176,923	24,912,730	52,089,653
1938	23,935,190	22,741,290	46,676,480

“EXHIBIT No. 2527,” introduced on p. 16595, is on file with the committee

“EXHIBIT No. 2528,” appears in text on p. 16599.

“EXHIBIT No. 2529,” facing p. 16600.

“EXHIBIT No. 2529-A,” facing p. 16600.

EXHIBIT No. 2529-B

Burro Crans

Cost of Crane, \$641; ¼ Yard Bucket, \$382.

Cost of Outfit, \$8,023.

Working Period, 180 Days (9 Months) Per Year.

MISCELLANEOUS WORK

[Loading Heavy Scrap; Unloading, Loading and Laying Rail; Ditching; Distributing and Unloading Heavy Material]

By Use of One Machine				By Hand			
Organization:				Organization:			
1 Engineer Work Equipment—Hourly Rate.	\$.74	\$.74	\$.74	1 Foreman—Monthly Rate.	\$153	\$153	\$153
1 Laborer—Hourly Rate.	.30	.35	.40	12 Laborers—Hourly Rate.	.30	.35	.40
2 Men.				13 Men.			
Wages.....	\$1,488	\$1,570	\$1,642	Wages.....	\$6,561	\$7,425	\$8,289
3% Federal Pension, 3% Federal Unemployment Insurance, 6%.	90	94	98	6% Tax.....	394	445	497
Total Wages.....	\$1,588	\$1,664	\$1,740		\$6,955	\$7,870	\$8,786
Work Train Labor.....							
Work Train Expense.....							
Interest—5% on \$8,023.....	\$401	\$401	\$401				
Depredation { 6.6% on \$7,641. (\$504.)	542	542	542				
{ 9.9% on \$382. (\$38.)							
Supplies.....	486	486	486	} Tool—\$10.00 Per Man.....	130	130	130
Running Repairs.....	108	108	108				
Annual Overhaul.....	827	827	827				
Total Cost.....	\$3,952	\$4,028	\$4,104		\$7,085	\$8,000	\$8,916

Curtalement of Force and Expenditures by Use of One Burro Crans With Bucket

180 Day—Hand Organization

	Force	Expenditures	Miscellaneous	
At 30% Rate.....	11	\$3,133	37 Days Loading Scrap.....	1 Foreman .. 12 Laborers.
At 35% Rate.....	11	3,972	22 " Loading, Unloading & Laying Rail.....	1 " -- 9 "
At 40% Rate.....	11	4,812	70 Days Ditching (Straight).....	1 " -- 11 "
			30 " Ditching, Loading & Unloading.....	1 " -- 19 "
			21 Days Distributing Heavy Material.....	1 " -- 7 "

CONCENTRATION OF ECONOMIC POWER

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EXHIBIT No. 2530

A typical main track railroad—1,200 miles main track

Number of machines	Requirement Type	Days operated in one year	Cost	Interest	Depreciation	Supplies and repairs	Operating cost and fixed charges	Men displaced	Man days
6	Power track nutters.....	160	\$4,974	\$249	\$492	\$2,368	\$3,129	18	2,880
2	Power rail drills.....	60	1,264	64	126	364	554	6	360
	Rail laying—4 tie adzers only.....	120	7,616	358	707	2,452	3,517	35	4,200
2	Burro cranes.....	180	16,046	802	1,084	2,842	4,728	22	3,960
8	Air tamping outfits.....	190	68,162	2,904	5,760	13,800	22,464	24	4,560
20	Unit tie tampers.....	180	5,940	295	590	3,005	3,890	10	1,800
2	Drag line crane and 1 bulldozer.....	120	22,301	1,115	1,636	2,756	5,497	17	2,040
2	Discers.....	62	2,484	124	246	596	966	170	8,840
1	Scarifier.....	85	8,097	405	802	1,226	2,433	90	7,650
1	Weed burner.....	75	9,354	468	926	2,769	4,163	150	11,250
2	Weed mowers.....	60	3,642	182	360	1,534	2,076	60	3,600
4	Power jacks and 2 power tampers.....	160	21,100	1,055	2,089	7,780	10,924	106	16,960
	Total.....		\$160,970				\$64,341		68,100

255 working days per year on 5-day week basis:
 $\frac{68,100}{255} = 267$ total men displaced by above mechanization.

$\frac{100,970}{267} = 603$ or for each \$603 invested in M. W. machinery one man will be displaced.

EXHIBIT No. 2531

Total railway capital outstanding

CLASS I RAILWAYS

Year	Stock (000)	Bonds(000)	Total Capital Outstanding (000)	Year	Stock (000)	Bonds(000)	Total Capital Outstanding (000)
1921.....	\$7,302,689	\$9,739,348	\$17,042,037	1930.....	\$8,267,129	\$10,739,147	\$19,006,276
1922.....	7,242,119	9,773,227	17,015,346	1931.....	8,271,977	10,735,198	19,007,175
1923.....	7,356,547	10,234,588	17,591,135	1932.....	8,245,137	10,769,301	19,014,438
1924.....	7,547,567	10,629,842	18,177,399	1933.....	8,232,658	10,613,455	18,846,113
1925.....	7,633,455	10,464,709	18,098,164	1934.....	8,225,836	10,561,826	18,787,662
1926.....	7,685,014	10,571,513	18,256,527	1935.....	8,218,994	10,311,046	18,530,040
1927.....	7,831,282	10,465,754	18,297,036	1936.....	8,029,965	10,001,038	18,031,003
1928.....	8,079,978	10,527,078	18,607,051	1937.....	8,123,195	10,150,244	18,273,439
1929.....	8,184,640	10,637,789	18,822,429	1938.....	8,148,602	9,934,666	18,083,268

Source: Statistics of Railways in United States, 1938, ICC, Table 141; old table 17 in volume for prior years.

EXHIBIT No. 2532

Investment in road and equipment, Class I railways and their lessor companies

Year	Expenditures for New Lines & Extensions	Expenditures for Additions and Betterments	Credits for Property Retired	Total Investment during the year
1921.....	\$18,884,834	\$638,150,618	\$100,322,842	\$456,712,610
1922.....	59,466,185	474,022,769	158,434,456	375,054,498
1923.....	29,952,809	1,038,413,598	265,580,367	802,780,040
1924.....	27,876,910	902,787,824	206,879,197	723,785,637
1925.....	47,317,034	753,595,034	217,066,014	583,826,054
1926.....	38,219,191	831,368,677	214,445,078	655,142,794
1927.....	166,782,844	764,000,365	222,345,686	708,437,523
1928.....	54,578,063	668,345,443	253,112,006	469,811,500
1929.....	34,792,771	829,422,609	325,931,122	538,284,258
1930.....	31,907,722	801,213,940	240,656,949	592,464,713
1931.....	36,043,070	811,799,101	211,145,172	136,666,999
1932.....	6,759,833	162,360,230	194,714,063	D 25,694,020
1933.....	6,470,158	105,574,145	273,369,222	D 161,351,919
1934.....	¹ D 7,657,122	179,282,269	245,372,295	D 173,747,128
1935.....	2,045,149	190,051,138	334,783,432	D 142,687,145
1936.....	11,637,308	302,698,164	354,296,288	D 39,960,916
1937.....	3,535,188	537,390,444	323,058,170	212,867,456
1938.....	1,207,675	258,966,026	244,438,345	15,735,866
	569,820,122	9,649,385,414	4,490,976,725	5,728,228,611

¹ Includes an adjustment of \$15,659,181 made in accounts of A. B. & C. Railway Company, so as to state its investment in road and equipment on basis required by order of the Commission.

Source: Statistics of Railways of United States, ICC, 1938, Table No. 137, and old Table 46 in the Volume for earlier years.

EXHIBIT No. 2533

[Submitted by the Brotherhood of Railway Clerks]

Number and tractive effort of steam locomotives ¹

CLASS I RAILWAYS

Year	Number	Total Tractive Effort (Thousands)	Average Tractive Effort	Year	Number	Total Tractive Effort (Thousands)	Average Tractive Effort
1921.....	64,585	2,385,470	36,935	1930.....	55,875	2,526,940	45,225
1922.....	64,140	2,401,452	37,441	1931.....	54,385	2,488,861	45,764
1923.....	64,939	2,544,115	39,177	1932.....	52,492	2,430,328	46,299
1924.....	65,006	2,593,178	39,891	1933.....	50,064	2,348,821	46,916
1925.....	63,612	2,586,868	40,666	1934.....	47,436	2,263,267	47,712
1926.....	62,342	2,611,238	41,886	1935.....	45,614	2,206,201	48,367
1927.....	60,895	2,606,171	42,798	1936.....	44,162	2,262,699	48,972
1928.....	58,845	2,579,643	43,838	1937.....	43,624	2,153,555	49,412
1929.....	56,936	2,550,818	44,801	1938.....	42,637	2,133,464	49,803

¹ Tractive Effort of boosters not included in totals.

Source: Statistics of Railways in United States, 1938, ICC, Table 18 for years 1929-1938; years 1921-1928 from Statement No. 8 of the 1929 volume.

CONCENTRATION OF ECONOMIC POWER

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EXHIBIT No. 2534

[Submitted by the Brotherhood of Railway Clerks]

Average tractive effort of steam locomotives in service ¹

[Excluding Switching and Terminal Companies]

Year	Passenger	Freight	All Locomotives ²	Year	Passenger	Freight	All Locomotives ²
1921			36,935	1931	33,438	52,219	45,764
1922			37,441	1932	34,087	52,693	46,299
1923			39,177	1933	34,512	53,314	46,916
1924	28,702	46,060	39,891	1934	35,378	54,074	47,712
1925	29,234	46,932	40,666	1935	36,255	54,657	48,367
1926	30,432	48,322	41,886	1936	36,777	55,249	48,972
1927	31,469	49,186	42,798	1937	37,192	55,592	49,412
1928	32,469	50,314	43,838	1938	37,793	55,948	49,803
1929	33,328	52,368	44,801	1939			
1930	32,945	51,672	45,225				

Passenger locomotives ----- % of increase 1938 over 1924=31.7
 Freight locomotives ----- % of increase 1938 over 1929=13.4
 All locomotives ----- % of increase 1938 over 1924=21.5
 ----- % of increase 1938 over 1929= 8.9
 ----- % of increase 1938 over 1921=34.8
 ----- % of increase 1938 over 1929=11.2

¹ Tractive effort of boosters not included in totals.
² In addition to passenger and freight locomotives this total includes those of the type use in passenger or freight and switching service.
 Source: Data for years 1921 to 1928 from Statement No. 3, Statistics of Railways in U. S., 1929, ICC years 1929 to 1938 from Statement No. 8, Statistics of Railways in U. S., ICC 1938.

EXHIBIT No. 2535

[Submitted by the Brotherhood of Railway Clerks]

Fuel consumed in freight and passenger service

CLASS I RAILWAYS ¹

[Coal or Equivalent]

Year	Per 1,000 Gross ton-miles Freight Service	Per passenger train car-mile	Year	Per 1,000 Gross ton-miles Freight Service	Per passenger train car-mile
1921	162 lbs.	17.7 lbs.	1931	119 lbs.	14.5 lbs.
1922	163	17.9	1932	123	14.9
1923	161	18.1	1933	121	15.2
1924	149	17.0	1934	122	15.2
1925	140	16.1	1935	120	15.5
1926	137	15.8	1936	119	15.3
1927	131	15.4	1937	117	15.1
1928	127	15.0	1938	115	14.9
1929	125	14.9	1939	112	14.8
1930	121	14.7			

Decrease in fuel consumption, Freight Service 1921 to 1939=30.9.
 Decrease in fuel consumption, Passenger Service 1921 to 1939=16.4.

¹ Includes locomotives.

Source: Freight service data for years 1921-1932 from p. 8, 44, Statistics of Railways in U. S. 1932, ICC; data for years 1933-1935 from p. 8, 52, Statistics of Railways in U. S. 1936, ICC; 1937 from p. 182, statement #56, Statistics of Railways in U. S. 1937, ICC, 1938 from Table 165, 1939 from ICC Statement M-230 (OS-E).
 Passenger service data for years 1921-1925 from p. 16, Table IV, Economic Factors in Railway Situation, Miscellaneous Series No. 39, Bureau of Railway Economics; years 1926-1934, p. 88, Railroad Facts, Western Railway Committee on Public Relations; 1935-1937 from Statement No. 66 of the Statistics of Railways in U. S., ICC, for the same years. 1938 from Table 165. 1939 from ICC Statement M-230 (OS-E).

CONCENTRATION OF ECONOMIC POWER

EXHIBIT No. 2536

[Submitted by the Brotherhood of Railway Clerks]

Locomotives, passenger and freight cars installed and retired¹

CLASS I RAILWAYS

Year	No. of Freight Cars		No. of passenger Cars		Locomotives	
	Installed During the Year	Retired During the Year	Installed During the Year	Retired During the Year	Installed During the Year	Retired During the Year
1921.....	63,406	69,245	1,681	929	1,330	1,130
1922.....	105,394	126,471	1,328	1,286	1,226	1,082
1923.....	232,060	213,789	2,658	2,360	4,360	3,746
1924.....	156,572	118,590	2,755	2,295	2,786	2,629
1925.....	139,083	128,573	3,230	3,569	1,600	2,873
1926.....	93,369	103,182	3,455	3,309	1,882	3,105
1927.....	73,254	96,991	2,646	3,612	1,542	2,976
1928.....	62,945	90,707	2,524	3,252	1,017	3,047
1929.....	94,946	115,869	2,663	3,499	1,229	3,134
1930.....	81,038	82,101	1,900	2,036	1,160	2,204
1931.....	14,910	82,828	697	1,938	482	1,802
1932.....	8,545	69,394	579	1,928	477	2,316
1933.....	6,410	117,268	607	3,443	268	2,681
1934.....	31,366	129,026	703	3,368	312	2,912
1935.....	18,496	122,346	730	3,049	424	2,150
1936.....	75,979	131,754	1,123	1,631	1,054	1,798
1937.....	91,128	105,324	1,074	1,413	877	1,321
1938.....	26,721	70,235	642	1,592	396	1,237

¹ "Installed" includes new and used equipment purchased; equipment leased from others; the return to service of equipment that was leased to others; equipment rebuilt or converted, and units (except locomotives) transferred from one class of service to another. "Retired" includes equipment permanently withdrawn from transportation service; equipment leased to others; the return of leased equipment to the owning company; equipment rebuilt or converted, and units (except locomotives) transferred from one class of service to another.

Source: Statistics of Railways in United States, 1938, ICC, Table 26 for years 1929-1938; years 1921-1928 from Statement No. 15 of the volume for the year 1929.

EXHIBIT No. 2537

[Submitted by the Brotherhood of Railway Clerks]

Average capacity of freight cars in service of class I steam railways, 1921 to 1938

Year	Average Capacity, Tons	Year	Average Capacity, Tons	Year	Average Capacity, Tons
1921.....	42.5	1928.....	45.8	1935.....	48.3
1922.....	43.1	1929.....	46.3	1936.....	48.8
1923.....	43.8	1930.....	46.6	1937.....	49.2
1924.....	44.3	1931.....	47.0	1938.....	49.4
1925.....	44.8	1932.....	47.0		
1926.....	45.1	1933.....	47.5		
1927.....	45.5	1934.....	48.0		

% of increase to 1938 since 1921=16.3.

% of increase to 1938 since 1929=6.7.

Source: Data for years 1921 to 1928 from Statement No. 9, Statistics of Railways in U. S., 1929, ICC; 1929 to 1938 from Statement No. 9, Statistics of Railways in U. S., ICC, 1938.

CONCENTRATION OF ECONOMIC POWER

17371

EXHIBIT No. 2538

[Submitted by the Brotherhood of Railway Clerks]

Ties laid in replacement ¹

CLASS I RAILWAYS, 1921-1938

Year	Untreated Ties	Treated Ties	Total Ties Other Than Wood	Total Tie Replacements	Per cent of Treated Ties Used to Total Replacements
	(Thousands)	(Thousands)	(Thousands)	(Thousands)	
1921.....	40,913	36,072	536	86,521	41.7
1922.....	45,458	40,630	554	86,642	46.9
1923.....	42,332	41,668	447	84,435	49.3
1924.....	38,580	44,490	3	83,073	53.6
1925.....	32,623	60,090	3	82,716	60.6
1926.....	25,185	55,558	3	80,746	68.8
1927.....	21,240	57,083	17	78,340	72.9
1928.....	18,192	59,158	22	77,372	76.5
1929.....	15,615	59,047	17	74,679	79.1
1930.....	13,619	49,720	15	63,354	78.5
1931.....	11,659	39,828	15	51,502	77.3
1932.....	9,741	29,435	15	39,191	75.1
1933.....	10,947	26,340	9	37,296	70.6
1934.....	11,482	31,808	16	43,306	73.4
1935.....	11,029	33,281	16	44,326	75.1
1936.....	10,573	36,772	16	47,361	77.6
1937.....	9,639	38,075	16	47,730	79.8
1938.....	7,690	33,783	(²)	41,453	81.4
1939.....	(³)	(³)	(³)	(³)	(³)

- ¹ Does not include bridge and switch ties.
- ² Includes a small number of secondhand ties.
- ³ Less than one thousand.
- ⁴ Not yet available.

Source: Statistics of Railways in U. S., ICC, Statement No. 51 for years 1921 to 1925 inclusive; 1926 to 1928 inclusive from the 1933 volume p. 8-95; 1929 to 1938 inclusive from the 1938 volume, Table 91.

EXHIBIT No. 2539

[Submitted by the Brotherhood of Railway Clerks]

Annual expenditures for small tools and supplies, and roadway machines, class I carriers, 1910 to 1938, inclusive

Year	Small Tools and Supplies	Roadway Machines	Year	Small Tools and Supplies	Roadway Machines
Year ended June 30:			Year ended Dec. 31—Con.		
1910.....	\$5,141,983	(¹)	1926.....	\$11,876,012	\$6,947,613
1911.....	4,459,271	(¹)	1927.....	11,564,375	7,104,394
1912.....	4,479,555	(¹)	1928.....	10,759,423	7,053,346
1913.....	5,689,129	(¹)	1929.....	12,101,729	7,757,683
1914.....	5,337,876	(¹)	1930.....	9,470,255	7,067,190
1915.....	3,376,160	\$1,340,554	1931.....	6,585,022	5,249,387
1916.....	4,447,480	1,761,241	1932.....	4,447,016	3,470,638
Year ended Dec. 31:			1933.....	4,464,060	3,586,814
1916.....	5,103,136	1,977,056	1934.....	5,622,747	5,043,523
1917.....	6,127,127	2,417,028	1935.....	5,643,328	5,400,701
1918.....	8,168,315	3,652,491	1936.....	6,966,327	6,485,995
1919.....	11,217,818	5,012,463	1937.....	8,031,657	7,376,510
1920.....	12,822,470	6,429,178	1938.....	5,896,303	5,569,909
1921.....	9,294,982	4,902,642	Total 1920-1929 inclusive.....		
1922.....	9,632,916	5,168,492	110,000,348		
1923.....	11,143,440	6,158,319	Total 1930-1938 inclusive.....		
1924.....	10,036,182	5,954,639	57,126,645		
1925.....	10,768,819	6,216,123			

¹ Not reported by I. C. O. prior to 1916.

Source: STATISTICS OF RAILWAYS IN THE UNITED STATES, 1910 Statement 48A; 1911, Statement 41A; 1912, Statement 43A; 1913 and 1914, Statement 42A; 1915 to June 30, 1916, Statement 39; calendar year 1916 to 1919, Statement 37; 1920 and 1921, Statement 36; 1922 to 1937, Statement 37; 1938, Table 89.

CONCENTRATION OF ECONOMIC POWER

EXHIBIT No. 2540

[Submitted by the Brotherhood of Railway Clerks]

Total number of employes, total number of hours worked, and total compensation, class I carriers, in the United States, excluding switching and terminal companies for specified years

Year (1)	Employes		Total Time Paid For		Compensation	
	Number (2)	Index (3)	Hours (4)	Index (5)	Amount (6)	Index (7)
			(000)		(000)	
1920.....	2,022,832	100.0	5,446,741	100.0	\$3,681,801	100.0
1921.....	1,659,513	82.0	4,147,319	76.1	2,765,218	74.9
1922.....	1,626,834	80.4	4,311,097	79.1	2,640,817	71.7
1923.....	1,857,674	91.8	4,928,651	90.5	3,004,072	81.6
1924.....	1,761,362	86.6	4,534,879	83.3	2,825,775	76.7
1925.....	1,744,311	86.2	4,531,361	83.2	2,860,900	77.7
1926.....	1,779,275	88.0	4,671,736	85.8	2,946,114	80.0
1927.....	1,735,105	85.8	4,519,281	83.0	2,910,183	79.0
1928.....	1,656,411	81.9	4,313,574	79.2	2,826,590	76.8
1929.....	1,660,850	82.1	4,346,822	79.8	2,896,566	78.7
1930.....	1,487,839	73.5	3,759,772	69.0	2,550,789	69.3
1931.....	1,258,719	62.2	3,039,110	55.8	2,094,994	56.9
1932.....	1,031,703	51.0	2,378,206	43.7	1,512,816	41.1
1933.....	971,196	48.0	2,233,045	41.0	1,403,841	38.1
1934.....	1,007,702	49.8	2,393,899	44.0	1,519,352	41.3
1935.....	994,371	49.2	2,397,353	44.0	1,543,379	41.6
1936.....	1,065,624	52.7	2,675,345	49.1	1,848,636	50.2
1937.....	1,114,663	55.1	2,799,639	51.4	1,985,447	53.9
1938.....	939,171	46.4	2,329,606	42.8	1,746,141	47.4
1939.....	967,943	48.8	2,489,689	45.7	1,863,503	50.6

NOTE.—Includes executives, officials, and staff assistants.

Source: Statistics of Railways in the United States, ICC, Statement No. 16; 1933 from Table 67 (old Table No. 16); 1939 from Statement M-300, ICC.

EXHIBIT No. 2541

[Submitted by the Brotherhood of Railway Clerks]

Average number of employes by major subdivisions ¹

[Average of Middle of Month Count for the Twelve-Months' Period]

Major Subdivisions	1921 ²	1922	1923	1924	1925	1926	1927	1928	1929	1930
I. Executives, officials, and staff assistants.....	15,164	15,250	16,088	16,035	16,261	16,570	16,710	16,664	16,701	16,313
II. Professional, clerical, and general.....	274,282	277,514	282,491	278,136	278,036	280,928	276,595	267,319	265,885	249,969
III. Maintenance of way and structures.....	395,057	359,885	308,291	384,568	385,414	413,058	410,772	396,025	406,259	345,306
IV. Maintenance of equipment and stores.....	480,985	451,589	584,573	529,037	518,975	513,830	485,040	456,172	450,380	400,939
V. Transportation (other than train, engine and yard).....	208,782	202,578	213,455	205,994	205,904	206,652	202,267	194,913	193,469	178,597
VI. (a) Transportation (yardmasters, switchtenders, and hostlers).....	23,523	22,934	25,548	23,946	23,350	23,449	22,578	21,332	20,990	19,474
VI. (b) Transportation (train and engine service).....	297,680	297,084	337,228	313,846	315,344	324,788	315,143	303,986	306,566	277,241
Total Above Group (all employes).....	1,895,473	1,626,834	1,857,674	1,751,362	1,744,311	1,779,275	1,735,105	1,656,411	1,660,850	1,487,839

Major Subdivisions	1931	1932	1933	1934	1935	1936	1937	1938	1939
I. Executives, officials, and staff assistants.....	15,115	13,366	12,223	12,010	11,911	12,010	12,309	11,905	11,745
II. Professional, clerical, and general.....	218,933	181,855	163,432	165,160	163,085	167,338	176,147	169,072	163,059
III. Maintenance of way and structures.....	272,307	213,259	198,154	208,369	206,034	224,266	231,280	186,812	201,943
IV. Maintenance of equipment and stores.....	339,834	279,125	262,572	276,131	271,258	280,437	311,125	239,784	264,160
V. Transportation (other than train, engine and yard).....	158,845	132,404	123,396	124,870	122,886	127,545	134,088	122,852	125,149
VI. (a) Transportation (yardmasters, switchtenders, and hostlers).....	16,584	13,485	12,107	12,423	12,202	12,811	13,483	12,062	12,141
VI. (b) Transportation (train and engine service).....	238,881	198,209	199,312	208,739	206,995	225,167	236,231	202,684	209,749
Total Above Group (all employes).....	1,258,719	1,031,703	971,196	1,007,702	994,371	1,065,624	1,114,663	939,171	987,943

¹ Data for year 1921 includes Switching and Terminal Companies; for years 1922-1938 excludes Switching and Terminal Companies.

² Data for last six months of year, only comparable basis available.

Source: Statement No. 16, Statistics of Railways in U. S., I. C. C., for years 1921-1938. 1939 data from I. C. C. Statement M-300.

Average number of employes by major subdivisions—Continued

Group	Change, 1923 to 1929	Change, 1929 to 1933	Change, 1929 to 1939	Change, 1923 to 1939	Group	Change, 1923 to 1929	Change, 1929 to 1933	Change, 1929 to 1939	Change, 1923 to 1939
	Percent	Percent	Percent	Percent		Percent	Percent	Percent	Percent
I.....	+3.8	-26.8	-29.8	-27.0	Via.....	-17.8	-42.8	-42.2	-52.5
II.....	-5.9	-32.5	-38.7	-42.3	Vib.....	-9.1	-35.0	-31.6	-37.8
III.....	+2.2	-51.8	-50.4	-49.3	Total.....	-10.6	-41.5	-40.5	-46.8
IV.....	-23.0	-41.7	-41.8	-54.8					
V.....	-9.4	-36.2	-35.3	-41.4					

EXHIBIT No. 2542

[Submitted by the Brotherhood of Railway Clerks]

Average hourly or daily earnings of employes by major subdivisions¹

CLASS I RAILWAYS IN THE UNITED STATES

Major subdivisions	1921*	1922	1923	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933	1934	1935	1936	1937	1938	1939
I. Executives, officials & staff assistants: Daily basis.....	\$15.70	\$15.97	\$16.20	\$16.48	\$16.73	\$16.86	\$17.24	\$17.51	\$17.80	\$18.15	\$18.27	\$16.68	\$16.24	\$16.19	\$17.08	\$17.49	\$18.12	\$18.35	\$18.38
II. Professional, clerical & general:																			
Daily basis.....	6.72	6.74	6.83	6.97	7.03	7.11	7.29	7.43	7.51	7.64	7.73	7.08	7.03	7.14	7.72	7.80	7.96	8.22	8.25
Hourly basis.....	.578	.566	.570	.583	.587	.593	.609	.624	.632	.639	.645	.592	.589	.597	.646	.651	.672	.705	.708
III. Maintenance of way & structures:																			
Daily basis.....	8.73	8.88	8.92	8.95	9.09	9.12	9.20	9.21	9.29	9.36	9.33	8.38	8.28	8.36	9.04	9.17	9.28	9.56	9.57
Hourly basis.....	.437	.418	.426	.431	.434	.436	.439	.442	.446	.459	.467	.429	.420	.430	.462	.460	.482	.518	.517
IV. Maintenance of equipment & stores:																			
Daily basis.....	8.83	8.94	8.82	8.85	8.94	8.94	9.03	9.01	9.09	9.15	9.16	8.22	7.98	8.17	8.82	8.91	9.08	9.31	9.34
Hourly basis.....	.621	.602	.583	.590	.590	.604	.616	.619	.645	.649	.647	.587	.582	.593	.642	.654	.671	.696	.703
V. Transportation (other than train, engine & yard):																			
Daily basis.....	3.81	3.24	3.24	3.28	3.32	3.36	3.45	3.48	3.54	3.59	3.58	3.21	3.17	3.22	3.49	3.53	3.73	3.96	3.99
Hourly basis.....	.544	.533	.534	.546	.549	.553	.564	.575	.580	.588	.595	.552	.545	.550	.591	.592	.606	.643	.641
VIa. Transportation (yardmasters, switchtenders & hostlers):																			
Daily basis.....	8.43	8.45	8.40	8.48	8.51	8.51	8.73	8.83	8.97	8.97	8.96	8.09	7.95	8.09	8.70	8.84	9.01	9.29	9.31
Hourly basis.....	.609	.616	.616	.635	.651	.654	.600	.695	.694	.693	.692	.631	.623	.631	.683	.692	.707	.748	.748

VII. Transportation (train & engine service): Hourly basis.	.787	.791	.789	.819	.838	.814	.840	.860	.866	.864	.861	.785	.777	.787	.853	.867	.879	.923	.922
All employees:																			
Daily basis.....	7.45	7.55	7.64	7.73	7.94	7.94	8.13	8.26	8.40	8.53	8.56	7.72	7.55	7.64	8.21	8.35	8.63	8.88	8.92
Hourly basis.....	.596	.588	.586	.597	.605	.604	.615	.625	.636	.644	.651	.600	.595	.602	.651	.659	.676	.713	.714
Total above groups—all employees—average hourly compensation.....	.620	.613	.610	.623	.631	.631	.644	.655	.666	.678	.689	.636	.629	.635	.686	.691	.709	.750	.748

¹ Data for year 1921 includes Switching and Terminal Companies; for years 1922-1939 *excludes* Switching and Terminal Companies.

² Data for last six months of year, only comparable basis available.

Source: Statement No. 16, Statistics of Railways in United States, I. O. C., for years 1921-1938. 1939 data from I. O. C. Statement M-300.

EXHIBIT No. 2543

[Submitted by the Brotherhood of Railway Clerks]

**AVERAGE HOURLY COMPENSATION
OF RAILROAD EMPLOYEES IN THE UNITED STATES**
CLASS I RAILROADS REPRESENTING 94% OF MILEAGE OPERATED
AND APPROXIMATELY 95% OF TOTAL NUMBER OF EMPLOYEES

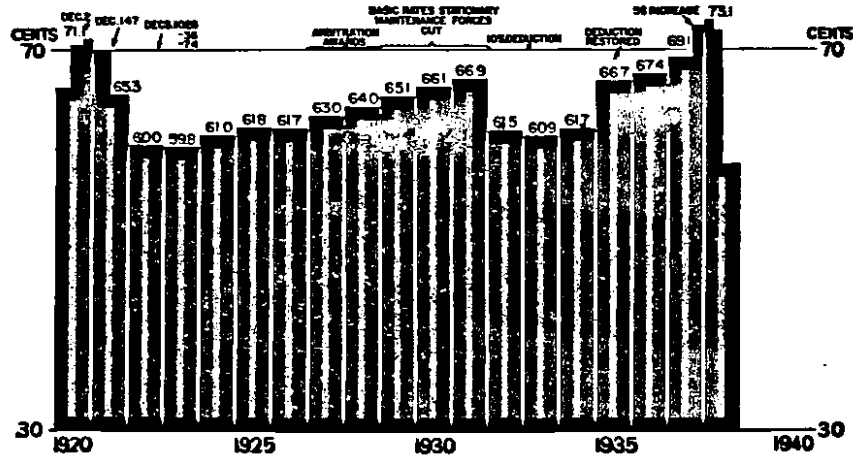


EXHIBIT No. 2544

[Submitted by the Brotherhood of Railway Clerks]

Total operating revenues and total employees' compensation, class I carriers, excluding switching and terminal companies, in the United States, for specified years

Year (1)	Operating Revenues		Employees' Compensation	
	Amount (2)	Index (3)	Amount (4)	Index (5)
1920	\$6,173,121	100.0	\$3,681,801	100.0
1921	5,516,598	89.3	2,765,218	74.9
1922	5,559,093	90.0	2,640,817	71.7
1923	6,289,580	101.8	3,004,072	81.6
1924	5,921,496	95.8	2,825,775	76.7
1925	6,122,510	99.1	2,860,600	77.7
1926	6,382,940	103.3	2,948,114	80.0
1927	6,136,300	99.3	2,910,183	79.0
1928	6,111,736	98.9	2,826,590	76.8
1929	6,279,521	101.6	2,896,566	78.7
1930	5,281,197	85.5	2,550,789	69.3
1931	4,183,343	67.8	2,094,964	56.9
1932	3,126,760	50.6	1,512,816	41.1
1933	3,095,404	50.1	1,403,841	38.1
1934	3,271,967	53.0	1,519,352	41.3
1935	3,451,929	55.9	1,643,879	44.6
1936	4,032,734	65.6	1,848,636	50.2
1937	4,166,069	67.4	1,965,447	53.9
1938	3,565,491	57.7	1,746,141	47.4
1939	3,995,071	64.7	1,863,503	50.6

Source: Operating Revenues from Statistics of Railways in the United States, Statement No. 35, ICC, (1938, Table 80); 1939 from Statement M-100, ICC. Compensation from Statistics of Railways in the United States, ICC, Statement No. 16; 1938 from Table No. 67 (old Table No. 16); 1939 from Statement M-300, ICC.

EXHIBIT No. 2545

[Submitted by the Brotherhood of Railway Clerks]

Distribution of railway operating revenues of Class I railways in the United States, calendar years ended December 31, 1920 to 1939

[Railways having annual operating revenues above \$1,000,000—excludes returns of switching and terminal companies]

DISTRIBUTION EXPRESSED IN CENTS PER DOLLAR OF GROSS REVENUE

Item	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929
1 Total operating revenues	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
2 Labor (salaries and wages) ¹	55.4	48.9	44.4	44.3	44.3	43.2	42.6	43.9	43.0	42.6
3 Fuel (steam locomotive)	10.9	9.5	9.3	8.4	7.4	6.6	6.4	6.3	5.8	5.4
4 Other materials and supplies and miscellaneous ²	22.1	20.6	20.7	20.1	19.1	18.9	18.6	18.5	17.7	17.7
5 Loss & damage, inj. to persons, insurance & pensions ³	3.6	2.9	2.0	1.8	1.8	1.7	2.0	2.0	2.0	2.0
6 Depreciation	2.3	2.8	3.0	3.2	3.5	3.7	3.6	3.9	3.9	4.1
7 Taxes	4.4	5.0	5.4	5.3	5.8	5.9	6.1	6.1	6.4	6.3
8 Hire of equipment and joint facility net rentals	1.0	1.4	1.5	1.6	1.7	1.7	1.7	1.9	2.0	2.0
9 Total expenses and taxes	99.7	89.1	86.3	84.7	83.6	81.7	81.0	82.6	80.8	80.1
10 Net railway operating income	0.3	10.9	13.7	15.3	16.4	18.3	19.0	17.4	19.2	19.9

Item	1930	1931	1932	1933	1934	1935	1936	1937	1938	1939
1 Total operating revenues	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
2 Labor (salaries and wages) ¹	44.8	48.9	46.0	43.2	44.1	45.0	42.0	44.8	46.5	44.4
3 Fuel (steam locomotive)	5.4	5.3	5.4	5.1	5.8	5.9	5.8	6.2	6.3	(3)
4 Other materials and supplies and miscellaneous ²	17.4	17.0	16.2	15.4	15.9	16.3	16.5	17.3	16.3	(3)
5 Loss & damage, inj. to persons, insurance & pensions ³	2.2	2.5	2.6	2.5	3.0	2.3	2.3	1.8	1.6	(3)
6 Depreciation	4.6	5.3	6.7	6.5	5.9	5.8	4.8	4.7	5.7	5.1
7 Taxes	6.6	7.3	8.8	8.1	7.3	6.9	7.9	7.8	9.5	8.9
8 Hire of equipment and joint facility net rentals	2.5	3.2	3.9	3.9	3.9	3.5	3.3	3.2	3.6	3.3
9 Total expenses and taxes	83.5	87.5	89.6	84.7	85.9	85.5	83.5	85.8	89.5	85.3
10 Net railway operating income	16.5	12.5	10.4	15.3	14.1	14.5	16.5	14.2	10.5	14.7

¹ Labor expenditures do not include that portion of payroll chargeable to Capital Account.

² Includes a relatively small amount of uncollectible railway revenues for years 1920 to 1925, inclusive.

³ Includes a relatively small amount of uncollectible railway revenues for years 1926 to 1935, inclusive.

⁴ Not yet available.

Source: Years 1920-1925, inclusive, from Statistical Summary No. 12, Statistics of Railways of Class I; years 1926-1928, inclusive, from Statistical Summary No. 23, Statistics of Railways of Class I; Bureau of Railway Economics.

EXHIBIT No. 2546

[Submitted by the Brotherhood of Railway Clerks]

Operating revenue per employee, per hour of service and per dollar of compensation, class I carriers, excluding switching and terminal companies, in the United States, for specified years

Year (1)	Total Operating Revenues		Total Operating Revenue Per					
	Amount (000) (2)	Index (3)	Employee (4)	Index (5)	Hour of Service (6)	Index (7)	Dollar Index of Comp'n (8) (9)	
1920	\$6,178,121	100.0	\$3,054	100.0	\$1.13	100.0	\$1.68	100.0
1921	5,516,598	89.2	3,324	108.8	1.33	117.7	1.99	118.5
1922	5,559,093	90.0	3,417	111.9	1.29	114.2	2.11	125.6
1923	6,289,530	101.8	3,384	110.8	1.28	113.3	2.09	124.4
1924	5,921,496	95.8	3,381	110.7	1.31	115.9	2.10	135.0
1925	6,212,510	99.1	3,510	114.9	1.35	119.5	2.14	127.4
1926	6,382,940	103.2	3,587	117.5	1.37	121.2	2.17	129.2
1927	6,138,300	99.3	3,537	115.8	1.38	120.4	2.11	125.6
1928	6,111,736	98.9	3,690	120.8	1.42	125.7	2.16	128.6
1929	6,279,521	101.6	3,781	123.8	1.44	127.4	2.17	129.2
1930	5,281,197	85.5	3,550	116.2	1.40	123.9	2.07	123.2
1931	4,188,343	67.8	3,327	108.9	1.38	122.1	2.00	119.0
1932	3,126,760	50.6	3,031	99.2	1.31	115.9	2.07	123.2
1933	3,095,404	50.1	3,187	104.4	1.39	123.0	2.20	131.0
1934	3,271,567	53.0	3,247	106.3	1.37	121.2	2.15	128.0
1935	3,451,929	55.9	3,471	113.7	1.44	127.4	2.10	125.0
1936	4,052,734	65.6	3,803	124.5	1.51	133.6	2.19	130.4
1937	4,166,069	67.4	3,738	122.4	1.49	131.9	2.10	125.0
1938	3,565,491	57.7	3,796	124.3	1.53	135.4	2.04	121.4
1939	3,995,071	64.7	4,044	132.4	1.60	141.6	2.14	127.4

Source: Operating Revenues from Statistics of Railways in the United States, Statement No. 35, ICC, (1933, Table 80); 1939 from Statement M-100, ICC. Employee, Hours and Compensation data from accompanying table showing totals.

EXHIBIT No. 2547

(Chart based on following statistical data appears in text on p. 18628)

Freight revenues per revenue ton-mile, wages per revenue ton-mile and freight revenues received for revenue ton-mile carried per employee, class I carriers, excluding switching and terminal companies, in the United States, for specified years

Year (1)	Freight Revenues per Revenue Ton-Mile		Wages Per Revenue Ton-Mile		Freight Revenues Received for Rev. Ton-Mile Carried per Employee	
	Amount (cents) (2)	Index (3)	Amount (cents) (4)	Index (5)	Amount (6)	Index (7)
1920	1.052	100.0	.897	100.0	\$2.134	100.0
1921	1.275	121.2	.901	100.4	2.241	106.0
1922	1.177	111.9	.778	86.7	2.455	115.0
1923	1.116	106.1	.728	81.2	2.479	116.2
1924	1.116	106.1	.628	70.2	2.475	116.0
1925	1.097	104.3	.691	77.0	2.602	121.9
1926	1.081	102.8	.684	74.0	2.606	122.3
1927	1.080	102.7	.679	75.7	2.669	125.1
1928	1.081	102.8	.643	72.8	2.825	132.4
1929	1.076	102.3	.648	72.2	2.898	135.8
1930	1.063	101.0	.665	74.1	2.740	128.4
1931	1.051	99.9	.677	75.5	2.582	121.0
1932	1.046	99.4	.647	72.1	2.373	111.2
1933	.999	95.0	.563	62.8	2.564	120.1
1934	.973	93.0	.565	63.0	2.606	122.2
1935	.988	93.9	.583	65.0	2.802	131.3
1936	.974	92.6	.545	60.8	3.101	145.3
1937	.935	88.9	.551	61.4	3.025	141.8
1938	.983	93.4	.602	67.1	3.039	142.4
1939	.974	92.6	.559	62.3	3.267	154.0

Source: Statistics of Railways in the United States, ICC. Revenues per ton-mile, Statement No. 25 (1933, Table 44); 1939 from Statement M-220, ICC. Wages per ton-mile—Total Employees' Compensation divided by Total Revenues Ton Mileage. Revenue received for ton-mile carried per employee—Ton-Miles per Employee multiplied by revenues per ton-mile.

EXHIBIT No. 2548

[Submitted by the Brotherhood of Railway Clerks]

Total mileage of track operated by class I railways, excluding switching and terminal companies, in the United States, and number of employes, number of hours worked, and total compensation of employes per mile of track operated for specified years

Year (1)	Total Mileage All Tracks Operated		Employes Per Mile of Track Operated		Hours Worked Per Mile of Track Operated		Total Compensation Per Mile of Track Operated	
	Mileage (2)	Index (3)	Number (4)	Index (5)	Number (6)	Index (7)	Amount (8)	Index (9)
1920	377, 379	100.0	5.4	100.0	14, 483	100.0	\$9, 756	100.0
1921	379, 254	100.5	5.0	92.6	10, 935	75.8	6, 828	70.0
1922	362, 143	101.3	4.3	79.6	11, 261	78.2	6, 911	70.8
1923	335, 856	102.2	4.8	88.9	12, 773	88.5	7, 785	79.8
1924	367, 862	102.8	4.5	83.3	11, 691	81.0	7, 265	74.7
1925	391, 639	103.8	4.5	83.3	11, 573	80.2	7, 306	74.9
1926	394, 944	104.7	4.5	83.3	11, 829	82.0	7, 460	76.5
1927	399, 214	105.8	4.3	79.6	11, 320	78.4	7, 290	74.7
1928	403, 481	106.9	4.1	75.9	10, 691	74.1	7, 005	71.8
1929	406, 453	107.7	4.1	75.9	10, 695	74.1	7, 125	73.1
1930	407, 999	108.1	3.6	66.7	9, 215	63.8	6, 262	64.1
1931	408, 237	108.2	3.1	57.4	7, 444	51.6	5, 132	52.6
1932	407, 069	107.9	2.5	46.3	5, 842	40.5	3, 710	38.1
1933	404, 908	107.3	2.4	44.4	5, 515	38.2	3, 467	35.5
1934	402, 431	106.6	2.5	46.3	5, 949	41.2	3, 775	38.7
1935	400, 271	106.1	2.5	46.3	5, 989	41.5	4, 107	42.1
1936	397, 844	105.4	2.7	50.0	6, 725	46.6	4, 647	47.6
1937	395, 633	104.8	2.8	51.9	7, 076	49.0	5, 018	51.4
1938	393, 541	104.3	2.4	44.4	5, 920	41.0	4, 437	45.5

Source: STATISTICS OF RAILWAYS IN THE UNITED STATES, I. C. C. Mileage all Tracks Operated, Statement No. 3 (1938, Table 4) Employes, Hours and Compensation data from accompanying table showing totals.

EXHIBIT No. 2549

[Submitted by the Brotherhood of Railway Clerks]

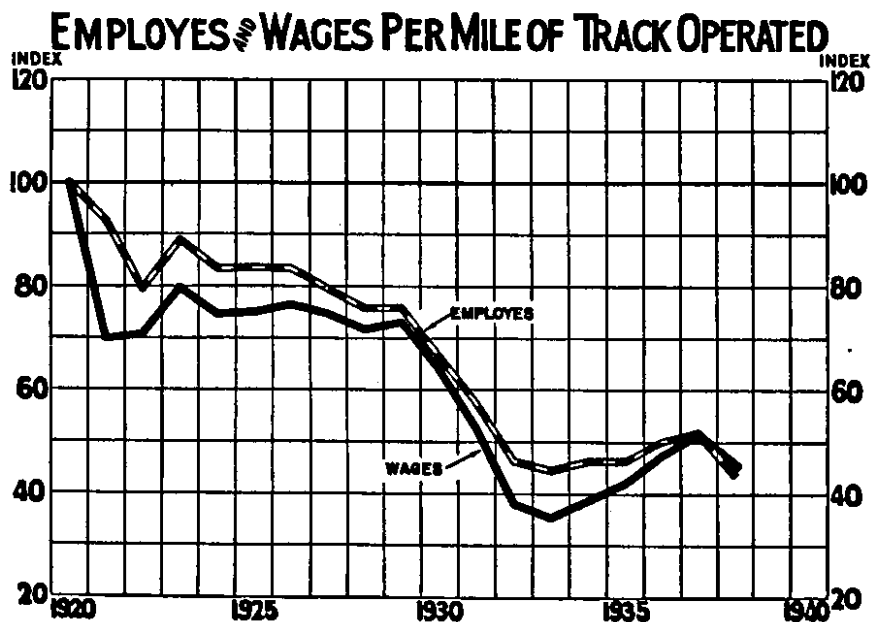
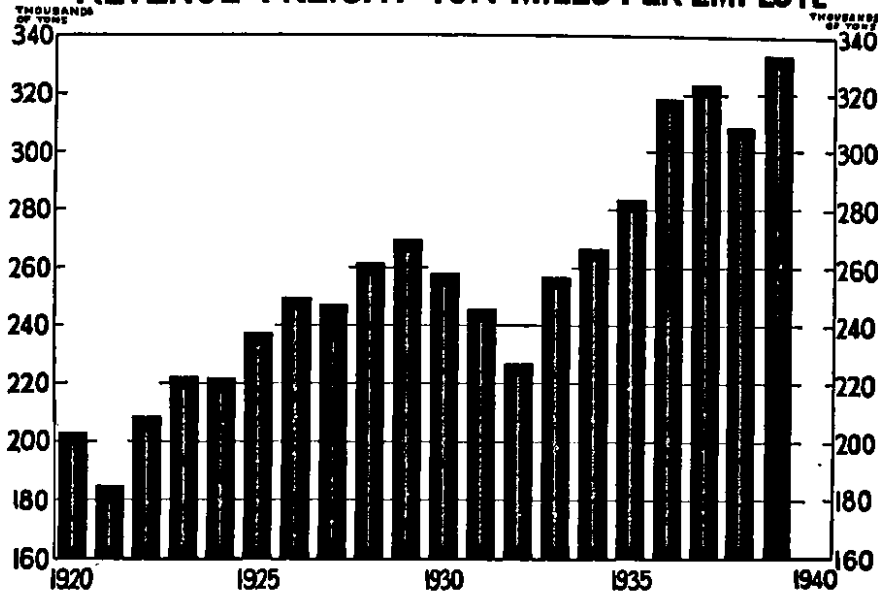


EXHIBIT No. 2550

[Submitted by the Association of American Railroads]

REVENUE FREIGHT TON-MILES PER EMPLOYE



[Chart based on following statistical data appears above.]

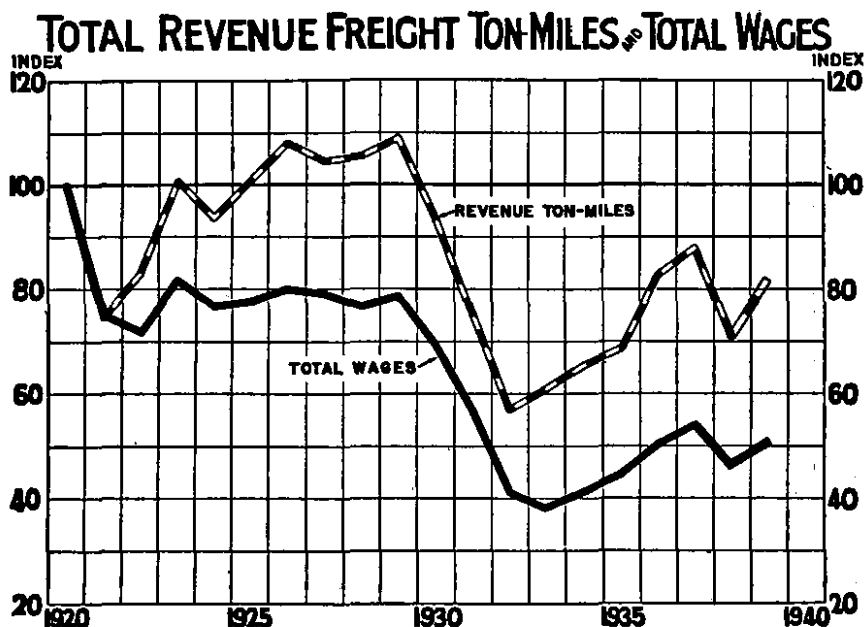
Revenue freight ton-miles per employe, per hour of service, and per dollar of compensation, class I railways, excluding switching and terminal companies, in the United States, for specified years

Year (1)	Rev. Frt. Ton-Miles		Revenue Freight Ton-Miles Per					
	Number (2)	Index (3)	Em- ploye (4)	Index (5)	Hour of Service (6)	Index (7)	Dollar of Comps'n (8)	Index (9)
	(000)							
1920	410,306,210	100.0	202,638	100.0	75.8	100.0	111.4	100.0
1921	306,840,204	74.8	184,898	91.2	74.0	98.8	111.0	99.6
1922	339,285,347	82.7	208,550	102.8	78.7	104.5	128.5	115.4
1923	412,727,228	100.6	222,175	109.5	83.7	111.2	137.4	123.3
1924	388,415,812	93.7	221,779	109.3	85.6	113.7	137.5	123.4
1925	413,914,261	100.9	237,237	117.0	91.8	121.2	144.7	129.9
1926	443,746,487	108.1	240,398	123.0	95.0	126.9	150.6	135.2
1927	428,736,962	104.5	247,096	121.8	94.9	126.0	147.3	132.2
1928	432,915,185	105.5	261,357	128.8	100.4	133.3	163.2	137.5
1929	447,321,561	109.0	269,333	132.8	102.3	136.7	164.4	138.6
1930	383,449,588	93.5	257,723	127.1	102.0	135.5	160.3	134.9
1931	309,224,879	75.4	245,666	121.1	101.7	135.1	147.6	132.5
1932	233,977,009	57.0	226,788	111.8	98.4	130.7	154.7	136.9
1933	249,223,180	60.7	256,615	126.5	111.6	148.2	177.5	159.3
1934	268,710,507	65.5	266,657	131.5	112.2	149.3	176.9	158.8
1935	282,036,932	68.7	283,633	139.8	117.6	149.0	171.6	154.0
1936	330,245,826	82.7	318,364	156.9	126.8	168.4	183.5	164.7
1937	360,620,269	87.9	323,524	159.5	128.8	171.0	181.6	163.0
1938	390,084,371	70.7	308,873	152.3	124.5	165.8	166.1	149.1
1939	333,444,199	81.3	337,514	166.4	133.0	177.8	178.9	160.6

Source: Revenue Freight Ton-Miles from Statistics of Railways in the United States, Statement No. 25 (1938, Table 44); 1939 from Statement M-230, I.C.C. Employees, Hours and Compensation data from accompanying table showing totals.

EXHIBIT No. 2551

[Submitted by the Brotherhood of Railway Clerks]



[Chart based on following statistical data appears above.]

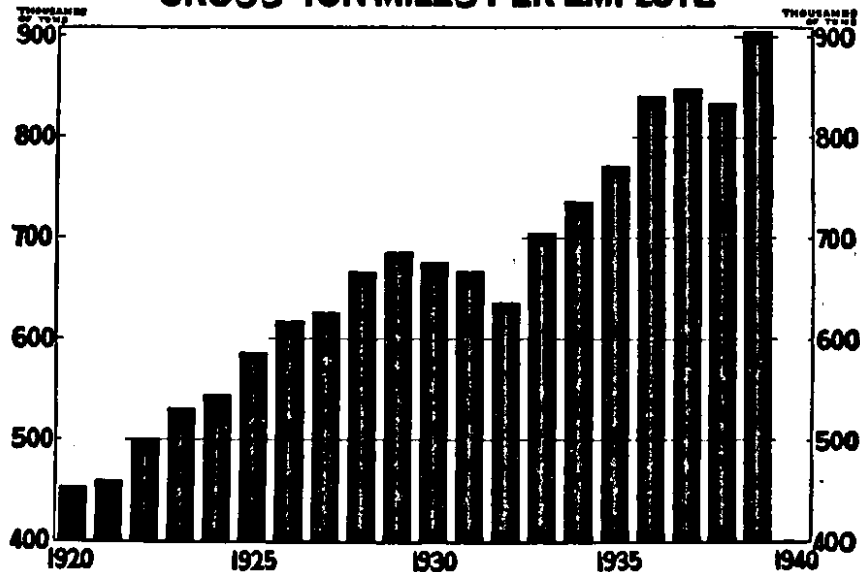
Wages paid per 1,000 revenue freight ton-miles, Class I steam railways in the United States, excluding switching and terminal companies, for specified years

Year (1)	Rev. Freight Ton-Miles		Employees' Compensation		Wages Per 1,000 Revenue Frt. Ton-Miles	
	Number (2)	Index (3)	Amount (4)	Index (5)	Amount (6)	Index (7)
	(000)		(000)			
1920.....	410,306,210	100.0	\$3,681,801	100.0	\$8.97	100.0
1921.....	306,840,204	74.8	2,765,218	74.9	9.01	100.4
1922.....	339,285,347	82.7	2,640,817	71.7	7.78	86.7
1923.....	412,727,228	100.6	3,004,072	81.6	7.28	81.2
1924.....	368,415,312	93.7	2,825,775	76.7	7.28	81.2
1925.....	413,814,261	100.9	2,860,600	77.7	6.91	77.0
1926.....	443,746,487	108.1	2,946,114	80.0	6.64	74.0
1927.....	428,736,962	104.5	2,910,183	79.0	6.79	75.7
1928.....	432,915,186	105.6	2,826,590	76.8	6.53	72.8
1929.....	447,321,561	109.0	2,896,566	78.7	6.48	72.2
1930.....	383,449,588	93.5	2,550,789	69.3	6.65	74.1
1931.....	309,224,879	75.4	2,094,994	56.9	6.77	75.5
1932.....	233,977,009	57.0	1,512,816	41.1	6.47	72.1
1933.....	249,223,180	60.7	1,403,841	38.1	5.63	62.8
1934.....	268,710,507	65.5	1,519,352	41.3	5.65	63.0
1935.....	282,036,932	69.7	1,643,879	44.6	5.83	66.0
1936.....	339,245,826	82.7	1,848,036	50.2	5.45	60.8
1937.....	360,620,269	87.9	1,885,447	53.9	5.51	61.4
1938.....	290,084,371	70.7	1,746,141	47.4	6.02	67.1
1939.....	333,444,199	81.3	1,863,503	50.6	5.59	62.3

Source: Revenue Freight Ton-Miles from Statistics of Railways in the United States, Statement No. 25 ICC (1933, Table 44); 1939 from Statement M-220, ICC. Compensation from Statistics of Railways in the United States, ICC, Table No. 16; 1938 from Table No. 67 (old Table No. 16); 1939 from Statement M-300, ICC.

[Submitted by the Brotherhood of Railway Clerks

GROSS TON-MILES PER EMPLOYE



[Chart based on following statistical data appears above.]

Gross ton-miles per employe, per hour of service, and per dollar of compensation, Class I carriers, excluding switching and terminal companies, in the United States, for specified years

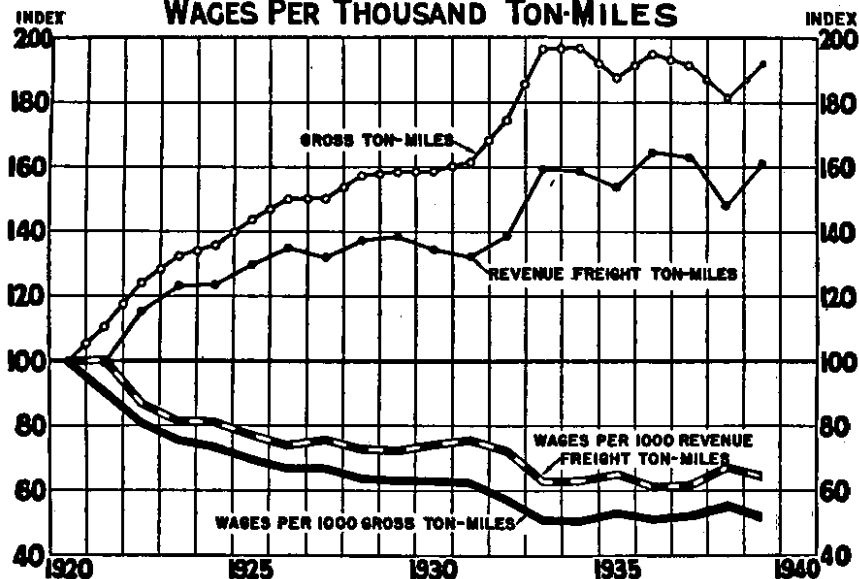
Year (1)	Gross Ton-Miles (Ex. Loco. & Ten.)		Gross Ton-Miles Per					
	Number (2)	Index (3)	Employe (4)	Index (5)	Hour of Service (6)	Index (7)	Dollar of Compa'n (8)	Index (9)
	(000,000)							
1920	914,940	100.0	452,306	100.0	168.0	100.0	248.5	100.0
1921	760,716	83.1	458,397	101.3	183.4	109.2	275.1	110.7
1922	813,741	88.9	500,200	110.6	188.8	112.4	308.1	124.0
1923	987,326	107.9	531,486	117.5	200.0	119.0	328.7	132.3
1924	954,072	104.3	544,760	120.4	210.3	125.1	337.6	135.9
1925	1,023,370	111.9	586,690	129.7	225.8	134.4	357.7	143.9
1926	1,098,965	120.1	617,657	136.6	235.2	140.0	373.0	150.1
1927	1,066,872	116.8	626,402	138.6	240.4	143.1	373.5	150.3
1928	1,105,889	120.9	667,636	147.6	244.7	145.7	391.2	157.4
1929	1,141,886	124.8	687,615	152.0	262.7	156.4	394.2	158.6
1930	1,006,505	110.0	676,488	149.6	267.7	159.3	394.6	158.8
1931	839,643	91.8	667,066	147.5	223.3	132.9	400.8	161.3
1932	657,309	71.8	637,111	140.9	276.4	164.5	434.5	174.8
1933	685,402	74.9	705,729	156.0	306.9	182.7	488.2	196.5
1934	743,554	81.3	737,872	163.1	310.6	184.9	489.4	196.9
1935	766,873	83.8	771,214	170.5	319.9	190.4	496.5	197.7
1936	896,956	98.0	841,719	186.1	335.3	199.6	485.2	195.2
1937	941,061	102.9	844,256	186.7	336.1	200.1	474.0	190.7
1938	789,240	86.3	840,358	185.8	338.8	201.7	452.0	181.9
1939	889,679	97.2	900,537	199.1	357.3	212.7	477.4	192.1

Source: Gross Ton-Miles from Statistics of Railways in the United States, Statement No. 25, ICC (1938, Table 44); 1939 from Statement M-211, ICC. Employes, Hours and Compensation data from accompanying table showing totals.

EXHIBIT No. 2553

[Submitted by the Brotherhood of Railway Clerks]

TON-MILES PER DOLLAR OF WAGES
WAGES PER THOUSAND TON-MILES



(Chart based on following statistical data appears above.)

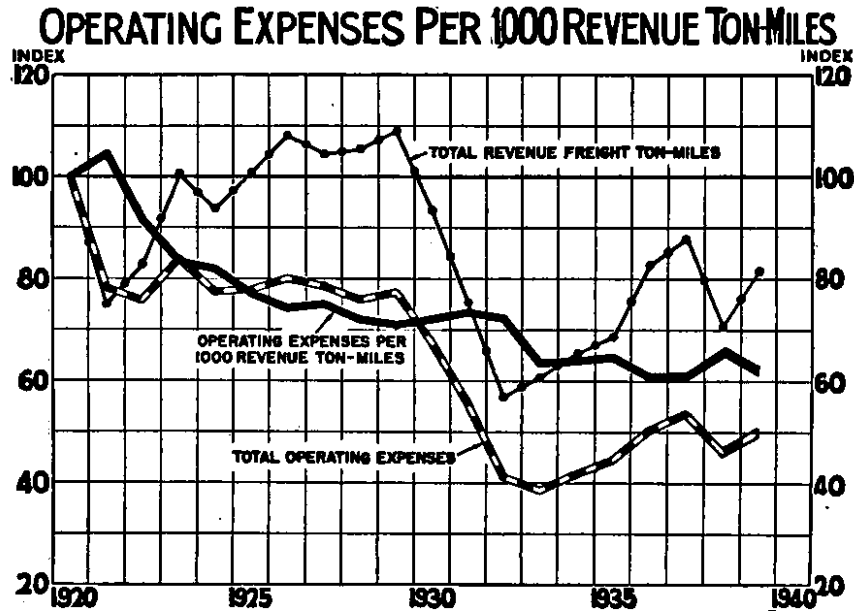
Wages per 1,000 gross ton-miles, class I carriers, excluding switching and terminal companies, in the United States for specified years

Year (1)	Gross Ton-Miles (Ex. Locomotive & Tender)		Employees' Compensation		Wages Per 1,000 Gross Ton-Miles (Ex. Loco. & Tender)	
	Number (2)	Index (3)	Amount (4)	Index (5)	Amount (6)	Index (7)
	(000)		(000)			
1920	914,940,000	100.0	\$3,691,801	100.0	\$4.02	100.0
1921	760,718,000	83.1	2,765,218	74.9	3.64	90.5
1922	813,741,000	88.9	2,640,817	71.7	3.25	80.8
1923	967,326,000	107.9	3,004,072	81.6	3.04	75.6
1924	954,072,000	104.3	2,825,775	76.7	2.96	73.8
1925	1,023,370,000	111.9	2,860,600	77.7	2.80	69.7
1926	1,098,985,000	120.1	2,946,114	80.0	2.68	66.7
1927	1,088,872,000	118.8	2,910,183	79.0	2.68	66.7
1928	1,106,889,000	120.9	2,826,690	76.8	2.56	63.7
1929	1,141,866,000	124.8	2,896,566	78.7	2.54	63.2
1930	1,006,505,000	110.0	2,550,789	69.8	2.53	62.9
1931	839,643,000	91.8	2,094,964	56.9	2.50	62.2
1932	657,309,000	71.8	1,612,816	41.1	2.30	57.2
1933	686,402,000	74.9	1,408,841	38.1	2.05	51.0
1934	743,554,000	81.3	1,619,352	41.8	2.04	50.7
1935	766,873,000	83.8	1,645,879	44.6	2.14	53.2
1936	896,956,000	98.0	1,848,636	50.2	2.06	51.2
1937	941,061,000	102.9	1,985,447	53.9	2.11	52.5
1938	789,240,000	86.3	1,746,141	47.4	2.21	55.0
1939	889,679,000	97.2	1,863,608	50.6	2.09	52.0

Source: Gross Ton-Miles from Statistics of Railways in the United States, Statement No. 26, ICC, (1938, Table 44); 1939 from Statement M-211, ICC. Compensation from Statistics of Railways in the United States, ICC, Statement No. 16; 1938 from Table No. 67 (old Table No. 16); 1939 from Statement M-300, ICC.

EXHIBIT No. 2554

[Submitted by the Brotherhood of Railway Clerks]



(Chart based on following statistical data appears above.)

Operating expenses per 1,000 revenue ton-miles, class 1 carriers, excluding switching and terminal companies, in the United States for specified years

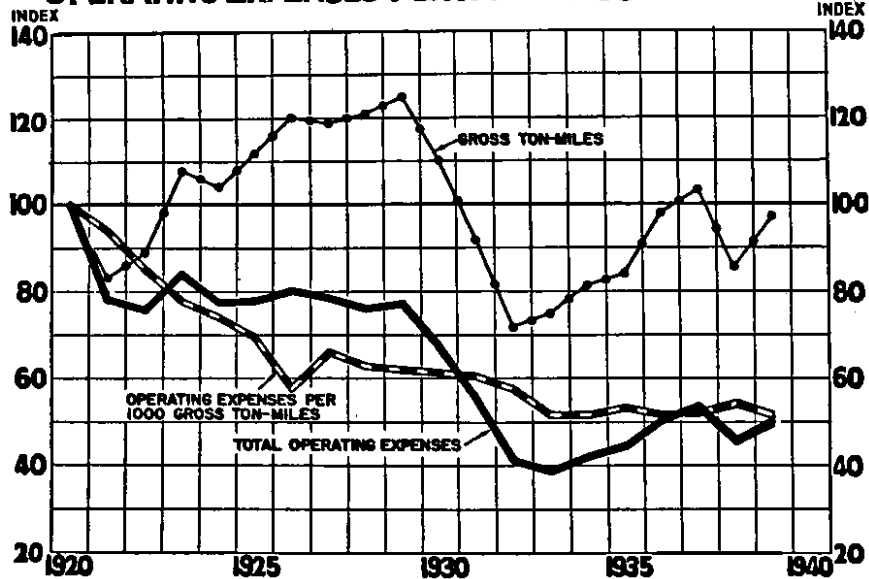
Year (1)	Total Operating Ex- penses		Total Revenue Freight Ton-Miles		Operating Exp. per 1,000 Rev. Ton- Miles	
	Amount (2)	Index (3)	Number (4)	Index (5)	Amount (6)	Index (7)
	(000)		(000)			
1920.....	\$5,827,591	100.0	410,206,210	100.0	\$14.20	100.0
1921.....	4,662,668	78.8	306,840,204	74.8	14.87	104.7
1922.....	4,414,622	75.8	339,285,347	82.7	13.01	91.6
1923.....	4,895,167	84.0	412,727,228	100.6	11.86	83.5
1924.....	4,607,885	77.4	388,415,312	93.7	11.61	81.8
1925.....	4,636,880	77.9	412,814,261	100.9	10.96	77.2
1926.....	4,069,337	80.1	442,746,487	108.1	10.59	74.1
1927.....	4,574,178	78.5	428,736,962	104.5	10.67	75.1
1928.....	4,427,995	75.0	432,915,185	105.5	10.23	72.0
1929.....	4,506,050	77.3	447,321,561	109.0	10.07	70.9
1930.....	3,930,929	67.5	383,449,588	93.5	10.25	72.2
1931.....	3,223,575	55.3	309,224,879	75.4	10.42	73.4
1932.....	2,403,445	41.2	233,977,009	57.0	10.27	72.3
1933.....	2,249,232	38.6	249,223,180	60.7	9.02	63.5
1934.....	2,441,823	41.9	268,710,507	65.5	9.09	64.0
1935.....	2,592,741	44.5	282,036,932	68.7	9.19	64.7
1936.....	2,931,425	50.3	339,245,826	82.7	8.64	60.8
1937.....	3,119,065	53.5	360,620,269	87.9	8.65	60.9
1938.....	2,722,199	46.7	290,084,371	70.7	9.38	66.1
1939.....	2,918,216	50.1	333,444,199	81.3	8.75	61.6

Source: Statistics of Railways in the United States, ICC. Operating Expenses, Statement 36 (1938, Table 86); 1939 from Statement M-100, ICC. Revenue Freight Ton-Miles, Statement 25 (1939 from Statement M-220; 1938 Table 44).

EXHIBIT No. 2555

[Submitted by the Brotherhood of Railway Clerks]

OPERATING EXPENSES PER 1000 GROSS TON-MILES



[Chart based on following statistical data appears above.]

Operating expenses per 1,000 gross ton-miles, class I carriers, excluding switching and terminal companies, in the United States, for specified years

Year	Total Operating Expenses		Gross Ton-Miles (Ex. Locomotive & Tender)		Operating Exp. per 1,000 Gross Ton-Miles	
	Amount	Index	Number	Index	Amount	Index
(1)	(2)	(3)	(4)	(5)	(6)	(7)
	(000)		(000)			
1920	\$6,827,591	100.0	914,940,000	100.0	\$6.37	100.0
1921	4,562,668	78.3	760,716,000	83.1	6.00	94.2
1922	4,414,622	75.8	813,741,000	88.9	5.42	85.1
1923	4,895,167	84.0	987,326,000	107.9	4.96	77.9
1924	4,607,885	77.4	954,072,000	104.8	4.72	74.1
1925	4,636,860	77.9	1,023,370,000	111.9	4.43	69.6
1926	4,669,337	80.1	1,098,985,000	120.1	4.25	57.7
1927	4,574,178	78.5	1,086,872,000	118.6	4.21	66.1
1928	4,427,995	76.0	1,105,889,000	120.9	4.00	62.8
1929	4,606,056	77.3	1,141,866,000	124.8	3.95	62.0
1930	3,930,929	67.5	1,006,505,000	110.0	3.91	61.4
1931	3,223,576	55.3	839,643,000	91.8	3.84	60.3
1932	2,403,445	41.2	657,309,000	71.8	3.66	57.5
1933	2,249,232	38.6	685,402,000	74.9	3.28	51.5
1934	2,441,823	42.0	743,554,000	81.3	3.28	51.5
1935	2,592,741	44.5	766,373,000	83.8	3.38	53.1
1936	2,931,425	50.3	896,956,000	98.0	3.27	51.8
1937	3,119,065	53.5	941,061,000	102.9	3.31	52.0
1938	2,722,199	46.7	789,240,000	86.3	3.45	54.2
1939	2,918,216	50.1	889,679,000	97.2	3.28	51.6

Source: Statistics of Railways in the United States, I. C. C. Operating Expenses, Statement No. 36 (1938, Table 86); 1939 from Statement M-100, I. C. C. Gross Ton-Miles (excluding locomotives & tender), Statement No. 25, (1933, Table 44); 1939 from Statement M-211, I. C. C.

CONCENTRATION OF ECONOMIC POWER

EXHIBIT No. 2556

[Submitted by the Brotherhood of Railway Clerks]

Revenue freight ton-miles and gross ton-miles per dollar of operating expense, class I carriers, excluding switching and terminal companies, in the United States, for specified years

Year (1)	Revenue Frt. Ton-Miles per Dollar of Operating Expense		Gross Ton-Miles (Ex. Loco. & Tender) per Dollar of Operating Expense	
	Number (2)	Index (3)	Number (4)	Index (5)
1920	70.4	100.0	187.0	100.0
1921	87.2	95.5	166.7	106.2
1922	76.9	109.2	184.8	117.4
1923	84.3	119.7	201.6	128.4
1924	86.2	122.4	211.6	134.8
1925	91.2	129.5	225.6	143.7
1926	95.0	134.9	235.4	149.9
1927	93.7	133.1	237.6	151.3
1928	97.8	138.9	249.7	159.0
1929	99.3	141.0	253.4	161.4
1930	97.5	138.5	256.0	163.1
1931	95.9	136.2	260.5	165.9
1932	97.3	138.2	273.4	174.1
1933	110.8	157.4	304.7	194.1
1934	110.1	156.4	304.5	193.9
1935	108.8	154.5	295.7	189.3
1936	115.7	164.3	306.0	194.0
1937	115.6	164.2	301.7	192.2
1938	108.6	151.4	289.9	184.6
1939	114.3	162.4	304.9	194.2

Source: Statistics of Railways in the United States, I. C. C. Operating Expenses, Statement No. 86, (1938, Table 86); 1939 from Statement M-100, I. C. C. Revenue Freight and Gross Ton-Miles, Statement No. 25, (1938, Table 44); 1939 Revenue Freight Ton-Miles from Statement M-220, I. C. C.; 1939 Gross Ton-Miles from Statement M-211, I. C. C.

EXHIBIT No. 2557

[Submitted by the Brotherhood of Railway Clerks]

Operating expenses per mile of road and per mile of all tracks, class I carriers, excluding switching and terminal companies, in the United States for specified years

Year (1)	Operating Expenses per			
	Mile of Road		Mile of all Tracks	
	Amount (2)	Index (3)	Amount (4)	Index (5)
1920	\$24,789	100.0	\$15,403	100.0
1921	19,400	78.3	11,991	77.8
1922	18,738	75.7	11,514	74.8
1923	20,747	83.8	12,646	82.1
1924	19,079	77.0	11,584	75.2
1925	19,115	77.2	11,550	75.0
1926	19,573	79.4	11,787	76.5
1927	19,159	77.4	11,422	74.2
1928	18,380	74.2	10,939	71.0
1929	18,596	75.1	11,053	71.8
1930	16,191	65.4	9,610	62.4
1931	13,278	53.6	7,876	51.1
1932	9,926	40.0	5,889	38.2
1933	9,325	37.5	5,542	36.0
1934	10,194	41.1	6,053	39.3
1935	10,370	43.9	6,462	42.0
1936	12,330	49.8	7,341	47.7
1937	13,199	53.3	7,852	51.0
1938	11,564	46.7	6,890	44.7
1939	12,499	50.5	7,400	47.7

Source: Statistics of Railways in the United States, I. C. C. Statement No. 77 (1938, Table 59); 1939 Operating Expenses per mile of road calculated from basic data from Statement M-100, I. C. C.

CONCENTRATION OF ECONOMIC POWER

17387

EXHIBIT No. 2558

[Submitted by the Brotherhood of Railway Clerks]

Increased efficiency and productivity reflected in selected items of freight service operating averages, class I carriers, excluding switching and terminal companies, in the United States, for specified years

Year (1)	Aver. No. of Cars in Each Freight Train		Aver. Speed per Hour of Freight Trains		Gross Ton-Miles per Freight Train Hour (Ex. Loco. & Tender)		Service Performed by Average Frt. Train in One Hour	
	Number (incl. caboose) (2)	Index (3)	Miles (4)	Index (5)	Number (6)	Index (7)	Tons of Freight Hauled 1 Mile (8)	Index (9)
1920	36.6	100.0	10.8	100.0	14,877	100.0	7,303	100.0
1921	38.4	104.9	11.5	111.7	16,555	111.3	7,506	102.8
1922	38.4	104.9	11.1	107.8	16,188	108.8	7,479	102.4
1923	39.9	109.0	10.9	105.8	16,764	112.7	7,770	104.4
1924	41.7	113.9	11.5	111.7	18,257	122.7	8,222	112.6
1925	43.8	119.7	11.8	114.6	19,685	132.3	8,773	120.1
1926	45.2	123.5	11.9	115.5	20,692	139.1	9,201	126.0
1927	46.5	127.0	12.3	119.4	21,940	147.5	9,583	131.2
1928	48.1	131.4	12.9	125.2	23,600	158.6	10,183	139.4
1929	49.6	132.8	13.2	128.2	24,539	164.9	10,580	144.9
1930	48.9	133.6	13.8	134.0	25,837	173.7	10,836	148.4
1931	47.9	130.9	14.8	143.7	26,721	179.6	10,825	148.2
1932	44.8	122.4	15.5	150.5	26,042	175.0	10,265	140.6
1933	45.8	125.1	15.7	152.4	27,344	183.8	10,574	150.3
1934	46.2	126.2	15.9	154.4	28,040	188.5	11,225	153.7
1935	46.2	126.2	16.0	155.3	28,674	192.7	11,718	160.5
1936	(1)		15.8	153.4	29,200	196.3	(1)	
1937	(1)		16.1	156.8	30,349	204.0	(1)	
1938	(1)		16.6	161.2	31,138	209.3	(1)	
1939	(1)		16.7	162.1	32,808	220.5	(1)	

¹ Data not published after 1935.

Source: Bureau of Railway Economics' Statistical Summaries Nos. 15, 16, 19, and 23; 1939 from Statement M-211, I. C. O.

EXHIBIT No. 2559

[Submitted by the Brotherhood of Railway Clerks]

Cost of clearing wrecks, and damage to property, class I carriers, excluding switching and terminal companies, in the United States, for specified years

Year (1)	Clearing Wrecks		Damage to Property	
	Amount (2)	Index (3)	Amount (4)	Index (5)
1920	\$20,887,933	100.0	\$10,048,734	100.0
1921	9,967,746	47.7	6,336,098	63.0
1922	9,461,022	45.2	5,356,628	53.3
1923	11,419,872	54.7	5,662,988	56.4
1924	9,020,918	43.2	5,351,536	53.3
1925	8,361,223	40.0	5,016,139	49.9
1926	8,487,299	40.6	5,247,258	52.2
1927	7,684,798	36.8	4,629,169	46.1
1928	6,476,538	31.0	4,260,084	42.4
1929	6,369,986	30.6	4,362,032	43.4
1930	4,371,570	20.9	4,339,294	43.2
1931	2,885,015	13.8	2,925,844	29.1
1932	1,923,241	9.2	1,961,096	19.5
1933	1,897,613	9.1	1,729,563	17.2
1934	1,919,082	9.2	1,957,965	19.5
1935	2,298,097	11.0	1,880,737	18.7
1936	2,965,079	14.2	2,631,736	26.2
1937	3,046,387	14.2	2,358,299	23.5
1938	2,107,192	10.1	1,949,538	19.4

Source: STATISTICS OF RAILWAYS IN THE UNITED STATES, I. C. O. Statement No. 37, IV. (1938, Table 89 IV).

EXHIBIT No. 2560

[Submitted by the Brotherhood of Railway Clerks]

Traffic units

Year	Average Receipts per Passenger per Mile	Average Receipts per Ton per Mile	Ratio Col. 1 to 2	Revenue Passenger-Miles	Adjusted Revenue Passenger-Miles	Revenue Ton-Miles	Traffic Units (Col. 5 & 6)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	<i>Cents</i>	<i>Cents</i>		<i>000</i>	<i>000</i>	<i>000</i>	<i>Millions</i>
1921	3.088	1.275	2.4	37,312,586	89,550,206	306,840,204	396,390
1922	3.027	1.177	2.6	35,469,962	92,221,901	339,285,348	431,607
1923	3.018	1.116	2.7	37,956,595	102,402,807	412,727,228	515,210
1924	2.978	1.116	2.7	36,090,886	97,445,392	388,415,312	485,881
1925	2.938	1.097	2.7	35,950,223	97,065,602	413,814,261	510,880
1926	2.938	1.081	2.7	35,477,525	95,789,318	443,746,487	539,536
1927	2.896	1.080	2.7	33,649,706	90,854,206	428,736,962	519,691
1928	2.860	1.081	2.6	31,601,242	82,163,489	432,915,185	515,079
1929	2.808	1.076	2.6	31,074,135	80,792,751	447,321,661	528,114
1930	2.72	1.063	2.6	28,814,825	69,718,545	383,449,688	453,168
1931	2.51	1.051	2.4	21,894,421	52,546,610	309,224,879	361,771
1932	2.22	1.046	2.1	18,971,044	35,639,192	233,977,009	269,616
1933	2.01	.999	2.0	16,240,510	32,681,020	249,223,180	281,904
1934	1.92	.978	2.0	18,033,309	36,066,618	268,710,507	304,777
1935	1.93	.988	2.0	18,475,572	36,951,144	282,036,932	318,988
1936	1.84	.974	1.9	22,421,009	42,599,917	339,245,826	381,846
1937	1.79	.935	1.9	24,655,414	46,845,287	360,620,269	407,466
1938	1.87	.963	1.9	21,628,718	41,094,564	290,084,371	331,179
1939	1.84	.974	1.9	22,657,464	43,049,182	333,444,199	376,493

NOTE.—Traffic units are calculated by combining passenger-miles and ton-miles. Passenger-miles are weighted by the ratio of average receipts per revenue passenger-mile to the average receipts per revenue ton-mile as it is determined by the operations for the particular year shown.

Source: Basic data from Table 25, Statistics of Railways in U. S., 1929, ICC, years 1921-1928, Table 44, Statistics of Railways in U. S., 1938, years 1929-1938. 1939 data from Statement M-220, ICC.

EXHIBIT No. 2561

[Submitted by the Brotherhood of Railway Clerks]

Decrease in employment opportunities

CLASS I RAILWAYS IN U. S., 1921-1939

Year	Traffic Units ¹	Number of Employees Required to Handle Traffic Units at the 1921 Rate	Actual Average Number of Employees ²	Decrease in Job Opportunities; Difference between Col. 2 and Col. 3	Per Cent of Increased Employment Required to Handle Traffic Units at the 1921 Rate
	<i>Millions</i>				
1921	396,390	1,695,473	1,695,473		
1922	431,507	1,845,680	1,626,834	218,846	13.5
1923	515,210	2,203,702	1,857,674	346,028	15.6
1924	485,881	1,864,303	1,751,262	112,941	6.4
1925	510,880	2,185,181	1,744,311	440,870	25.3
1926	539,536	2,307,751	1,799,275	508,476	28.3
1927	519,691	2,222,440	1,735,105	487,335	28.1
1928	515,079	2,203,141	1,656,411	546,730	33.0
1929	528,114	2,258,896	1,660,850	598,046	36.0
1930	453,168	1,938,330	1,487,839	450,491	30.3
1931	361,771	1,547,399	1,258,719	288,680	22.9
1932	269,616	1,153,225	1,031,703	121,522	11.8
1933	281,904	1,205,785	971,196	234,589	24.2
1934	304,777	1,303,619	1,007,702	295,917	29.4
1935	318,988	1,364,404	994,371	370,033	37.2
1936	381,846	1,633,265	1,065,624	567,641	53.3
1937	407,466	1,742,849	1,114,663	628,186	56.4
1938	331,179	1,416,548	939,171	477,377	60.8
1939	376,493	1,610,369	987,943	622,426	63.0

¹ Basic data from Table 25, Statistics of Railways in U. S., 1929, ICC, years 1921-1928; Table 44, Statistics of Railways in U. S., 1938, years 1929-1938. 1939 figures from ICC Statement M-220.

² From Statement No. 16, Statistics of Railways in U. S., ICC, for years 1921-1938. 1939 figures from ICC Statement M-300.

Average Number of Traffic Units per Employee in 1921=233,793.

CONCENTRATION OF ECONOMIC POWER

17389

EXHIBIT No. 2562

[Submitted by the Brotherhood of Railway Clerks]

Decrease in employment opportunities—Executives, officials and staff assistants

CLASS I RAILWAYS IN U. S., 1921-1939

Year	Traffic Units ¹	Number of Employes Required to Handle Traf- fic Units at the 1921 Rate	Actual Aver- age Number of Employes ²	Decrease in Job Oppor- tunities; Difference between Col. 2 and Col. 3	Per Cent of Increased Em- ployment Required to Handle Traf- fic Units at the 1921 Rate
	<i>Millions</i>				
1921.....	396,390	15,164	15,164	-----	-----
1922.....	431,507	16,507	15,250	1,257	8.2
1923.....	515,210	19,709	16,088	3,621	22.5
1924.....	485,861	18,587	16,035	2,552	15.9
1925.....	510,880	19,544	16,261	3,283	20.2
1926.....	539,536	20,640	16,570	4,070	24.6
1927.....	519,591	19,877	16,710	3,167	19.0
1928.....	515,079	19,704	16,664	3,040	18.2
1929.....	528,114	20,203	16,701	3,502	21.0
1930.....	453,168	17,336	16,313	1,023	6.3
1931.....	361,771	13,840	15,115	-1,275	-8.4
1932.....	269,616	10,314	13,366	-3,052	-22.8
1933.....	281,904	10,784	12,223	-1,439	-11.8
1934.....	304,777	11,659	12,010	-351	-2.9
1935.....	318,988	12,203	11,911	292	2.5
1936.....	281,846	14,608	12,010	2,598	21.6
1937.....	407,466	15,588	12,309	3,279	26.6
1938.....	331,179	12,669	11,905	764	6.4
1939.....	376,493	14,403	11,745	2,658	22.6

¹ Basic data from Table 25, Statistics of Railways in U. S., 1929, ICC, years 1921-1928; Table 44, Statistics of Railways in U. S. 1938, years 1929-1938. 1939 figures from ICC Statement M-220.

² From Statement No. 16, Statistics of Railways in U. S., ICC, for years 1921-1938. 1939 figures from ICC Statement M-300.

Average Number of Traffic Units per Employe in 1921 = 26,140,200.

*Average number of employees by major subdivision*¹
 [Average of Middle of Month Count for the Twelve-Months' Period]

Major Subdivision	1921 ²	1922	1923	1924	1925	1926	1927	1928	1929	1930
I. Executives, officials, and staff assistants.....	15,164	15,250	16,088	16,035	16,261	16,570	16,710	16,664	16,701	16,313
II. Professional, clerical, and general.....	274,282	277,514	282,491	278,136	278,063	280,928	278,505	267,310	265,885	249,069
III. Maintenance of way and structures.....	895,057	859,585	898,291	884,568	898,414	418,058	418,772	396,025	408,859	348,806
IV. Maintenance of equipment and stores.....	450,985	451,389	584,573	529,037	518,975	513,830	485,040	456,172	450,380	400,939
V. Transportation (other than train, engine and yard).....	208,782	202,578	213,455	205,904	205,904	206,652	202,267	194,913	193,469	178,597
VI. (a) Transportation (yardmasters, switchtenders, and hostlers).....	23,523	22,934	25,548	23,940	23,850	23,449	22,678	21,332	20,990	19,474
VI. (b) Transportation (train and engine service).....	297,680	297,084	337,228	313,640	315,344	324,788	315,143	303,986	305,566	277,241
Total Above Group (all employees).....	1,695,473	1,620,834	1,857,674	1,751,362	1,744,311	1,779,275	1,785,105	1,656,411	1,660,850	1,487,839

Major Subdivisions	1931	1932	1933	1934	1935	1936	1937	1938	1939
I. Executives, officials, and staff assistants.....	15,115	13,366	12,223	12,010	11,911	12,010	12,309	11,905	11,745
II. Professional, clerical, and general.....	218,933	181,855	163,432	165,160	163,085	167,388	176,147	163,072	163,056
III. Maintenance of way and structures.....	272,307	213,259	198,154	208,359	206,034	224,266	231,280	186,812	201,948
IV. Maintenance of equipment and stores.....	839,834	279,125	262,572	276,131	271,258	296,437	311,125	239,784	264,160
V. Transportation (other than train, engine and yard).....	156,845	132,404	123,395	124,870	122,886	127,545	134,088	122,652	125,149
VI. (a) Transportation (yardmasters, switchtenders, and hostlers).....	16,854	13,485	12,107	12,423	12,202	12,811	13,493	12,062	12,141
VI. (b) Transportation (train and engine service).....	238,631	188,209	190,312	208,739	206,995	225,167	236,231	202,684	209,749
Total Above Group (all employees).....	1,268,710	1,031,703	971,199	1,007,702	994,371	1,065,624	1,114,663	939,171	987,943

¹ Data for year 1921 includes Switching and Terminal Companies; for years 1922-1938 excludes Switching and Terminal Companies.

² Data for last six months of year, only comparable basis available.

Source: Statement No. 16, Statistics of Railways in U. S., IOC, for years 1921-1938. 1939 data from IOC Statement M-300.

Group	Change, 1923 to 1929	Change, 1929 to 1933	Change, 1929 to 1939	Change, 1923 to 1939	Group	Change, 1923 to 1929	Change, 1929 to 1933	Change, 1929 to 1939	Change, 1923 to 1939
	Percent	Percent	Percent	Percent		Percent	Percent	Percent	Percent
I.....	+3.8	-25.8	-29.7	-27.0	VIa.....	-17.8	-42.3	-42.2	-52.5
II.....	-5.9	-38.5	-38.7	-42.3	VIb.....	-9.1	-35.0	-31.6	-37.8
III.....	+2.2	-51.3	-50.4	-49.3	Total.....	-10.6	-41.5	-40.5	-46.8
IV.....	-23.0	-41.7	-41.3	-54.8					
V.....	-9.4	-36.2	-35.3	-41.4					

Average hourly or daily earnings of employees by major subdivisions¹

CLASS I RAILWAYS IN THE UNITED STATES

Major subdivisions	1921 ²	1922	1923	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933	1934	1935	1936	1937	1938	1939
I. Executives, officials & staff assistants: Daily basis.....	\$15.79	\$15.97	\$16.20	\$16.48	\$16.73	\$16.86	\$17.24	\$17.51	\$17.80	\$18.15	\$18.27	\$16.08	\$16.24	\$16.19	\$17.08	\$17.49	\$18.12	\$18.35	\$18.38
II. Professional, clerical & general:																			
Daily basis.....	6.72	6.74	6.88	6.97	7.03	7.11	7.29	7.43	7.51	7.64	7.73	7.08	7.03	7.14	7.72	7.80	7.95	8.22	8.25
Hourly basis.....	.578	.566	.570	.583	.587	.593	.609	.624	.632	.639	.645	.592	.589	.597	.646	.651	.672	.705	.708
III. Maintenance of way & structures:																			
Daily basis.....	8.73	8.88	8.92	8.95	9.09	9.12	9.20	9.21	9.29	9.36	9.33	8.38	8.28	8.36	9.04	9.17	9.28	9.56	9.57
Hourly basis.....	.437	.418	.426	.431	.434	.436	.439	.442	.446	.459	.467	.429	.420	.430	.462	.460	.482	.518	.517
IV. Maintenance of equipment & stores:																			
Daily basis.....	8.83	8.94	8.82	8.85	8.94	8.94	9.03	9.01	9.09	9.15	9.16	8.22	7.98	8.17	8.82	8.91	9.08	9.31	9.34
Hourly basis.....	.621	.602	.583	.590	.596	.604	.616	.619	.645	.640	.647	.587	.582	.593	.642	.654	.671	.696	.703
V. Transportation (other than train, engine & yard):																			
Daily basis.....	3.31	3.24	3.24	3.28	3.32	3.35	3.45	3.48	3.54	3.59	3.58	3.21	3.17	3.22	3.49	3.58	3.73	3.95	3.99
Hourly basis.....	.544	.533	.534	.546	.549	.553	.564	.575	.580	.588	.595	.552	.545	.550	.591	.592	.608	.643	.641
VIa. Transportation (yardmasters, switchtenders & hostlers):																			
Daily basis.....	8.43	8.45	8.40	8.48	8.51	8.51	8.73	8.88	8.97	8.97	8.98	8.09	7.95	8.09	8.76	8.84	9.01	9.29	9.31
Hourly basis.....	.609	.615	.616	.635	.651	.654	.680	.695	.694	.693	.692	.631	.623	.631	.683	.692	.707	.748	.748
VIb. Transportation (train & engine service): Hourly basis.	.787	.791	.789	.819	.838	.814	.840	.860	.866	.864	.851	.785	.777	.787	.858	.867	.879	.923	.922
All employees:																			
Daily basis.....	7.45	7.55	7.64	7.73	7.84	7.94	8.13	8.26	8.40	8.53	8.56	7.72	7.55	7.64	8.21	8.35	8.63	8.88	8.92
Hourly basis.....	.596	.588	.586	.597	.605	.604	.615	.625	.636	.644	.651	.600	.595	.602	.651	.659	.676	.713	.714
Total above groups— all employees—average hourly compensation.....	.620	.613	.610	.623	.631	.631	.644	.655	.666	.678	.689	.636	.629	.635	.686	.691	.709	.750	.748

¹ Data for year 1921 includes Switching and Terminal Companies; for years 1922-1939 excludes Switching and Terminal Companies.

² Data for last six months of year, only comparable basis available.

Source: Statement No. 16, Statistics of Railways in United States, I. C. C., for years 1921-1938. 1939 data from I. C. C. Statement M-300.

CONCENTRATION OF ECONOMIC POWER

EXHIBIT No. 2563

[Submitted by the Brotherhood of Railway Clerks]

Decrease in employment opportunities—Professional, clerical and general

CLASS I RAILWAYS IN U. S., 1921-1939

Year	Traffic Units ¹	Number of Employees Required to Handle Traffic Units at the 1921 rate	Actual Average Number of Employees ²	Decrease in Job Opportunities; Difference between Col. 2 and Col. 3	Per Cent of Increased Employment Required to Handle Traffic Units at the 1921 rate
	<i>Millions</i>				
1921	396,300	274,262	274,262		
1922	431,507	298,581	277,514	21,067	7.6
1923	515,210	356,500	282,491	74,009	26.2
1924	485,861	336,192	278,136	58,056	20.9
1925	510,890	353,503	278,063	75,440	27.1
1926	539,536	373,332	290,928	92,404	32.9
1927	519,591	359,531	276,595	82,936	30.0
1928	515,079	356,409	267,319	89,090	33.3
1929	528,114	365,429	265,685	99,744	37.4
1930	453,168	313,570	249,969	63,601	25.4
1931	361,771	250,327	218,933	31,394	14.3
1932	269,616	186,561	181,855	4,706	2.6
1933	281,904	195,063	163,432	31,631	19.4
1934	304,777	210,890	165,160	45,730	27.7
1935	318,968	220,734	163,085	57,649	35.3
1936	381,846	264,218	167,368	96,850	57.8
1937	407,466	281,946	176,147	105,799	60.1
1938	331,179	229,159	163,072	66,087	40.6
1939	376,493	260,514	163,036	97,468	59.8

¹ Basic data from Table 25, Statistics of Railways in U. S., 1929, ICC, years 1921-1928; Table 44, Statistics of Railways in U. S., 1938, years 1929-1938. 1939 figures from ICC Statement M-220.

² From Statement No. 16, Statistics of Railways in U. S. for years 1921-1938. 1939 figures from ICC Statement M-300.

Average Number of Traffic Units per Employee in 1921=1,445,191.

EXHIBIT No. 2564

[Submitted by the Brotherhood of Railway Clerks]

Decrease in employment opportunities—Maintenance of way and structures

CLASS I RAILWAYS IN U. S., 1921-1939

Year	Traffic Units ¹	Number of Employees Required to Handle Traffic Units at the 1921 rate	Actual Average Number of Employees ²	Decrease in Job Opportunities; Difference between Col. 2 and Col. 3	Per Cent of Increased Employment Required to Handle Traffic Units at the 1921 rate
	<i>Millions</i>				
1921	396,300	395,057	395,057		
1922	431,507	430,056	359,885	70,171	19.5
1923	515,210	513,478	398,291	115,187	26.9
1924	485,861	484,227	384,568	99,659	26.9
1925	510,890	509,162	386,414	122,748	31.8
1926	539,536	537,722	413,058	124,664	30.9
1927	519,591	517,844	416,772	101,072	24.3
1928	515,079	513,347	396,025	117,322	29.6
1929	528,114	526,338	406,859	119,479	29.4
1930	453,168	451,644	346,306	105,338	30.8
1931	361,771	360,554	272,307	88,247	32.4
1932	269,616	268,709	213,259	55,450	26.0
1933	281,904	280,956	198,154	82,802	41.8
1934	304,777	303,732	203,939	99,793	45.8
1935	318,968	317,915	206,034	111,881	54.3
1936	381,846	380,562	224,266	156,296	60.7
1937	407,466	406,096	221,290	174,816	75.0
1938	331,179	330,065	186,612	143,453	76.9
1939	376,493	376,227	201,943	174,284	56.8

¹ Basic data from Table 25, Statistics of Railways in U. S., 1929, ICC, years 1921-1928; Table 44, Statistics of Railways in U. S., 1938, years 1929-1938. 1939 figures from ICC Statement M-220.

² From Statement No. 16, Statistics of Railways in U. S. for years 1921-1938. 1939 figures from ICC Statement M-300.

Average Number of Traffic Units per Employee in 1921=1,003,374.

CONCENTRATION OF ECONOMIC POWER

17393

EXHIBIT No. 2565

[Submitted by the Brotherhood of Railway Clerks]

Decrease in employment opportunities—maintenance of equipment and stores

CLASS I RAILWAYS IN U. S. 1921-1939

Year	Traffic Units ¹	Number of Employees Required to Handle Traffic Units at the 1921 rate	Actual Average Number of Employees ²	Decrease in Job Opportunities; Difference between Col. 2 and Col. 3	Per Cent of Increased Employment Required to Handle Traffic Units at the 1921 rate
1921	396,390	490,985	490,985		
1922	431,507	523,597	451,539	72,058	15.9
1923	515,210	625,163	584,573	40,590	6.9
1924	485,861	589,551	529,037	60,514	11.4
1925	510,880	619,909	518,975	100,934	19.4
1926	539,536	654,681	513,530	140,851	27.4
1927	519,591	630,479	485,040	145,439	30.0
1928	515,079	625,004	456,172	168,832	37.0
1929	528,114	640,821	450,350	190,441	42.3
1930	453,168	549,830	440,939	148,841	37.1
1931	361,771	438,978	339,834	99,144	29.2
1932	269,616	327,156	279,125	48,031	17.2
1933	281,904	342,066	262,572	79,494	30.3
1934	304,777	369,821	276,131	93,690	33.9
1935	313,858	387,065	271,258	115,807	42.7
1936	381,846	463,337	296,437	166,900	56.3
1937	407,466	494,425	311,125	183,300	58.9
1938	331,179	401,857	239,784	162,073	57.6
1939	376,493	456,842	264,160	192,682	72.9

¹ Basic data from Table 25, Statistics of Railways in U. S., 1929, ICC, years 1921-1928; Table 44, Statistics of Railways in U. S., 1938, years 1929-1938. 1939 figures from ICC Statement M-220.
² From Statement No. 16, Statistics of Railways in U. S., ICC, for years 1921-1938. 1939 figures from ICC Statement M-300.

Average Number of Traffic Units per Employee in 1921=824, 121.

EXHIBIT No. 2566

[Submitted by the Brotherhood of Railway Clerks]

Decrease in employment opportunities—transportation other than train, engine engine and yard

CLASS I RAILWAYS IN U. S., 1921-1939

Year	Traffic Units ¹	Number of Employees Required to Handle Traffic Units at the 1921 rate	Actual Average Number of Employees ²	Decrease in Job Opportunities; Difference between Col. 2 and Col. 3	Per Cent of Increased Employment Required to Handle Traffic Units at the 1921 rate
	<i>Millions</i>				
1921	396,390	208,782	208,782		
1922	431,507	227,278	202,578	24,700	12.2
1923	515,210	271,266	213,455	57,811	27.1
1924	485,861	255,907	205,994	49,913	24.2
1925	510,880	269,085	205,904	63,181	30.7
1926	539,536	284,178	206,662	77,516	37.5
1927	519,591	273,673	202,267	71,406	36.3
1928	515,079	271,297	194,913	76,384	39.2
1929	528,114	273,162	193,469	84,693	43.8
1930	453,168	238,687	178,597	60,090	33.6
1931	361,771	190,548	150,845	39,703	21.5
1932	269,616	142,009	132,404	9,605	7.3
1933	281,904	148,481	124,404	24,077	16.2
1934	304,777	160,529	122,896	37,633	23.4
1935	313,858	168,014	122,896	45,122	36.7
1936	381,846	201,122	127,545	73,577	57.7
1937	407,466	214,618	134,088	80,530	60.1
1938	331,179	174,436	122,852	51,584	43.0
1939	376,493	198,302	125,149	73,153	58.5

¹ Basic data from Table 25, Statistics of Railways in U. S., 1929, ICC, years 1921-1928; Table 44, Statistics of Railways in U. S., 1938, years 1929-1938. 1939 figures from ICC Statement M-220.
² From Statement No. 18, Statistics of Railways in U. S., ICC, for years 1921-1938. 1939 figures from ICC Statement M-300.

Average Number of Traffic Units per Employee in 1921=1,898,583.

CONCENTRATION OF ECONOMIC POWER

EXHIBIT No. 2567

[Submitted by the Brotherhood of Railway Clerks]

Decrease in employment opportunities—transportation, yardmasters, switchtenders and hostlers

CLASS I RAILWAYS IN U. S., 1921-1939

Year	Traffic Units ¹ (Millions)	Number of Employees Required to Handle Traf- fic Units at the 1921 rate	Actual Avera- ge Number of Employees ²	Decrease in Job Oppor- tunities: Difference between Col. 2 and Col. 3	Per Cent of Increased Em- ployment Required to Handle Traf- fic Units at the 1921 rate
1921	396,390	23,523	23,523		
1922	431,507	25,607	22,934	2,673	11.7
1923	515,210	30,574	25,548	5,026	19.7
1924	485,861	28,532	23,946	4,586	20.4
1925	510,880	30,317	23,350	6,967	29.8
1926	539,636	32,018	23,449	8,569	36.5
1927	519,591	30,534	22,578	8,256	36.6
1928	515,079	30,566	21,332	9,234	43.3
1929	528,114	31,340	20,990	10,350	49.3
1930	483,168	29,892	19,474	7,418	38.1
1931	381,771	21,469	16,854	4,615	27.4
1932	269,616	16,000	13,485	2,515	18.7
1933	251,904	16,729	12,107	4,622	38.2
1934	304,777	18,088	12,423	5,665	45.6
1935	318,988	18,630	12,202	6,728	55.1
1936	381,846	22,680	12,811	9,869	78.9
1937	407,466	24,180	13,483	10,697	79.3
1938	371,179	19,633	12,062	7,571	62.9
1939	376,493	22,342	12,141	10,201	84.0

¹ Basic data from Table 25, Statistics of Railways in U. S., 1929, ICC, years 1921-1928; Table 44, Statistics of Railways in U. S., 1938, years 1929-1938. 1939 figures from ICC Statement M-220.

² From Statement No. 16, Statistics of Railways in U. S., ICC, for years 1921-1938. 1939 figures from ICC Statement M-300.

Average Number of Traffic Units per Employee in 1921—16,851,167.

CONCENTRATION OF ECONOMIC POWER

17395

EXHIBIT No. 2568

[Submitted by the Brotherhood of Railway Clerks]

Decrease in employment opportunities—train and engine service employes

CLASS I RAILWAYS, 1921-1939

Year	Traffic Units ¹ (Millions)	Locomotive Miles, Transportation Service ² (Thousands)	Traffic Units per Locomotive Mile	Locomotive Miles Required to Handle Traffic Units at 1921 Rate per Locomotive Mile (Thousands)	Average Number Employes Train and Engine Service ³	Locomotive Miles per Employe	Train and Engine Service Employes Required to Handle Traffic Units at the 1921 Rate per Locomotive Mile	Decrease in Job Opportunity Difference Between Column Five and Column Seven	% of Increase Number of Employes it would have required to Handle Traffic Units at the 1921 Rate per Employe per Locomotive Mile
1921.....	396,390	1,470,897	369	1,470,897	297,680	4,941.2	324,641	27,557	9.3
1922.....	431,507	1,510,517	288	1,604,115	297,084	5,084.5	387,614	50,396	14.9
1923.....	515,210	1,696,588	304	1,915,279	337,228	5,031.0	365,634	51,888	16.5
1924.....	485,861	1,619,115	300	1,806,175	313,646	5,162.2	384,356	69,012	21.9
1925.....	510,880	1,647,488	310	1,899,182	315,344	5,224.4	405,916	81,128	25.0
1926.....	539,536	1,689,537	319	2,005,710	324,788	5,202.0	390,910	75,767	24.0
1927.....	519,591	1,635,158	318	1,931,565	315,143	5,188.6	387,516	83,530	27.5
1928.....	515,079	1,602,164	321	1,914,792	303,966	5,270.5	397,322	90,756	29.6
1929.....	528,114	1,624,371	325	1,963,249	306,566	5,298.6	340,937	63,696	23.0
1930.....	453,168	1,453,756	312	1,684,639	277,241	5,243.7	272,176	38,345	14.0
1931.....	361,771	1,241,354	291	1,344,874	238,631	5,197.6	202,843	4,434	2.3
1932.....	269,616	1,030,642	262	1,002,290	198,209	5,199.8	212,088	12,776	6.4
1933.....	281,904	1,000,545	282	1,047,970	199,312	5,020.0	229,297	20,558	9.8
1934.....	304,777	1,050,150	290	1,133,000	208,739	5,030.9	239,988	32,993	15.9
1935.....	318,988	1,068,432	299	1,185,829	206,995	5,162.1	287,279	62,112	27.6
1936.....	381,848	1,196,131	319	1,419,502	225,167	5,312.9	306,554	70,323	29.8
1937.....	407,466	1,239,198	329	1,514,743	236,231	5,245.7	249,160	46,476	22.9
1938.....	331,179	1,068,655	310	1,231,149	202,684	5,272.5	283,251	73,502	35.0
1939.....	376,493	1,116,323	297	1,399,602	309,749	5,322.2			

¹ Basic Data from Table 25, Statistics of Railways in U. S. 1929, ICC, years 1921-1928; Table 44, Statistics of Railways in U. S. 1938, years 1929-38. 1939 figures from ICC Statement No. M-220.

² From Table 26, Statistics of Railways in U. S. 1929, ICC for years 1921-28; Table 54, Statistics of Railways in U. S. 1938, ICC for years 1929-1938.

³ From Statement No. 16, Statistics of Railways in U. S., ICC for years 1921-1938. 1939 figures from ICC Statement No. M-300.

⁴ Basic figures from ICC Statements Nos. M-211 (OS-A) for passenger train-miles; M-213 (OS-B) for freight train-miles; Locomotive miles for yard switching have been estimated on the basis of the per cent of the total locomotive miles in 1938 in all branches of the service that was represented by the yard service locomotives. The 1938 percentage represented by yard service locomotive miles was applied to the 1939 data on the assumption that the relative portion of the total would remain approximately the same.

“EXHIBIT No. 2569” appears in text on p. 16640.

“EXHIBIT No. 2570” appears in text on p. 16641.

“EXHIBIT No. 2571” appears in text on p. 16646.

EXHIBIT No. 2572

TECHNOLOGY IN THE BELL SYSTEM WITH PARTICULAR REFERENCE TO
EMPLOYMENT

W. H. Harrison, Vice President, American Telephone and Telegraph Company,
New York. April 17, 1940

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This statement and exhibits were prepared following the receipt of a letter dated January 24, 1940, from the Temporary National Economic Committee to the American Telephone and Telegraph Company inviting information on technology in the telephone industry. An attachment to that letter defines technology as follows:

"While technology is often used to mean the machine process which increases productivity, it is here meant to describe that noticeable change or combination of changes in the techniques of management, trade, finance, production, processing, and distribution by which the productivity of labor is considerably increased."

This statement accordingly deals with the broad aspect of technology as it may be encountered in the activities of the Bell System with particular reference to employment.

At the outset it may be well to outline briefly the need for and character of technology in the Bell System.

The telephone business is a business based upon scientific discovery and scientific invention. Technological progress in the physical instrumentalities of the business and in management methods has been continuously required to meet the ever-changing actual and potential needs of the nation for telephone service. Without the technological progress which has been achieved, it would have been impossible to provide telephone service of the present scope at any price. Without this technological progress, it would have been impossible to furnish a telephone service which is unequaled anywhere else in the world for scope, speed, accuracy, dependability and low cost.

The record shows that the Bell System has been alert to foresee and anticipate the needs and opportunities for technological progress. But more than that, it also has been the aim and policy to introduce into its plant or practices those new technical developments which are clearly essential to progress, and to do this in such a way as to avoid or minimize any possible adverse effects in the nature of economic waste or human hardship. Broadly speaking, employees affected by improvements in apparatus or operating methods have not been laid off but have been retrained and reassigned. An exception has been the conversion of certain manual central offices to dial operation. Even in these instances, the separations from service consequent upon the conversion have been held to a minimum; and since the early 1930's it has been increasingly the practice to make lump-sum termination payments to those individual employees for whom no work could be found, in order to help them over the interval before they secured new employment if new employment was sought.

The long term effects of technological progress upon the scope, quality and cost of telephone service without exception have been beneficial to all participants in the business—employees, investors, and customers—as well as to society as a whole. By overcoming, one after another, physical limitations upon the possibilities of telephone expansion, technology has increased the aggregate opportunities for employment. Similarly, it has created new investment opportunities and has expanded the demand for capital goods. Technology has made for advances in wages, shorter hours, more highly skilled jobs and many other betterments in working conditions; and these betterments have been realized without the use of "speed-up" systems.

Technology in the Bell System has not benefited one group at the expense of any other group. Labor has received a practically constant proportion of the revenue dollar. While the proportion of the revenue dollar going to capital has tended to decline, investors have received regular reasonable returns (partly out of past earnings in years when current earnings have been insufficient).

In the future, technology in the pursuance of Bell System policy will produce the same type of results as in the past. There is a large potential market for more and more telephone service. The importance of developing this market is recognized. Technology will be a force in this. The resultant growth will increase employment. The need for new capital goods for plant additions and betterments will be substantial and new capital must be attracted to the business.

ORGANIZATION

In directing attention to the more specific aspects of technology in the Bell System it will be helpful to first outline briefly the nature and scope of the organization we are considering.

The Bell System is a closely integrated group of telephone companies associated for the purpose of providing, in conjunction with several thousand independently owned companies, a single, unified telephone service in the United States. There are now close to 21,000,000 telephones in the United States, of which nearly 17,000,000 are in the Bell System.

The American Telephone and Telegraph Company is the parent company, and there are twenty-four principal telephone operating subsidiaries, each functioning within a given territory.

In general, the operating companies provide telephone service and interconnect communities within their own territories. The American Company, through its Long Lines Department, constructs, maintains, and operates inter-state long distance lines and other facilities by which the telephone lines of the operating companies, and of independent connecting companies, are united to provide nationwide and world-wide service, and are linked with telephones on ships at sea.

The American Company also performs certain functions which can most effectively and economically be performed centrally and which are essential to the continuous improvement of telephone service and its provision at the lowest cost to the public. Its headquarters staff furnishes the operating companies with engineering assistance and operating advice, as well as assistance and advice in legal, accounting, financial and other matters. Also it conducts for the System extensive research and development work in the Bell Telephone Laboratories. A subsidiary, the Western Electric Company, serves as the manufacturer and purchasing agent for the System.

GROWTH

Before embarking on a consideration of the kaleidoscopic changes which have taken place in recent years in the art of communication, it will be helpful to retrace the road traveled by this comparatively young industry.

Prior to the invention of the telephone in 1875, communication other than by direct conversation was for the most part confined to the interchange of written messages by the mails and the telegraph. The telephone made it possible for the first time to transmit the spoken word and thus opened up the whole range of present-day voice communication which now knows no barriers of time or distance—world-wide telephony, radio broadcasting and all the related fields.

That these possibilities were early recognized is shown by the following excerpt from the Certificate of Incorporation of the American Telephone and Telegraph Company, dated February 28, 1885.

"And it is further declared and certified that the general route of the lines of this association, in addition to those hereinbefore described or designated, will connect one or more points in each and every city, town or place in the State of New York with one or more points in each and every other city, town or place in said State, and in each and every other of the United States, and in Canada and Mexico, and each and every of said cities, towns and places is to be connected with each and every other city, town or place in said States and Countries, and also by cable and other appropriate means with the rest of the known world as may hereafter become necessary or desirable in conducting the business of this association."

This romantic picture was drawn when there was only the most elementary knowledge of the art. The telephone had grown out of science and the founders of the industry foresaw the unlimited possibilities through further application of science, research and management. Today's telephone service affirms the completeness of this early vision.

The history of the Bell System is the story of an organization serving the every-changing needs of society in a field where new frontiers of knowledge in the arts and sciences are constantly opening up.

Some of the more significant aspects of the expansion of the business are illustrated in the graphs opposite.¹

These graphs suggest the extent to which a single invention, continuously developed, has contributed to economic and social progress. It has made possible a service which not only of itself has aided progress, but has provided increased opportunities for labor and for capital. When it is realized that the graphs cover only the Bell Operating Companies and not the independent operating companies, the manufacturing companies or the telephone operators employed in connection with private branch exchange and other services on the customer's premises, the magnitude of this contribution becomes even more striking. Furthermore, the very trends give strong hope of continued progress.

To facilitate discussion, the graphs and references herein cover the American Company and its principal telephone subsidiaries, which comprise nearly 90 per cent. of the employees and about 97 per cent. of the investment of the entire Bell organization.

NATURE OF TECHNOLOGICAL CHANGES

To consider the general matter of technology and the productivity of labor within the System in relation to employment, it is first necessary to review briefly some of the basic factors which control the trend of technological development.

General.—To the layman, the operations of the telephone business may appear simple, seeing, as he does, only such things as the telephone instrument and poles and wires, but to one who has been able to look behind the scenes the complexity and evolutionary nature of the business become immediately apparent. In no period has the business ever remained static—and this is so today—controlled as it is by the changing and expanding needs of society and the continuous advances in the fund of human knowledge. All the engineering arts and their underlying sciences are basic to its progress. All the complex facilities for the transmission of speech and signaling and for the control or switching of channels of communication have had to be devised. New materials, alloys, and compounds have had to be invented or developed. Mathematics, physics and chemistry all underlie this work. Biology and botany enter into the consideration of textiles and timber products used in telephone plant. Physiology and psychology enter into many aspects of the action of the vocal and auditory organs of the human body, so intimately associated with the use of the telephone.

Technological advances are therefore basic. Equally essential to the sound conduct of the business are advances in administration, operation, finance and human relationships so necessary to the rendering of a public service.

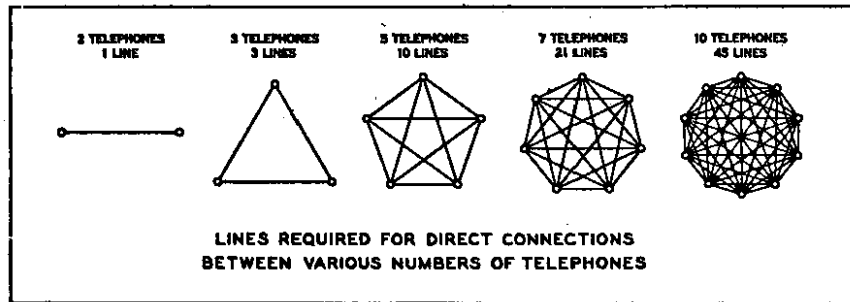
It will be clear from later discussion that the very nature of the business—growth, constantly changing requirements, advances in knowledge of the art, etc.—has brought about the evolutionary change in instrumentalities, practices and procedures. Similarly it will be clear that each change is weighed carefully in relation to its possible effect on employment and any other considerations that may affect the men and women of the organization.

With this background, a brief discussion of some of the technological changes in connection with the telephone business and the reasons leading thereto is appropriate. No attempt will be made to consider separately the research and development, operation or manufacturing aspects. Many phases of operations might be chosen but the two most basic will indicate the trend. One is the development of switching systems for interconnecting individual telephone customers with one another; the other, the instrumentalities for the transmission of conversation.

Switching Systems.—The earliest problem of interconnecting telephones grew out of the multiplicity of lines required for direct connections between subscribers. With only two subscribers to be interconnected, simply one line would be required; for direct connections for three subscribers, three lines; for five sub-

¹ Entered as "Exhibit No. 2569," see supra, p. 16040.

scribers, 10 lines; for 10 subscribers, 45 lines; for 100 subscribers, 4,950 lines; 1,000 subscribers, nearly one-half million lines; and so on to astronomical numbers. The principle is indicated diagrammatically below.



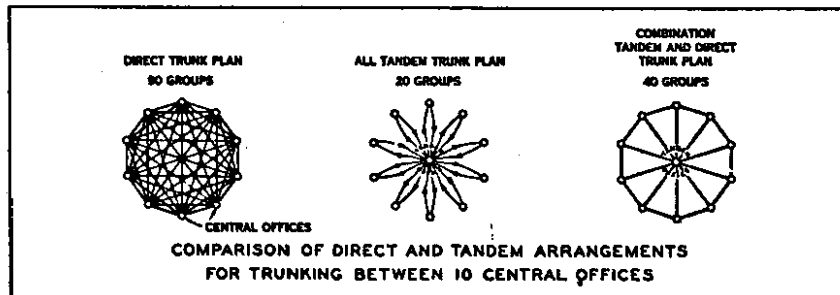
It was clear that this complexity had to be met by means of a "switchboard" where all subscribers' lines terminated and where any two could be linked together by an operator.

The only apparatus available at that time for this purpose was that employed in telegraph, messenger, and burglar alarm systems. While some of this, such as wire, insulators, batteries, annunciators, etc., was found useful, the requirements of telephone service called for signaling and switching equipment different from that employed in any other branch of the electrical industry. This made it necessary to develop an entirely new switching art.

When the number of calls became too great for one operator to handle, the subscribers' terminals had to be duplicated or multiplied one or more times so that each of the operators could reach all terminals for completing calls. This requirement caused a large increase in the central office in the amount of equipment for each subscriber and greatly increased the complexity of the equipment and operating work.

As the number of subscribers in a community became too great for a single central office, a second office just like the first had to be installed and means provided for connecting the two offices. This necessitated circuits called "trunks" between the two offices. Later on an additional switchboard of a new type called a "B" switchboard, for terminating these trunks in each office, was required. This meant extra operators in each office for completing the trunk calls. Each such call thus required the services of two operators.

Now, as the number of central offices grew, more interconnecting problems arose similar to the original one of connecting individual subscribers. For example, to connect two central offices, two trunks or groups are required, one in each direction; to connect four offices, 12 groups are required; for 10 offices, 90 groups; for 100 offices, 9,900 groups, etc. In order to reduce the number of trunks another new type of switchboard, known as a "tandem" board, had to be developed. How such a board made possible fewer trunks is illustrated below.



As the business grew, the increase of trunking and the introduction of tandem switching further complicated the operating work. The operators had to know or be able to ascertain quickly the route to a large and increasing number of called offices. With the introduction of the third operator (tandem operator) on some calls, the chances for delays and errors materially increased.

It is a long step from the early switchboards to the modern ones. As time went on wholly manual service became increasingly inadequate and more and more mechanical aids were necessary in order to give speedy, accurate and effective service. For example, at the start it was necessary for the subscriber to signal the operator by turning a crank on a magneto generator at his station, which action tripped a "drop" in front of the operator which she had to restore by hand after answering the call. Later, a lamp was substituted which lighted when the subscriber lifted his receiver to make a call and was extinguished when he hung up his receiver. Many other arrangements of a machine character became necessary and desirable. Among these were automatic ringing of the subscriber's bell and many forms of signaling. Thus, requirements of the service called for more and more automatic operation, although very few of these changes were visible to the public.

It early became evident that the future demand for service would be such that switching systems and operating methods would continue to be more and more complex and it was clear that manual operation, even with such automatic features as could reasonably be introduced, would be less and less suitable for handling the anticipated volumes of traffic, to say nothing of permitting improvements in quality of service. As an indication of this problem, one has but to consider the situation in one of the large cities where hundreds of thousands of telephones are served from many central offices. Each subscriber in this network—and it must be borne in mind that there are many types of service: Business, residence, coin box, measured, flat rate, etc.—must be able to reach promptly every other subscriber and every other class of service. Furthermore, the necessity for reaching the extensive suburban areas as well as the vast number of cities, towns and rural communities throughout the country requires the handling of thousands of suburban and long distance messages daily, each of which must be recorded, supervised and timed. One can readily appreciate the growing complexity of the operating work to meet this situation and the difficulty of maintaining an accurate and efficient service through the medium of manual operating methods alone. From such practical realities as these, it was certain that manual switchboards, even with such automatic features as could be provided to assist the operator, could not continue indefinitely to meet adequately the local operating problems of the larger cities.

It inevitably followed that switching equipment to complete certain types of connections entirely by mechanical means would ultimately be required. After exhaustive investigations and experiments, an automatic switchboard which met the exacting service conditions was developed and introduced for general use in the early 1920's. Like the manual boards, these automatic boards continue to undergo change and improvement to better adapt them for the ever-expanding needs of the business. As an indication of this continuing evolution, a new dial switchboard known as the "cross-bar" was introduced in 1938.

Transmission of Speech.—No matter how speedy and accurate the connection, service is unsatisfactory if the maze of wires, switchboards and other apparatus does not provide connections over which customers can talk and hear easily and without repetition or interruption. Thus, in addition to the problems of switching, there are the problems of putting together and maintaining the various parts which go to make up the intricate and extensive telephone plant so that every one of the millions of connections established each day will permit a satisfactory talk, no matter what the distance.

In the early days the transmitters and receivers were, of course, relatively crude and inefficient. The lines were noisy and were affected by all manner of electrical disturbances. Connections were limited to distances of a few miles. To permit the service to expand, ways had to be found to improve transmission. Early research in this field led to the development of such things as the metallic circuit, hard-drawn copper wire, and to improvements in the subscribers' instruments themselves.

With the continued increase in the number of subscribers, especially in the larger cities, the amount of wire strung along the pole lines and across housetops began to be so great as to constitute a serious problem. For example, some of the open wire routes along the principal streets of the cities employed poles ranging up to 90 feet in height which carried over 20 crossarms. These cumbersome structures with the mass of wires carried across highways and rooftops where vulnerable to

fires and sleet storms. This is illustrated by the picture which shows the pole line and wire arrangements on lower Broadway at John Street, New York City, in 1890.

Under these conditions, and looking ahead, more reliable and compact forms of line construction became necessary. This led to the development of cables. The earliest ones were far from satisfactory. As the single wire grounded method of transmission was employed, noise and crosstalk, that is, overhearing from one circuit to another, were troublesome. Also, the existing types of insulation resulted in the strength of the voice currents being reduced rapidly as they proceeded along the circuit. These conditions limited the length of cable to a few thousand feet and necessitated development of more efficient cables. This led to the use of paper insulation on the wires, which reduced the transmission losses, and to the provision of twisted pairs in the cables for metallic transmission. With more satisfactory cable circuits, the process of replacing open wires in the larger cities proceeded rapidly. Longer and longer lengths of cable required still more efficient transmitters and receivers; this in turn necessitated continued development to bring about improvements in station apparatus.

Along with the rapid expansion within cities, there was a rising demand for service between cities. The first line between Boston and New York was completed in 1894 and there followed many extensions to more distant parts of the country. These lines, of the open wire type, were subject to the same hazards of sleet and fire as the city plant and soon many had to be placed in cable. Due to the large transmission losses these first intercity cables were limited to tens rather than hundreds of miles. In the early 1900's, after intensive development work, a new means of improving the transmission in cables became available, known as the loading coil. This is an inductance which, when inserted in the cable pairs at periodic intervals, greatly reduces the transmission loss. With this new development, it was possible by 1913 to place the toll circuits in cable along the eastern seaboard from Boston to Washington, D. C.

Even with large gauge conductors equipped with the best loading coils available, inter-city cables could not be extended as far as desired. Furthermore, even with the open wire plant, Denver was about the farthest point with which conversations could be successfully carried on from New York City. To overcome these limitations, work was begun on the development of a telephone repeater, that is, an amplifier, that could be inserted at intervals along the route to overcome transmission losses. A repeater employing a vacuum tube was developed and applied to the New York-San Francisco route in 1914.

These and other developments made it possible to meet the rapidly growing demands for long distance service, using modern-day inter-city cables which provide within a single sheath several hundred telephone circuits and many telegraph and broadcasting network circuits. Looking ahead, it became evident that still other developments were necessary and efforts were directed to finding ways and means of superposing a number of speech channels on one or two pairs of wires. This resulted in the development of telephone carrier, one present-day example of which is the cable carrier system, which provides 12 telephone circuits on two pairs of wires by the use of special terminal equipment and intermediate amplifiers at many points along the line. Intensive research continues and still other forms of carrier employing copper tubing are in the offing.

It is only by means of many technological improvements such as those mentioned above that it has been possible to provide the satisfactory quality of transmission which has been so essential to extending the scope of the business.

These examples of technological changes arising from many sources, some even wholly outside the industry, could be multiplied many times. They are presented here simply to illustrate a fundamental characteristic of the business, namely, that one upon another, technological advances are essential to its very life. And it is clear that progress will only be through this process.

Other Aspects of Technological Changes.—The beneficial long-term effects of technical progress are present in all phases of operations. Reference already has been made to the relation of technology to growth, and to the continual improvements in speed, accuracy and dependability of service.

The very nature of the telephone business (speedy, accurate inter-connection of the constantly expanding millions of telephones throughout the nation, any one with any other—no limitation as to distance or time) necessitates more and more intricate and complex physical instrumentalities. In this, technological advances are essential to keep costs down. While it might be interesting, yet it would be futile, to speculate as to what the cost of present-day service might be under the state of the art say thirty, twenty, or, in some respects, even ten years ago, for the simple reason that service of the present day scope and quality could

not be provided in the light of the art of other days. No one questions that technology has held costs down. It would be impossible to measure the degree. Costs under an outmoded art are themselves outmoded.

The increase in Bell System plant investment which has accompanied technical progress is depicted on the graph opposite page 4 and indicates the magnitude of the demand for new capital investment which growth has entailed. But the demand for new capital goods is not limited to requirements for growth. Capital goods already embodied in physical plant wear out or become outmoded and must be replaced. Therefore, in its effect upon demand for new investment funds for growth and for new capital goods, technological progress in the telephone business has greatly increased the needs.

Finally, what has been the effect of technology upon the human element in the telephone business—the opportunities, wages, and general welfare of men and women? All of this is of vital concern to Bell System management; and since the Committee has indicated a special interest in the subject, a somewhat extended treatment of it appears in the following.

TECHNOLOGY AND EMPLOYMENT

The net result of technological development in the Bell System over the years is—

To create and enlarge opportunity for employment.

To increase the productivity of labor.

To make possible constantly higher wages, shorter hours, and better working conditions.

Enlarged Opportunity for Employment.—Whether or not, as is sometimes said, mechanization and other technological changes reduce opportunities for employment in some industries, such changes in the telephone industry increase employment in the long run. Technological advance, of course, often reduces the labor content of individual telephone operations. To attach undue importance to this would be to overlook the more fundamental consideration that such development overcomes the barriers limiting expansion and thereby opens up new and greater opportunities for employment.

This result is demonstrated in the graphs opposite, showing the trends of employees and payroll.³ Naturally, these trends were interrupted by circumstances growing out of the depression. But, serious as is this setback, there is nothing to indicate that the long-term upward trend will not continue. This has already been resumed.

Productivity of Labor.—Efficiency, consistent with safe and wholesome working conditions, has been an objective of the Bell System from the beginning. On the whole, however, the continual improvements in instrumentalities and methods have been made to permit of extending the scope or improving the quality of the service and not primarily to increase labor productivity.

Naturally, many new arrangements and methods reduce the labor required for specific operations—the dial switchboard illustrates this. Furthermore, many changes introduced solely to improve service lessen the work involved in the operations concerned. For example, improved transmission between customer and operators reduces errors and repetition of orders and reports; this, in turn, reduces the effort required to complete a connection. Improvements in "Information" switchboards and the provision of more complete and simplified records for the use of operators who supply information regarding telephone numbers, changes, moves, etc., have made it possible to perform this service more promptly and completely and with less work-time per call. Another example is the creosote treatment of telephone poles, which lengthens the life of the poles and reduces the amount of work required for inspection and replacement.

Since, however, one of the fundamental policies of the Bell System, and one which has been adhered to from the beginning, has been to make every effort to provide security of employment, the introduction of technological changes has been undertaken in each case with the most careful consideration of the welfare of the employees involved. As changes occur in instrumentalities or methods, the employees affected are generally absorbed elsewhere in the business by retraining and reassignments, usually in the same locality.

The technological change which may be said to result in actual loss of jobs is the introduction of the dial switchboard. For the most part, the operators released are those in manual central offices who were engaged for the period preceding the conversion of these offices to dial. These separations are scattered and their

³ Entered as "Exhibit No. 2570", see supra, p. 16641.

number is not large in relation to the operating force as a whole. They are offset, in part, by increased work for men. Except for the dial program, specific technological changes have rarely caused employees to lose their jobs.

Because of the general interest in the dial, there follows a discussion of that subject at some length.

The Dial Program.—A fundamental of forward looking management is the careful timing of changes to permit of steady progress with a minimum of fluctuation in employment, as well as in overall operating results, both for the short period and the long pull. The dial program was so planned. A large proportion of the change was accomplished during the period of expansion in the 20's when most of the employees displaced by the change could be absorbed within the business and those who could not, found relatively little difficulty in locating jobs elsewhere. During the depression the rate of introduction of new dial offices was reduced to a minimum. On the whole, the introduction of the dial has proceeded at a moderate rather than a rapid pace.

Large numbers of operators are needed with the dial system. This is frequently not realized, perhaps because of the nature of the dial itself and its original designation as "automatic". The dial system substitutes electromechanical processes for some, but not all, of the manual operations. In a dial area, operators are needed to assist customers who dial incorrectly or who require other help. Manual or dial, there is equal need of operators for many special services—among them, interception of calls on changed or discontinued numbers and supplying information about new telephones or telephone numbers in distant places. Also, large numbers of operators continue to be required for handling toll and long distance calls. The same is true of operators at private branch exchange boards, of whom there are about as many in the country as telephone company central office operators. On the whole, it is expected that the number of operators will increase, rather than decrease, with the growth of the business.

Conjecture as to the number of operators that would be required today, whether more or less, had the dial switchboard not been introduced, is futile. The present-day scope, quality and price of telephone service would be impossible under all-manual operation. The change to dial was inevitable for that reason alone—the limitations of the manual switchboard. The dial system, like many of the other technological improvements discussed, overcomes these limitations and by making continued growth possible, increases employment opportunities in the aggregate over the long term.

Discussion of the effect of the dial on employment is not complete if confined to operators. While, on the one hand, the conversion of individual central offices to dial operation displaces operators at the time, on the other hand the day-to-day operation of the dial system makes for more employment of men, as well as in the manufacturing, construction and installation aspects of the business. Moreover, under dial operation there is an increase in the complexity of equipment and practices, with the result that greater knowledge and skill are required of the employees, both men and women, with resultant higher wages.

In dealing with the specific problems involved in the readjustment of the operating force when individual central offices are changed to dial operation, management is constantly endeavoring to avoid adverse reaction on the employees and takes the utmost care in planning and carrying out the necessary program in each case. Usually the replacement requires the construction of a new building and the manufacture and installation of the necessary equipment. Plans for the conversion, therefore, must be under way some 2 to 3 years in advance of the actual change. The methods used are perhaps unique in some respects and a brief mention of the principal ones may be of interest.

As a first step, well in advance of the probable date of conversion, forecasts are made of force requirements up to and following the conversion. A thorough-going survey is made of placement opportunities for the operators likely to be affected by the conversion. On the basis of these estimates and of the practices outlined below, a program is developed which coordinates all pertinent factors so that the force will be of requisite size at all times and the number of operators released after the conversion will be held to a minimum. This program, of course, is modified from time to time as required by changing conditions.

Usually, most of the employees on the payroll at the time the dial program is started can be given assurance of continued employment; this is partly because the force progressively reduces itself by normal resignations and partly because of the opportunities for reassignments. At the earliest possible date each member of the force is made thoroughly conversant with her probable status after the office changes to dial operation.

During a period extending from a few months to a year or more prior to the conversion, all losses from the force are replaced with temporary people who are engaged with the understanding that their employment is for the period up to the time of the conversion. These temporary employees are chiefly people who desire work for limited periods, such as persons taking a year out from school or expecting to be married soon, or ex-employees who are willing to return for a few weeks to a few months. Sometimes part of the force losses prior to conversion are replaced with employees borrowed from other central offices in the same or other cities. Many other measures are employed to minimize force requirements prior to the conversion date and the number of employees to be released after such date; an example is the postponement of most of the vacations until after the conversion. Employees released are given regular vacation pay, and, since the early 1930's, generally lump sum separation allowances.

Over a period following the conversion, the operating force is readjusted to the work requirements of the new basis. A large proportion is retained for services which continue to be handled manually, such as customer assistance, information, toll and long distance. Scheduled transfers and postponed resignations take effect. Borrowed employees return to their home offices. Part or all of the temporary employees are released, some of whom go to positions which have previously been arranged for on private branch exchange switchboards.

There are many other interesting aspects of the adjustment of the operating force in connection with dial conversions, but the foregoing gives some picture of how this problem is handled with a minimum of unfavorable effect on the employees.

Other Employment Considerations.—In addition to increasing employment opportunities, technological development benefits labor in other ways. That labor has shared in the fruits of technological development is demonstrated by the large and consistent proportion of the revenues of the business which is expended for wages and associated benefits. The wage rates themselves have increased greatly and today are higher than ever before, notwithstanding the considerable reduction in hours.

The rise in the average weekly earnings of telephone employees is shown in one of the graphs opposite page 12. This rise is chiefly the result of increases in basic wage rates, but other factors have influenced the trend, such as greater length of service and increasing proportion of more highly skilled jobs.

Other advances which labor has gained with the progress of the business are longer vacations, increased number of holidays, greater security of employment, more liberal payments during periods of sickness, more wholesome and safer conditions of work, and similar betterments. Important as is the Bell System Benefit and Pension Plan in furthering the economic security of the employees and their dependents, it will suffice merely to mention that here.

Finally, it may be pointed out that while technological development often decreases the number of employees required for individual operations, usually the changed operations require greater knowledge and skill on the part of the employees. In other words, technology in the telephone business has the effect of "up-grading" the workers with, of course, a corresponding favorable influence on the trend of wage rates.

1933 Period.—The whole of the foregoing, discussing broadly the extent to which employment opportunity and welfare of labor are dependent upon technological advances, deals with the general matter from the long-term viewpoint. This is in accord with the broad approach which the Committee has suggested.

In the Committee's advance statement specific reference is made to the failure of substantial recovery since 1933 to eliminate unemployment. The following has to do with that reference.

Broadly stated and as indicated in the graph opposite page 4, recovery of revenues, of services (telephones-conversations) and of total wages has been at about the same rate; in fact, services to customers (telephones-conversations) and wages to employees have increased somewhat more rapidly than have the revenues of the business. There is no need, therefore, to refer further to these relationships here.

On the other hand, the number of employees has not increased as rapidly as these other factors. To understand the reason for this, and also the reason for the relatively greater drop in employees and in payrolls from the high of 1930 to the low point, it is necessary to outline the situation prior to 1930, and the situation as it existed during the depression years.

The telephone industry, while relatively stable, is none the less directly affected by the level of business in general. Its activities fall into two broad divisions:

one, day-to-day operations; the other, construction of plant to meet future needs. Construction is naturally less stable than operations.

There can be no back log of unfilled orders—telephone connections between customers must be completed promptly as requested. Facilities must be provided in advance. Personnel must be engaged and trained in advance.

Under this obligation of preparedness, and with the heavy demands for service in the 1920 decade, a large construction program had to be carried on to insure adequate physical facilities. In this period, annual gross additions rose from a level of 200 million dollars to 600 million dollars per year; in all some 3.5 billion dollars of construction was completed as compared with one billion a decade earlier. The investment in plant rose from 1.2 billion at the beginning of 1920 to 3.7 billions at the end of 1929.

To assure preparedness in personnel, large numbers of new employees had to be engaged and trained, and in advance. Thousands of these were needed simply to maintain the existing force—during the 20's, for example, resignations and other normal losses amounted on the average each year to more than 40 per cent. of the force. The losses are shown in the graph below.¹ These had to be replaced, and other thousands of new employees had to be engaged for the increased requirements. By the end of 1929, there were about 90,000 employees with less than one year of service—25 per cent. of the total force. On the average, 40,000 employees were engaged in the construction of plant necessary to care for current growth.

The result of all these factors was that by the end of 1929 the Bell System personnel reached a total of 364,000. This was clearly an abnormal situation and not an appropriate yardstick with which to appraise subsequent developments.

With the depression, and in 1930, came a sudden, sharp drop in demands for new facilities and a slowing up in telephone usage. To make the force situation more difficult, normal force losses decreased materially, incidental absences dropped, the experience and resulting skill of the forces increased and operating conditions generally become easier. These changes at once produced a surplus of people and this situation became progressively more acute.

As the work volume dropped, adjustments had to be made to bring the forces more in line. This was done in an orderly way and with the utmost regard for the welfare of the men and women. Construction was carried on for a period at existing levels but had to be curtailed as more and more telephones were discontinued and usage reduced. Intensive sales and other promotional activities were carried on. Thousands of employees were retained by spreading the available work and other thousands by introducing productive "made" work.

Despite all efforts, work requirements dropped steadily. There was simply not enough work to go around. Had the System released all employees not actually needed, instead of spreading work and providing made work, there would have been more than 60,000 fewer employees at the bottom of the depression; this condition prevailed in varying degree throughout the depression.

The readjustments of the force took place gradually and over a period of years. For the most part the readjustments occurred by not making replacements of natural losses—resignations, deaths and retirements. Layoffs because of lack of work and dismissals because of unsatisfactory work actually averaged a lower percentage of the regular force during the depression than during the previous 10 years. This is shown by the preceding graph. Those affected were chiefly the short service employees, not the older people.

Employees laid off were given their regular vacation pay in advance and, in addition, it became increasingly the practice to pay lump sum allowances at the time of separation in order to assist them in their readjustments.

In brief, as the situation existed at the time, all was done that soundly could be done to lessen the reaction.

Here, then, stood the situation late in 1933 as losses in telephones and shrinkage in usage and in revenues stopped. There was appreciable excess plant, the result of the loss of 2,600,000 telephones and the continuing of construction in the interest of employment—there remained an excess in the force because of the desirable practice of spreading of work—there were those on "made" work. The force as a whole had an experience factor theretofore never attained. In 1933 the average length of service was 10 years; the 1928-1929 average was 5½. During this period there were no new technological changes which might have tended to aggravate the immediate unfavorable employment situation.

With this greater experience—with plant margins beyond any that existed before—with little of the day-to-day activities of the organization associated

¹ Entered as "Exhibit No. 2671," see supra, p. 16646.

with the problems incident to growth—with incidental force absence small, and with the continuing improvements in management procedures and practices—the effectiveness of the entire organization became progressively greater.

Therefore, as the losses in telephones were regained, as usage became greater, and as the number of dial telephones increased, the added work was handled with relatively few additions to the force, particularly as during the early part of the "pick-up" period there was less and less spreading of work, until the force as a whole worked full time—40 hours.

Stated briefly, as the work load dropped the forces were not readjusted downward to the full extent of this—at the low point, as previously mentioned, there were some 60,000 employees over and above the actual requirements. These had to be gradually absorbed; and there was little new plant required. This explains why the increase in number of employees has not kept pace with the increase in telephones, usage and revenues. On the other hand, the number of employees has increased over the past few years and, as growth continues and the telephone markets are further developed, it is expected that this upward trend will continue. More and more people will be required to meet additional construction needs and for day-to-day operations.

CONCLUSION

In conclusion, it is clear that the provision of communication facilities adequate to care for the expanding and ever-changing social and business needs of the nation can be met in no other way than through a close adherence to the established policy of prompt recognition, development and introduction of essential technological changes making for cheaper and better plant as well as for more efficient administration and operation.

As to the effect of these changes on employment, the number of people now employed in the Bell System is certainly far greater than it would have been had the art remained static. Opportunities for employment have been enlarged. Higher wages have resulted, along with shorter hours and many other betterments in working conditions.

The meeting of Bell System objectives of the best possible service of broadest scope at lowest cost consistent with fair return and just treatment of employees has been possible only as a result of taking full advantage of these technological advances.

CONCENTRATION OF ECONOMIC POWER

17407

EXHIBIT No. 2573

(Chart based on following statistical data appears in text on p. 16685.)

Production, Employment and income Distributed, Bell System, 1919-1938

[1923-25=100]

Year	Pay rolls ¹	Dividends and interest ²	Operating Revenues		Production		Employment ³
			Unadjusted ⁴	Adjusted ⁴	Weighted ⁵	Un-weighted ⁶	
Average amount in base period: ⁷	\$360,238	\$ 24,499	\$687,640	54.2	69.5	66.5	281,580
1919	55.3	54.2	56.4	54.2	69.5	66.5	74.5
1920	73.2	57.6	66.6	57.4	73.8	72.4	82.1
1921	76.3	68.0	73.7	75.2	79.1	76.5	79.6
1922	82.5	78.8	81.2	85.5	87.4	83.7	86.3
1923	92.7	88.5	90.6	91.5	94.5	93.4	96.6
1924	101.3	99.7	98.6	99.6	99.7	100.0	99.8
1925	106.0	111.8	110.7	108.5	106.0	106.5	104.1
1926	113.4	120.8	122.8	120.4	113.1	114.3	106.8
1927	119.3	130.8	133.3	130.7	119.0	120.5	109.7
1928	129.5	137.3	145.9	139.0	126.4	128.9	118.7
1929	146.2	154.1	162.2	151.6	136.5	140.1	129.3
1930	148.4	179.0	167.5	165.8	134.2	142.6	115.2
1931	134.2	197.3	161.8	179.8	128.7	141.7	104.7
1932	115.0	192.9	141.7	179.4	115.4	133.3	94.6
1933	98.9	190.8	130.0	168.8	107.2	125.0	88.2
1934	103.2	193.4	130.8	159.5	110.6	128.4	88.4
1935	107.5	189.2	138.0	158.6	113.9	133.4	86.9
1936	115.8	188.3	148.5	161.4	124.2	143.7	92.1
1937	132.2	181.3	157.0	163.5	130.5	152.2	97.9
1938	135.7	179.6	157.2	170.9	131.0	154.6	93.0

¹ Employment series based on all employees and pay roll series on salaries and wages. Employees of Western Electric Company, Inc., are not included. Based on figures from American Telephone and Telegraph Company, *Comptroller's Annual Report 1938*, Part I, Bell System, Statement No. 54, and the same for 1933, Statement No. 48.

² Dividends paid to the public and interest deductions. Figures for dividends from Federal Communications Commission, Special Investigation, Docket No. 1, *Report on American Telephone and Telegraph Company, Corporate and Financial History*, Vol. I, p. 109. Figures for interest from *Annual Report of the American Telephone and Telegraph Company* for respective years.

³ Federal Communications Commission, Special Investigation, cited in footnote 1.

⁴ Unadjusted index divided by Snyder's index of the general price level.

⁵ Weighted average of exchange and toll messages of the Bell System as computed by the National Bureau of Economic Research and published in its Bulletin No. 59.

⁶ Based on average daily conversations as reported in Federal Communications Commission, Special Investigation, cited in footnote 1 p. 115.

⁷ Dollars in thousands.

⁸ Occasional employees and employees on leaves of absence in excess of one month without pay not included beginning with 1933.

⁹ The published figures for the Bell System for these years have been raised to include The Southern New England Telephone Company and The Cincinnati and Suburban Bell Telephone Company in order to make these years comparable with those for the earlier period. Data for these companies were supplied by the Federal Communications Commission.

"EXHIBIT No. 2574," introduced on p. 16678, is on file with the committee

"EXHIBIT No. 2575," introduced on p. 16678, is on file with the committee

"EXHIBIT No. 2576," introduced on p. 16679, is on file with the committee

"EXHIBIT No. 2577," introduced on p. 16679, is on file with the committee

"EXHIBIT No. 2578," introduced on p. 16679, is on file with the committee

EXHIBIT No. 2579

[Submitted by the National Federation of Telephone Workers]

[From Fifth Annual Report of the Federal Communications Commission for fiscal year ending June 30, 1939]

Selected data showing the development through the years 1926 to 1938, inclusive, of Class A telephone carriers which reported for the year 1938¹

Year	Number of Carriers	Investment in Telephone Pft.	Depreciation Reserve	Ratio of depreciation to investment	Capitalization
				Percent	
1926	140	\$2,973,932,711	\$801,481,850	20.22	See below.
1927	146	3,215,271,753	624,614,255	19.43	
1928	142	3,481,218,250	674,727,230	19.38	
1929	139	3,862,241,317	724,413,173	18.76	
1930	136	4,217,710,052	782,345,270	18.07	
1931	109	4,384,958,752	814,241,820	18.57	
1932	91	4,423,555,828	848,151,536	19.15	
1933 ²	83	4,433,207,365	929,495,109	20.97	
1934	84	4,442,414,118	1,007,750,873	22.68	
1935	83	4,460,060,270	1,102,225,896	24.71	
1936	79	4,536,600,007	1,187,499,944	26.18	
1937 ²	73	4,674,627,528	1,261,070,772	26.98	
1938	73	4,783,082,079	1,316,367,516	27.52	

	Capital stock	Capitalization		Ratio of debt to total Capitalization
		Funded debt	Total Capitalization	
				Percent
1926	\$2,583,283,669	\$938,246,141	\$3,521,529,810	27.07
1927	2,863,966,791	974,594,895	3,838,561,686	25.39
1928	3,181,105,824	973,665,048	4,154,770,872	23.43
1929	3,320,379,615	1,143,540,703	4,463,920,318	25.62
1930	4,090,105,534	1,094,811,355	5,184,916,889	21.12
1931	4,276,926,127	1,021,222,053	5,298,148,180	19.28
1932	4,217,783,773	994,714,437	5,212,498,210	19.08
1933 ²	4,254,146,109	987,797,508	5,241,943,617	18.84
1934	4,273,574,149	984,931,828	5,258,505,972	18.73
1935	4,273,955,436	1,013,702,525	5,287,657,961	19.17
1936	4,305,034,328	971,773,400	5,276,807,728	18.42
1937 ²	4,275,062,632	939,852,080	5,214,914,712	18.02
1938	4,284,792,921	1,031,567,735	5,316,360,656	19.40

¹ Includes, for the entire period, carriers consolidated and merged in prior years for which annual report data are available. Intercorporate duplications have not been excluded.

² In comparing data in this table, considerations may be given to the minor effect of the revisions of the uniform system of accounts, first revised issue, and the issue of June 19, 1935, as amended, resulting in certain changes in and rearrangements of both the balance sheet and the income statement.

NOTE.—Class A telephone carriers are those carriers having average annual operating revenues exceeding \$100,000.

CONCENTRATION OF ECONOMIC POWER

17409¹

EXHIBIT No. 2580

[Submitted by the National Federation of Telephone Workers]

[From Fifth Annual Report of the Federal Communications Commission for fiscal year ending June 30, 1939]

Selected data showing the development through the years 1926 to 1938, inclusive, of Class A telephone carriers which reported for the year 1938¹

Year	Total Surplus	Interest on Funded Debt	Dividends Declared	Operating
1926.....	\$344,539,547	\$49,010,892	\$189,752,127	See below.
1927.....	477,511,166	48,804,397	211,056,375	
1928.....	545,406,259	48,916,199	234,303,419	
1929.....	631,643,523	62,341,709	255,372,149	
1930.....	638,094,296	67,212,814	293,847,585	
1931.....	639,375,808	54,231,013	333,544,383	
1932.....	589,495,032	50,229,270	336,005,596	
1933 ²	522,947,692	49,608,524	321,595,698	
1934.....	459,605,230	49,340,883	308,510,650	
1935.....	411,901,270	49,603,662	314,303,414	
1936.....	386,450,890	47,259,891	346,625,791	
1937 ²	339,869,290	38,378,940	350,933,890	
1938.....	362,922,201	38,933,819	338,175,841	

	Operating Revenues	Operating Expense	Operating Ratio %	Net Income
1926.....	\$879,503,186	\$589,236,728	67.00	\$247,371,069
1927.....	948,205,721	637,159,692	67.20	314,201,683
1928.....	1,032,113,717	690,998,145	66.95	308,616,556
1929.....	1,132,732,200	766,062,199	67.63	346,389,980
1930.....	1,166,447,243	803,857,137	68.92	341,126,045
1931.....	1,136,464,163	768,117,829	67.59	347,649,908
1932.....	1,010,513,593	689,776,938	68.28	289,020,367
1933 ²	932,787,485	666,427,361	71.44	266,745,812
1934.....	944,172,583	665,188,994	70.45	251,383,681
1935.....	990,630,593	702,091,043	70.45	278,212,728
1936.....	1,075,902,427	721,514,563	67.06	362,403,616
1937 ²	1,137,279,373	773,954,020	68.05	363,582,760
1938.....	1,139,737,165	783,964,478	68.78	323,489,437

¹ Includes, for the entire period, carriers consolidated and merged in prior years for which annual report data are available. Intercompany duplications have not been excluded.

² In comparing data in this table, considerations may be given to the minor effect of the revisions of the uniform system of accounts, first revised issue, and the issue of June 19, 1935, as amended, resulting in certain changes in and rearrangements of both the balance sheet and the income statement.

NOTE.—Class A telephone carriers are those carriers having average annual operating revenues exceeding \$100,000.

17410

CONCENTRATION OF ECONOMIC POWER

EXHIBIT No. 2581

[Submitted by the National Federation of Telephone Workers]

[From Fifth Annual Report of the FEDERAL COMMUNICATIONS COMMISSION for the fiscal year ending June 30th 1939]

Selected data showing the development through the years 1926 to 1938, inclusive, of Class A telephone carriers which reported for the year 1938¹

Year	Total Miles of Wire ²	Total Tele-phones	Average number of calls Originated per Month		Number Employ-ees at close yr.	Total Compensation
			Local	Toll		
1926	54,438,139	14,371,922	2,016,708,881	76,236,937	322,526	(4)
1927	60,414,601	15,191,034	2,073,997,804	82,639,163	327,839	(4)
1928	65,825,733	16,035,598	2,191,999,849	90,656,284	350,008	(4)
1929	73,050,705	16,988,590	2,354,593,215	98,532,631	387,023	(4)
1930	80,523,201	17,088,841	2,355,187,583	88,967,215	346,212	(4)
1931	84,288,944	16,791,784	2,312,053,095	82,070,762	314,727	(4)
1932	85,868,108	14,979,602	2,163,674,876	66,963,473	284,450	(4)
1933 ³	82,202,832	14,263,261	1,996,903,490	60,268,139	267,129	\$366,139,229
1934	82,077,616	14,618,023	2,047,546,412	62,421,097	267,674	385,755,421
1935	82,427,109	15,111,865	2,136,383,682	64,749,630	284,873	401,849,306
1936	83,188,628	16,037,622	2,290,569,404	72,616,128	289,985	433,066,028
1937 ⁴	85,455,726	16,961,705	2,429,225,217	73,947,702	294,821	488,422,528
1938	87,395,248	17,431,353	2,483,731,922	72,857,647	285,650	501,504,752

¹ Includes, for the entire period, carriers consolidated and merged in prior years for which annual report data are available. Intercorporate duplications have not been excluded.² In comparing data in this table, considerations may be given to the minor effect of the revisions of the uniform system of accounts, first revised issue, and the issue of June 10, 1935, as amended, resulting in certain changes in and rearrangements of both the balance sheet and the income statement.³ The decrease reflected in data shown for the year 1933 is due mainly to the fact that prior to that year the total of wire jointly owned with other companies was included, whereas from 1933 on only the respondent's portion of jointly owned wire was included.⁴ Data not reported.

NOTE.—Class A telephone carriers are those carriers having average annual operating revenues exceeding \$100,000.

EXHIBIT 2582

[Submitted by the National Federation of Telephone Workers]

RELATIVE ACTIVITY OF WESTERN ELECTRIC COMPANY'S PLANTS

The following table shows the relative activity of Western's plants during the period 1927-1935, measured by the number of hours of labor employed in production, and the manufacturing expense or overhead incurred by Western for each such hour:

Direct labor hours

Year	Total Hours	Relation to Average of Normal Yrs. 1927-1928	Manufacturing Expense	
			Total	Per Direct Hour Labor
1927	35,849,000	-----	\$36,836,000	\$1.03
1928	41,824,000	-----	43,113,000	1.03
Ave. 1927-1928	38,836,000	100.0	39,975,000	1.03
1929	78,359,000	203.1	69,991,000	1.89
1930	63,579,000	163.7	65,813,000	1.03
1931	36,939,000	95.1	50,987,000	1.38
1932	16,172,000	41.6	31,662,000	1.96
1933	8,698,000	22.4	21,690,000	2.50
1934	11,474,000	29.5	22,841,000	1.99
1935	12,492,000	32.2	24,394,000	1.95

CONCENTRATION OF ECONOMIC POWER

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EXHIBIT No. 2583

[Submitted by the National Federation of Telephone Workers]

*Bell System—Index of output per employee and employee man-hour*¹

Year	Employee	Employee Man-hour	Year	Employee	Employee Man-hour
1932.....	100.0	100.0	1935.....	111.9	116.5
1933.....	102.2	109.3	1936.....	117.8	121.0
1934.....	105.5	110.7	1937.....	115.9	119.0

¹ From Works Progress Administration National Research Project, *Production Employment and Productivity in 59 Manufacturing Industries*, Part III: *Appendixes* (Report No. S-1, Part Three, Philadelphia, Pennsylvania, 1939) p. 160.

EXHIBIT No. 2584

[Submitted by the National Federation of Telephone Workers]

*Progress of dialization in Bell System*¹

Year	Percentage distribution of Bell Telephones		Year	Percentage distribution of Bell Telephones	
	Manual	Dial		Manual	Dial
1920.....	68.1	1.9	1927.....	81.4	18.6
1921.....	67.3	2.7	1928.....	78.3	21.7
1922.....	66.4	3.6	1929.....	74.0	26.0
1923.....	64.5	5.5	1930.....	68.3	31.7
1924.....	61.4	8.6	1931.....	62.8	37.2
1925.....	57.6	12.4	1932.....	57.5	42.5
1926.....	54.6	15.4	1935.....	52	48

¹ From Works Progress Administration National Research Project, *Production Employment and Productivity in 59 Manufacturing Industries*, Part III: *Appendixes* (Report No. S-1, Part Three, Philadelphia, Pa. May 1939, page 160.)

EXHIBIT No. 2585

[Submitted by the National Federation of Telephone Workers]

*Production, employment and productivity summary indexes for the telephones industry (Bell System)—Operators: 1919-1937*¹

[1929=100]

Year	Production	Number of Operators	Output per Operator	Year	Production	Number of Operators	Output per Operator
1919.....	45.9	65.3	70.8	1929.....	100.0	100.0	100.0
1920.....	48.4	76.6	63.2	1930.....	97.4	89.1	109.3
1921.....	51.7	73.3	70.5	1931.....	94.0	80.5	116.8
1922.....	57.3	78.0	73.5	1932.....	85.0	71.7	118.5
1923.....	63.5	85.6	74.2	1933.....	77.9	62.8	124.0
1924.....	68.0	86.5	78.6	1934.....	80.0	61.9	129.2
1925.....	74.5	92.1	80.9	1935.....	83.3	60.7	137.2
1926.....	81.1	93.2	87.0	1936.....	90.5	63.7	142.1
1927.....	86.2	93.0	92.7	1937.....	95.0	68.5	138.8
1928.....	92.5	94.8	97.6				

¹ From Works Progress Administration National Research Project *Production Employment and Productivity in 59 Manufacturing Industries*, Part III: *Appendixes* (Report No. S-1, Part Three, Philadelphia, Pa., 1939) p. 162.

EXHIBIT No. 2586

[Submitted by the National Federation of Telephone Workers]

Production, employment and output per employes summary indexes for the telephone industry (Bell System)—All employes: 1919-37¹

[1929=100]

Year	Production	Employment	Output per Employee	Year	Production	Employment	Output per Employee
1919	45.9	57.3	80.1	1929	100.0	100.0	100.0
1920	48.4	64.6	74.9	1930	97.4	97.0	100.4
1921	51.7	63.3	81.7	1931	94.0	86.0	109.3
1922	57.3	67.0	85.6	1932	85.0	78.8	107.9
1923	63.5	74.3	85.5	1933	77.9	70.6	110.3
1924	68.0	79.1	86.0	1934	80.0	70.3	113.8
1925	74.5	81.2	91.7	1935	83.3	69.0	120.7
1926	81.1	84.2	95.3	1936	90.5	71.3	127.1
1927	86.2	86.6	90.5	1937	95.1	76.0	125.1
1928	92.5	91.6	101.0				

¹ From Works Progress Administration National Research Project *Production Employment and Productivity in 59 Manufacturing Industries*, Part III: *Appendices* (Report No. 6-1, Part Three, Philadelphia, Pa., 1939), p. 161.

"EXHIBITS Nos. 2587 to 2604" appear in *Hearings*, Part 28, appendix, pp. 15634-15641

EXHIBIT No. 2605

[Submitted by the United Electrical, Radio, and Machine Workers of America]

STATEMENT OF JAMES B. CAREY, GENERAL PRESIDENT, UNITED ELECTRICAL, RADIO AND MACHINE WORKERS OF AMERICA¹

In 1937, according to the U. S. Census, the electrical manufacturing industry (not including radio, refrigerators and other major appliance) was the 5th largest on the basis of number of employees; 6th largest on the basis of value produced; and 3rd largest on the basis of "value added by manufacture."

In addition to its being one of the largest industries, it has been growing more rapidly than industry generally in the United States since 1899. This is true on the basis of either workers or amount of products. In 1899, the electrical industry represented 0.9 percent of all the workers employed in manufacturing; in 1937, it represented 3.7 percent. In 1899, .92 percent of all the value added by manufacture was in the electrical industry; and by 1937 this had risen to 4.05 percent, which thus shows a relatively greater rise than employment.

Electrical & Radio Industry as Percent of Total Manufacturing

Year	Value Added	No. of Workers	Year	Value Added	No. of Workers
1899	.92	.9	1925	3.51	3.1
1904	1.23	1.3	1927	3.90	3.1
1909	1.38	1.4	1929	4.30	4.0
1914	1.91	1.8	1931	4.11	3.6
1919	2.42	2.5	1933	3.88	3.9
1921	2.82	2.5	1935	3.71	3.1
1923	3.00	2.5	1937	4.05	3.7

NOTE.—Prior to and including 1929, the Bureau of the Census included radio in the electrical manufacturing industry, and for consistency, we have added radio to electrical from 1931 to date.

Of special significance in any discussion of technology is the unique position which the electrical manufacturing industry occupies in the total industrial picture, for this industry produces much of the apparatus which, especially in recent years, has brought about technological change in other industries.

For example, in the last 5 census years, almost \$150,000,000 worth of control apparatus were produced—*control apparatus*, which rose from 2.1 percent of

¹ Italics indicate words written in in pencil; words scratched through are indicated by line type.

total electrical production of 2.5 percent, and approximately \$620,000,000 worth of motors, motors which rose from 10.1 percent of the total production to 15.1 percent. Of these two items, it is probably safe to say that the majority of the first, control apparatus, and a sizable percentage of the second have gone to other industries, where they have replaced more primitive apparatus.

In addition to the control apparatus mentioned above, there is a separate industry classified by the census as "INSTRUMENTS AND APPARATUS, PROFESSIONAL, SCIENTIFIC, COMMERCIAL AND INDUSTRIAL," which, according to "Industrial Instruments and Changing Technology" (WPA National Research Project, Report # M1, October, 1938) is being more and more refined on electrical principles. This industry, between 1909 and 1929, increased its production almost fifty-fold, and in the latter year sold \$30,000,000 worth of products to industrial concerns. It is pointed out, however, that whereas in 1919, for each thousand dollars \$1,000 invested in machinery only \$3 was spent for control instruments, by 1935 for each thousand dollars of machinery purchased, there was purchased that figure had reached \$14.37 of control apparatus.

The second important factor along this line in this connection is the fact that direct controlling apparatus, such as tachometers, flow meters, etc., as opposed to strictly indicating and recording instruments, are becoming increasingly important. Thus, in 1923, only 7.7 percent of all instruments produced were control instruments, but by 1935 control instruments represented 33 1/2 percent of all new instrument sales. "These increasingly important industrial instruments represent a type of equipment which is relatively inexpensive and serve to contribute substantially toward reducing costs of production and toward increasing effective capacity of equipment already in use, thus obviating the installation of new machinery. As a safeguard against break-down, instruments serve to reduce the volume of repair work. Through securing uniformity of operation, they help minimize the wear of machinery and extend its normal life.

It must be remembered that, conversely, technological changes in other industries brought about through products developed in the electrical industry will in turn reflect upon the production and employment in the electrical industry itself.

Thus the Federal Power Commission reports, in "National Power Survey: Interim Report, Powers Series #1, 1935," that steam-power units installed in central power stations in the period of 1931 to 1934 averaged over 30,000 kilowatts in capacity, as against approximately 15,000 kilowatts per unit in 1921 to 1925. "The original investment per unit of capacity is a great deal smaller for large steam-electric generating stations than for small ones, ranging from \$135 to \$150 per kilowatt for stations of a capacity of 2,000 kilowatts to \$92 to \$115 per kilowatt for stations of 200,000 kilowatts. The cost per unit of capacity in the case of boilers capable of producing 1 million pounds of steam per hour is less than one-half that of a boiler with one-tenth that capacity.

"Likewise, in Diesel plants investment per unit of capacity varies inversely with the capacity, declining from \$230 to \$106 as the capacity increases from 100 to 10,000 kilowatts."¹

"Again, wherever large-capacity electric motors are required, similar economies in investment per unit of motor capacity are secured as the capacity of the motors increases."²

"Another outstanding development in the power industry has been the growing use of the 'topping' technique, whereby the exhaust steam from high-pressure, high-temperature turbines is utilized by being discharged into the steam headers of lower-pressure units. In this way it is possible to increase the capacity of existing stations from 40 to 90 percent without an increase in fuel requirements and without corresponding additions to plant and equipment. Instead of replacing all of the obsolete units in the recovery years since 1933, replacement of certain key units was thus sufficient to secure the required modernization of equipment and expansion of capacity. 'Topping' units represented more than 75 percent of the total turbine capacity installed in the period from January 1936 to May 1937 in central stations using pressures of 1,000 pounds and over and about 30 percent of all turbine capacity installed using pressures above 400 pounds."³

All the above have had the effect of lowering the amount of employment and production in the electrical industry.

The electrical industry, for all practical purposes, could be termed a concentrated industry. Of 29 states reported in the U. S. Census, 95 percent of the

¹ "Effects of Technological Developments upon Capital Formation"—National Research Project, p. 6.

² "Effects of Technological Developments Upon Capital Formation"—National Research Project, p. 4.

³ "Effects of Technological Developments Upon Capital Formation"—National Research Project, p. 8.

total electrical products manufactured are produced in 12 states. Of these 12, 9 which are located north of the Mason-Dixon Line and east of the Mississippi River produce 87 percent of the total production. It could be pointed out further that within these states there are rather decided concentrations in limited areas, such as Philadelphia and Pittsburgh, in the State of Pennsylvania. Furthermore, the industry is concentrated from the standpoint of the importance of major companies; General Electric, Westinghouse, and Western Electric, for example, annually produce between 25 to and 35 percent of the total production.

In *The Structure of the American Economy*, the National Resources Committee reports that 44.4 percent of the total value of production in the electrical machinery apparatus and supplies industry was produced by the 4 largest producers. The tabulation which follows points out this fact to an even more startling degree, for whereas only 4 percent of the 1,400 plants in the electrical industry had an annual production in 1937 of \$5,000,000 or more (and it must be remembered that this 4 percent includes in many cases more than one plant of a given company, such as General Electric) this 4 percent employed 51.7 percent of all the wage earners, and produced 57.6 percent of the value of products.

Electrical Industry 1937 Classified by Value Produced—Percentage

Value Produced (\$000)	Number of Establishments	Wage Earners	Value of Products	Value Produced (\$000)	Number of Establishments	Wage Earners	Value of Products
TOTAL.....	100.0	100.0	100.0	250-499.9.....	12.6	4.4	4.0
5-19.9.....	13.2	0.2	0.1	500-999.9.....	9.8	7.7	6.3
20-49.9.....	14.4	0.6	0.4	1,000-2,499.9.....	9.3	14.5	12.8
50-99.9.....	14.7	0.8	0.9	2,500-4,999.9.....	4.9	16.5	15.3
100-249.9.....	17.0	3.2	2.5	5,000 & over.....	4.0	51.7	57.6

In the radio industry, 9 out of 162, or 5.6 percent of the plants, produced in excess of \$5,000,000. They employed 47.5 percent of the wage earners and produced 52.1 percent of the total production.

Radio Industry 1937 Classified by Value Produced—Percentage

Value Produced (000)	No. of Establish't.	Wage Earners	Value of Products	Value Produced (000)	No. of Establish't.	Wage Earners	Value of Products
TOTAL.....	100.0	100.0	100.0	250-499.9.....	8.6	1.8	1.8
5-19.9.....	6.2	0.05	0.1	500-999.9.....	17.9	8.4	7.6
20-49.9.....	11.7	0.3	0.3	1,000-2,499.9.....	13.0	13.8	13.0
50-99.9.....	10.5	0.5	0.6	2,500-4,999.9.....	11.1	28.0	23.6
100-249.9.....	15.4	1.5	1.6	5,000 & over.....	5.6	47.5	52.1

Both of these factors—concentration geographically and concentration according to size of plant—exert a strong influence on technological change in our industry; the first, because it allows changes in technique rapidly to pervade the entire industry; and the second, because the major companies are in a better position to spend money on research, and due to their large surpluses immediately to put into effect in their plant any practical results. *The importance of the latter is well stated in the following quotations:*

"Aside from the fact that the availability of large-capacity equipment provided the technological basis for the tendency toward a concentration of production in fewer and larger plants, the trend toward larger-capacity units was accompanied by decreases in equipment expenditures per unit of capacity."⁴

"While the transition to large equipment units means a smaller capital outlay per unit of capacity, it permits at the same time further economies in the utilization of the equipment. In many cases large-capacity equipment will, for instance, justify the use of refinements and of auxiliary devices which result in improved efficiency of operation. The advantages of large-capacity units are also often due to greater mechanical efficiency. Furthermore, the operation of large machinery involves the use of a considerably smaller amount of fuel and also of labor

⁴ "Effects of Technological Developments Upon Capital Formation"—National Research Project, p. 3.

per unit of capacity or of output than is called for in the operation of smaller equipment units.

"In addition to those direct economies brought about by the introduction of large-capacity units, there are indirect ones, such as those associated with installation costs per unit of capacity. Floor space required per unit of capacity is much smaller for larger than for smaller units. Saving in floor space clearly implies a smaller volume of plant construction to secure a given productive capacity. There are similar economies in transportation costs per unit of capacity as larger-capacity units are used.

"The obvious implication of the trend toward larger-capacity equipment is that during the recovery period after 1933—as idle plants were being put into operation and as old obsolete machinery was being replaced—considerably smaller capital outlays and less construction of equipment were required than in the middle twenties to secure the same or even an increased volume of output."⁵

Regarding the second point mentioned above, the question of research in relationship to large companies, the report of the National Research Project, entitled, "Industrial Research and Changing Technology" points out that the electrical industry was one of the first to engage in large scale research. At the present time, the electrical industry is the fourth largest industrial group as to research, and accounts for approximately 7 percent of the total industrial research employment in the United States.

Radio, another branch of our industry, at present accounts for approximately 2.5 percent of industrial research employment.

Furthermore, between 1927 and 1938 research employment in the electrical industry has grown 58 percent, while research employment in the radio industry has grown 1,600 percent.

Regarding the concentration of research within these specific fields, the report states that 18 companies, which represent 25 percent of all electrical companies conducting research, employ 82 percent of the research workers.

In radio, 5 companies, which represent 25 percent of those doing research, account for 83 percent of the research employment.

Finally, among the 45 largest employers of research workers, there are 6 firms in the electrical and radio field as well as 2 others whose secondary production in the electrical apparatus division is very great.

In relation to large plants, another factor is of great importance. These concerns have, for several years, been experimenting with job specifications, and this process has perhaps been given wider acceptance in our field than in many other industries. In this manner, they have been able to break down jobs into a number of minor operations, and on the basis of classification of these minor operations the workers are hired and paid. Thus, instead of hiring a machinist, for example, who is unquestionably a skilled worker and receives much higher rates of pay, new workers are today hired as punch press operators, screw machine operators, etc. at considerably lower rates. This tendency has reached alarming proportions, for the *ratio* rate of skilled workers to the total labor force is continually dropping. In fact, *dead* many previously skilled workers have today become, by definition and in fact, semi-skilled workers. We estimate that today less than ¼ of the employees in our industry are in the skilled classifications. The following table will give some idea of the importance of these classifications:

Skilled.....	78,000	21 percent
Semi-Skilled.....	196,000	52 percent
Unskilled.....	105,000	27 percent

(These classifications include the same occupations as those of the Bureau of Labor Statistics.)

The productivity of American workers has been increasing steadily. If 1899 were considered 100 percent, productivity per wage earner was between 151 percent and 155 percent in 1927, according to *Recent Economic Changes*. There is no reason to believe that since that time productivity has declined or has even decelerated.

Regarding one branch of our industry, *Production, Employment and Productivity in 59 Manufacturing Industries*, Report # S1 of the National Research Project, states that the output per man hour in the electric lamp industry rose from 25.4 in 1920 to 108.2 in 1931, using 1929 as 100.

Working only from 1929 to date, we have found the following to be true of our industry. Taking 1937 as 100 and considering the entire industry—that is, electrical machinery apparatus and supplies, radios and parts, refrigerators and

⁵ "Effect of Technological Developments Upon Capital Formation," National Research Project, p. 5.

other major appliances—we find that the units produced in 1929 were 108.5 which dropped to 39.3 in 1932, and was 74.5 in 1938 and 99.7 in 1939. Hours worked per week are now about 25 percent under 1929, and employment is approximately 16 percent under 1929. However, production per man is 10 percent over 1929 and 18 percent higher than 1937. Production per man hour is, at present, almost 36 percent higher than in 1929 and 19 percent higher than in 1937. The greatest gain made in productivity was in the heavy section of the industry, that is, electrical machinery and apparatus, where production per man is now 23 percent above both 1929 and 1937, while productivity per man hour is about 32 percent above 1929 and 29 percent above 1937.

In radio, productivity in 1938 was higher than in 1939, but in 1939 productivity per man is still almost 36 percent above 1937, and over 100 percent higher than in 1929. Practically the same is true of productivity per man hour.

In the appliances and miscellaneous field, productivity per man is slightly less than it was in 1929, but is about 3 percent better than 1927, while productivity per man hour is 4 percent better than 1927 and 28 percent better than 1929. (See Tables 1 to 5 following.)

Using a different method of computation, and considering only the census data of the electrical machinery, apparatus and supplies industry, we find the following: Productivity per man-hour, with 1929 being considered as 100, rose to 132.5 in 1931. There are various reasons for this, among which are the closing down of less efficient plants, the closing down of less efficient departments of plants, concentration of production in the most efficient units, laying off all but the most "capable" workers, intensification or speed-up of work, and the introduction of more mechanical processes. By 1933 productivity was back to 122.8 and dropped another 2 percent by 1935, and then rose in 1937 to 122.7. We estimate that in 1938 it had again risen to 125 and in 1939 reached a peak of 137.5. (See Table 6 following.)

TABLE 1.—*Value of production*

1a—

[In millions]

	Total	Appliances, etc. ¹	Electrical	Radio
1929.....	2,815	514	1,889	412
1932.....	816	235	483	98
1933.....	920	245	553	122
1934.....	1,249	328	785	136
1935.....	1,567	406	960	201
1936.....	2,079	491	1,270	318
1937.....	2,473	573	1,622	278
1938.....	1,843	451	1,150	242
1939.....	2,357	527	1,530	300

¹ Includes the products listed in the following table:

1939 PRODUCTION AND EMPLOYMENT FOR ITEMIZED PRODUCTS

	Production	Employment
Washing Machines.....	57	8
Clocks.....	12	2
Turbines.....	18	2
Tools.....	7	1
Refrigerators.....	172	24
Light Equipment.....	95	17
Signs.....	24	6
Sewing Machines.....	17	5
Business Machines.....	125	21
Appliances & Miscellaneous:		
Sub Total.....	527	86
Electrical.....	1,530	214
Radio.....	300	39
Grand total.....	2,357	² 339

² Due to rounding out individual items, Grand Total on Employment is one (1) higher.

CONCENTRATION OF ECONOMIC POWER

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TABLE 1.—Value of production—Continued

EMPLOYMENT

1b—

[In Thousands]

	Total	Appl. ances etc.	Elec- trical	Radio
1929.....	402	78	270	59
1932.....	203	52	135	21
1933.....	221	58	131	33
1934.....	270	63	161	46
1935.....	295	70	180	45
1936.....	335	81	203	51
1937.....	399	93	258	48
1938.....	288	76	183	29
1939.....	338	85	214	39

TABLE 2.—Electrical industry—Production, Employment, Hours, Wages, Productivity & Labor Cost 1929 and 1932 to 1939

[1937=100]

Year	Total Production		Average Monthly Employ- ment	Average Weekly Hours Worked	Average Weekly Wage Per Man
	Actual Dollar Value	Units (Correc- ted Value)			
1929.....	114.0	108.5	100.5	123.8	105.0
1932.....	3.0	39.3	52.0	86.0	77.0
1933.....	37.2	44.6	55.4	90.6	74.0
1934.....	50.5	55.6	67.5	88.9	77.6
1935.....	63.5	70.3	73.8	95.7	84.3
1936.....	84.0	92.2	84.0	102.0	90.8
1937.....	100.0	100.0	100.0	100.0	100.0
1938.....	74.5	74.5	72.2	91.8	91.9
1939.....	98.0	99.7	84.6	99.1	100.5

DERIVED INDEXES

	Productivity		Labor Cost Per \$100 Value Pro- duced	Unit of Product
	Per Man Em- ployed	Per Man Hour Worked		
1929.....	108.0	87.2	92.1	107.8
1932.....	75.5	57.8	121.4	102.0
1933.....	80.5	58.9	110.5	90.3
1934.....	82.5	62.7	104.0	94.6
1935.....	95.3	69.6	98.0	85.5
1936.....	110.0	107.5	90.8	82.7
1937.....	100.0	100.0	100.0	100.0
1938.....	103.3	113.8	88.0	88.0
1939.....	118.0	118.7	86.8	85.4

CONCENTRATION OF ECONOMIC POWER

TABLE 3.—*Electrical machinery and supplies*
[U. S. Census]

Year	Total Production		Average Monthly Employment	Average Weekly Hours Worked	Average Weekly Wage Per Man
	Actual Dollar Value	Units (Corrected Value)			
1929	116.4	110.8	111.0	120.5	101.8
1932	29.7	35.5	52.4	79.2	72.8
1933	34.1	40.8	50.8	84.0	70.6
1934	48.4	53.3	63.0	86.4	74.3
1935	59.2	65.5	69.8	93.5	81.5
1936	78.4	86.2	79.3	101.5	89.0
1937	100.0	100.0	100.0	100.0	100.0
1938	70.9	70.9	71.1	88.9	90.5
1939	94.7	96.2	77.7	96.0	100.0

DERIVED INDEXES

Year	Productivity		Labor Cost Per \$100 Value Produced	Unit of Product
	Per Man Employed	Per Man Hour Worked		
1929	100.0	97.2	101.3	102.0
1932	67.7	56.5	128.5	107.7
1933	80.4	66.7	105.2	88.4
1934	84.8	68.2	98.7	87.8
1935	53.8	55.3	96.2	86.6
1936	108.6	107.0	96.2	82.2
1937	100.0	100.0	100.0	100.0
1938	99.8	115.0	90.8	90.8
1939	123.6	128.8	82.0	80.6

TABLE 4.—*Radio—U. S. Census—Production, Employment, Hours, Wages, Productivity & Labor Cost 1929 and 1932 to 1939*

[1937=100]

Year	Total Production		Average Monthly Employment	Average Weekly Hours Worked	Average Weekly Wage Per Man
	Actual Dollar Value	Units (Corrected Value)			
1929	148.5	62.9	113.6	143.0	99.3
1932	33.4	36.1	43.2	66.2	93.7
1933	44.0	55.7	68.0	100.4	86.1
1934	49.0	56.4	66.4	92.7	86.8
1935	72.4	78.6	62.7	88.9	81.3
1936	114.5	103.3	105.0	103.0	94.5
1937	100.0	100.0	100.0	100.0	100.0
1938	87.0	86.3	61.0	99.1	101.3
1939	108.0	110.2	81.2	103.8	102.3

Year	Productivity		Labor Cost Per \$100 Value Produced	Unit of Product
	Per Man Employed	Per Man Hour Worked		
1929	55.4	33.8	75.7	179.0
1932	83.5	86.8	121.3	112.0
1933	82.0	81.5	133.0	105.1
1934	58.6	63.3	172.0	148.5
1935	82.7	83.7	117.0	110.5
1936	98.3	95.3	86.7	95.5
1937	100.0	100.0	100.0	100.0
1938	141.5	143.0	73.0	71.6
1939	135.9	131.0	77.0	75.5

TABLE 5.—Appliances and Miscellaneous Products—Production, Employment, Hours, Wages, Productivity & Labor Cost 1929 and 1932 to 1939

[1937=100]

Year	Total Production		Average Monthly Employment	Average Weekly Hours Worked	Average Weekly Wage Per Man
	Actual Dollar Value	Units (Corrected Value)			
1929	89.6	85.3	78.0	128.0	115.5
1932	41.0	48.8	55.8	86.0	79.2
1933	42.7	51.2	62.3	90.6	76.4
1934	57.1	62.6	67.3	88.9	81.2
1935	70.8	78.4	75.0	95.7	87.6
1936	85.6	94.0	86.6	102.0	93.4
1937	100.0	100.0	100.0	100.0	100.0
1938	79.0	79.0	81.8	91.8	94.8
1939	92.0	93.6	91.0	99.1	100.9

Year	Productivity		Labor Cost Per \$100 Value Produced	Unit of Product
	Per Man Employed	Per Man Hour Worked		
1929	109.4	85.4	100.5	107.0
1932	87.4	101.6	108.0	90.5
1933	82.3	90.3	111.3	93.0
1934	93.2	105.0	95.8	87.0
1935	104.5	109.2	97.6	84.0
1936	108.5	106.3	94.5	88.9
1937	100.0	100.0	100.0	100.0
1938	97.5	106.0	97.5	97.5
1939	103.0	104.2	100.0	98.5

TABLE 6.—Computation of Productivity in the Electrical Industry on Basis of Average Value Produced per Worker

	A	B	C	D	E	F	G	H
	Average Hours Worked Per Week U. S. Dept. Labor	Hours Worked Per Week 1923=100 Nat. Ind. Conf. Board	Value Produced Per Man U. S. Census	Relative Production Per Man Hour Col. C Divided by Col. B	Relative Production Indexed to 1929=100	Value of the Dollar at Wholesale Survey Current Bus.	Unit Prod. Man Hour Col. E Corrected by Col. F	Index of Productivity Per Man Hour 1929=100 Col. G
1925		97.2	\$6910	71.1	101.3	105.5	106.8	101.1
1927		94.4	6760	71.6	102.1	104.1	106.1	100.5
1929		99.2	6960	70.2	100.0	105.6	105.6	100.0
1931		74.5	5530	74.2	100.7	138.0	146.8	132.5
1933	33.1	69.5	4220	60.8	87.7	152.8	134.0	122.8
1935	36.8	75.5	5340	70.8	100.9	125.9	127.0	120.4
1937	39.4	80.8	6290	77.8	110.8	116.7	129.8	122.7
1938 ¹	34.1	71.7	* 5150	72.0	102.8	128.5	131.8	125.0
1939 ¹	37.7	78.8	6080	77.9	109.6	132.0	144.0	137.5

¹ BLS Spliced.

* UE Estimates.

² Based on Sales.

On the basis of the above productivity figures we can point out the following:

- 1) The same amount of electrical machinery, etc., as was produced in 1929 can now be made with about 24 percent fewer workers.
 - 2) The same amount of radios, etc., as was produced in 1929 can now be made with about 50 percent fewer workers.
- In addition—and perhaps more important—is the fact that if the number of hours worked per week were now raised to equal the work week prevailing in 1929:
- 1) The electrical machinery branch of the industry could produce an equal volume with $\frac{1}{3}$ of the labor force.
 - 2) The radio branch of the industry could produce an equal volume with about $\frac{1}{4}$ of the labor force.

To put this data in still a different form, if the labor force of 1929 in our industry (machinery, apparatus, radio appliances, etc.) were now employed on a 35-hour week, the volume of production would be about the same as in 1929; and if the present work week were used, production would be approximately 10 percent greater than 1929.

Should the argument be advanced that productivity figures based upon the units produced are invalid due to price changes, the following points from the tables previously submitted should be worth noting.

For the entire industry, the labor cost per \$100 of value produced has dropped about 15 percent between 1929 and 1939. In the heavy branch of the industry, that is electrical machinery and apparatus, labor costs have dropped about 19 percent. In radio the drop has been only about 2 percent and in the appliances and miscellaneous products, the drop has been approximately .5 percent.

This would indicate that whether we calculated productivity on the basis of units, or value produced, there has been an increase over the past 10 years in all lines.

We must, furthermore, point out that whether we consider productivity on the basis of units or value, or whether we consider productivity per man or per man hour, wages have not kept up *with productivity*. Between 1929 and 1939 the average weekly wage for the entire industry has dropped approximately 5 percent, while the productivity figures, as mentioned above, have gone up. In the heavy branch of the industry wages dropped 2 percent; in radio they are slightly above 1929, and in the appliances and miscellaneous field the drop has been over 15 percent.

Present technological trends are not so revolutionary as the introduction of steam or electricity. "These technological changes are directed primarily at improving the existing technology . . .".⁶ In many cases there is no change in a machine itself, but in the attachment of a controlling mechanism. In many cases it does not effect the producing mechanism at all but consists of an improved raw material.

Technology affects the worker in many ways. By simplifying operations it reduces skills, allows time study norms to be easily established and results in lowered total employment, lower wages, and loss of skill. It also increases the relative proportion of women employed and affects to a great extent the age distribution of workers.⁷

The concluding section of our report will cite specific instances in our industry which demonstrate all the above conclusions.⁸

The following excerpts of reports sent to the National Office of the U. E. give a much better picture of technological changes in our industry than several volumes of derived statistics.

1. From a man who has worked for 5 years in an instrument shop in New York City.

"I have been employed as instrument-assembler since September 1935.

"About one year ago the following labor saving machines were installed:

- 1) One Warner & Swasey Turret Lathe #4, model 1933, reconditioned, to replace on Engine lathe.

On operations at present performed, double output per man-hour, setting-up time included in the new working hours. This machine has capitalized its cost after about ½ year of operation.

- 2) One high speed 4-spindle drill press, to replace one 3-spindle drill press of less power and speed.

Output per man-hour increased about 10 percent.

- 3) One Pratt & Whitney M-1115 Multiple Drill-press with 16 adjustable spindles, to perform jig-drill work, formerly done on the 3-spindle drill-press.

On operations at present performed (up to 8 spindles used simultaneously) output per man-hour increased on some parts as much as 10-fold, due to less jiggling and due to drilling all holes in one stroke; average increase on all operations now performed on this unit about 4 to 5-fold.

⁶ "Effects of Technological Developments upon Capital Formation", Works Progress Administration, National Research Project.

⁷ In September 1939 the Electrical Industry employed 15.8% more men but 32.2% more women than in September 1938. In Radio the increases were 29.7% for men and 60.1% for women. (Women's Bureau, U. S. Dep't of Labor).

⁸ At the Westinghouse plant in Pittsburg the output of two departments was increased 2¼ and 2½ times, with no increase in labor force, thru a rearrangement of machines combined with installation of some conveyors, etc. (C. G. Johnson, "Plant Layout Cashes in on Motion Economy" *Factory Management and Maintenance*, Vol. 92, No. 3 (Mar. 1934), pp. 114-6.)

- 4) One turret attachment for one of the two precision lathes, transforming the same for many purposes into a handscrew machine.
Correct data not available due to lay-off of former operator, who worked without attachment.
Inside of the last 3 months the following new tool machines were added:
- 5) Two Hardinge Cataract Precision lathes with turret attachments.
Without turret attachment each unit about 10 percent more effective, due to quicker speed-change and easier set-up performance.
- 6) Two Ettco Emric Drill presses, specially adapted for holding precision tapping attachments, to perform tapping operations formerly done with ordinary tapping attachments on a regular 1-spindle or on a 3-spindle drill press.
Probably 20 percent more effective, besides saving on broken taps due to automatic clutch.
- 7) Several single spindle drill presses, mainly for use in the assembly department, to cut down on unnecessary handling of material and assemblies.

"To keep the new machines working under full load, many jobs, formerly done under sub-contract by other concerns for the Corp., are now done in their own machine shop. *Total average increase of output per man-hour of the whole machine-shop department is about 50 percent.*

Total Number of employees one year ago 75; of those in machine shop 30 (40 percent).

Total Number of employees at present 102; of those in machine shop 38 (37 percent).

and this smaller percentage of machinists doing work, formerly done on the outside, decreasing thereby the jobs on hand by the sub-contractor, and fully supplying an assembly department, which itself is working more efficiently due to installation of department-drill presses, arbor-presses, and various jigs and fixtures. (A new W&S Turret lathe #4-1939 recently installed not calculated.)

"Production is mainly for U. S. Army and Navy (airplane, ship and submarine gauges). A reduction in the production-cost, even when expressed in a lower selling price will not increase the demand by as much as one unit."

2. Fuse production, Brooklyn:

"Previously it took 17 people and 17 operations to complete the making of a fuse. The company installed a machine, the Weiss machine, whereby 9 people can now complete the fuse."

3. Metal fabrication, Brooklyn:

"Bright acid dip: Process whereby metals are dipped in a bright acid solution and the process of hand polishing on a buff is eliminated."

4. From an electric plant in St. Louis:

"My work for the past 3 years has been assembling oil burners.

"When I began working here I could assemble, test, and inspect 5 burners in a 9 hour shift. Now I am able to carry 8 through the line in an 8½ hour shift.

"This has been accomplished by a technical simplification of the parts used thereby cutting down the cost of labor in the assembly line and also cost of materials. Formerly where two units were used for pump and cut-off valve now only one is used, as the cut-off valve has been incorporated within the pump itself at a smaller cost than the making of two units, and at the same time eliminating work in the assembly line.

"A number of other technical simplifications were made which cut down the work of assembling.

"As a result this has cut down my income as I now only work a little more than half the time I formerly worked.

"When such changes take place in industry the old men who have been displaced are kicked out and new unskilled men and sometimes women are brought in to run the machines at reduced wages, as the new machines take the skill out of the work and thus the trade becomes nil."

5. From an incandescent lamp works in New Jersey:

"In reply to your letter of January 30, 1940, I submit some facts. In and prior to 1929—it required the work of 6 girls to make a production of 3,500 packed lamps of various types per day working 8½ hours per day and receiving between \$23 and \$25 per week. Today it requires less than 6 girls to produce 15,000 per day in 8 hours. This is considered slow—we have new machines running 2,000 per hour or 17,600 per day. So much for girls. By moving machinery closer together and the use of mechanical arms, conveyor belts, etc. it also helped reduce the amount of men needed to maintain these machines."

6. From one of the largest producers of electrical machinery:

"My department, consisting of 48 employees, produces 20,000 double or 40,000 single magnets per week, working one shift of 8 hours, 5 days per week.

"A new system of manufacturing magnets is now being introduced and within a few months the new set up will be complete. Under the new set up, production will be the same but the number of employees will be reduced by 12. The chief difference in the new set up is that the magnets will now be poured into moulds instead of formed, thus eliminating such operations as cutting the steel for the magnets, forming the steel, hardening (in the new set up hardening will be accomplished by the use of cobalt), aging, gap grinding, shoeing, single magnetizing and measuring.

"Elimination of operations and the consequent reduction in the cost of production was not the reason for installing the new set up. The new type magnet is of a better grade and was already being produced by competitors."

7. The meter department of the same company:

"I have been employed in the meter department as a drill press operator for the past 15 years. In 1939, 33 men were employed in the machining of cast iron frames for meters, 3 8-hour shifts, 11 men to a shift. The total man hours for one week was 1320, and 15,000 frames were produced.

"In 1939 a machine known as the straight line machine was set up in the department. This machine is 60 ft. long, is composed of 75 tools, 18 jigs, 28 motors, 3 hydraulic pumps, 8 safety switches, and will perform 37 operations. This machine eliminates such man operations as drilling, tapping, milling, profiling, counter boring, and reaming.

"The machine operates 2 shifts a day, with one operator a shift, and the total production capacity is 240 frames per hour, or better than 19,000 per week for the 2 shifts, but due to occasional breakdowns the average production is 15,000 per week, or the same production as that of 33 men.

"Two new jobs per shift have been created—mechanics to service the machine, and repair in case of breakdown. Thus, 6 men produce the same number of frames per week as did 33 in 1938, a reduction of 27 men, and the man hours have been cut from 1320 to 240 per week."

8. From a lamp company in Ohio:

"(A) Stem Machine—Used for making the insides of standard electric light bulbs. The machine used in the past, produced 1600 stems per hour. The new machine will produce 2000 stems per hour, an increase of 400 per hour.

"(B) Three or four years ago an automatic feeder was built for a machine doing a certain operation on radio tubes. Before the feeder was used, 4 girls were required to serve one machine. After the feeder was put in operation, it required only 1 girl to serve 5 machines.

"(C) 15 years ago the Glass Division used 8 bulb blowing machines, producing 3500 bulbs per hour, and required the services of 50 girls per shift and 3 shifts per day,—150 girls for the 24 hrs. Today 2 new machines make 360 bulbs per minute, or 21,600 bulbs per hour, and use 100 girls for the 24 hours.

"(D) New production methods and modern machinery has enabled the management to decrease the working force by 81 men, and still produce more than at any time in the history of the company."

9. From a large battery plant in New Jersey:

"About 7 years ago there was a rolling mill in operation at our plant. This mill employed about 30 men. The company installed a Stickle Mill, with the result that they can now produce considerably more rolled metal and require only 4 men.

"In the Iron Load Department the elimination of 50 men was accomplished by the installation of more modern machinery.

"There is a department known as the 'Crane Department' which at one time contained twenty cranes. Each Crane required an operator prior to the invention of the automatic crane which runs without any human assistance. They now produce about double the quantity with 10 of these automatic cranes and no operators.

"In our plating department the installation of continual plating machines has enabled the company to do away with about 75 men.

"In 1938, with normal production, we had about 2000 people on the payroll. With peak production in 1937 we had only 937 people employed."

10. From a battery plant in Wisconsin:

"I have been working here for about 7 years, and in that time these are the changes that have been made. In the production of batteries there are lead plates

to be made and at the beginning of my employment the lead plates were made by hand, and now they are being made by a fast producing machine which is capable of turning out about 10,000 lead plates per 8-hour day, where when same plates were made by hand a man could put out about 1500-2000 lead plates per 8 hour day. Lead parts are to be made by a machine, whereas now they are being made by hand thereby taking off approximately 2 men per 8-hour shift. At the present time there are about 8-10 men trimming lead parts, whereas when the new machine will be in full running, these men will be taken off, as the new machine will produce lead parts that will not necessitate the trimming of the parts. A process of pasting of the lead parts were previously done by 6 men, now is produced by a machine operated by 3 men.

"In our Forming Room, work which was done previously by 5 men is now being done by 3 men on an 8 hour production basis. There are other operations which the writer is not familiar with, but are being handled by the firm in the manner as the aforementioned operations."

11. From a metal fabricating plant in New Jersey:

"I have been working for over 6 years on power presses, stamping aluminum, and have never been laid off, until this year. The reason for this is simply that before a man had to operate one machine, whereas now one man operates 3 or 4 machines. I have every reason to believe that in the near future one man might have to operate more than 3 or 4.

"Firstly, the company had installed hitch feeds, that is the hitch feed feeds the stock into the die. Secondly, they began to install automatic stops; that is if the machine jams, it will stop itself. Thirdly, as I was laid off they were contemplating the installment of electric eyes on the presses so that even if the stock came to an end, the machine would stop and a red light would flash on. And finally, they have improved the dies in such a manner that whereas before each die had one operation, now that same die does 4 operations, therefore, they can get much more work out with not quite half the number of men that they had previously."

12. From another shop in St. Louis the following changes are reported:

PUNCH SHOP MOTOR WORK

Production per day *was*—H D 1013-1237 stators (perf or notch); 8 min.—12,000 a day

Production per day *now*—H D 1013-1237 stators (perf or notch); 2 min. 5 seconds—47,200 a day

Was—H D 2023 Rotors (perf or notch); 8½ min.—13,600 a day per man per 100

Now—H D 2023 Rotors (perf or notch) 4½ min.—21,600 a day per man per 100

Was—H D 1410-8577 Rotors (perf or notch); 7½ min.—11,200 a day

Now—H D 1410-8577 Rotors (perf or notch); 3½ min.—28,000 a day

SMALL MOTOR DIVISION

Stator Core Division:—5 men—610 day. Formerly hand rolled band to hold iron together, new hydraulic press does 630 pcs. 2 men operating. All figures on 8 hr. day. This speed up within the last 30 days.

Punch Shop—motor work: Copper seg. bland 29,600 a day (formerly done) Now being done—55,000 a day. Protector Blank #3712, 24,000 per day formerly. Protector Blank #3712, 96,000 per day now.

Welding machines on dust shields Hydraulic Brakes since 1936—job of welding shoe guides on dust shields speeded up from 380 (ore welding) pcs. until today 768 (machine welding). Brake shoe group 1½ for 1 man was 400—1 man today—2400.

<i>Was</i> —	<i>Now</i> —
#MB 5075 short center weight blank (perf stack); and using 2 men at 4 min. per bunch—240 bunches per day	#MB 5075 short center weight blank perf stack—1:20 bunch or 730 bunches per day—1 man
#F C 309 retainer's blank perf. 2 min—48,000 day (formerly 10 min. 9,600 day)	#F C 309 retainer's blank perf. 1½ min.—64,000 day
1304 Valve Body Blank & perf 8,000 day	#1304 Valve Body Blank & perf 2½ min.—36,400 day
4084 Baffle plates assemble 28 min—3,400 day	#4084 Baffle plates assemble 6 min—16,000 day

TRANSFORMER—FARM LINE

Operation—lead assembly (making leads & adding terminal)
 1937—6 min to each lead
 1940—1.16 min per lead
 Farm line—boxing—assembling transformer element in tank straight hourly rate
 42 min each in 1937 (42¢ per hour)
 1940—34 min each

NOTES TO TABLES

Table 1.—Employment in the appliances field for the individual items are estimated for census years on the basis of production per man. Thus in 1937 there were 50,623 workers in the refrigeration industry who produced \$363,000,000 worth of products. In the same year there were approximately \$193,000,000 worth of electrical refrigerators produced in the refrigerator industry. Thus, if production per man was the same throughout, we can assume that approximately 53 percent of the workers were employed in the manufacture of electrical refrigerators. The same reasoning was carried out for each of the products listed. Intercensal years were then figured on the basis of B. L. S. indexes of employment.

Values were obtained by adding census items. A smooth curve of the ratio of census production to new orders as reported in the "Survey of Current Business" was constructed in order to interpolate intercensal years' production. Supplementary data published by NEMA, trade journals, and some company data were used as a check and to obtain the relative amount of electrical production in certain census branches, such as turbines and tools.

We have used production and employment of business machines as a whole, because the non-electrical parts of this industry would be balanced by certain other electrical machines in other fields, as electrical typewriters, duplicators, etc.

Table 2. Production.—The method of obtaining the intercensal figures on production are discussed above. Employment is based on B. L. S. data. The same method was followed to obtain production in the electrical machinery, apparatus, and supplies industry, and in appliances and miscellaneous products. The production in radio is based upon the census, and an article by Julius Weinberger, entitled "Economic Trends in the Radio Industry", published in the November 1939 issue of the *Proceedings of the I. R. E.*

Tables 2, 3, 4, and 5, derived indexes, were obtained as follows: productivity per man is obtained by dividing the indexes of production per man by the index of average weekly hours worked. Labor cost per \$100 value, is obtained by dividing the product of employment and weekly wages by the index of units produced.

"EXHIBIT No. 2606," introduced on p. 16746, is on file with the committee.

EXHIBIT No. 2607

[Submitted by the International Business Machines Corp.]

Wages and Hours of Labor at the IBM Endicott Plant, 1926-1939

Year	Average number of hourly workers	Average annual earnings	Average hourly rate	Average hours worked per week	Standard hours per work-week
1926	806	\$1,420.00	58.6 cents	46.6	48
1927	917	1,423.26	59.5 "	46.0	48
1928	1,038	1,441.46	58.9 "	47.1	48
1929	1,534	1,395.33	56.5 "	45.9	48
1930	1,607	1,444.33	62.0 "	44.0	48
1931	1,400	1,396.43	61.0 "	43.4	48
1932	1,583	1,356.07	56.8 "	45.6	48
1933	2,165	1,255.11	57.2 "	42.2	48-40
1934	2,997	1,314.56	63.7 "	39.6	40
1935	3,005	1,364.08	68.5 "	38.3	40
1936	2,891	1,567.17	75.2 "	40.1	40
1937	3,157	1,913.08	86.7 "	41.6	40
1938	3,320	1,813.85	87.1 "	39.8	40
1939	3,148	1,850.68	89.5 "	39.8	40

CONCENTRATION OF ECONOMIC POWER

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EXHIBIT No. 2608

Routine Clerical Workers: ¹ Cumulative Percentage Distribution by Annual Earnings in Large and Small Cities, 1929

Occupation	No. in Sample		Percentage of Workers with Annual Earnings of Less Than					
	Large Cities ²	Small Cities ³	\$1,550		\$1,850		\$2,350	
			Large Cities ²	Small Cities ³	Large Cities ²	Small Cities ³	Large Cities ²	Small Cities ³
Group, as Whole.....	80,117	31,978	64.9	70.8	66.9	66.9	97.8	97.2
Routine Stenographer.....	13,346	5,974	70.3	82.3	93.4	96.3	99.5	99.7
Routine Stenographer-Clerk.....	6,135	3,072	69.5	76.7	91.9	93.7	99.2	99.7
Dictating-Machine Operator.....	2,867	1,242	81.2	92.5	98.4	99.4	99.8	100.0
Calculating Machine Operator.....	6,335	2,196	89.3	89.7	98.4	98.1	99.8	100.0
Tabulating Machine Operator.....	859	447	83.4	84.1	95.2	94.2	99.4	99.3
Bookkeeping Machine Operator.....	7,907	3,112	79.4	85.0	94.2	96.4	98.3	99.8
Routine Bookkeeper.....	5,708	1,737	48.1	54.3	77.8	75.9	95.8	93.8
Junior Clerk.....	37,530	14,193	56.2	58.3	78.2	77.8	96.5	94.9

¹ CAF-2.

² 32 cities with population of over 200,000 in 1920.

³ Cities with population of less than 200,000 in 1920.

Source: U. S. Personnel Classification Board, *Salaries for Routine Clerical Work in Private Industry, 1929*, pp. 67, 69.

EXHIBIT No. 2609

[Submitted by United Office and Professional Workers of America]

White Collar Workers Compared with Total Gainfully Employed

Sex and Class of Occupation 1930	Total Gainful workers	White Collar Workers		
		Number of white collar workers	Percent Distribution	Percent of all Gainful workers in class
MALES				
Native white.....	27,511,863	4,262,882	87.4	15.5
Foreign born white.....	6,256,071	528,593	10.8	8.5
Negro.....	3,662,893	62,138	1.8	1.7
Other races.....	647,978	23,622	.5	3.6
Total.....	38,077,804	4,877,235	100.0	12.8
FEMALES				
Native white.....	7,661,508	2,840,835	92.5	37.1
Foreign born white.....	1,156,056	302,611	6.6	17.5
Negro.....	1,840,642	20,531	.7	1.1
Other races.....	93,910	8,243	.3	8.8
BOTH SEXES				
Native white.....	35,173,370	7,103,717	89.4	20.8
Foreign born white.....	7,411,127	731,204	9.2	9.9
Negro.....	5,503,535	82,669	1.0	1.6
Other races.....	741,898	31,865	.4	4.3
Total.....	48,829,920	7,949,455	100.0	16.7

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CONCENTRATION OF ECONOMIC POWER

EXHIBIT No. 2610

[Submitted by United Office and Professional Workers of America]

Growth of Clerical Class

1870.....	297,399 men....	8,103 women.	1910.....	1,129,849 men..	588,609 women.
1880.....	487,695 ".....	30,744 ".....	1920.....	1,689,911 "....	1,421,925 "....
1890.....	715,335 ".....	118,170 ".....	1930.....	2,038,494 "....	1,986,830 "....
1900.....	826,813 ".....	252,180 ".....			

EXHIBIT No. 2611

[Submitted by the United Office and Professional Workers of America]

White Collar Workers in Industry

Industry	Clerks & kindred workers	Total # in industry	Percent
All.....	¹ 5,421,408	48,829,920	11.1
Banking & brokerage.....	357,544	624,783	57.2
Advertising agencies.....	43,746	64,488	67.8
Insurance.....	212,026	507,299	41.8
Real Estate.....	45,000	288,299	15.6
Elec. Machinery & Supply.....	77,565	383,870	20.2
Elec. Lt. & Power.....	71,838	289,255	24.8
Rubber Products.....	24,829	166,391	14.9
Iron & Steel Furnaces Rolling Mills.....	55,534	520,894	8.9
Auto factories.....	63,846	640,474	10.0
Oil Wells & Gas Wells.....	14,342	198,448	7.2
Petroleum Refineries.....	33,974	173,798	19.5
Gas Works.....	34,157	114,930	29.7
Garages, etc.....	24,863	428,843	5.8
Slaughter & Packing Houses.....	30,147	164,882	18.3
Bakeries.....	37,344	261,835	14.3
Printing & Publishing.....	140,410	544,608	25.8
Professional Service.....	328,629	2,965,742	11.1
Whole & Retail Trade.....	1,265,576	5,438,671	23.6
Hotels, Restnts., Boarding Houses.....	78,265	1,357,381	5.8
Building Trades.....	45,967	2,574,968	1.8
Railroads.....	320,850	1,645,306	19.5
Telegraph & Telephone.....	425,190	587,566	72.4
Postal Service.....	233,847	283,926	82.4

¹ Note low figure here.² Figure is crossed out and figure in italic was substituted in pencil.

EXHIBIT No. 2612

[Submitted by the United Office and Professional Workers of America]

Clerical & Professional Workers Employed & Unemployed

	Clerical	Professional
Totally unemployed.....	839,693	143,766
Emergency workers.....	204,926	82,313
Partially unemployed.....	237,450	58,159
	1,282,069	284,238

CONCENTRATION OF ECONOMIC POWER

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EXHIBIT No. 2613

[Submitted by the United Office and Professional Workers of America]

Distribution of Clerical Employees in 30 Cities by Earnings 1935-1936

Earnings of less than	Percentage of workers	Earnings of less than	Percentage of workers	Earnings of less than	Percentage of workers	Earnings of less than	Percentage of workers
\$500.....	13.7	\$1,800	84.6	\$1,200.....	61.2	\$2,500	97.4
600.....	16.8	1,900	89.4	1,300.....	66.5	3,000	98.7
700.....	21.8	2,000	90.8	1,400.....	72.9	3,500	99.4
800.....	33.4	2,100	92.8	1,500.....	75.6	4,000	99.7
900.....	39.5	2,200	94.3	1,600.....	81.3	5,000	100.0
1,000.....	47.8	2,300	94.9	1,700.....	83.0		
1,100.....	57.3	2,400	95.8				

EXHIBIT No. 2614

[Submitted by the United Office and Professional Workers of America]

Median annual incomes of clerical and professional employees by age groups ^{1 2}

	5-24 yrs.	25-34 yrs.	35-44 yrs.	45-54 yrs.	55-64 yrs.	65 yrs. & over
Clerical.....	\$630	\$1,030	\$1,285	\$1,270	\$1,180	\$985
Professional.....	585	1,270	1,665	1,735	1,600	1,520

¹ Report on proposal to exempt clerical employees from the hours provision of the Fair Labor Standards Act, 1940.

² Labor in the United States by W. S. Woytinsky. Social Science Research Council, 1938.

EXHIBIT No. 2615

[Submitted by the United Office and Professional Workers of America]

Weekly hours of office employees in private business ¹—1928 ²

[Distributed according to percentage working each stated number of hours]

Working Hours	Banking & Finance	Insurance	Whole & Retail	Mfg. & Mining	Public Util.	News. & Pub.	All %	Business Cumulative
Less than 35.9.....	0.39	2.91		0.09			.40	.40
36 to 39.9.....	25.63	60.40	8.12	10.70	43.17	11.54	30.91	31.31
40 to 42.....	32.42	31.73	16.44	18.40	3.56	16.91	15.71	47.02
42.1 to 43.9.....	3.30	2.26	8.64	9.94	8.25	.25	5.21	52.23
44 to 44.9.....	16.63	2.60	12.26	49.03	31.24	13.69	27.73	79.96
45 to 47.9.....	17.68	.08	34.41	6.69	15.94	21.38	14.11	94.07
48 to 51.9.....	3.80	.02	18.17	4.53	2.84	33.17	5.46	99.53
52 to 55.9.....	.16		1.94	.82		3.06	.46	99.99
56 and over.....			.02				.01	100.00
	100	100	100	100	100	100		

¹ U. S. Personnel Classification Board—House Record 602, 70th Congress, 2nd Session.

² "The white Collar Class Joins the Labor Movement," Joel Berrall, 1932.

CONCENTRATION OF ECONOMIC POWER

EXHIBIT No. 2616

[Submitted by the United Office and Professional Workers of America]

Overtime compensation table

	No Pay	Hourly Rate	Supper Money	Equiv. Time off	1 1/4 times Hr. Rate
Textiles.....	3		1	1	
Office Equipment.....	3		2	2	
Publishers.....	4	5	9	4	
Food Products.....	11	1	10	1	1
Retailers (small).....	1	1			
Retailers (large).....	2	1	8	3	1
Wholesalers (small).....	6	2	7	2	
Wholesalers (large).....	1		2		
Banks.....	1		3	1	
Utilities.....	2	1	7	6	
Manufacturers.....	25	10	36	21	2
Heavy Industries.....	7	2	12	3	
Auto Access & Equip.....	1		3		
Railroads.....					3
Aircraft.....	1	1	1		1
Furniture & Stoves.....	2			2	
Farm Implements.....			2		
Insurance.....	5	1	7	2	
Petroleum Prod.....	1		4	2	
Bldg. Mat & Equip.....	8	1	7	5	
Amusements.....	1	1	3	1	
Drugs, Soap, Cosmet.....		1	3		
Miscellaneous.....	11	4	12	6	

EXHIBIT No. 2617

Productivity and labor requirements in manufacture of cotton textiles, 1910 and 1936

Mill Producing	Man-hour output of finished product (grey cloth)					Labor-time requirements for identical quantity of output			
	1910		1936		% increase	Output Yds. of grey cloth	Man-hours required for two 40-hr. shifts		
	Lbs.	Yards	Lbs.	Yards			1910	1936	% decrease
Carded broadcloth.....	3.23	16.30	4.38	24.40	49.69	437,890	26,890	17,900	33.13
Combed broadcloth.....	2.65	10.60	4.26	17.04	60.75	295,828	27,890	17,390	37.73
Sheeting.....	3.95	15.80	6.14	24.56	55.44	541,496	34,200	22,040	35.56
Carded-filling sateen.....	2.76	12.14	4.05	19.28	46.74	343,742	26,120	17,840	31.70
Canton flannel.....	7.25	12.55	11.37	21.44	58.21	559,149	41,280	25,080	38.52
Print cloth.....	3.05	12.20	4.62	18.48	61.80	307,000	25,200	16,600	34.10
Lawns.....	.92	3.28	1.75	15.75	90.20	220,000	26,680	14,000	47.50
Terry cloth.....	2.84	10.79	7.15	27.17	151.80	{ 701,080 712,480 }	75,400	30,240	59.90

¹ Data for 1935.² 1910.

Source: Boris Stern, "Mechanical Changes in the Cotton Textile Industry, 1910-1936", Monthly Labor Review, August, 1937, p. 319.

CONCENTRATION OF ECONOMIC POWER

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EXHIBIT No. 2618

Per cent of increase in man-hour output of processing departments in 1936 compared with 1910

PER CENT OF INCREASE IN MAN-HOUR OUTPUT IN MILL PRODUCING

Department	Carded Broad-cloth	Combed Broad-cloth	Sheeting	Sateen	Flannel	Print	Lawn	Terry cloth
Carding.....	85.12	101.86	112.49	81.39	95.02	93.05	100.00	112.30
Spinning.....	32.21	31.58	88.89	32.75	32.54	37.35	43.06	45.56
Spooling & warping.....	150.00	169.18	120.00	120.00	142.31	159.74	122.22	171.74
Slashing & drawing.....	50.00	37.49	60.00	42.86	57.18	66.67	16.69	65.56
Weaving.....	48.33	60.00	37.78	47.30	50.56	41.24	184.90	200.62
Cloth room.....	11.77	15.38	22.22	14.29	22.22	15.34	20.05	2.99

Source: *Ibid.*, p. 220.

EXHIBIT No. 2619

Man-hour output in textile industries

[1929=100]

Year	Cotton Textiles	Woolens & Worsted	Knit Goods	Rayon Yarn	Silk & Rayon Goods
1919.....	85.0	88.9	75.1		62.6
1920.....	89.6	97.2			42.3
1921.....	82.9	90.7	85.5		58.6
1922.....	95.0	91.1			72.3
1923.....	95.0	94.6	87.4	77.1	72.3
1924.....	95.3	96.5		76.8	74.6
1925.....	96.3	104.0	97.3	83.0	82.6
1926.....	91.9	104.4		107.6	85.5
1927.....	89.0	102.5	94.6	93.0	91.5
1928.....	95.7	103.1		100.9	94.7
1929.....	100.0	100.0	100.0	100.0	100.0
1930.....	96.7	100.7		126.1	105.2
1931.....	94.0	110.1	122.3	150.6	114.6
1932.....	102.7	116.3		154.6	145.5
1933.....	109.1	117.2	134.0	200.3	109.0
1934.....	118.5	126.4		205.7	
1935.....	122.8	135.9	145.2	223.2	153.3
1936.....	132.9	145.4		239.6	
1937.....	133.0	150.2	139.3	261.5	
1938.....	133.4	144.4		289.7	
1939.....	139.4	157.1		338.0	

Source: U. S. Works Progress Administration National Research Project Production, Employment and Productivity in 59 manufacturing industries, 3 parts, Philadelphia, Penna., May 1939.

EXHIBIT No. 2620

Index of output per man-hour in the cotton goods industry

Year:	Index of output per man-hour	Year:	Index of output per man-hour
1928.....	85	1935.....	117
1930.....	92	1936.....	127
1932.....	100	1937.....	128
1933.....	105	1938.....	129
1934.....	109	1939.....	135

Source: A. F. Hinrichs, "Wages in Cotton Goods Manufacturing", U. S. Department of Labor, Bureau of Labor Statistics, Bulletin 663, p. 47 (figures for 1937 secured by a special tabulation).

EXHIBIT No. 2621

Labor productivity and man-hour requirements in manufacturing woolens and worsteds, 1910 and 1936

	Man-hour output of finished product				% increase	Requirements for two 40-hour shifts			
	1910		1936			Yards of woven cloth	# Man Hours		% decrease
	Lbs.	Yds.	Lbs.	Yds.			1910	1936	
MILL PRODUCING									
Woolen products:									
32-ounce overcoating ¹	4.99	2.16	9.21	3.98	84.60	21,816	10,120	5,480	45.80
12-ounce wool flannel.....	3.08	3.67	5.79	6.88	87.50	37,440	10,200	5,440	46.70
Worsted:									
Worsted serge ¹	1.32	1.56	2.47	2.90	86.30	74,400	47,840	25,680	46.30
Cotton-warp worsted-filled suitings ¹	2.13	4.06	3.99	7.62	87.50	129,500	21,840	11,680	46.50

¹ Covers only departments included in this study.

Source: Boris Stern, "Effects of Mechanical Changes in the Woolen and Worsted Industries, 1910 to 1935," Monthly Labor Review, January, 1938, p. 80.

EXHIBIT No. 2622

Changes in man hour output of woolens and worsteds, by processing department 1910 and 1936¹

Dept.	Woolen Cloth				Dept.	Worsted Cloth—Worsted Serge		Cotton Warp Worsted filled Suiting	
	32 oz. overcoating		12 oz. flannel			Rel. sig. of dept. in 1910 ²	% increase in man-hour output 1910-36	Rel. Sig. of dept. in 1910	% increase of man-hour output 1910-1936
	Relative significance of dept. in 1910 ³	% increase in man-hour output 1910-36	Relative Sig. of dept. in 1910 ³	% increase in man-hour output 1910-36					
Rag picking.....	6.3	54.10	(?)	-----	Sorting scouring & picking.....	6.5	93.70	5.1	93.80
Burr picking.....	(?)	-----	0.8	(?)	Carding.....	2.5	47.90	2.6	35.80
Blending & picking.....	4.5	237.30	6.3	208.30	Top making (combing & gilling).....	6.2	25.70	4.8	26.10
Carding.....	15.0	83.20	13.3	81.90	Drawing.....	10.0	15.90	8.1	6.70
Spinning.....	16.6	21.60	27.5	49.80	Spinning.....	13.0	18.20	6.1	18.50
Spooling & dressing.....	10.3	85.70	11.8	114.40	Twisting.....	13.4	166.70	(?)	-----
Weaving.....	46.2	112.70	40.4	101.90	Spooling & Warping.....	.8	25.00	(?)	-----
					Slashing.....	5.2	153.20	10.6	158.40
					Filling preparation.....	30.5	159.30	60.8	121.30
					Weaving.....				

¹ Measured for each dept. in terms of the product made in the dept.

² Ratio of the labor time of each dept. to the total labor time of all the depts.

³ Not required.

⁴ No change.

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EXHIBIT No. 2623

Annual fiber consumption in the United States

[Units are millions of pounds]

	Cotton	Wool	Rayon	Silk	Linen	Total
1919	2,818.2	329.1	9.3	40.2		3,191.8
1920	2,828.1	314.2	8.7	29.3		3,180.3
1921	2,696.3	343.4	19.8	42.5		3,001.0
1922	2,909.8	406.5	24.7	48.3		3,389.3
1923	3,120.5	422.4	32.6	47.2		3,622.7
1924	2,636.6	342.2	42.2	48.0		3,069.0
1925	3,074.7	349.9	58.3	66.0		3,548.9
1926	3,214.8	342.7	60.6	65.9		3,674.0
1927	3,587.7	354.1	100.0	72.0		4,113.8
1928	3,184.2	333.2	100.5	74.9		3,692.8
1929	3,422.7	368.1	133.4	81.3		4,005.5
1930	2,810.9	263.2	118.8	76.0	34.7	3,103.6
1931	2,656.6	311.0	159.0	77.3	28.7	2,232.6
1932	2,463.3	230.1	155.3	70.9	27.3	2,948.9
1933	3,052.5	317.1	217.8	59.8	31.4	3,678.1
1934	2,655.4	226.7	197.2	58.5	29.8	3,169.6
1935	2,754.7	417.5	258.7	62.3	31.5	3,524.7
1936	3,470.2	406.1	322.6	57.8	35.9	4,292.6
1937	3,357.1	380.8	307.9	53.0	35.5	4,434.9
1938	2,903.9	284.5	327.1	51.7	20.7	3,587.9
1939	3,026.7	396.5	462.8	47.8	26.0	4,558.3

Source: Rayon Organon February 1940—V. XI, p. 31 except for 1919.

EXHIBIT No. 2624

Index numbers of wholesale prices of textile products

[1920-1939 (1920=100)]

1920	164.8	1930	80.3
1921	94.5	1931	66.3
1922	100.2	1932	54.9
1923	111.3	1933	64.8
1924	106.7	1934	72.9
1925	108.3	1935	70.9
1926	100.0	1936	71.5
1927	95.7	1937	76.3
1928	95.5	1938	66.7
1929	90.4	1939	69.7

Source: U. S. Bureau of Labor Statistics.

EXHIBIT No. 2625

(Chart based on the following statistical data appears in text on p. 16845)

Outstanding statistical facts in address by Emil Rieve, president Textile Workers Union of America, before the Temporary National Economic Committee

	Years	Percentage Increases		Percentage Decreases	
		Production	Man-Hour Output	Man-Hours	Employment
Textile industry	1919-1939	125		30.4	(*)
Cotton textile	1919-1939	18	64	28	9
Woolens & Worsteds	1919-1939	21	77	32	10
Silk & Rayon goods	1919-1939	(*)	145	438	426
Knit goods	1919-1935	87	88	43	426
Synthetic yarn	1923-1939	962	333	108	222
Carpets & Rugs	1910-1936		25-36		

* Average of period.
 † No change.
 ‡ Probably doubled.

§ 1919-1939.
 ¶ Increase.
 • Mechanical advance.

EXHIBIT No. 2626

Indexes of total man-hours & employment in textile industry (1929=100)

Year	Average Weekly Hours	Entire Textile Industry ^{1 2}		Cotton Textiles ³		Woolens & Worsteds ³		Rayon Yarn ³		Knit goods ³		Silk and Rayon ³	
		Man-hrs.	Employment	Man-hrs.	Employment	Man-hrs.	Employment	Man-hrs.	Employment	Man-hrs.	Employment	Man-hrs.	Employment
1919	46.1	91.9	94.4	100.2	101.4	114.0	113.5	(b)	(b)	81.0	82.8	92.5	97.2
1920	45.1	89.3	93.9	94.1	101.8	92.4	102.3	(b)	(b)	81.6	86.1	87.3	99.6
1921	45.3	88.1	90.3	94.5	97.0	109.3	110.5	(b)	(b)	76.8	77.6	87.3	93.0
1922	47.6	94.5	94.1	95.6	97.7	116.4	113.5	(b)	(b)	91.2	92.8	87.1	91.1
1923	48.0	106.5	105.3	104.8	110.0	135.5	132.4	38.9	36.8	90.6	93.2	93.4	96.0
1924	44.4	87.9	93.8	88.7	96.3	110.9	118.6	40.1	38.7	76.5	83.3	86.7	91.3
1925	45.9	96.6	99.9	101.0	104.8	106.8	112.4	51.2	48.9	84.8	89.5	99.7	101.6
1926	45.8	99.3	98.5	108.1	105.9	99.3	101.9	48.4	48.6	85.2	90.0	93.8	99.2
1927	42.5	101.9	101.7	117.8	110.0	102.1	105.0	66.9	67.4	90.1	91.3	93.9	97.8
1928	46.7	95.3	96.7	98.2	99.4	96.3	100.6	79.3	79.8	89.8	91.3	96.4	97.4
1929	47.4	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1930	44.2	80.9	83.8	76.8	84.1	73.1	81.5	84.8	99.2	82.9	91.1	86.0	91.6
1931	43.5	74.9	81.6	78.1	77.7	73.3	81.3	86.8	99.1	75.7	95.4	77.6	83.7
1932	42.9	66.4	73.5	66.0	69.9	57.5	67.9	77.6	87.8	67.5	83.4	57.8	71.3
1933	40.8	77.1	89.6	78.0	89.3	73.7	86.6	95.1	113.3	74.9	91.0	65.6	84.6
1934	33.6	65.9	93.0	64.6	92.6	57.2	81.3	90.0	119.4	71.3	98.1	64.2	91.0
1935	35.0	71.9	97.3	62.9	86.9	83.9	107.9	99.8	129.3	76.4	105.4	70.3	96.5
1936	36.5	76.3	98.7	72.4	92.4	80.4	105.1	103.0	131.0	82.0	107.0	65.7	86.8
1937	35.8	77.6	102.9	75.8	99.4	77.3	108.7	110.5	140.9	81.9	110.8	67.2	89.6
1938	33.9	60.8	86.7	60.4	84.9	59.7	83.8	83.8	116.6	71.0	99.1	62.1	68.2
1939	36.3	72.9	95.1	72.3	92.7	78.3	102.1	94.3	122.2	73.3	104.9	66.2	71.5

¹ Excluding rayon yarn.
² Prepared on basis of work information in Vol. 3 of the volume noted in footnote 3.
³ U. S. Works Progress Administration National Research Project, Production, Employment and Productivity in 60 Manufacturing Industries, 3 parts, Philadelphia, Penna., May 1939.
⁴ Does not include rayon yarn.
⁵ Not available.

CONCENTRATION OF ECONOMIC POWER

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EXHIBIT No. 2627

Spindles in place, 1921-39 by regions

[In thousands]

Crop year	United States	New England States	Cotton-growing States	All other States	Crop year	United States	New England States	Cotton-growing States	All other States
1921-22.....	36,945	18,856	16,074	2,014	1930-31.....	32,673	12,167	10,109	1,396
1922-23.....	37,408	18,930	16,458	2,020	1931-32.....	31,708	11,373	10,137	1,197
1923-24.....	37,804	18,575	17,226	2,002	1932-33.....	30,892	10,810	10,052	1,030
1924-25.....	37,928	18,332	17,634	1,961	1933-34.....	30,942	10,582	10,330	1,029
1925-26.....	37,588	17,946	17,874	1,765	1934-35.....	30,008	9,741	10,340	1,012
1926-27.....	36,695	16,871	18,169	1,655	1935-36.....	28,147	8,135	10,025	987
1927-28.....	35,539	15,463	18,508	1,568	1936-37.....	26,982	7,172	10,891	918
1928-29.....	34,819	14,548	18,848	1,422	1937-38.....	26,372	6,773	10,798	821
1929-30.....	34,024	13,478	19,122	1,423	1938-39.....	25,261	6,143	10,319	799

“EXHIBIT No. 2628” appears in text on p. 16879

“EXHIBIT No. 2629” appears in text on p. 16883

“EXHIBIT No. 2630” appears in text on p. 16884

“EXHIBIT No. 2631” appears in text on p. 16885

“EXHIBIT No. 2632” appears in text on p. 16886

“EXHIBIT No. 2633” appears in text on p. 16889

EXHIBIT No. 2634

[Submitted by the Brotherhood of Railroad Trainmen]

Index of employment in manufacturing industries and railroad industry

[1923-25=100]

Year	Manufacturing Industries	Railroad Industry	Year	Manufacturing Industries	Railroad Industry
1933.....	73.4	54.4	1937.....	105.8	62.4
1934.....	85.7	54.5	1938.....	80.7	52.6
1935.....	91.3	55.7	1939.....	106.8	55.3
1936.....	97.8	59.7			

¹ Estimated.

Sources: Interstate Commerce Commission (Statement No. M-300) and Bureau of Labor Statistics.

“EXHIBIT No. 2635”, introduced on p. 16909, is on file with the committee.

EXHIBIT No. 2636

[Submitted by Brotherhood of Railroad Trainmen]

PRESIDENT'S DEPARTMENT

MACHINERY CREATES JOBS—WHAT OF IT?

There is considerable propaganda against shorter work-hour legislation, which propaganda although largely based on fact, draws erroneous conclusions. The argument is that notwithstanding the growing increase of labor-saving machinery, the percent of our population gainfully employed has actually increased. This is a fact. In 1880, 47.3 percent of our population, ten years and older, were gainfully employed. In 1930, 49.5 per cent of our population, ten years of age and older, were gainfully employed. However, those who argue against shorter work hours on the basis of these statistics, make a convenient omission of what happened between 1880 and 1930. The following figures showing the per cent of gainfully employed, ten years of age and older, are interesting:

1880.....	47.3%
1890.....	49.2
1900.....	50.2
1910.....	53.3
1920.....	50.3
1930.....	49.5

It will be noted from the above that there was an ascending per cent of gainfully employed from 1880 to 1910. From 1910 to 1930, the per cent of gainfully employed began to drop off and we find that by 1930, it had decreased to 49.5 per cent, which was almost the same percent as in 1890. Along with these figures, we should also consider the fact that we reached the peak of industrial production in 1929, but we had reached the peak of industrial employment in 1918.

These figures are explainable. In the years prior to 1930, there was a period of great expansion in this country. Railroads and highways were being laid out, factories were being built, and our frontiers were being expanded to the Pacific Ocean. During the rapid growth of this country, our problem was not one of unemployment, but rather one of a shortage of human beings. Naturally, in such a building period the per cent of gainfully employed was on the ascendency. Had this not been true, we would have had an unbearable amount of unemployment, because our population was also expanding rapidly. Five per cent unemployment in an expanding nation of 30,000,000 largely self-sustaining, rural, rugged individualists may not present serious social consequences, but the same per cent of unemployment in a nation of 127,000,000 people, living in a highly complex social and economic system, with hugh cities, vanished frontiers and "No Trespass" signs on all lands, gives rise to serious social problems. But now our factories are built, if not over-built, and our use of electrical power is growing out of all proportion to human employment. Strenuous efforts are being made to tear up railroad trackage and terminals rather than to expand them. This leveling off process is even extending to our population, and it is estimated that our population growth will become static within another decade or so. The above figures on gainful employment show that the leveling off process began on employment between 1910 and 1920.

I was interested to read the following statement in the *CHEROKEE (Iowa) COURIER*, republished from an Iowa newspaper sixty-three years ago, on December, 18, 1872. It follows:

"The House of Representatives at Washington last Thursday passed a land bounty bill that gives to each officer, soldier, sailor or marine, the right to enter a quarter section or any unoccupied lands including double minimum priced lands along lines of land grant railways, and procure patent at once in the regular way, and he becomes than as free as any holder of public lands to sell if he desires. It is said that there will be a good deal of opposition to the bill in the Senate."

In those days, the government was actually giving land away in order to get settlers to occupy it and thereby spread our frontiers. Does anyone know of anywhere in the United States today where good agricultural land is being given away? Instead of giving away land now, the present President of the United States and his predecessor, have found it necessary to promise the people that "no one in our land shall be permitted to starve." This is not a very complimentary goal for a nation possessed with greater wealth than any other nation in the world. Now, we are trying to prevent full use of the available agricultural land, on the theory of creating profits by artificially creating scarcity. If people were not suffering for want of food this might make sense. This brings us to another important factor which those who are arguing against shorter work hours

are overlooking. Through its spokesman, Mr. W. J. Cameron, the Ford Motor Company, in its weekly Sunday night radio broadcasts, has been giving some interesting facts, but also some very erroneous conclusions. Mr. Cameron points out that in 1870, it required 324 persons out of every one thousand of the population to produce what the consumers demanded, but in 1930, "with the machine predominant," as Mr. Cameron says, it required 400 persons out of every thousand. He concludes from this that the charge that machines make fewer jobs is completely refuted.

Mr. Cameron overlooks the fact that in 1870 this nation was mainly composed of an agricultural economy, whereas in 1930, it was an industrial economy. According to page 337 of the *WORLD ALMANAC* for 1933, 10,482,323 persons were engaged in agriculture in the United States in 1930. This was a little more than 8 percent of our total population. It is estimated that in colonial days the farm population constituted about 95 percent of the total, whereas now it is about 22 percent. If the modern farmers were given an opportunity to produce at full capacity, the change from an agricultural to an industrial economy would be even more pronounced. Fifty percent of our farmers produce 88 percent of the marketable agricultural produce. If given a fair opportunity, they could easily produce the other 12 percent, and thus eliminate half of those now engaged in agricultural pursuits.

When we consider that in the early days, such a small per cent of our population was engaged in industrial occupations, as compared with those so engaged today, the amazing fact is, not that there has been an increase in the per cent of those gainfully employed, but that the increase has been so small.

Why has this per cent of increase in gainful employment been so small in comparison with the great growth of industrial enterprise over agricultural pursuits? The answer clearly is, the use of machinery and the great technological achievements that have accompanied the Machine and Power Age. There are two ways of viewing this problem brought about by the change from an agricultural to an industrial economy, followed by the inevitable leveling off processes now under way. One view is that of the narrow-minded industrialist who ignores the sociological implications of these changes in our economic and social existence. The industrialist, such as Henry Ford, answers it as follows:

"One year when the (Ford) Company spent four million dollars for machinery, its employees increased by 20,000 men, and the pay roll by 48 million dollars. Another year when the Company spent nine million dollars for machinery, its employees increased by 40,000 men, and its pay roll by 88 million dollars. In another year when the Company invested 10 million dollars in machinery, employment increased by 37,000 men, and the pay roll by 76 million dollars. That was the invariable experience—the more machinery, the more men."

Such a statement cannot be considered as industrial statesmanship. Rather, it is a futile effort to chart the destiny of 127,000,000 people on the basis of what one sees in his own backyard. Mr. Cameron of the Ford Motor Company further asserts that industry has never employed, in round numbers, more than 8,800,000 persons. He states that industry, never having employed as many as nine million persons, is now being "asked to employ immediately an additional eleven million persons, 'or else.'" This is an important fact.

Industrialists claim that they will solve the unemployment problem if the government, the people, will let them alone and enable them to regain their "confidence." The Cameron viewpoint suggests that industry is now doing its full duty and that the great social problem of unemployment is not a problem for industry. If the government is not permitted to solve the unemployment problem and industry feels that it is unreasonable to expect it to give jobs to the millions of unemployed, then starvation seems to be the only alternative for a great portion of our citizenry. At the beginning of the panic, industry promised President Hoover to cooperate fully in maintaining wage and employment levels. Both then and before the panic struck, industry had the gold standard, "sound" money, extensive foreign trade, a strong durable goods market, a balanced governmental budget, freedom from governmental "interference," "confidence" and everything it is now asking for, yet the panic came and has lasted since 1929. Through Henry Ford's spokesman, industry now admits that the unemployment problem is beyond its capacity to solve. If industrial leaders would take their minds off profits long enough to realize that the fundamental law of self-preservation will eventually compel the social body to defend its own existence, they would realize that their rather egotistic attitude of self-satisfaction is leading them to self-destruction.

Mr. Cameron, with an air of self-satisfaction, asserts that his company has employed more men as it has installed more machinery. He creates the impression that the Ford Company has "done its bit" and will not be interested in the salva-

tion of society itself. But Mr. Cameron tells us nothing about the greatly increased productivity of the workers employed by his company to operate the machines it has installed. He does not tell us that in 1929, the *labor* cost of making an automobile door was \$4.00, but today it is only 15c. He has not told us that in 1929, it cost \$3.00 *in wages* for body framing one automobile, but today it costs 35c; or that in 1929, it cost \$3.00 to hand-finish the body frames of wood before paneling, but now it costs 20c. In other words, Mr. Ford is anxious to spend some of his fortune to tell the people, in a nationwide radio hook-up, what he is doing in the way of giving jobs to workers, but he is significantly silent as to what the workers are giving him in return for it as a result of their greatly increased productivity.

The director of the governmental survey known as the National Survey of Potential Product Capacity, Mr. Harold Loeb, is authority for the statement that "Productivity per worker has gone up from 1,648 (1913) dollars in 1869 in manufacturing, to 6,533 (1913) dollars in 1932. Per capita income has gone up from 277 (1913) dollars in 1890, to 282 (1913) dollars in 1932." This represents an increase of 296.4 per cent in dollar value of the workers' productivity, but the per capita income has increased by the pitifully small amount of only 1.8 per cent. Production per worker in our manufacturing industries has increased 71 per cent from 1919 to 1933, while the workers' share has decreased 6 per cent. While profits have increased 50 per cent, wages have decreased 40 per cent. With a 296.4 per cent increase in dollar value of worker productivity and only 1.8 per cent increase in per capita income, where has this wealth gone? Because profits and inflated capital structures have taken more than their share, this potential, not actual, wealth has been dissipated through the practice of non-production. These are some of the pertinent facts that Mr. Ford does not reveal to the public.

They are pertinent because they prove that as the workers have increased their productivity, instead of being given incomes sufficient to enable them to buy-back the real wealth which they have produced, it has been diverted into capital investment, factories, machinery, etc., thereby enlarging the workers' productive capacity, without correspondingly increasing his purchasing or consuming ability. Instead of the "prosperous" years preceding the panic, being years of improvident spending, they are marked as the period of the greatest savings in history. During this period, while housewives were spending \$34,700,000,000 on consumable goods, capital was spending \$53,900,000,000 on capital investment. Capital investment is savings. It is now clearly evident to any thinking person that such a course would eventually wreck the economic system. An important reason why the collapse did not come before 1929 was because of the debt-creating device of installment selling by which the workers were enabled to obtain a part of the wealth they produced, not as a matter of right, but by mortgaging their future earnings. In the face of this history, our "expert economists" are telling us that all we need to restore prosperity, is such "confidence" as will inspire greater investment in capital goods.

We now have the over-expanded capital structures, idle factories, machinery, etc., as well as the debts which will require the masses, for some years to come, to pay the "coupon clippers" instead of consuming or buying back the wealth which they may produce in future years. Not only do we have the idle capital structure and the debts, but for over six years we have refrained from producing some \$350,000,000,000 of real wealth which we might have produced had we listened to the voice of reason and common sense instead of the *bought* voices of "expert economists." Let me explain parenthetically that by referring to an over-expanded capital structure, I have reference to over-expansion from the standpoint of purchasing power of the masses, rather than from the standpoint of the needs of the people. From the standpoint of "profitable" markets, and we are still under a profit system, there is over-expansion of capital enterprise, as witness the idle factories, but from the standpoint of human needs, there is no over-expansion, except possibly in unimportant and isolated instances, such as four gasoline stations on one corner.

What has Mr. Ford learned from the history that has been written in his lifetime and more especially in the last decade? His recent announcement, in an obvious air of triumph, that Ford cars may now be purchased for \$25.00 per month, would suggest that he has learned little. The Ford view is the narrow view of the industrialist, without statesmanlike vision and apparently without serious concern for the welfare of the society which has made it possible for him to become one of the richest men on earth. If this matter is viewed with courage and vision and with a consciousness of social welfare, then Mr. Ford's propaganda to the effect that he has employed more men as he has bought more machinery, may well be answered, "What of it? The fact remains, that we still have some ten or eleven million unemployed in this country."

Unless we consider, as Mr. Ford apparently does, that the prospect of having some eleven million men permanently unemployed in this country is no concern of ours, we must cease confining our vision to our own backyard and undertake to arrive at some solution of the great social problems before us, if Ford automobiles are to continue to be sold. In looking at this problem from the social viewpoint, we must bear in mind the great changes that have taken place in this country, particularly with reference to the change from an agricultural economy to an industrial society which consumes an amount of electrical power energy, the equivalent of which could not be furnished by the muscular power of a half billion stalwart able-bodied men.

Recently the Machinery and Allied Products Institute published a pamphlet entitled "Ten Facts on Technology and Employment," in which the narrow Ford viewpoint is taken, that machinery is really solving our unemployment problem, rather than creating a problem of technological unemployment. After giving various facts, and the usual erroneous conclusions, this Institute successfully destroys its own case in the following words:

"If technological advancement did not make possible a greater volume of production the standard of living could be raised only by increasing hand labor. Had it been necessary to increase hand labor in the same proportion as production between 1900 and 1930, every adult man and woman in the nation and several million children would have been needed in jobs. It would have required more than 60 per cent of the entire population whereas only about 40 per cent ever seeks gainful employment, the remaining 60 per cent being constituted chiefly of women and children supported by the 40 per cent."

Thus, the Machinery and Allied Products Institute starts out to prove that labor-saving machinery does not destroy jobs and ends up by proving that were it not for machines and modern technology, there would not be enough adult men and women workers in the country to accomplish the work now being accomplished with extensive use of machines and power.

We have already noted the great reduction in the per cent of our population engaged in agricultural pursuits. In 1850, we had 12.6 farm acres for every man, woman and child in the country, but today we have only 8 acres for each man, woman and child. What has happened during the period in which our population has doubled and redoubled, while those engaged in a largely self-sustaining occupation such as farming, have not increased in proportion. Industry has been able to absorb some of these people, as Mr. Cameron points out. But also, as Mr. Cameron points out, we cannot expect industry to employ all of the unemployed, at least, not on the present schedule of working hours. During the time that our frontiers were expanding nationally, internationally, and industrially, the slack was taken up, but now the gap is ever widening. The proportion of gainfully employed engaged in manufacturing dropped from 30.5 per cent to 28.6 per cent between 1920 and 1930, according to "Recent Social Trends." Although machines and modern conditions have created many new jobs, the existence of some eleven million unemployed testifies to the fact that machines have not created a sufficient number of jobs to assure economic security for all. But those who argue that machines and modern methods have created new jobs, seem to overlook the fact that they have also eliminated many jobs. Data assembled by the United States Bureau of Labor Statistics, which may be found on page 311 of the 1936 *WORLD ALMANAC*, relating to employees per million of United States population, is most interesting. A few of these facts are as follows:

Employees Per Million of United States Population

	1850	1860	1920	1930
Agriculture.....	103,568			85,294
Blacksmiths.....	4,308			1,013
Boot and Shoe Workers.....	5,644			2,482
Cabinet Makers.....	1,611			472
Carpenters, Joiners.....	8,609			7,570
Hackmen, Drivers and Draymen.....	1,757			1,240
Harness Workers.....	982			62
Marble and Stone Cutters.....	907			186
Millers.....	1,199			316
Physicians and Surgeons.....	1,757			1,253
Sailors and Deckhands.....	3,044			527
Tailors, Dressmakers, Milliners.....		8,045		4,421
Tanners and Curriers.....	646			373
Wagon and Coach Workers.....	673			34
Wheelwrights.....	1,323		35	none

It will be observed that the above occupations are those which have been reduced or eliminated entirely because of the machine and modern conditions. Not the least surprising in the above table is the fact that the American people had more physicians and surgeons per million of persons in 1850, than in 1930. This is an awful commentary on modern society. No doubt, many capable doctors are now in the breadlines or are digging in the frozen ground for WPA. Of course, physicians and surgeons also are subject to modern trends which reduce employment in their ranks. Doctors in large city hospitals can now attend far more patients than the country doctors of 1850, who were forced to struggle through the snowbanks of the byways, rather than on the hard surfaced highways of today.

By carrying through to the present population the same per cent of the above workers who had such jobs in 1850, we find that if these jobs had not been reduced or eliminated and if the same per cent were now so employed, we would now have 18,246,471 occupied in the above callings. However, on the basis of the per cent so occupied in 1930, which undoubtedly would be smaller now, instead of 18,246,471 being employed in these callings, only 13,365,861 are now so employed. Thus, machines, technology and changed habits have eliminated 4,880,610 jobs in the above few callings. Narrow-visioned industrialists are constantly pointing out, through a favorable press and radio, that machines and modern conditions create new opportunities for employment, such as Mr. Cameron's illustration of four blacksmiths formerly being employed in a Michigan town, where now there are no blacksmiths, but 23 men are employed in garages, filling stations and tire and auto accessory stores. But these industrialists are not willing to portray a realistic picture by giving all of the pertinent facts, such as those herein set forth relating to the decrease in jobs in certain callings.

Mr. Cameron's illustration pertaining to a Michigan town is worthy of a more thoughtful analysis than he gave it. It is valuable because it refers to a small urban community, whereas the problem of unemployment in our modern technological society is too frequently considered only with respect to large urban centers. Let us attempt to complete the picture of this small Michigan town, which was only outlined by Mr. Cameron. On the basis of the year 1850 ratio of Harness Workers and Wheelwrights to Blacksmiths, there was approximately one Wheelwright and Harness Worker for every two blacksmiths. Thus, Mr. Cameron should have added two Wheelwrights and Harness Workers to the four Blacksmiths, making six, instead of four comparable former workers in this Michigan town. To make the comparison more accurate, there should be included those working in livery stables and feed stores, figures on which are not available to the writer, but certainly there would be at least one man working in the livery stable and one man working in the feed store. This makes a total of eight former workers, instead of four in comparative occupations in the Michigan town. Thus, the 23 garage, filling station and auto accessory workers represents an increase in the eight former comparable workers of 187.5 per cent.

We shall assume that in the interests of accuracy Mr. Cameron selected a representative community. Having this in mind, although Mr. Cameron's illustration shows an increase in jobs, he significantly omits to point out that from 1850, when these former jobs existed, to 1936, there has been an increase in the nation's population of approximately 452 per cent, while Mr. Cameron shows an increase in jobs of only 187.5 per cent.

But in the interests of completeness and accuracy, we should carry through the per cent of population employed as Blacksmiths, etc., in 1850 and determine approximately what number would now be so employed had we not abandoned the horse and buggy for the automobile. The picture cannot be made complete because of the absence of figures relating to feed store and livery stable workers, but the omission is in Mr. Cameron's favor. By comparing the number of Blacksmiths, Wheelwrights and Harness Workers per million of population in 1850 with the number so employed today, we find the number of these jobs per million of population was 615 per cent greater in 1850 than in 1930, as compared with Mr. Cameron's increase of 187.5 per cent in jobs in the Michigan town as a result of the abandonment of the horse and buggy for the automobile. If we assume that the automobile had never been created and we tried to use horses, buggies and wagons to do the work now being done by automobiles and trucks, there would not be enough Blacksmiths, Harness Makers and Wheelwrights in the entire world to fill these necessary jobs in the United States. Does this look like the automobile brought about a net increase in available work opportunities? "Horses and buggies" may yet be the means of humiliating the modern Bourbons and Tories who are so solemnly propounding the American Liberty League philosophy.

We could not intelligently consider this problem without referring to a very pertinent statement of Thomas Edison, who said:

"Human slavery will not have been fully abolished until every task now accomplished by human hands is turned out by some machine."

Dr. Ure, an expert English economist, advised the manufacturing classes of England, in the middle of the nineteenth century, that the goal of the manufacturers should be the development of machinery to the point where they could use the labor of women and children, which was cheaper than that of men, and that the ultimate goal was to displace all labor, as nearly as possible, through the development of the machine. With this goal in mind, why is it that there are not a greater number of unemployed than there is? The answer to this question is not a great compliment to our modern society.

In the early days when the overwhelming part of our population was rural, the major part of the population was essentially self-sustaining, that is, the farmer consumed most of his own production. The farmer of those days had far fewer urbanities to support than today. In 1870, there was one person engaged in agricultural occupation for each 6.5 persons in the nation. By 1930, there was one person engaged in agriculture to 11.7 persons in this nation. With the increase in the general population expanding out of all proportion to the increase of those following agricultural pursuits, there has been a tremendous increase in non-self-sustaining and non-productive persons. We now have millions engaged in such pursuits as advertising, salesmanship, social, welfare and relief work, public employees, debt-merchants and debt collectors, real estate operators, brokers, bookmakers, bootleggers, and many other forms and kinds of non-producing individuals, not to mention our high and increasing prison population. From the standpoint of producing the needs of the people, these groups might be considered as parasites upon the real producers. Of course, I do not mean to say that under present conditions some of these non-producers are not necessary, particularly the welfare, relief and social workers. If we are going to maintain poverty and millions of unemployed, we must have hundreds of thousands engaged in the task of keeping them from starving. Can we doubt that if all or most of these non-producers were engaged in productive enterprise, the working hours of all could be shortened? It is true that this great increase of non-producers has helped to raise the per cent of gainfully employed, but it has also placed additional burdens on the backs of the producers of real wealth.

One who has only the selfish viewpoint of the industrialists who set profits as their only goal, may be content to dismiss this great social problem of our day merely by saying that the per cent of gainfully employed has increased along with the use of machinery. But the statesman who has social vision cannot so easily blind himself to the fact that, notwithstanding this, we have some eleven million unemployed and that if we again reach even the 1929 level of production volumes, we shall still have some eight million unemployed in this country.

Then we also have four gasoline stations on one corner, many struggling individual merchants and like "rugged individualists" who are struggling to stay in futile "private enterprise" rather than to lend their efforts toward achieving the productive capacities that will supply the needs of the people. In other words, the real producers of wealth in the country are having more and more non-producers to support. In the face of obvious potential abundance on the one hand and widespread poverty and unemployment on the other hand, we maintain these great non-productive classes, because we think we want that rugged individualism and private enterprise which it was possible for our fathers and grandfathers to have a hundred years ago. While we struggle to maintain private enterprise by requiring small merchants and farmers to work from sun-up to long after sundown, and industrial workers to labor many more hours than should be necessary in a system which has so increased their productivity, we seem to overlook the fact that the great aim in life is not profits, but to live and to live the more abundant life which the Saviour of men laid down as the goal for human achievement, when He said:

"I am come that ye might have life, and that ye might have it more abundantly."

"ЕХНІВІТ No. 2637" appears in text on p. 16924

"ЕХНІВІТ No. 2638" appears in text on p. 16924

17440

CONCENTRATION OF ECONOMIC POWER

"EXHIBIT No. 2639" appears in text on p. 16925

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"EXHIBIT No. 2644" appears in text on p. 16931

EXHIBIT No. 2645

Adjusted sharecropper and wage laborer net income in specified localities, 1932-37

[Submitted by the Bureau of Agricultural Economics, Department of Agriculture]

Area	Total net income	Net cash income	% home use & perq. of total net income	Net income per person		Net income per worker	
				Total net	Net cash	Total net	Net cash
SHARECROPPER							
1932							
Yazoo-Mississippi Delta ¹	262	119	52.8	66	31	87	41
1933							
Yazoo-Mississippi Delta ¹	334	202	39.5	95	58	119	72
1934							
Yazoo-Mississippi Delta ¹	381	243	38.2	109	69	186	87
Arkansas: Red, Arkansas and Mississippi River Basins ²	234	217	36.0	88	87	159	103
Atlantic Coast Plain ³	569	355	37.6	96	60	167	104
Upper Piedmont ⁴	386	204	47.2	74	39	133	70
Black Belt ⁴	360	207	42.8	60	40	124	71
Upper Delta ⁴	373	220	38.3	96	59	170	105
Lower Delta ⁴	204	98	32.0	49	26	85	41
1935							
Yazoo-Mississippi Delta ¹	424	261	38.4	118	73	146	90
Mississippi Delta ¹	492	303	38.4	114	70	141	87
Georgia Piedmont ⁵	518	187	38.9	93	33	122	48
South Carolina-Coast Plain ⁶	570	312	45.2	104	57	150	82
1936							
Yazoo-Mississippi Delta ¹	530	267	30.8	156	108	196	126
Mississippi-Black Belt ¹	310	204	34.0	82	54	107	70
Georgia-Lower Piedmont ⁶	401	162	30.0	73	39	106	48
Texas-Piney Woods Cotton Area ⁷	489	303	38.0	109	67	246	132
1937							
Arkansas: Red, Arkansas and Mississippi Deltas ⁸	483	313	35.0	118	78	161	104
South Carolina Piedmont ⁶	561	349	38.0	95	59	140	87
South Carolina Coast Plain ⁶	648	430	34.0	108	72	158	105

Footnotes at end of table.

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Adjusted sharecropper and wage laborer net income in specified localities,
1932-37¹—Continued

Area	Total net income	Net cash income	% home use & perq. of total net income	Net income per person		Net income per worker	
				Total net	Net cash	Total net	Net cash
WAGE LABORER							
1934							
Arkansas: Red, Arkansas and Mississippi River Delta ²	243	168	30.9	87	60	128	88
Atlantic Coast Plain ³	239	164	31.4	70	48	109	76
Upper Piedmont ⁴	193	126	34.7	84	56	129	84
Black Belt ⁴	205	136	33.7	64	43	98	65
Upper Delta ⁴	242	166	31.4	97	66	151	104
Lower Delta ⁴	245	169	31.0	91	63	136	94
1937							
Arkansas: Red, Arkansas and Mississippi Deltas ⁵	405	292	27.9	109	79	156	112
South Carolina Piedmont ⁶	344	228	33.7	93	62	138	91
South Carolina Coast Plain ⁶	371	273	26.4	76	56	128	94

¹ Various studies adjusted for comparability.
² Source: "Plantation Organization and Operation in the Yazoo-Mississippi Delta Area," Langford and Thibodeaux, USDA Technical Bulletin No. 682.
³ Source: "Plantation Organization in Arkansas," H. W. Blalock, Ark. Exp. Sta. Bull. 339.
⁴ Source: "Landlord and Tenant on the Cotton Plantation," T. J. Wooster, Jr., WPA.
⁵ Source: Bureau of Home Economics, USDA, Consumer Purchases Studies, WPA cooperating.
⁶ Source: Unpublished data, Program Planning Division, AAA, USDA, in cooperation with BAE, USDA, and the respective Agricultural Experiment Stations.

EXHIBIT No. 2646

(Submitted by the Bureau of Agricultural Economics, Department of Agriculture)

INCOME OF HIRED LABORERS

With respect to other areas and crops than cotton, few of the studies that have been made are comparable, owing to variations with respect to home use products, perquisites, total family earnings, and total earnings throughout the year. However, taking the figures as they stand, the incomes of farm laborers in the various crop areas studied may be grouped as follows:

Area	Approximate earnings per year
1. Tobacco (Kentucky) 1935-36	\$188
2. Small grains (Kansas and Minnesota) 1935-36	206-254
3. Truck (New Jersey) 1938	265
4. Corn (Illinois and Iowa) 1935-36	308-312
5. Sugar beets (4 States) 1935	340
6. Hops (Washington) 1937:	
Single person	352
Family head	496
7. California 1935	261
1935-36	651

In the areas covered by Messrs. Folsom and Vasey in 1936, the average earnings were as follows:

1. Self-sufficing (Tennessee)	\$126
2. Cotton (Louisiana)	130
(Texas)	162
3. Tobacco (Kentucky)	188
4. Small grains (Minnesota)	206
(Kansas)	254
5. Stock ranch (Colorado)	285
6. Corn (Illinois)	308
(Iowa)	312
7. Dairy (Pennsylvania)	353
8. Fruit (California)	651

CONCENTRATION OF ECONOMIC POWER

EXHIBIT No. 2647

[Submitted by the Bureau of Agricultural Economics, Department of Agriculture]

Farm Labor Income: Various Studies, 1930-38

Areas and studies	Author of study	Cash earnings exclusive of relief income
I. Corn Belt (Resident):		
A. Illinois—Livingston Co., 1935-36 ¹	Vasey and Folsom.....	\$308
B. Iowa—Hamilton Co., 1935-36 ¹	“ “ “.....	312
II. Small Grains (Resident and non-resident):		
A. Wheat—Kansas—Pawnee Co., 1935-36 ¹	“ “ “.....	254
B. Small grains—Minnesota ¹ Lac qui Parle Co., 1935-36.....	“ “ “.....	206
III. Sugar Beets (Resident and non-resident):		
Michigan-Minnesota-Montana-Wyoming, 1935.....	Johnson.....	340
IV. California (Migrants):		
A. Various areas and crops, 1930.....	SRA.....	343
1931.....		326
1932.....		308
1933.....		299
1934.....		287
1935.....		261
B. Placer Co.—fruit, 1935-36 ¹	Vasey and Folsom.....	651
V. Yakima Valley—Washington, 1935-36:		
Resident:		
A. Fruit and general farms:		
Single workers.....	} Brooks.....	217
Family heads.....		198
Non-Resident:		
A. Fruit and general farms:		
Single workers.....	} Brooks.....	334
Family heads.....		297
B. Hops, 1937:		
Single persons:		
(1) All workers.....	} Reuss, Landis, and Wakefield...}	620
(2) Earning from agriculture only.....		352
Family heads:		
(1) All workers.....		826
(2) Earning from agriculture only.....		496
VI. Kentucky (Resident):		
A. Todd Co.—Tobacco, 1935-36 ¹	Vasey and Folsom.....	188
VII. A. Truck-general dairy, New Jersey, 1935.....	Folsom ²	431
B. Truck, 1938 ²	Natl. Child Labor Com.....	265

¹ Vasey and Folsom studies are averages of single hands and family groups; in some cases they include sharecroppers, tenants and farm owners who worked out as laborers; in some instances migratory and resident workers' incomes are represented in the averages.

² Income represents earnings for seasonal employment on the farm only. Average number of days available for farm work was approximately 99. Income figures are case averages including both single persons and families of workers.

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EXHIBIT No. 2648

[Submitted by the Bureau of Agricultural Economics, Department of Agriculture]

Agricultural Employment in the United States, 1909-39

ANNUAL AVERAGE OF NUMBER OF PERSONS EMPLOYED ON FIRST OF EACH MONTH

Year	Total employment		Family workers		Hired workers	
	Avg. no. persons (thousands)	Index (1924-29=100)	Avg. no. persons (thousands)	Index (1924-29=100)	Avg. no. persons (thousands)	Index (1924-29=100)
1909	12,209	107	9,341	111	2,868	97
1910	12,146	107	9,269	110	2,877	98
1911	12,042	106	9,172	109	2,870	98
1912	12,038	106	9,149	109	2,889	98
1913	12,033	106	9,128	108	2,905	99
1914	12,000	106	9,081	108	2,919	99
1915	11,981	105	9,047	107	2,934	100
1916	12,016	106	9,050	107	2,966	101
1917	11,789	104	8,856	105	2,933	100
1918	11,948	100	8,507	101	2,841	97
1919	11,108	98	8,322	99	2,784	95
1920	11,362	100	8,479	101	2,883	98
1921	11,412	100	8,511	101	2,901	99
1922	11,443	101	8,528	101	2,915	99
1923	11,385	100	8,491	101	2,894	98
1924	11,362	100	8,488	101	2,874	98
1925	11,446	101	8,577	102	2,869	97
1926	11,534	102	8,507	101	3,027	103
1927	11,246	99	8,296	99	2,950	100
1928	11,295	99	8,340	99	2,955	100
1929	11,289	99	8,305	99	2,988	101
1930	11,178	98	8,323	99	2,850	97
1931	11,159	98	8,469	101	2,690	91
1932	11,069	97	8,571	102	2,498	85
1933	11,023	97	8,590	102	2,433	83
1934	10,852	96	8,506	101	2,346	80
1935	11,172	98	8,704	103	2,468	84
1936	10,997	97	8,502	101	2,494	85
1937	10,830	95	8,273	98	2,557	87
1938	10,745	95	8,216	98	2,529	86
1939	10,629	94	8,150	97	2,479	84

Source: Agricultural Marketing Service, U. S. Department of Agriculture.

“EXHIBIT No. 2649” appears in text on p. 16942.

“EXHIBIT No. 2650” appears in text on p. 16943.

“EXHIBIT No. 2651” appears in text on p. 16945.

“EXHIBIT No. 2652” appears in text on p. 16946.

“EXHIBIT No. 2653” appears in text on p. 16947.

“EXHIBIT No. 2654” appears in text on p. 16948.

“EXHIBIT No. 2655” appears in text on p. 16948.

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"EXHIBIT No. 2656" appears in text on p. 16949.

"EXHIBIT No. 2657" appears in text on p. 16951.

"EXHIBIT No. 2658" appears in text on p. 16953.

"EXHIBIT No. 2659" appears in text on p. 16954.

"EXHIBIT No. 2660" appears in text on p. 16955.

"EXHIBIT No. 2661" appears in text on p. 16956.

"EXHIBIT No. 2662" appears in text on p. 16959.

EXHIBIT No. 2663

[Submitted by the Bureau of Agricultural Economics, Department of Agriculture]

*Comparative Costs of Operating a 320 Acre Wheat Farm with Horses
or with Tractor*

	Horse Power	Tractor Power
Cash Outlay:		
Direct crop expense:		
hired labor @ \$2.50, 88 days.....	\$220	18 days..... \$45
threshing.....	193	
other crop expense.....	41	26
machinery (repairs, fuel, oil).....	96	543
Other expense:		
purchased feed.....	167	167
taxes.....	244	244
other.....	225	225
Total cash.....	\$1,151	\$1,250
Machinery Replacement.....	320	500
Total Charge.....	\$1,471	\$1,810
Cash Farm Receipts:		
Wheat, 2,000 bu.....	1,600	2,300 bu...1,888
Other crops.....	35	76
Livestock and products.....	480	480
Total.....	\$2,115	\$2,443
Difference.....	\$644	\$653
Acres of wheat.....	193	225
Acres of other crops.....	80	45
Farm value of equipment.....	\$1,600	\$2,800
Farm value of livestock.....	1,200	600

Wheat 80¢ bushel.

Labor \$2.50 day.

Data adjusted from original record, U. S. D. A.

CONCENTRATION OF ECONOMIC POWER

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EXHIBIT No. 2664

[Submitted by the Bureau of Agricultural Economics, Department of Agriculture]

Comparative Cost of Operating a 200 Acre Corn Belt Farm with Horses and Horse Equipment or with Tractor and Tractor Equipment

	Horse Power	Tractor Power
Cash Outlay:		
Direct crop expense:		
hired labor.....	\$129	
other crop expense.....	388	\$287
operating equipment.....	293	475
Livestock expense.....	75	65
Purchased feed.....	158	158
Repair buildings, taxes, etc.....	385	395
Total cash.....	\$1,428	\$1,380
Machinery Replacement.....	255	523
Total Charge.....	\$1,683	\$1,903
Cash Farm Receipts:		
Livestock.....	2,904	2,904
Crops.....	1,596	1,891
Other.....	30	30
Total.....	\$4,530	\$4,825
Difference.....	\$2,847	\$2,922
Man hours on crops.....	1,926	833
Investment in equipment and horses.....	\$2,265	\$2,445

Acres of corn, 77.
 Acres of oats and soybeans, 77.
 Acres of other crops, 12.
 Data adjusted from original record, U. S. D. A.

EXHIBIT No. 2665

[Submitted by the Bureau of Agricultural Economics, Department of Agriculture]

Expenses of Operating Plantations with Croppers and Mules, Wage Hands and Mules, Wage Hands and Tractors; Mississippi Delta

	Cropper Labor and Mules	Hired Labor and Mules	Hired Labor and Tractor Power
Cash Outlay:			
Wage labor hired.....	\$845	\$0,281	\$10,503
Work stock expense.....	342	342	54
Operate and repair equipment.....	756	756	2,444
Crop expense.....	1,593	3,043	4,139
Taxes, insurance, bldg. repairs.....	2,545	2,366	2,460
Total cash.....	\$6,081	\$16,788	\$19,600
Depreciation:			
Work stock and mule equipment.....	1,200	1,200	208
Tractors and tractor equipment.....			880
Buildings and improvements.....	598	381	453
Total Charge.....	\$7,879	\$17,369	\$21,141
Net Plantation Income.....	\$4,898	\$3,209	\$18,081
Cotton production, bales.....	338.8	354.2	473.2
Families on plantation.....	34	19	24

Cotton at 12¢ per lb.
 Cotton yield, 350 lbs. lint per acre.
 Picking 90¢ per 100 lbs.
 Labor \$1.00 per day.

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EXHIBIT No. 2666

[Submitted by the Bureau of Agricultural Economics, Department of Agriculture]

Comparison of Net Plantation Income Under Two Systems with Different Prices of Cotton and Different Wage Rates; Mississippi Delta

	Net Plantation Income	
	Cropper and Mule Power	Wage Hands and Tractors
Lint 12¢ per lb.; labor \$1.00 per day; Yield 350 lbs. per acre	\$4,898	\$12,190
Labor \$1.50 per day; Yield 350 lbs. per acre	\$4,475	\$6,751
Cotton 6¢ lb.; labor \$1.00 per day; Yield 350 lbs. per acre	\$939	\$4,318
Labor 50¢ per day	\$516	\$1,122

Data from U. S. D. A. Tech. Bul. 682.

"EXHIBIT No. 2667" appears in text on p. 16963.

EXHIBIT No. 2668

[Submitted by the Bureau of Agricultural Economics Department of Agriculture]

Changes in Farm Mortgage Debt and Value of Farm Real Estate, United States, 1910-39

Year	Total farm mortgage debt ¹	Value of farm real estate ²	Ratio of debt to value	Year	Total farm mortgage debt ¹	Value of farm real estate ²	Ratio of debt to value
	Million dollars	Million dollars	Percent		Million dollars	Million dollars	Percent
1910.....	3,208	34,801	9.2	1930.....	9,631	47,880	20.1
1920.....	8,449	66,316	12.7	1933.....	8,638	30,724	28.1
1923.....	10,786	52,710	20.5	1939.....	7,071	35,356	20.0

¹ As of January 1.² Based on value of land and buildings as of date of Census in Census years; values in intercensal years derived from index of land values per acre as of March 1.

EXHIBIT No. 2669

[Submitted by the Bureau of Agricultural Economics, Department of Agriculture]

TABLE A.—Estimated amount of farm-mortgage loans outstanding, by geographic divisions, January 1, 1910-39

Year	United States	New England	Middle Atlantic	East North Central	West North Central	South Atlantic	East South Central	West South Central	Mountain	Pacific
	1,000 dollars	1,000 dollars	1,000 dollars	1,000 dollars	1,000 dollars	1,000 dollars	1,000 dollars	1,000 dollars	1,000 dollars	1,000 dollars
1910.....	3,207,863	70,202	269,716	807,008	1,276,944	130,334	108,777	260,605	99,455	184,922
1911.....	3,522,121	70,525	273,296	870,488	1,419,760	139,915	118,550	306,971	121,819	201,807
1912.....	3,929,768	76,032	289,728	949,313	1,570,724	170,971	118,502	371,857	142,891	240,740
1913.....	4,347,679	83,911	317,966	1,017,526	1,717,743	177,327	126,470	421,479	175,413	309,844
1914.....	4,707,358	91,057	337,657	1,083,543	1,870,562	184,816	145,667	448,243	191,829	354,084
1915.....	4,990,785	98,442	338,810	1,135,733	2,033,042	193,048	141,441	451,187	214,338	384,746
1916.....	5,256,426	102,586	326,437	1,181,374	2,202,430	197,310	138,805	478,016	233,826	395,641
1917.....	5,825,851	108,392	314,939	1,288,376	2,497,278	220,894	149,248	518,876	285,173	441,676
1918.....	6,536,880	109,405	341,481	1,393,656	2,793,831	231,019	187,247	598,124	375,001	502,087
1919.....	7,137,365	105,763	359,611	1,457,580	3,032,137	267,497	240,198	687,106	461,930	525,563
1920.....	8,448,772	114,757	406,047	1,662,678	3,506,470	391,069	358,440	805,184	592,675	611,452
1921.....	10,221,128	125,828	446,685	1,964,232	4,376,022	505,770	447,840	902,149	719,922	733,338
1922.....	10,792,257	133,054	459,197	2,039,436	4,591,790	548,372	445,402	978,472	759,085	747,469
1923.....	10,785,621	142,129	463,382	2,091,683	4,636,928	530,457	406,385	1,016,690	771,600	727,357
1924.....	10,604,919	146,810	459,773	2,100,145	4,629,411	504,705	394,909	1,000,372	695,467	733,327
1925.....	9,912,650	141,117	446,620	1,938,810	4,277,934	491,410	378,036	923,342	681,088	734,293
1926.....	9,713,213	142,860	457,527	1,887,197	4,008,648	555,490	399,881	963,988	535,710	763,912
1927.....	9,658,422	140,878	467,939	1,854,988	3,807,772	600,170	426,453	1,034,816	525,035	800,871
1928.....	9,756,967	152,607	473,185	1,880,987	3,778,713	588,726	446,916	1,092,225	529,509	814,089
1929.....	9,756,559	162,858	472,613	1,917,596	3,734,571	546,167	439,773	1,091,781	551,371	839,839
1930.....	9,630,768	171,708	456,468	1,883,614	3,570,279	519,348	432,732	1,109,328	575,012	912,284
1931.....	9,458,281	176,170	464,033	1,818,684	3,474,157	494,501	418,479	1,089,845	587,974	934,538
1932.....	9,214,004	184,500	469,020	1,757,767	3,342,008	465,927	401,762	1,081,423	577,436	934,161
1933.....	8,638,383	185,799	459,317	1,657,756	3,082,199	423,008	366,538	1,020,388	540,400	902,978
1934.....	7,887,119	176,969	424,824	1,522,624	2,760,665	401,704	341,806	941,117	481,708	835,642
1935.....	7,785,971	176,003	413,578	1,535,006	2,694,140	421,644	354,212	934,687	474,214	782,487
1936.....	7,638,887	177,571	411,207	1,517,589	2,610,766	418,166	345,800	906,683	476,788	771,207
1937.....	7,389,797	180,458	408,443	1,471,281	2,466,544	408,348	341,931	879,928	463,423	769,441
1938.....	7,214,138	183,099	404,345	1,433,019	2,376,056	401,799	339,730	852,785	453,855	769,450
1939.....	7,070,696	186,574	400,681	1,409,046	2,290,887	397,024	340,396	831,806	445,915	768,567

CONCENTRATION OF ECONOMIC POWER

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EXHIBIT No. 2670

[Chart based on the following statistical data appears in text on p. 16968]

Percentage of the value of farm real estate belonging to farm operators in selected States, 1930 and 1935

State	1930	1935	Change in percentage of equity	State	1930	1935	Change in percentage of equity
	<i>Pct.</i>	<i>Pct.</i>	<i>Pct.</i>		<i>Pct.</i>	<i>Pct.</i>	<i>Pct.</i>
Maine.....	77.7	70.3	-7.4	Nebraska.....	33.0	29.6	-3.4
Connecticut.....	64.3	67.9	+3.6	Delaware.....	47.9	41.1	-6.8
Wisconsin.....	50.4	44.1	-6.3	Wyoming.....	40.4	34.6	-5.8
Minnesota.....	41.2	34.2	-7.0	New Mexico.....	39.8	43.4	+3.6
South Dakota.....	28.3	20.1	-8.2	Nevada.....	45.2	34.5	-10.7

EXHIBIT No. 2671

[Submitted by the Bureau of Agricultural Economics, Department of Agriculture]

TABLE B.—*Equities in farm real estate, by tenures, United States, 1930 and 1935 (Investments of farm operators and of other people)*

Tenure groups	Equity of the operator		Equity of others (Mortgage debt of the operator)		Operator had no ownership interest		Equity of all groups	
	1930	1935	1930	1935	1930	1935	1930	1935
	<i>Percent</i>	<i>Percent</i>	<i>Percent</i>	<i>Percent</i>	<i>Percent</i>	<i>Percent</i>	<i>Percent</i>	<i>Percent</i>
Farms operated by full owners.....	35.1	33.9	9.0	11.2	—	—	44.1	45.1
Farms operated by part owners.....	6.5	5.2	2.4	3.7	8.1	7.9	17.0	16.8
Manager farms.....	—	—	—	—	4.7	4.8	4.7	4.8
Tenant farms.....	—	—	—	—	34.2	33.3	34.2	33.3
All farms.....	41.6	39.1	11.4	14.9	47.0	46.0	100.0	100.0

The table above indicates by tenures the percentage of the total value of farm real estate belonging to various groups. The equity of operators in all farms in 1935 equalled 39.1 percent of the total value as compared with 41.6 percent in 1930. This decline represents primarily an increase in the ratio of debt to value, the percentage of the total value mortgaged by the operator increasing from 11.4 percent in 1930 to 14.9 percent in 1935. Even though debt was declining, values were falling much more rapidly during that period. Farms in which the operator had no ownership interest were 46 percent of the total value in 1935 as against 47 percent in 1930. While available data indicates that the number of farm tenants increased during the same period, the value of tenant farms represented a smaller percentage of total farm real estate values, and the percentage of all farmers who were tenants decreased.

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EXHIBIT No. 2672

[Submitted by the Bureau of Agricultural Economics, Department of Agriculture]

TABLE C.—Total farm mortgage debt and amounts held by principal lender groups, January 1, 1910-39

Beginning of year	Total farm-mortgage debt	Principal lender groups				
		Federal land banks and Land Bank Commissioner ¹	Joint stock land banks ²	Life insurance companies	Commercial banks ³	Individuals and others
	<i>1,000 dollars</i>	<i>1,000 dollars</i>	<i>1,000 dollars</i>	<i>1,000 dollars</i>	<i>1,000 dollars</i>	<i>1,000 dollars</i>
1910.....	3,207,863			386,961	406,248	2,414,654
1911.....	3,522,121			423,464	477,568	2,621,099
1912.....	3,929,768			479,653	580,300	2,869,805
1913.....	4,347,679			550,168	673,752	3,123,769
1914.....	4,707,358			597,462	723,787	3,386,109
1915.....	4,990,785			639,984	746,111	3,574,690
1916.....	5,256,425			705,571	776,269	3,714,585
1917.....	5,825,851			861,144	933,990	4,030,717
1918.....	6,536,860	89,112	1,888	955,591	1,008,492	4,531,777
1919.....	7,137,365	187,021	8,384	1,018,193	1,030,240	4,923,557
1920.....	8,448,772	296,396	60,038	974,826	1,204,383	5,913,139
1921.....	10,221,126	356,010	77,959	1,205,778	1,447,483	7,133,896
1922.....	10,702,267	443,082	85,017	1,432,367	1,540,005	7,201,806
1923.....	10,785,621	655,681	218,775	1,556,203	1,506,467	6,848,495
1924.....	10,664,919	822,161	392,639	1,792,145	1,388,106	6,269,868
1925.....	9,912,650	923,077	446,429	1,942,624	1,200,456	5,400,064
1926.....	9,713,213	998,552	545,559	2,030,301	1,178,490	4,960,341
1927.....	9,658,422	1,068,642	632,574	2,123,664	1,143,595	4,699,947
1928.....	9,756,957	1,144,984	667,314	2,172,803	1,097,085	4,674,711
1929.....	9,756,559	1,182,813	656,516	2,138,980	1,046,624	4,731,628
1930.....	9,630,768	1,186,765	626,980	2,105,477	997,468	4,715,078
1931.....	9,458,281	1,175,832	590,811	2,059,221	946,876	4,685,541
1932.....	9,214,004	1,161,660	536,644	2,007,361	940,135	4,578,206
1933.....	8,638,383	1,105,610	459,183	1,869,160	889,083	4,315,247
1934.....	7,887,119	1,273,881	392,438	1,661,046	710,863	3,848,891
1935.....	7,785,971	2,501,824	255,931	1,258,900	495,842	3,270,474
1936.....	7,638,867	2,863,966	175,677	1,054,770	487,505	3,066,949
1937.....	7,389,797	2,888,912	133,499	936,464	487,534	2,943,398
1938.....	7,214,138	2,835,962	104,163	895,470	501,450	2,877,093
1939.....	7,070,896	2,723,022	87,862	887,336	516,276	2,853,900

¹ Excluding Puerto Rico. Figures for 1918-24 are face amount of loans.
² Including banks in receivership.
³ Open State and national banks 1910-33, insured commercial banks 1934-39.

"EXHIBIT No. 2673" appears in text on p. 16970

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CONCENTRATION OF ECONOMIC POWER

EXHIBIT No. 2674

[Submitted by the Bureau of Agricultural Economics, Department of Agriculture]

Total farm real estate taxes and farm mortgage interest charges payable, and percentage such payments are of cash farm income, 1910-38

Year	Farm real estate taxes	Farm mortgage interest charges	Farm real estate taxes and farm mortgage interest charges	Cash farm income ¹	Taxes and interest as a percentage of cash farm income
	<i>Million dollars</i>	<i>Million dollars</i>	<i>Million dollars</i>	<i>Million dollars</i>	<i>Percent</i>
1910	166	203	369	5,785	6.4
1911	183	225	408	5,581	7.3
1912	191	252	443	5,966	7.4
1913	218	276	494	6,251	7.9
1914	222	296	518	6,015	8.6
1915	243	314	557	6,391	8.7
1916	260	341	601	7,755	7.7
1917	292	378	670	10,648	6.3
1918	311	417	728	13,464	5.4
1919	393	476	869	14,436	6.0
1920	483	574	1,057	12,553	8.4
1921	510	653	1,163	8,107	14.3
1922	509	680	1,189	8,518	14.0
1923	516	679	1,195	9,524	12.5
1924	511	647	1,158	10,150	11.4
1925	517	612	1,129	10,927	10.3
1926	526	598	1,124	10,529	10.7
1927	545	593	1,138	10,699	10.6
1928	558	590	1,146	11,024	10.4
1929	567	582	1,149	11,221	10.2
1930	566	572	1,138	8,883	12.8
1931	526	559	1,084	6,283	17.3
1932	460	534	994	4,682	21.2
1933	399	483	882	5,409	16.3
1934	384	446	830	6,720	12.4
1935	394	411	805	7,542	10.7
1936	397	385	782	8,499	9.2
1937	410	370	780	9,111	8.6
1938	407	357	764	8,081	9.5

¹ Cash income from farm marketings plus Government payments.

CONCENTRATION OF ECONOMIC POWER

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EXHIBIT No. 2675

[Submitted by the Bureau of Agricultural Economics, Department of Agriculture]

Estimated number of farms changing ownership by voluntary and forced sales, per 1,000 of all farms, by geographic divisions, 1926-39¹

Year	New England	Middle Atlantic	East North Central	West North Central	South Atlantic	East South Central	West South Central	Mountain	Pacific	United States
Voluntary:										
1926	34.0	35.4	25.8	23.0	28.0	33.5	34.7	32.0	35.6	29.6
1927	32.4	37.0	25.8	24.3	24.2	29.3	31.1	33.7	36.3	28.3
1928	34.9	33.7	24.0	23.9	20.0	27.5	27.9	34.8	34.3	26.3
1929	30.4	28.2	21.0	22.4	18.3	23.4	25.5	35.6	28.3	23.5
1930	30.7	28.3	20.8	22.9	18.2	23.9	24.2	38.7	30.1	23.7
1931	30.7	24.5	18.6	18.9	14.5	19.4	16.7	24.8	22.1	19.0
1932	24.8	20.4	16.8	14.2	12.3	17.2	15.4	17.6	22.3	16.2
1933	22.5	21.0	15.6	13.8	15.3	18.9	17.6	16.8	21.3	16.8
1934	19.9	20.1	16.5	15.5	17.6	19.1	18.8	17.5	20.9	17.8
1935	19.7	19.1	18.7	17.7	18.5	22.1	18.8	20.2	25.0	19.4
1936	22.3	22.8	23.9	22.5	22.7	31.8	23.0	25.9	33.3	24.8
1937	24.3	30.9	33.9	28.1	28.0	39.5	37.3	32.1	42.6	31.5
1938	24.0	28.4	29.0	28.9	28.2	37.4	37.1	32.3	41.4	29.9
1939 ²	22.3	27.6	27.1	26.3	25.8	35.2	26.4	30.0	37.0	28.2
Forced:³										
1926	13.8	11.8	18.9	30.8	19.5	16.4	18.7	60.2	20.6	21.6
1927	12.4	11.8	20.4	32.0	21.0	21.7	19.9	45.3	20.1	23.3
1928	10.7	11.8	20.7	32.4	23.3	20.0	18.5	39.4	19.9	22.8
1929	10.9	12.0	19.1	25.9	23.0	15.2	15.2	29.1	17.5	19.5
1930	11.2	13.1	22.3	27.5	23.2	16.1	16.8	29.4	16.2	20.8
1931	9.7	13.8	24.0	31.3	32.2	25.9	22.4	36.4	25.0	26.1
1932	15.5	18.0	34.3	52.5	47.1	50.6	40.2	43.5	37.6	41.7
1933	19.8	28.3	43.9	72.0	59.5	63.5	51.2	52.8	44.1	54.1
1934	20.1	26.2	32.0	50.9	40.7	44.9	34.3	44.1	37.1	39.1
1935	18.9	23.9	23.5	40.6	24.5	30.6	22.9	35.7	24.6	28.3
1936	16.8	21.6	22.1	38.0	21.3	28.9	22.0	36.0	25.8	26.2
1937	14.4	16.5	19.0	31.7	17.6	22.4	20.2	33.4	23.1	22.4
1938	13.3	14.1	13.5	27.0	13.6	14.0	16.5	27.3	19.1	17.4
1939 ²	12.7	13.5	13.5	26.9	13.4	12.4	15.5	24.2	17.5	16.8

¹ Years ended March 15.

² Preliminary.

³ Including loss of title resulting from tax delinquency, foreclosure, bankruptcy, default of contract, and sales and surrender of title to avoid foreclosure.

EXHIBIT No. 2676

[Submitted by the Bureau of Agricultural Economics, Department of Agriculture]

Farm real estate held by leading lending agencies January 1, 1929-39

Year	Federal land banks and Federal Farm Mortgage Corporation ¹	Life insurance companies ²	Joint-stock land banks ³	All active insured commercial banks ⁴	Three State credit agencies ⁵
	1,000 dollars	1,000 dollars	1,000 dollars	1,000 dollars	1,000 dollars
1929	26,478	83,305	15,236	(6)	19,840
1930	29,517	120,020	19,635	(6)	26,860
1931	36,931	151,229	22,202	(6)	33,511
1932	53,658	219,947	37,597	(6)	39,008
1933	83,336	316,931	71,741	(6)	47,454
1934	96,774	465,072	85,740	(6)	56,094
1935	96,780	600,873	81,700	(6)	60,270
1936	120,091	846,280	78,202	74,166	61,531
1937	135,178	713,166	72,781	69,525	68,444
1938	132,288	705,207	62,030	56,311	72,040
1939	189,440	702,861	83,885	49,143	73,301

¹ Investment, including sheriffs' certificates and judgments. Excluding prior liens.

² Investment—partially estimated.

³ Carrying value of real estate, including sheriffs' certificates and judgments. Real estate held by banks in receivership included at book value.

⁴ Book value.

⁵ Investment. Rural Credit Board of South Dakota, Bank of North Dakota, and Department of Rural Credit of Minnesota.

⁶ Data unavailable.

⁷ June 30.

Bureau of Agricultural Economics.

CONCENTRATION OF ECONOMIC POWER

EXHIBIT No. 2677

[Submitted by the Bureau of Agricultural Economics, Department of Agriculture]

Gross Income from Farm Production, Expenditures for Labor, and value of Farm Implements and Machinery on Farms, by Types of Farms, 1899 and 1929

Types of farms	Gross income value of products (not fed to stock)	Expend for labor	Value of impl. & machinery	Percent of gross income	
				Exp. for labor	Value of machinery
1899					
Hay & grain.....	1,033,198	100,097	218,636	10.0	21.8
Vegetables.....	103,672	18,500	21,597	18.9	20.8
Fruits.....	75,153	15,120	14,373	20.1	19.1
Livestock.....	1,232,846	101,545	235,508	8.2	19.1
Dairy products.....	281,314	37,428	71,916	13.3	25.6
Tobacco.....	65,341	8,424	8,151	8.3	12.5
Cotton.....	461,113	27,043	47,875	5.9	10.4
Rice.....	7,630	1,707	1,212	22.4	15.9
Sugar.....	39,050	14,574	33,651	37.3	85.2
Flowers & plants.....	18,423	4,155	1,367	22.6	7.4
Nursery products.....	10,098	2,305	1,540	22.9	5.4
Miscellaneous.....	466,353	39,406	106,565	8.4	22.9
Total 1899.....	3,764,178	365,306	761,262	9.7	20.2
1929					
General.....	1,544,998	86,112	565,875	5.6	36.6
Cash grains.....	1,338,335	111,475	624,698	8.3	46.7
Cotton.....	1,698,107	99,472	278,805	5.9	16.4
Crop specialty.....	834,365	84,785	187,160	10.2	22.4
Fruit.....	474,315	112,531	117,195	23.7	24.7
Truck.....	243,605	53,733	56,582	22.1	23.2
Dairy.....	1,672,132	144,530	575,527	8.6	34.4
Animal specialty.....	1,740,974	107,691	513,244	6.2	29.5
Stock-ranch.....	509,423	50,878	72,805	10.0	14.3
Poultry.....	331,167	15,824	70,741	4.8	21.4
Self-sufficing.....	211,720	4,091	62,279	1.9	29.4
Abnormal and unclassified.....	412,192	84,297	176,742	20.5	42.9
Total 1929.....	11,011,329	955,420	3,301,654	8.7	30.0

CONCENTRATION OF ECONOMIC POWER

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EXHIBIT No. 2678

[Submitted by the Bureau of Agricultural Economics, Department of Agriculture]

Cash Farm Income from Marketings and Cost of Operating Farm Machinery, Depreciation, and Wages Paid for Labor as Percent of Farm Cash Income, 1910-1939

	Cash farm income ¹ million dollars	Percent of cash farm income			
		Depreciation	Operation	Wages	Total
1910.....	5,785	5.39	.24	9.13	14.76
1911.....	5,581	5.97	.43	9.53	15.93
1912.....	5,966	5.97	.66	9.30	15.92
1913.....	6,251	5.73	.86	9.15	15.74
1914.....	6,015	6.30	1.16	9.41	16.87
1915.....	6,391	6.43	1.44	9.01	16.88
1916.....	7,755	5.73	1.84	8.27	15.84
1917.....	10,648	4.75	2.42	7.41	14.58
1918.....	13,464	4.36	2.81	7.13	14.30
1919.....	14,436	5.56	3.14	7.61	16.31
1920.....	12,553	7.25	4.41	10.56	22.22
1921.....	8,107	10.13	5.95	10.37	26.35
1922.....	8,518	8.85	5.42	9.63	23.40
1923.....	9,524	6.93	5.16	9.47	21.56
1924.....	10,150	6.59	6.45	8.99	21.03
1925.....	10,927	6.06	6.27	8.46	20.79
1926.....	10,529	6.53	7.61	9.41	23.55
1927.....	10,699	6.53	7.37	8.93	22.83
1928.....	11,024	7.16	7.66	8.57	23.39
1929.....	11,221	6.84	7.98	8.51	23.33
1930.....	8,883	8.54	9.74	9.43	27.71
1931.....	6,283	10.17	11.55	9.84	31.56
1932.....	4,682	11.75	13.97	8.97	34.69
1933.....	5,278	8.94	12.14	6.93	28.01
1934.....	6,273	7.52	11.29	6.26	25.07
1935.....	6,969	7.65	10.96	6.44	25.05
1936.....	8,212	7.31	9.84	5.94	23.09
1937.....	8,744	7.53	10.19	6.52	24.24
1938.....	7,599	8.86	11.71	7.32	27.89
1939.....	7,711	9.30	11.71	7.13	28.14

¹ Exclusive of government payments.

"EXHIBIT No. 2679" appears in text on p. 16982.

CONCENTRATION OF ECONOMIC POWER

EXHIBIT No. 2680

[Submitted by the Bureau of Agricultural Economics Department of Agriculture]

Distribution of gross farm income in each of 10 equal groups of farms, arranged according to size of income

Percent of farms	All Farms			Cotton Farms			Grain Farms		
	1899	1929	Diff	1899	1929	Diff	1899	1929	Diff
0-10.....	.8	1.1	+ .3	1.3	2.0	+ .7	.6	1.2	+ .6
10-20.....	1.9	2.3	+ .4	2.8	3.7	+ .9	1.6	2.8	+1.2
20-30.....	3.3	3.0	- .3	4.4	4.7	+ .3	3.1	4.4	+1.3
30-40.....	4.7	4.0	- .7	5.7	5.8	+ .1	4.5	5.6	+1.1
40-50.....	5.6	5.2	- .4	6.9	7.0	+ .1	6.3	7.2	+ .9
50-60.....	6.9	6.6	- .3	8.2	8.1	- .1	8.1	8.5	+ .4
60-70.....	8.9	8.9	0	9.8	9.4	- .4	10.2	10.2	0
70-80.....	11.8	11.5	- .3	11.7	11.6	- .1	13.3	12.3	-1.0
80-90.....	16.4	16.3	- .1	15.9	15.7	- .2	19.3	18.3	-1.0
90-100.....	39.7	41.2	+1.5	33.3	32.0	-1.3	33.0	31.5	-1.5
90-95.....	12.4	12.2	- .2	11.6	10.8	- .8	14.9	10.5	-4.4
95-100.....	27.3	29.0	+1.7	21.7	21.2	- .5	18.1	21.0	+2.9
Total.....	100.0	100.0	-----	100.0	100.0	-----	100.0	100.0	-----

	Livestock Farms			Fruit Farms			Crop Specialty Farms		
	1899	1929	Diff	1899	1929	Diff	1899	1929	Diff
0-10.....	1.1	1.0	- .1	.6	.7	+ .1	.5	1.9	+1.4
10-20.....	2.2	2.7	+ .5	1.6	1.3	- .3	1.4	2.3	+ .9
20-30.....	3.3	3.3	0	2.9	2.2	- .7	2.1	3.3	+1.2
30-40.....	4.2	5.0	+ .8	4.1	3.2	- .9	3.2	4.0	+ .8
40-50.....	3.6	6.0	+ .4	5.2	4.3	- .9	4.8	5.2	+ .4
50-60.....	7.3	7.0	- .3	6.8	5.6	-1.2	5.9	6.5	+ .6
60-70.....	9.3	9.0	- .3	9.3	7.6	-1.7	8.1	8.3	+ .2
70-80.....	13.0	10.0	-3.0	13.2	10.7	-2.5	11.6	10.7	- .9
80-90.....	20.2	14.7	-5.5	21.2	16.1	-5.1	18.4	15.3	-3.0
90-100.....	33.8	41.3	+7.5	35.1	48.3	+13.2	44.0	42.8	-1.2
90-95.....	14.4	10.5	-2.1	16.6	13.1	-3.5	14.0	12.2	-1.8
95-100.....	19.4	29.0	+9.6	18.5	35.2	+16.7	30.0	30.6	+ .6
Total.....	100.0	100.0	-----	100.0	100.0	-----	100.0	100.0	-----

Derived from Census of Agriculture, 1899 and 1929.

Grain farms: 1899 Grain and hay farms; 1929 cash grain farms.

Livestock farms: 1899 livestock farms; 1929 animal specialty, poultry, and stock ranches.

Crop specialty farms: 1899 vegetable, tobacco and sugar farms; 1929 crop specialty.

"EXHIBIT No. 2681" appears facing p. 17004.

"EXHIBIT No. 2682" appears in text on p. 17005.

"EXHIBIT No. 2683" appears in text on p. 17043.

"EXHIBIT No. 2684" appears in text on p. 17046.

"EXHIBIT No. 2685" appears in text on p. 17047.

CONCENTRATION OF ECONOMIC POWER

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EXHIBIT No. 2685-A

Measures of concentration in California agriculture

CROPS AND LIVESTOCK ENTERPRISES

Product	Year for which data obtained	Percentage of all producers	Percentage of output or capacity	In terms of
Apricots, Brentwood District.....	1939	12.2	52.3	Apricot tonnage.
Apricots, Santa Clara County.....	1939	7.6	26.9	Acreage in apricots.
Asparagus for canning.....	1939	1.5 had.....	23.4	deliveries to canners.
Chickens.....	1929	5.3 "	53.4	chickens.
Cotton (operating under AAA Program).....	1939	3.5 "	33.3	acreage in cotton.
Hops.....	1939	11.4 "	42.1	acreage in hops.
Lemons.....	1940	2.8 "	34.6	acreage in lemons.
Lettuce (proration zone #2).....	1939	3.2 "	34.0	Prorated lettuce acreage.
Milk (State).....	1929	4.7 "	38.8	milk produced.
Milk (Los Angeles County).....	1939	5.4 "	34.0	All dairy cattle in herds of 5 or more.
Olives for canning.....	1935	0.5 "	48.5	canning tonnage.
Oranges.....	1940	2.9 "	26.1	acreage in oranges.
Peaches for canning.....	1934	4.0 "	41.4	acreage in canning peaches.
Potatoes (operating under AAA Program).....	1938	8.7 "	50.1	acreage in potatoes.
Prunes.....	1935	4.9 "	39.8	prune tonnage.
Range land in AAA Program.....	1938	3.5 "	33.3	range capacity.
Rice.....	1938	4.5 "	28.1	acreage in rice.
Sugar beets.....	1938	8.1 "	39.2	sugar produced.
Vineyards.....	1930	17.2 "	52.5	acreage in vines.
Wheat.....	1939	4.4 "	33.7	acreage in wheat.

PAYMENTS UNDER AAA PROGRAMS

Program	Year	Percent of all payees	Percent of total of all payments under program
Agricultural Conservation.....	1938	2.0 received.....	43.6
Sugar Beets.....	1938	2.1 "	20.6
Range Conservation.....	1938	6.1 "	39.4

OTHER MEASURES

10 percent of all farms received, 53.2% of the 1929 gross farm income.
 9.4 percent of all farms spent, 66.0% of all expenditures for wage labor in 1929.
 7 percent of all farms employed, 68.0% of all farm workers in January, 1935.
 6.8 percent of all farms held, 41.6% of all crop land harvested in 1934.
 8.5 percent of all farms held, 62.3% of all land in farms in 1935.

Sources: U. S. Census. Record, Subcommittee of the U. S. Senate Committee on Education and Labor.

“EXHIBIT No. 2686” appears in text on p. 17057.

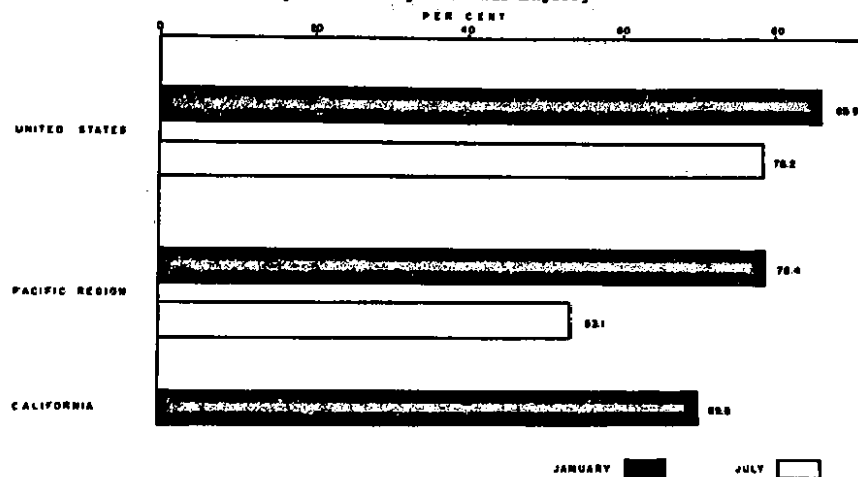
“EXHIBIT No. 2687” appears in text on p. 17058.

“EXHIBIT No. 2688” appears in text on p. 17061.

CONCENTRATION OF ECONOMIC POWER

EXHIBIT No. 2689.

[Submitted by Dr. Paul Taylor]



FARMS EMPLOYING NO HIRED LABORERS
 UNITED STATES, PACIFIC REGION AND CALIFORNIA

JANUARY AND JULY 1935

SOURCE: WENZEL, SOCIAL SECURITY BOARD, CENSUS 1935

EXHIBIT No. 2689-A

EXPERT TESTIMONY PRESENTED AT HEARINGS OF THE SUBCOMMITTEE OF THE UNITED STATES SENATE COMMITTEE ON EDUCATION AND LABOR WITH REFERENCE TO THE CONCENTRATION OF ECONOMIC POWER IN AGRICULTURE AND ALLIED INDUSTRIES IN CALIFORNIA

(December 6:)

Factors which underlie the infringement of Civil Rights of Laborers in agricultural and processing industries—Industrialized Agriculture, Employer Desire for Control of Wages, Perishability of Crops, Lack of Status of Mobile Workers, Interstate Migration of Excess Labor Supply—Dr. Paul S. Taylor, University of California.

Large Scale Farm Operators as a Factor in California Agriculture—Seasonal Demand for Large Labor Supply—Influx of Migratory Workers and Recent Changes in Farm Wages—National Trends in the Development of Industrialized Agriculture—Dr. Paul S. Taylor, University of California.

(December 13:)

Character of Ownership and Operation of Agricultural Lands in California—Arthur Stuart, Staff Economist.

Processing, Canning and Shipping Industry in California—Dr. Theodore Norman, Staff Economist.

(December 14:)

Relation of Shipper and Canner to the Farmer, and Integration of Farming with Processing, and Description of Large Scale Agricultural Corporations—Dr. Theodore Norman, Staff Economist.

Description of the Operations of the DiGiorgio Fruit Corporation.

(December 20:)

Cotton Cultivation in California and Farm Credit Financing of Cotton Growers—Dr. Theodore Norman, Staff Economist.

(January 16:)

The Structure of the Agricultural Economy in the Imperial Valley of California—Arthur Stuart, Staff Economist.

(January 17:)

A study of the citrus industry and agricultural labor—Dr. Theodore Norman, Staff Economist.

(January 23:)

The Structure of the Los Angeles County Milk Market—Arthur Stuart, Staff Economist.

EXHIBIT No. 2690
[Submitted for Dr. Pane Taylor]

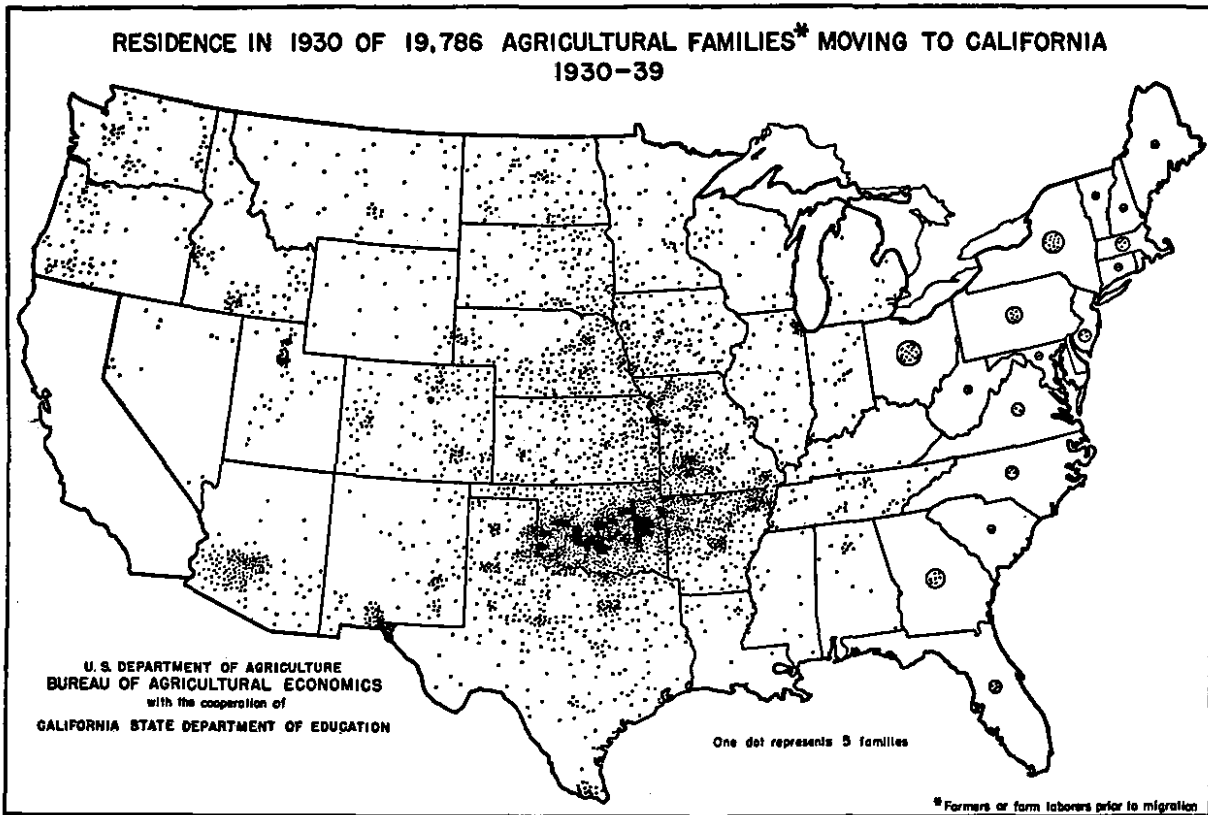


EXHIBIT No. 2691

17458

CONCENTRATION OF ECONOMIC POWER

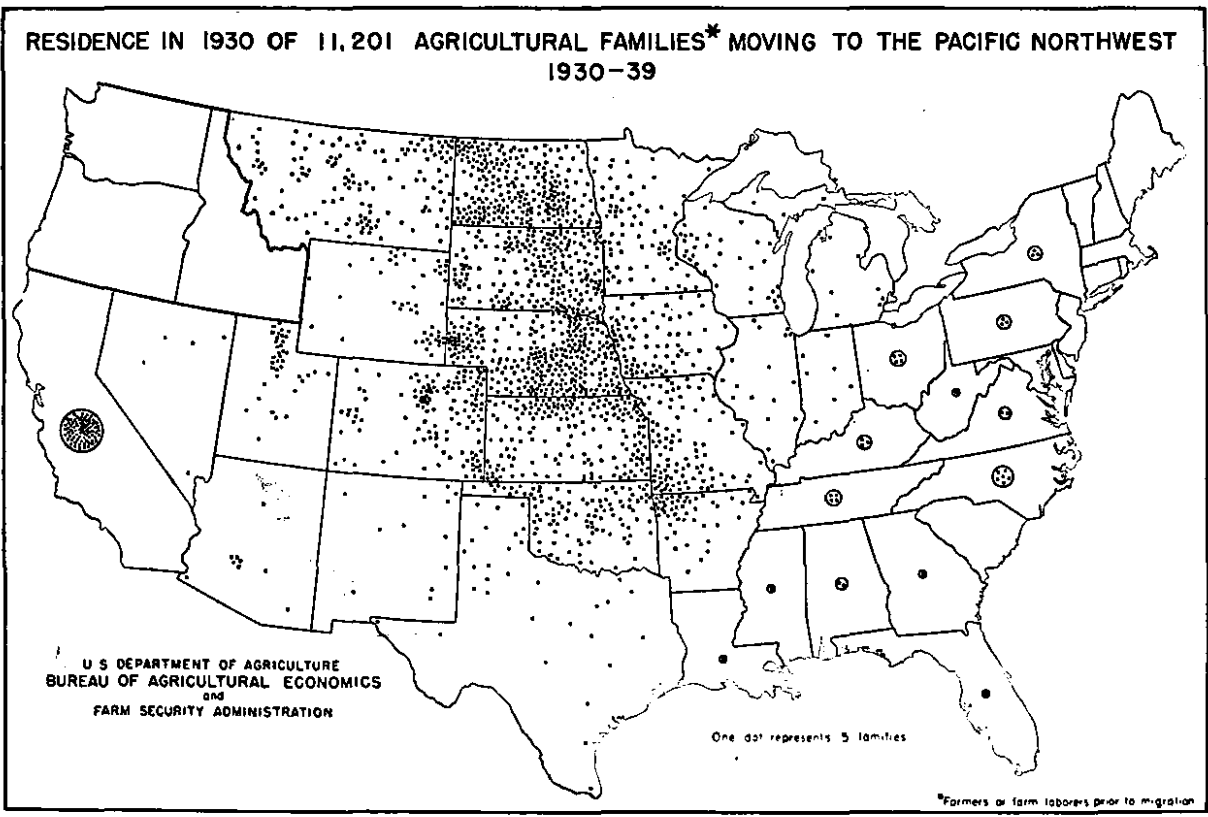
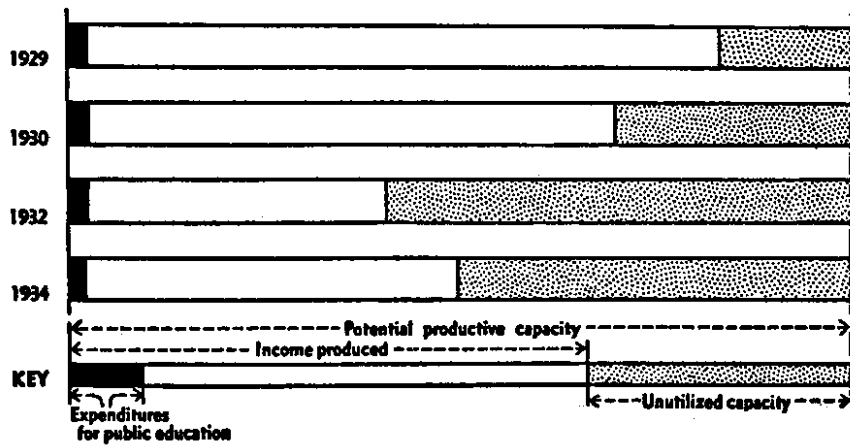


EXHIBIT No. 2692

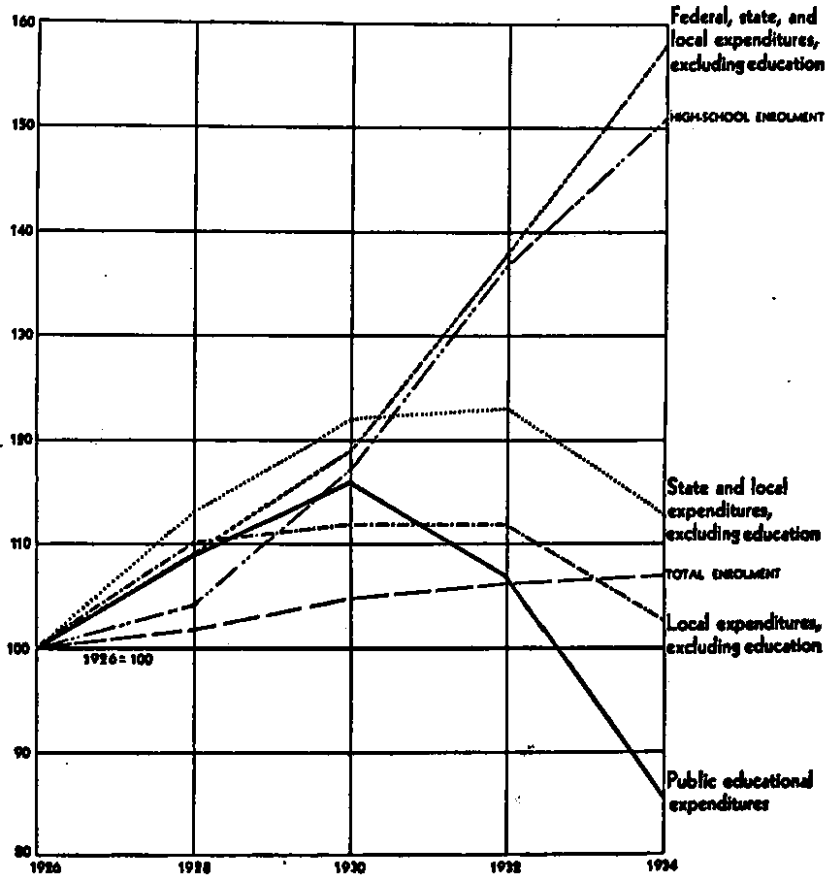
Potential Productive Capacity, Income Produced, and Expenditures for Public Education, 1929-1934



From Norton, J. K. and Norton, M. A., *Wealth, Children and Education*, p. 3

EXHIBIT No. 2698

Index of Educational Expenditures and Other Governmental Expenditures, 1926-34

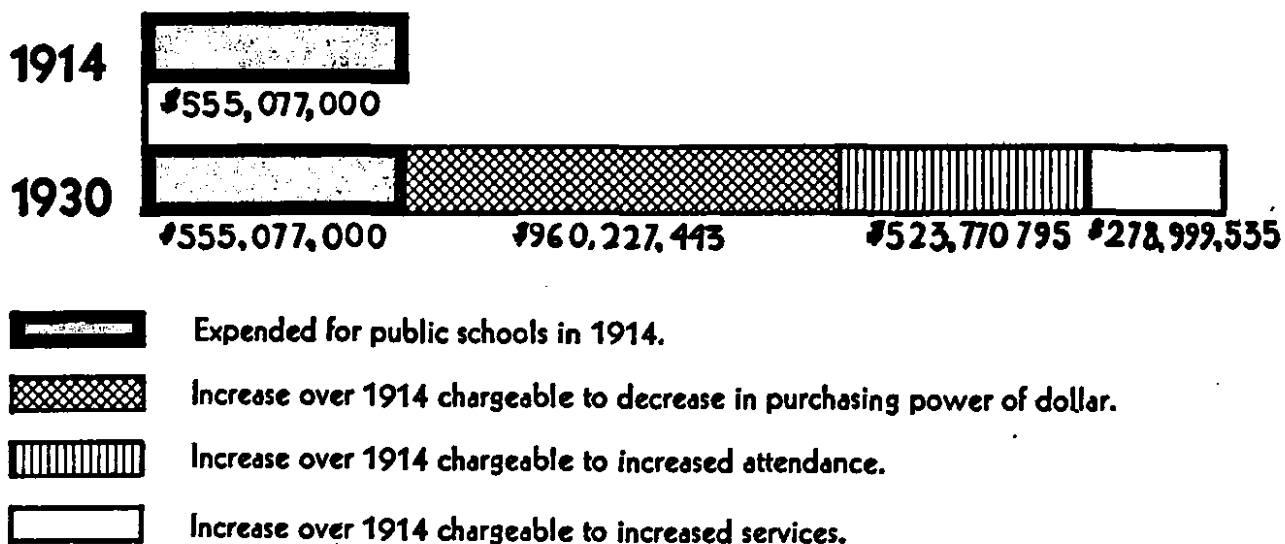


Based on "Cost of Government in the United States, 1923-35," National Industrial Conference Board, and "Biennial Survey of Education, 1932-34," Federal Office of Education.

From Research Bulletin of the National Education Association. *Federal Support for Education*, Vol. XV, No. 4, September 1937, p. 176.

EXHIBIT No. 2694

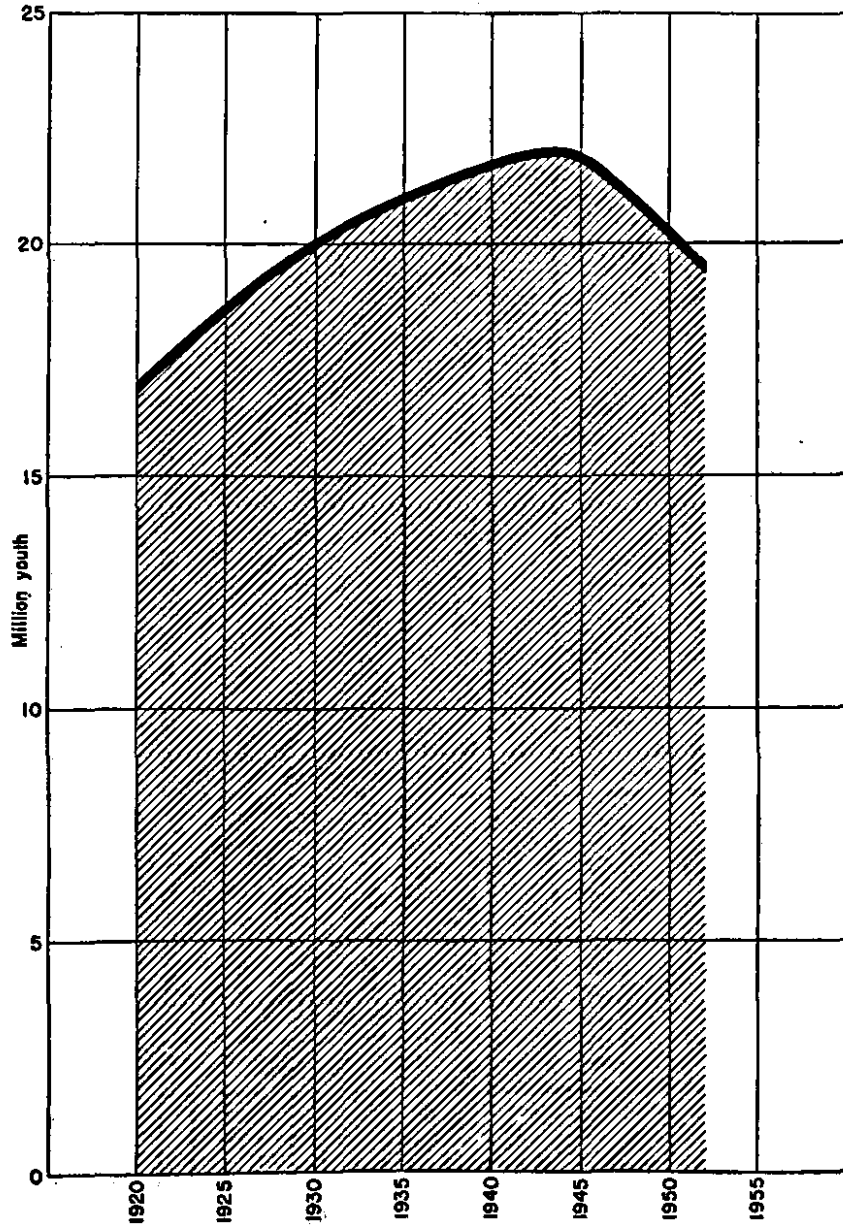
Estimated Causes of Increase in School Costs, 1914-1930



© Research Division, National Education Association.

From Research Bulletin of the National Education Association. *Why Schools Cost More*. Vol. XVI. No. 3. May 1938. p. 164.

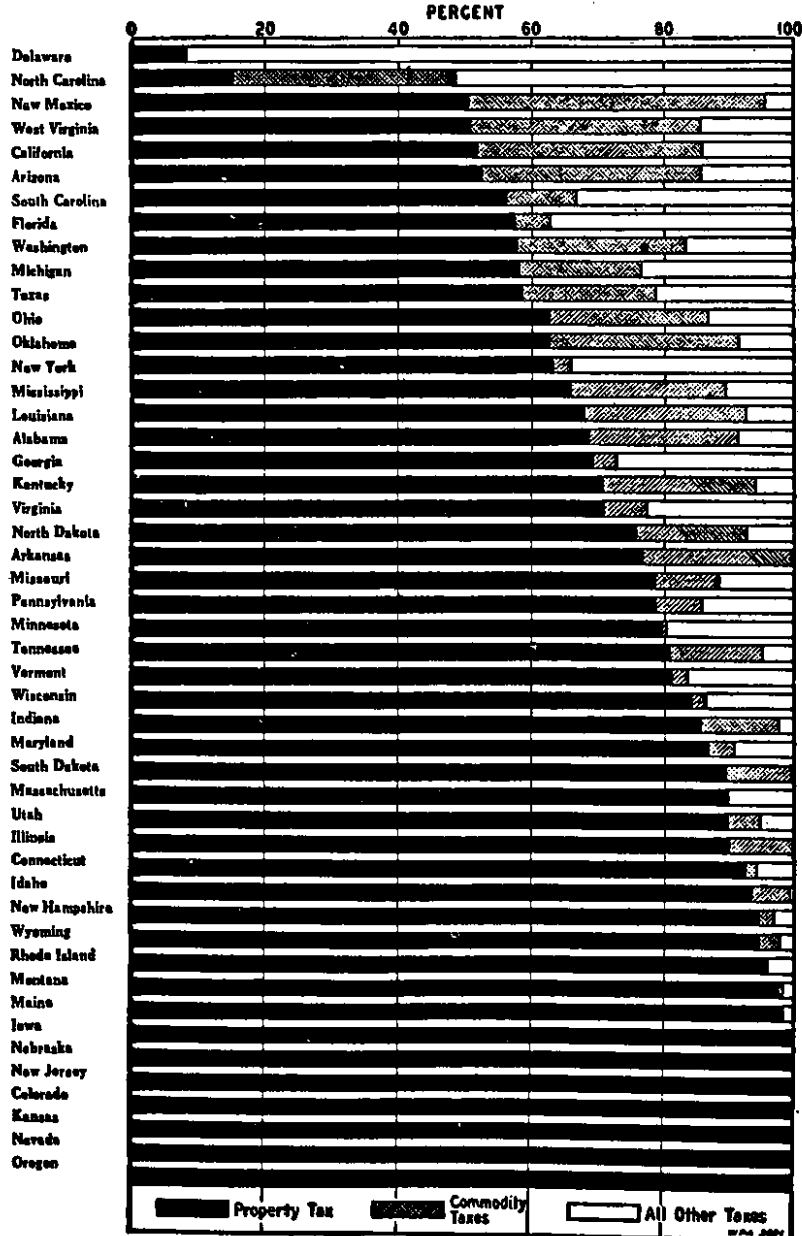
Trend in Number of Youth in the United States,
1920-1952



From Melvin, Bruce L. and Smith, Elna N., *Rural Youth: Their Situation and Prospects*. Works Progress Administration, Division of Social Research. Research monograph XV. 1938. p. 2.

EXHIBIT No. 2696

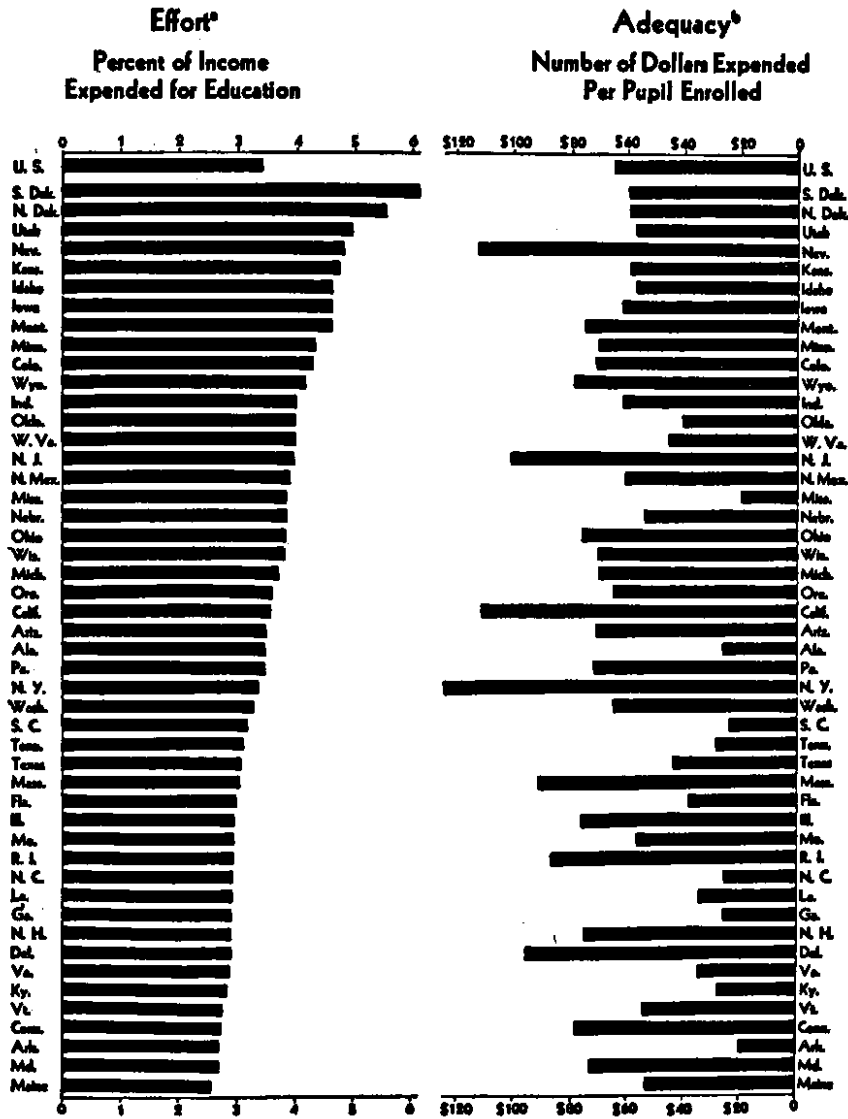
Percentages of State and Local Taxes and Appropriations for Public Elementary and Secondary Schools Derived from Property Taxes, Commodity Taxes, and All Other Taxes, in the Various States, 1935-36



From Heer, Clarence, *Federal Aid and the Tax Problem*. The Advisory Committee on Education. 1939. p. 43.

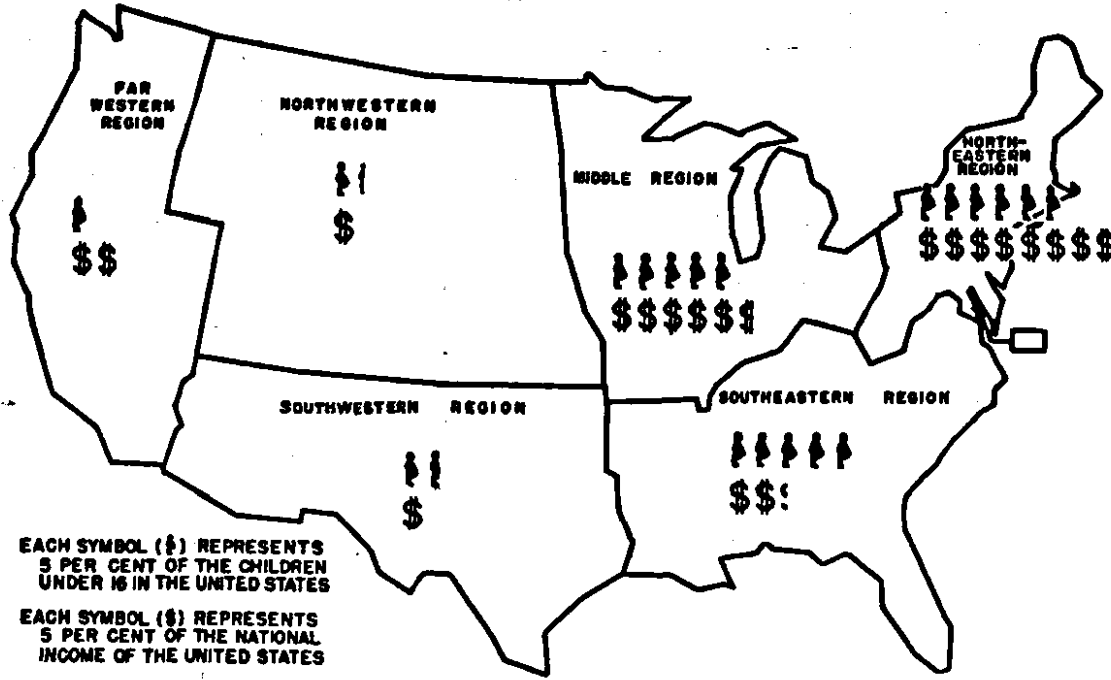
EXHIBIT No. 2897

Effort and Adequacy, 1934



From Research Bulletin of the National Education Association. *Financing Public Education*. Vol. XV, No. 1, January 1937, p. 44.

Children under 16 Years of Age and National Incomes; United States



EACH SYMBOL (\$) REPRESENTS 5 PER CENT OF THE CHILDREN UNDER 16 IN THE UNITED STATES

EACH SYMBOL (\$) REPRESENTS 5 PER CENT OF THE NATIONAL INCOME OF THE UNITED STATES

SOURCES: SOCIAL SECURITY BOARD, ESTIMATES AS OF JULY 1, 1938
BUREAU OF FOREIGN AND DOMESTIC COMMERCE, INCOME PAYMENTS, 1937

From preliminary General Conference Report, *White House Conference on Children in a Democracy*. U. S. Department of Labor, Children's Bureau. Frontispiece.

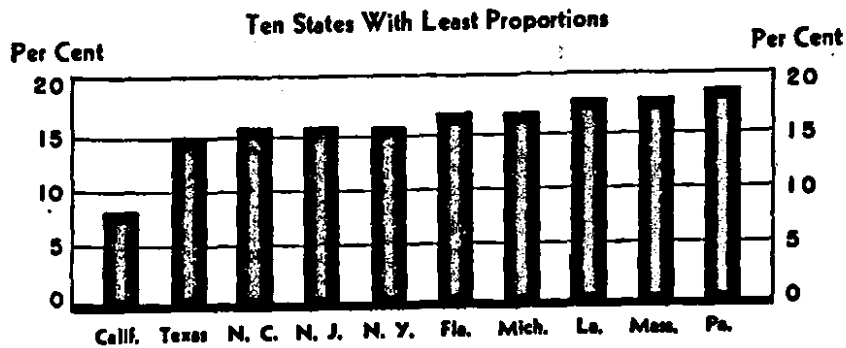
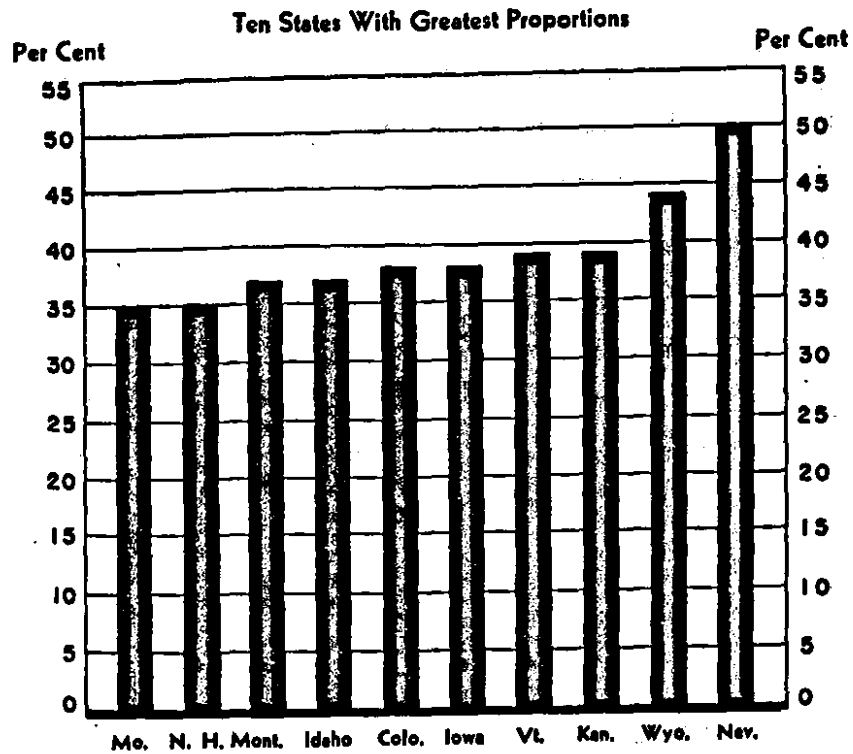
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CONCENTRATION OF ECONOMIC POWER

17465

EXHIBIT No. 2899

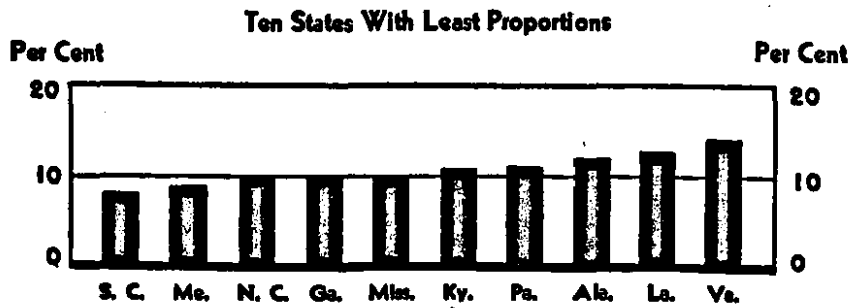
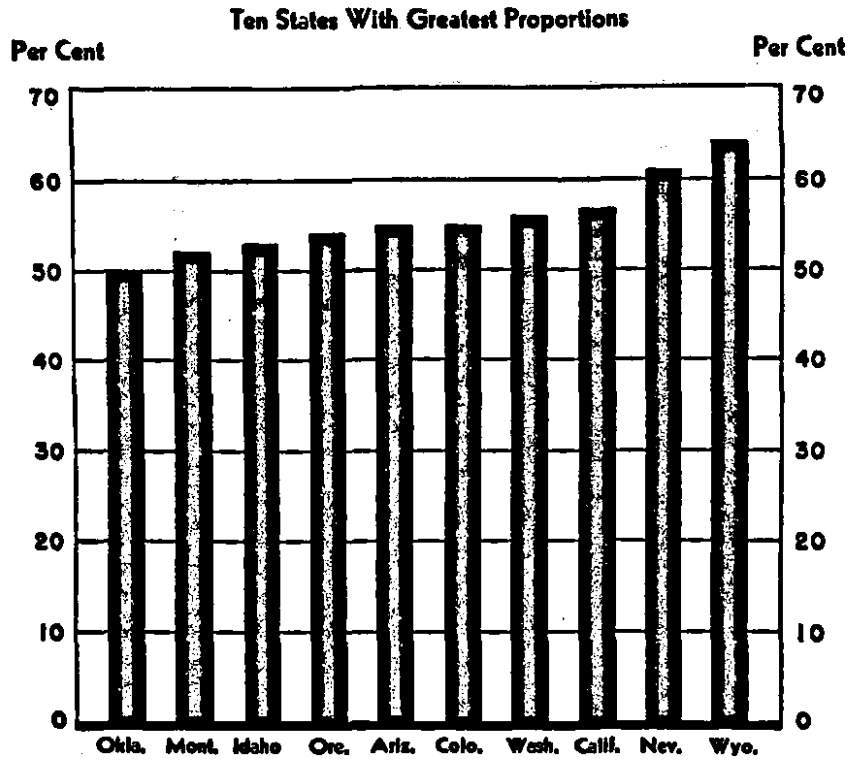
Proportion of Native Sons and Daughters Living in Other States, 1930



From Edwards, Newton, *Equal Educational Opportunity for Youth*. A report to the American Youth Commission, American Council on Education, 1939. p. 125.

EXHIBIT No. 2700

Proportion of State Residents Born outside the State, 1930



From Edwards, Newton. *Equal Educational Opportunity for Youth*. A report to the American Youth Commission, American Council on Education, 1939. p. 126.

EXHIBIT No. 2701
Does Education Pay? (Opinions of Youth)

WHITE

NEGRO

CONSIDERABLE
OR GREAT HELP



LITTLE OR
NO HELP



SOME HELP



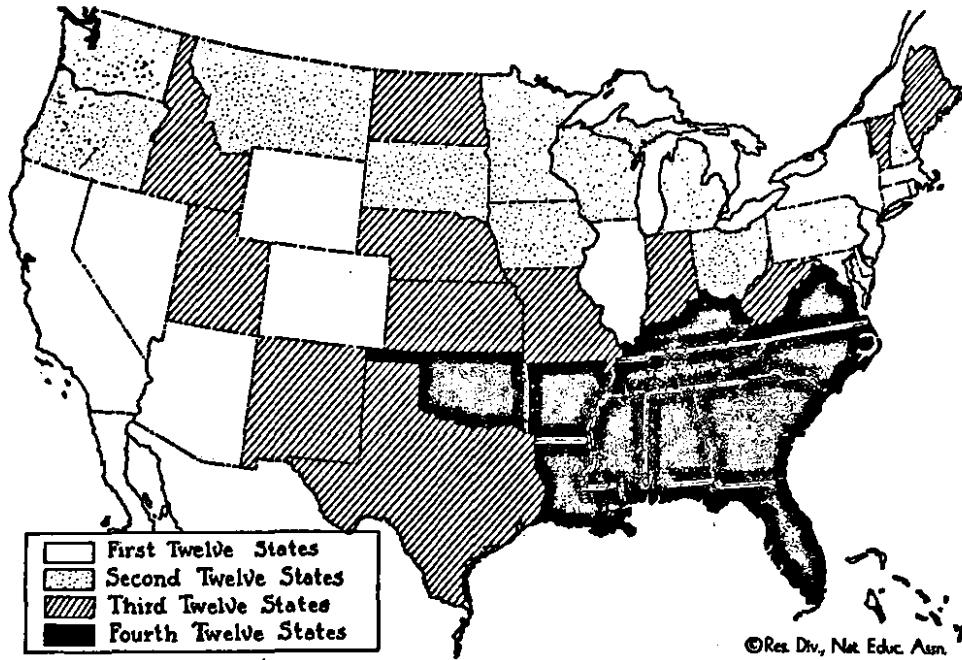
EACH SYMBOL REPRESENTS THE EVALUATIONS OF 3% OF EACH RACIAL GROUP

MARYLAND STUDY
THE AMERICAN YOUTH COMMISSION

From Bell, Howard M., *Youth Tell Their Story*. American Youth Commission, American Council on Education: 1938. p. 83.

EXHIBIT No. 2702

Expenditure Per Pupil in Average Daily Attendance, 1933-34



Source: United States Office of Education. *Statistics of State School Systems, 1933-34*. p.60-7.

Chart prepared by the Research Division, National Education Association.

EXHIBIT No. 2703
Current Expense Per Pupil in Average Daily Attendance, 1930-1938

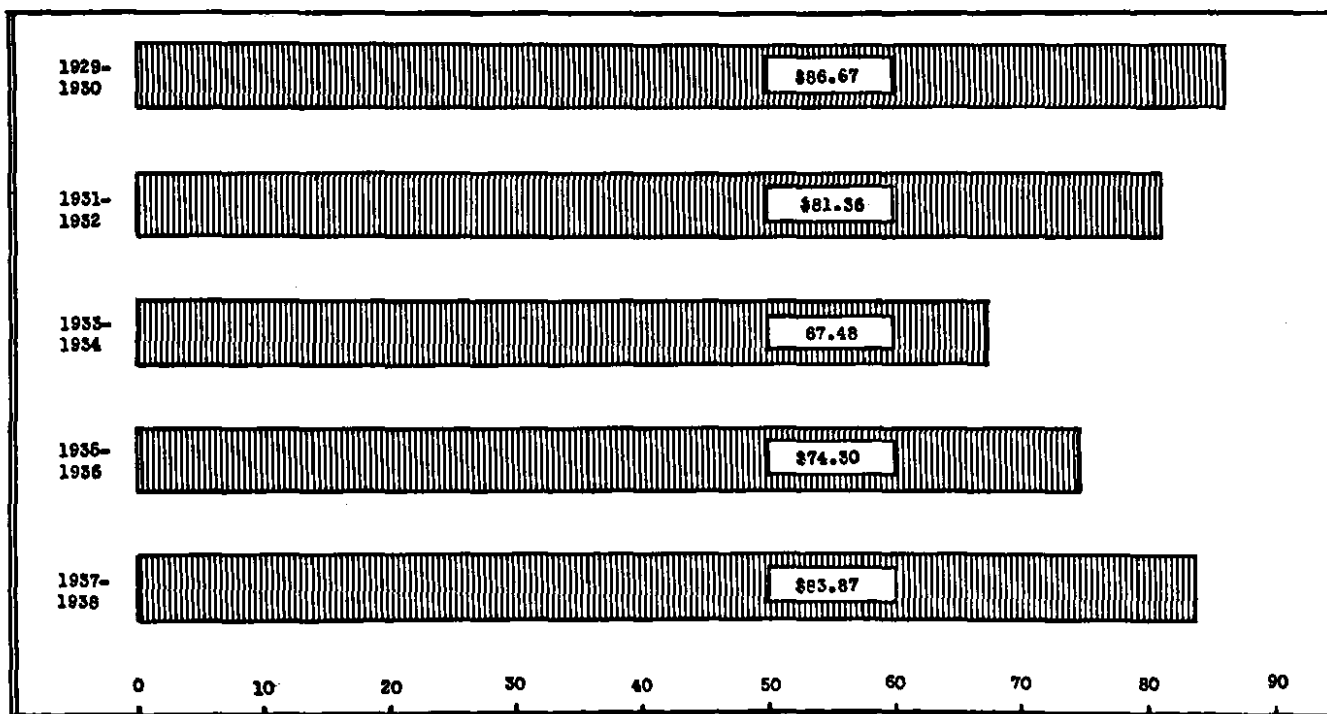
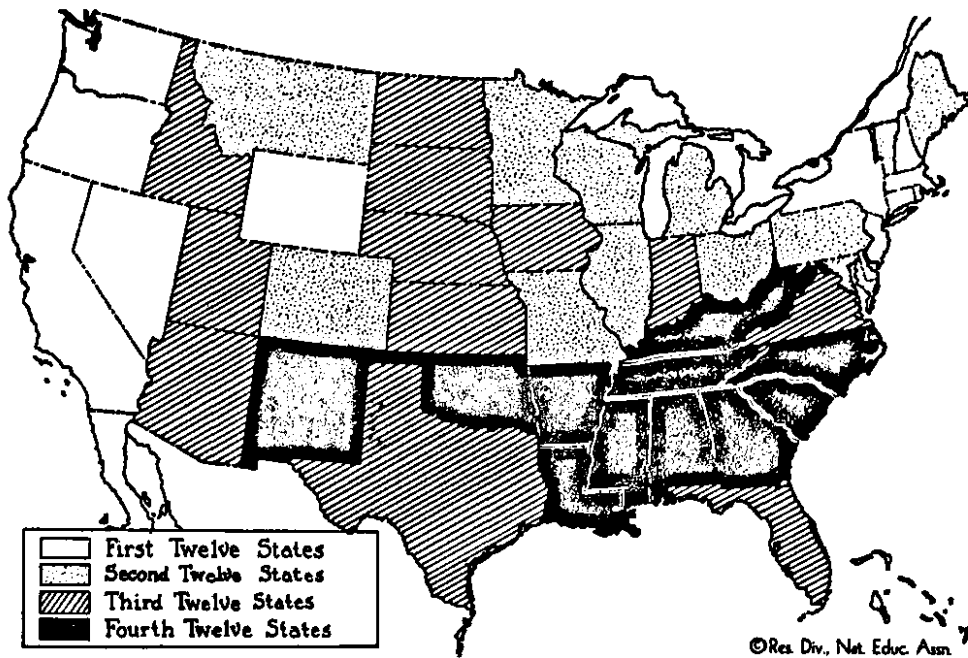


Chart prepared by the Educational Policies Commission.

EXHIBIT No. 2704

Per Capita Retail Sales (1933)



Source: U.S. Department of Commerce, Bureau of the Census

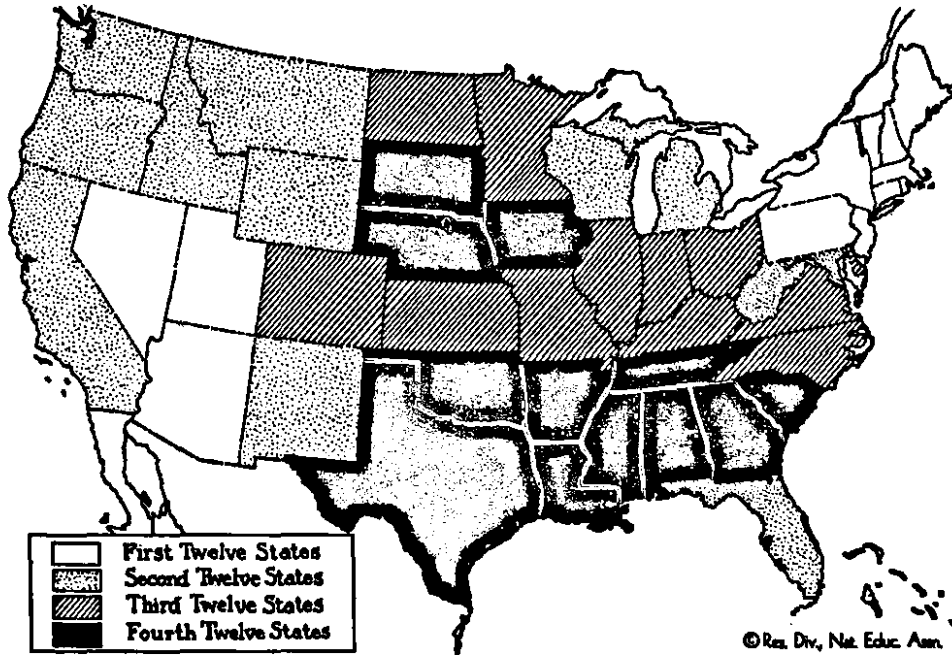
Chart prepared by the Research Division, National Education Association.

CONCENTRATION OF ECONOMIC POWER

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EXHIBIT No. 2705

Freedom from Farm Tenancy (1935)

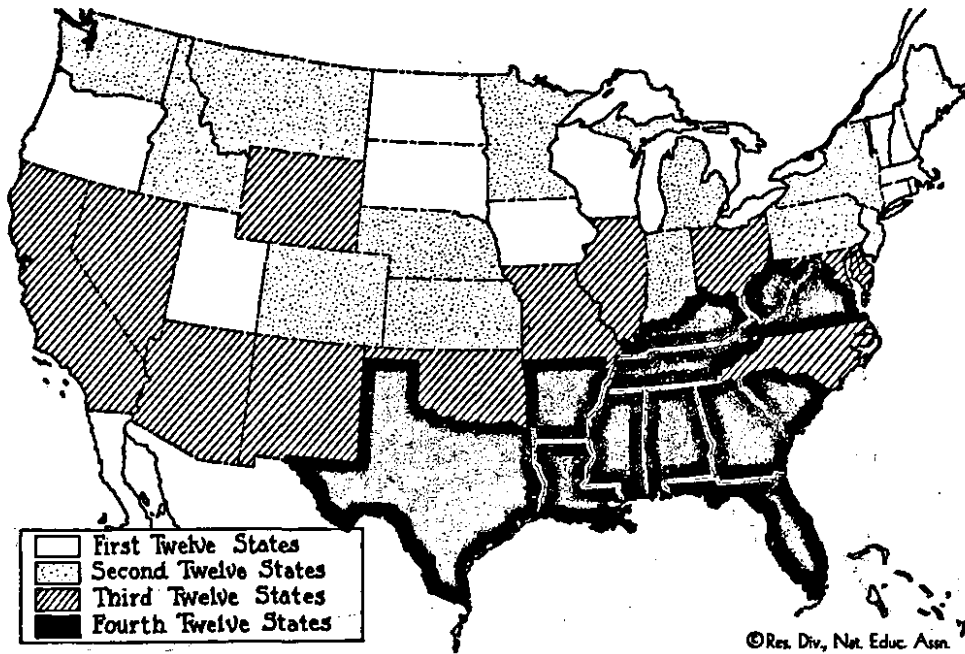


Source: United States Census of Agriculture, 1935 p. 327.

Chart prepared by the Research Division, National Education Association.

EXHIBIT No. 2706

Rate Per 100,000 Population of Deaths from Homicide (1934)

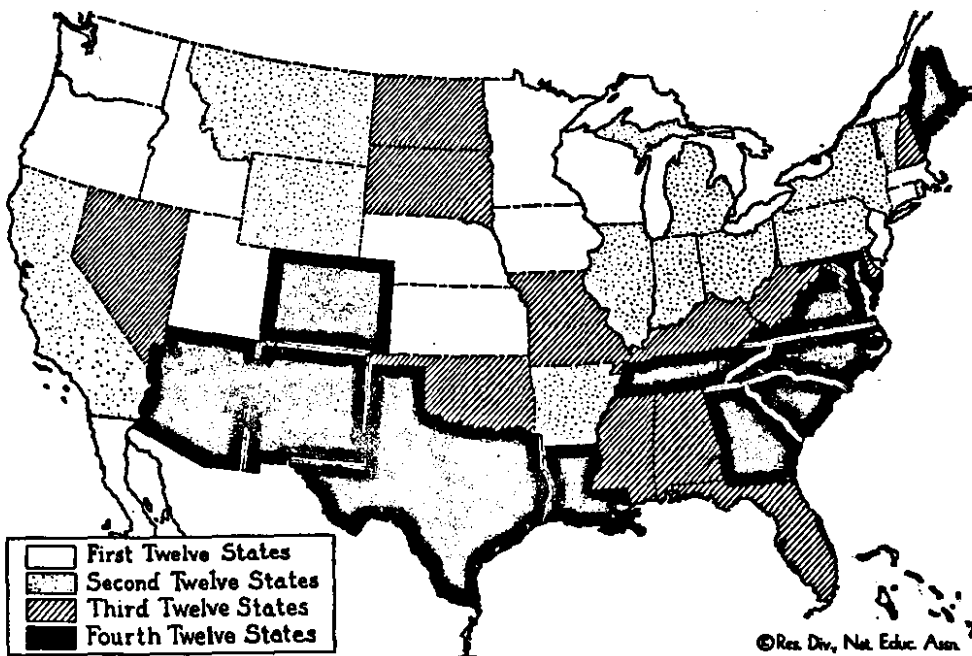


Source: U.S. Department of Commerce, Bureau of Census, 1937

Chart prepared by the Research Division, National Education Association.

EXHIBIT No. 2707

Freedom from Infant Mortality (1934)

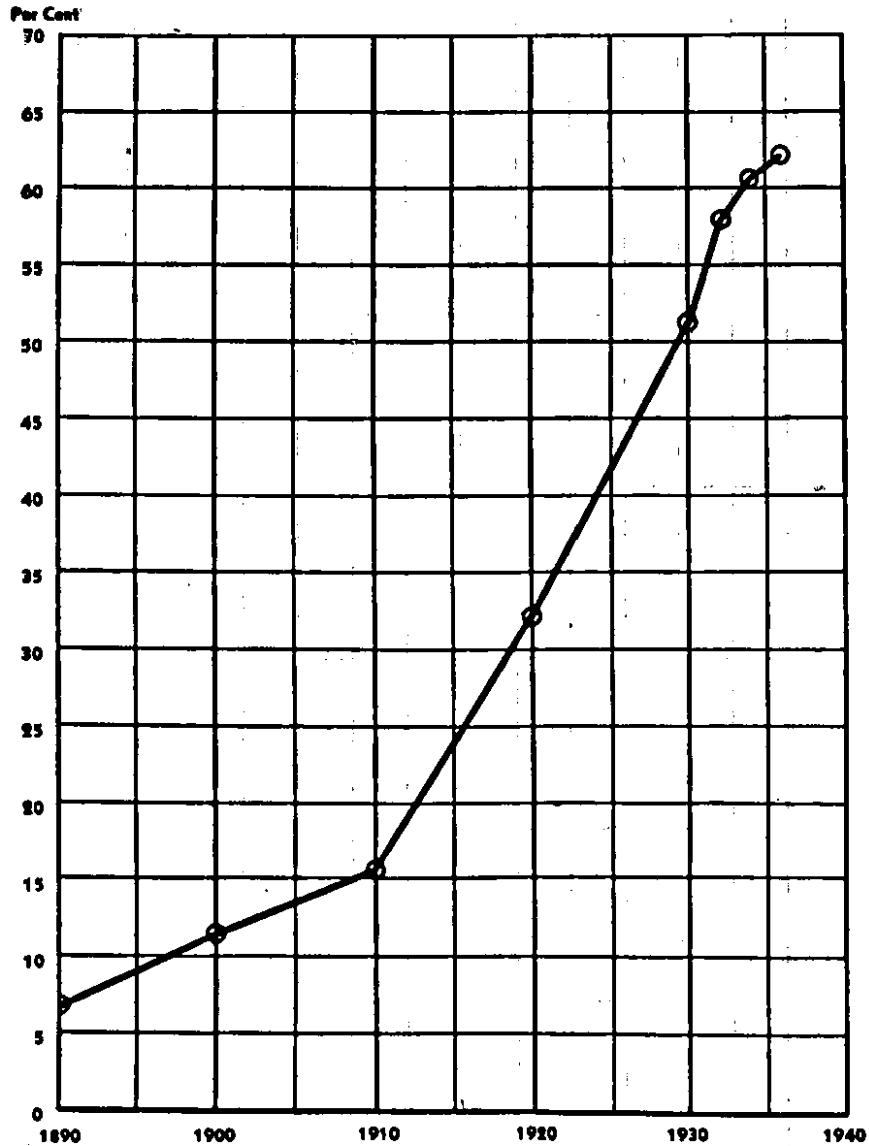


Source: Statistical Abstract of the United States, 1936 p. 90 (Deaths under One Year of Age)

Chart prepared by the Research Division, National Education Association.

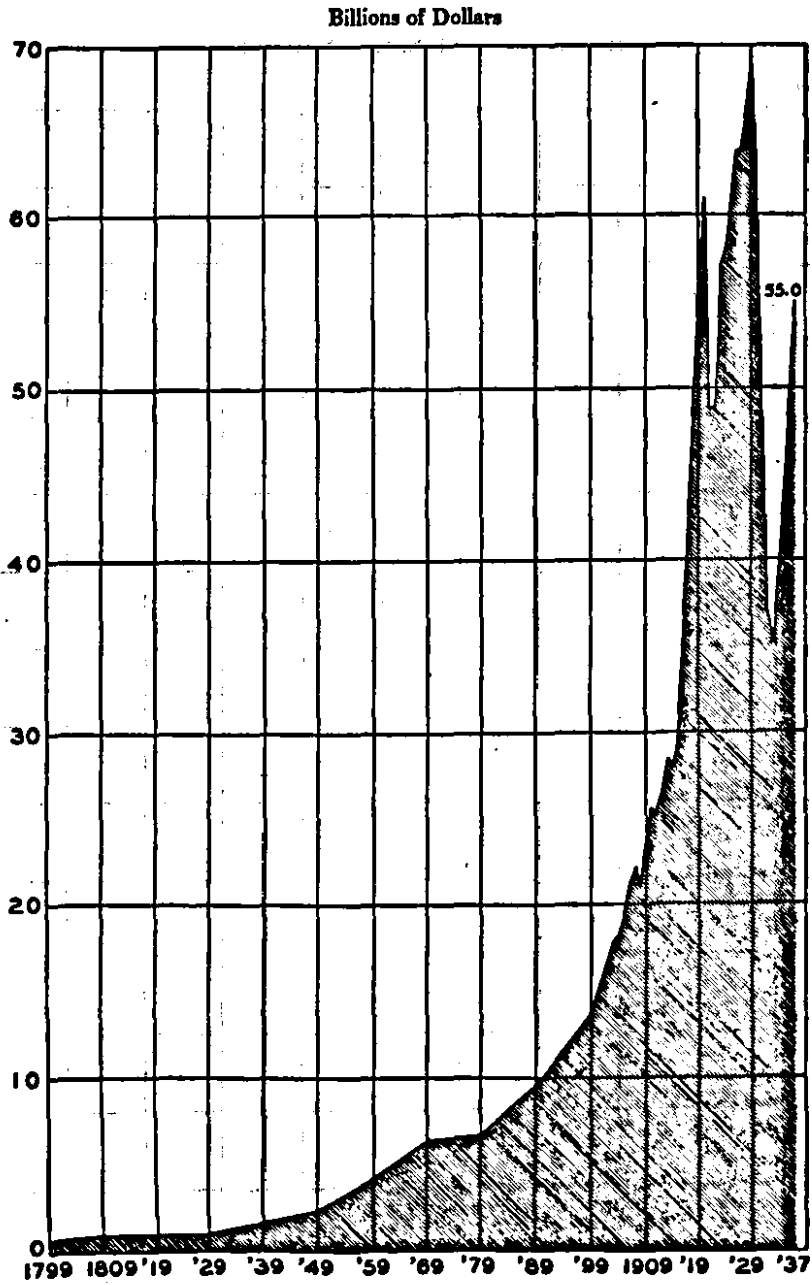
EXHIBIT No. 2708

Percentage of Children of High School Age (14 to 17 Years) Enrolled in Public and Private Schools in the United States Since 1890



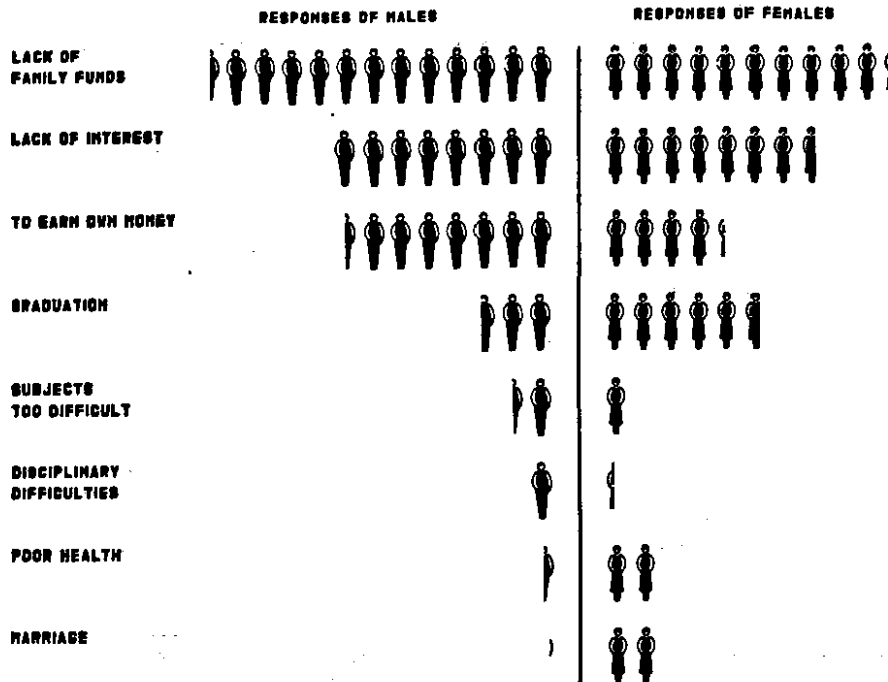
From Edwards, Newton, *Equal Educational Opportunity for Youth*. A report to the American Youth Commission, American Council on Education, 1919, p. 23.

Realized Private Production Income, 1799-1937



From Martin, R. F., *National Income in the United States*. National Industrial Conference Board. 1939. p. 24.

EXHIBIT No. 2710
 Why Do Youth Leave School?

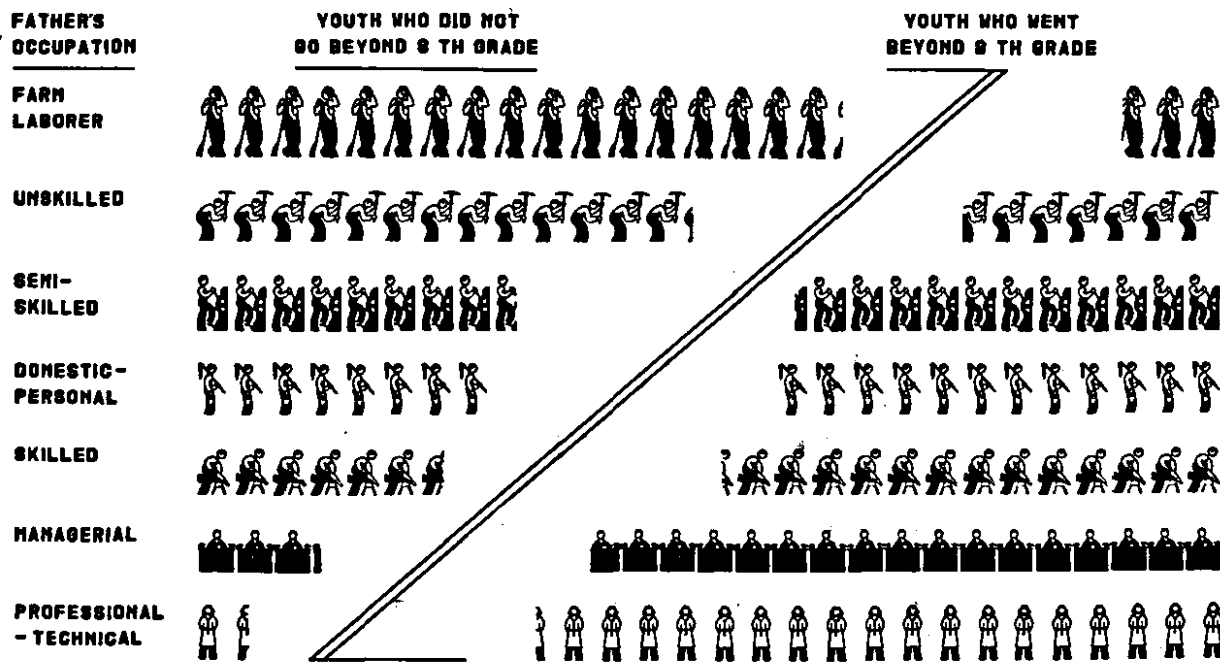


EACH FIGURE REPRESENTS THE REASONS GIVEN BY 5% OF EACH SEX GROUP. REPLACING BY THE NATIONAL YOUTH COMMISSION

From Bell, Howard M., *Youth Tell Their Story*. American Youth Commission, American Council on Education. 1938. p. 65.

CONCENTRATION OF ECONOMIC POWER
 17477

Relation of Fathers' Occupations to the Amount of Education Their Children Received



EACH FIGURE REPRESENTS 5% OF THE YOUTH WHOSE FATHERS WERE IN SPECIFIED OCCUPATIONAL GROUPS

HARVARD STUDY
THE AMERICAN YOUTH COMMISSION

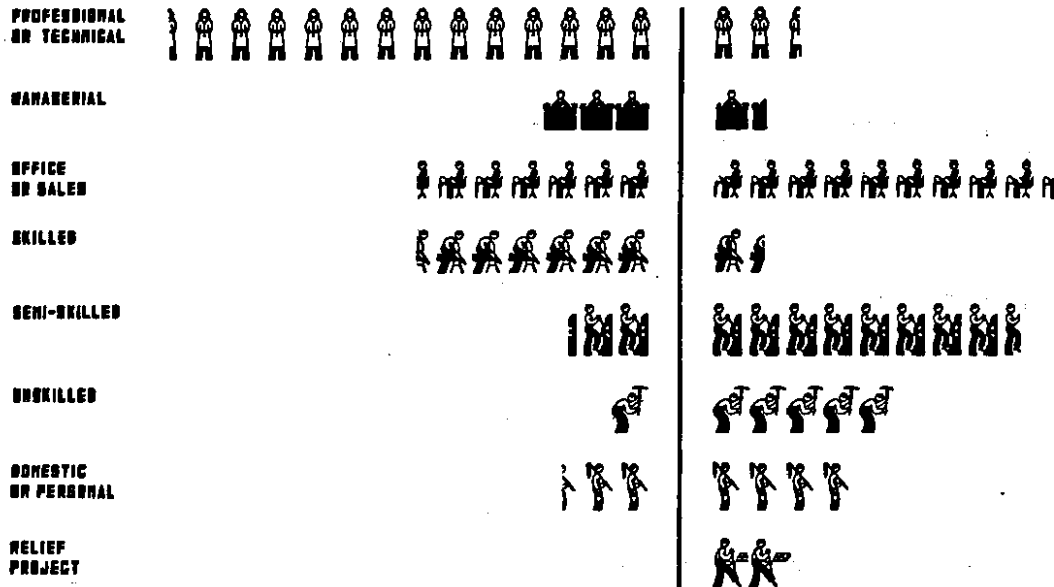
From Bell, Howard M., *Youth Tell Their Story*. American Youth Commission, American Council on Education. 1938. p. 59.

EXHIBIT No. 2712

The Jobs Youth Want and the Jobs They Get

WHAT THEY WANT

WHAT THEY GET



EACH FIGURE REPRESENTS 100 YOUTH

MARYLAND STUDY
THE AMERICAN YOUTH COMMISSION

From Bell, Howard M., *Youth Tell Their Story*. American Youth Commission, American Council on Education. 1938. p. 133.

CONCENTRATION OF ECONOMIC POWER

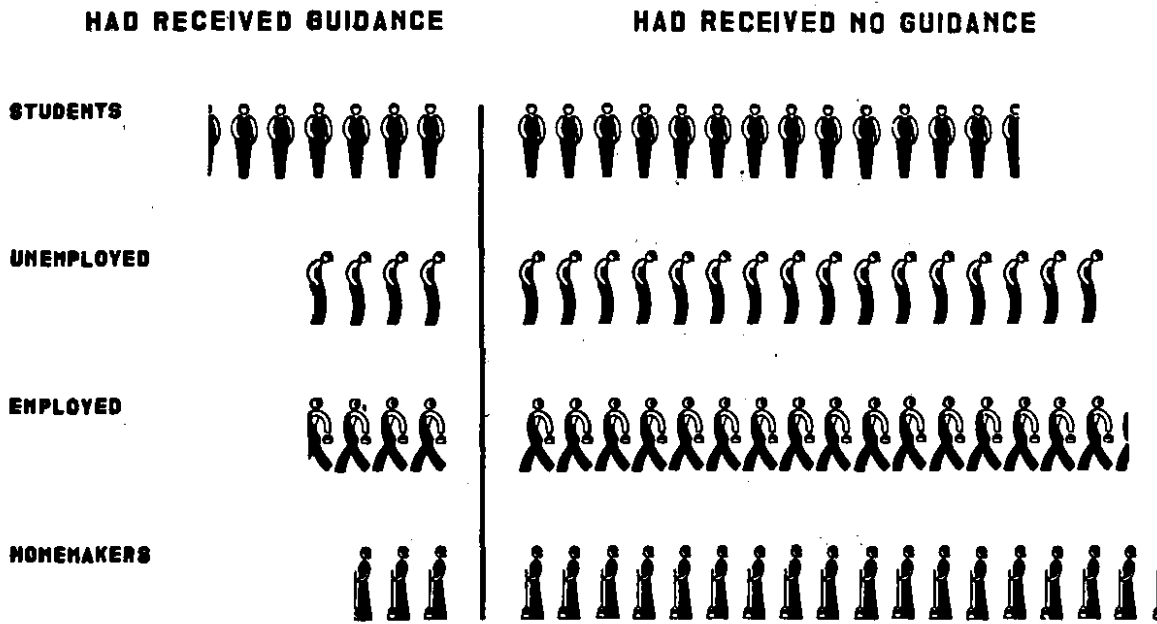
17479

EXHIBIT No. 2713

To What Extent Do Youth Receive Vocational Guidance from Schools?

17480

CONCENTRATION OF ECONOMIC POWER



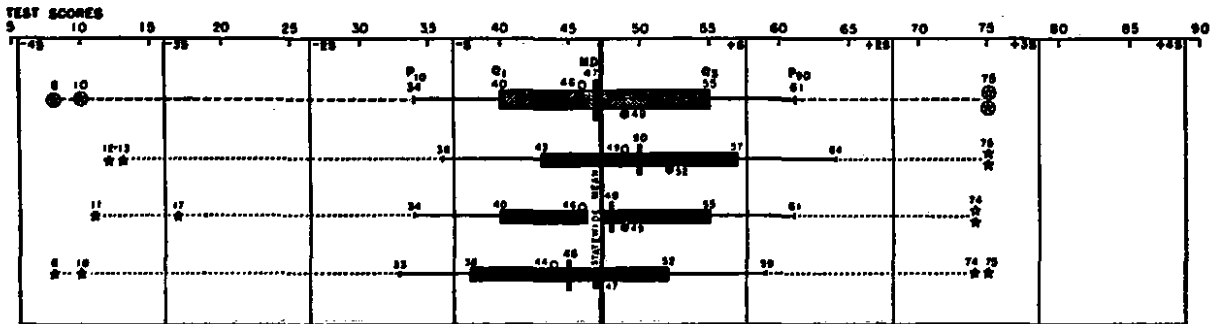
EACH COMPLETE FIGURE REPRESENTS 5% OF THE YOUTH IN EACH GROUP

MARYLAND STUDY
THE AMERICAN YOUTH COMMISSION

From Bell, Howard M., *Youth Tell Their Story*. American Youth Commission, American Council on Education. 1938. p. 73.

EXHIBIT No. 2714

Test Scores of High School Seniors According to Post-School Occupation. Aptitude



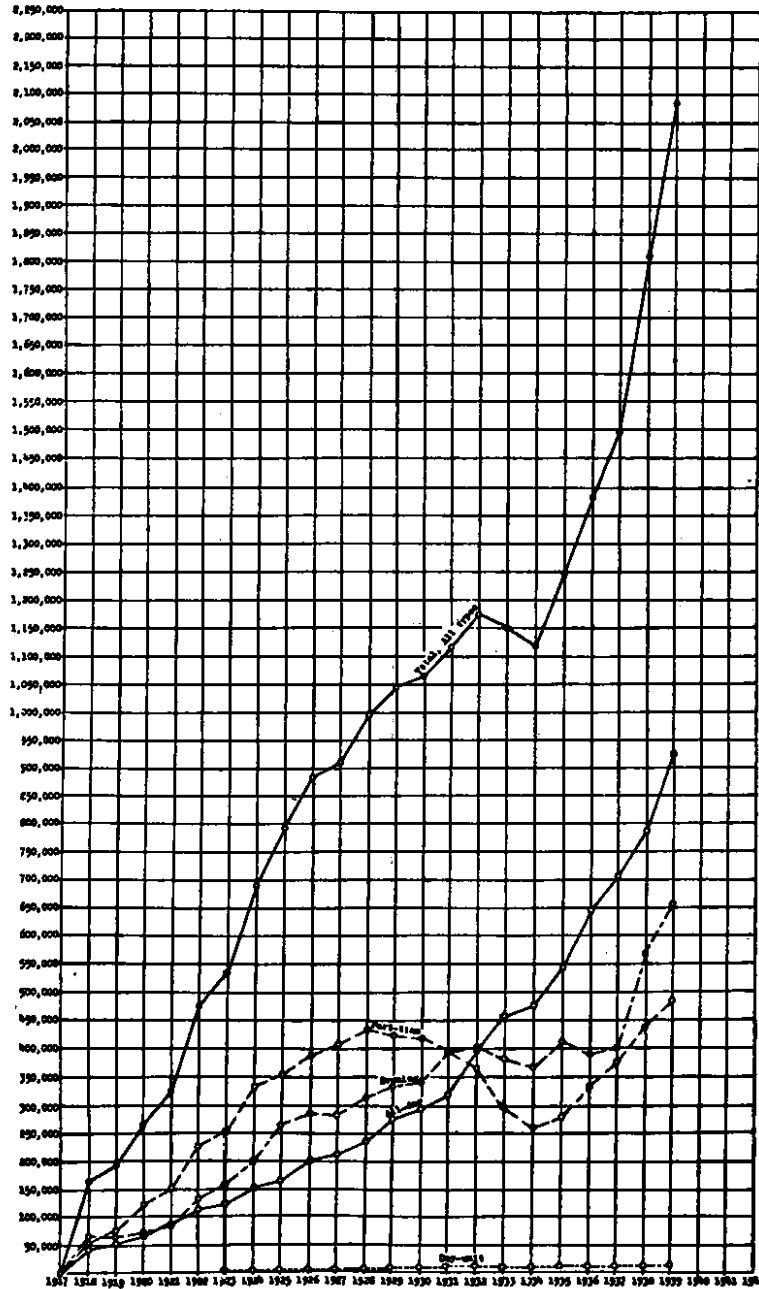
OTIS SELF-ADMINISTERING TEST OF MENTAL ABILITY
HIGHER EXAMINATION FORM A

	FREQUENCIES		
	GIRLS	BOYS	TOTAL
TOTAL	14,080	11,597	25,677
ADVANCED SCHOOLING	5,825	4,121	9,746
SCHOOLING & GAINFUL OCCUPATION	1,937	1,808	3,839
GAINFUL OR NON-SCHOOL OCCUPATIONS	6,318	5,574	12,092

From Learned, W. S. and Wood, Ben D., *The Student and His Knowledge*. The Carnegie Foundation for the Advancement of Teaching. Bulletin No. 29. 1938. p. 182.

EXHIBIT No. 2715

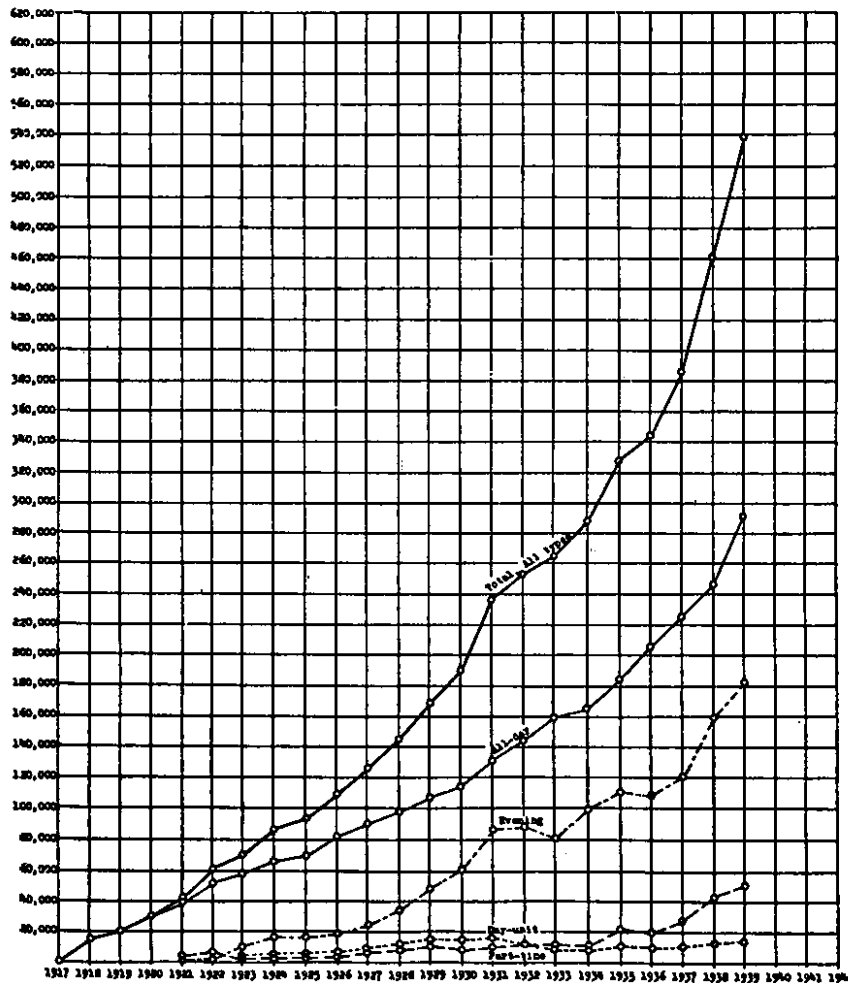
Enrolment in Vocational Schools or Classes Operated under State Plans, by Years, 1918-1939



From Digest of Annual Reports of State Boards for Vocational Education to the U. S. Office of Education 1939. p. 2.

EXHIBIT No. 2716

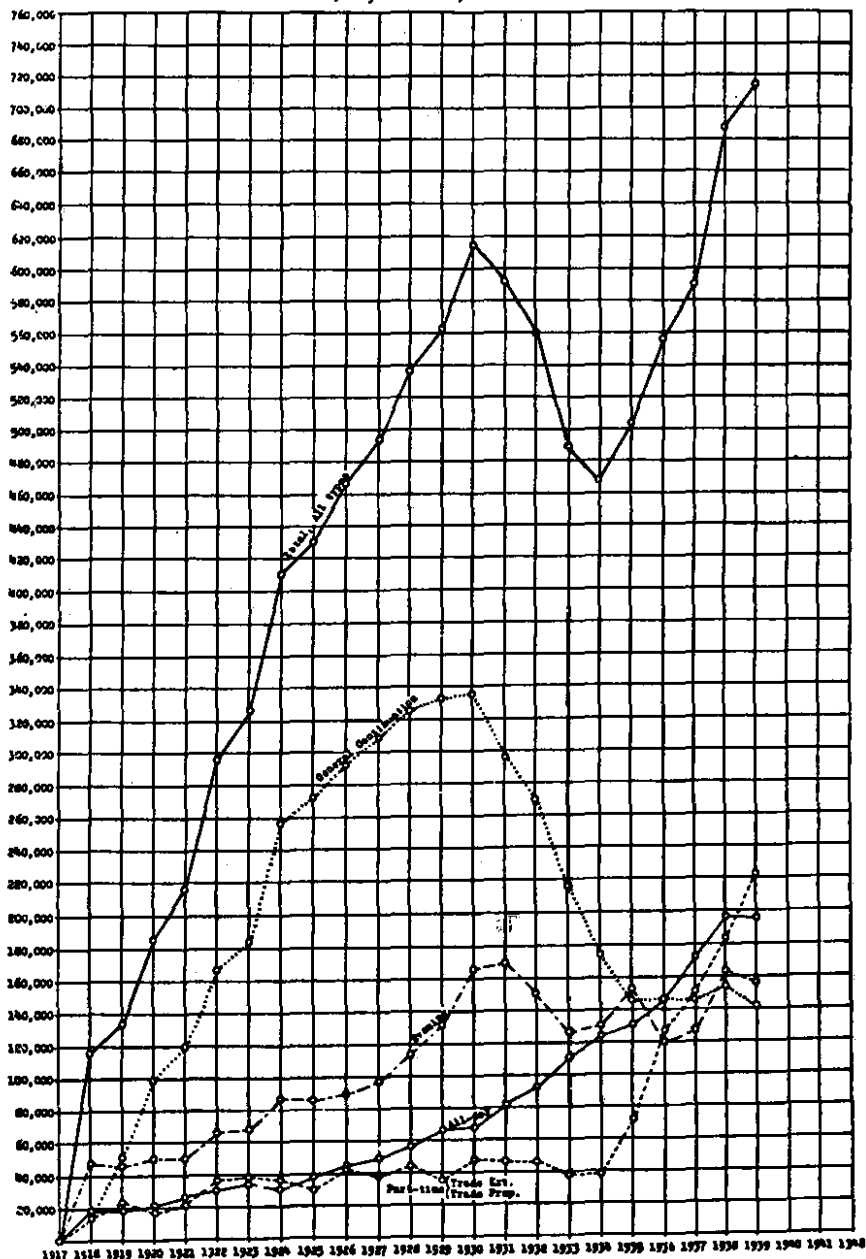
Enrolment in Federally Aided Agricultural Departments or Schools, by Years, 1918-1939



From Digest of Annual Reports of State Boards for Vocational Education to the U. S. Office of Education 1919, p. 18.

EXHIBIT No. 2717

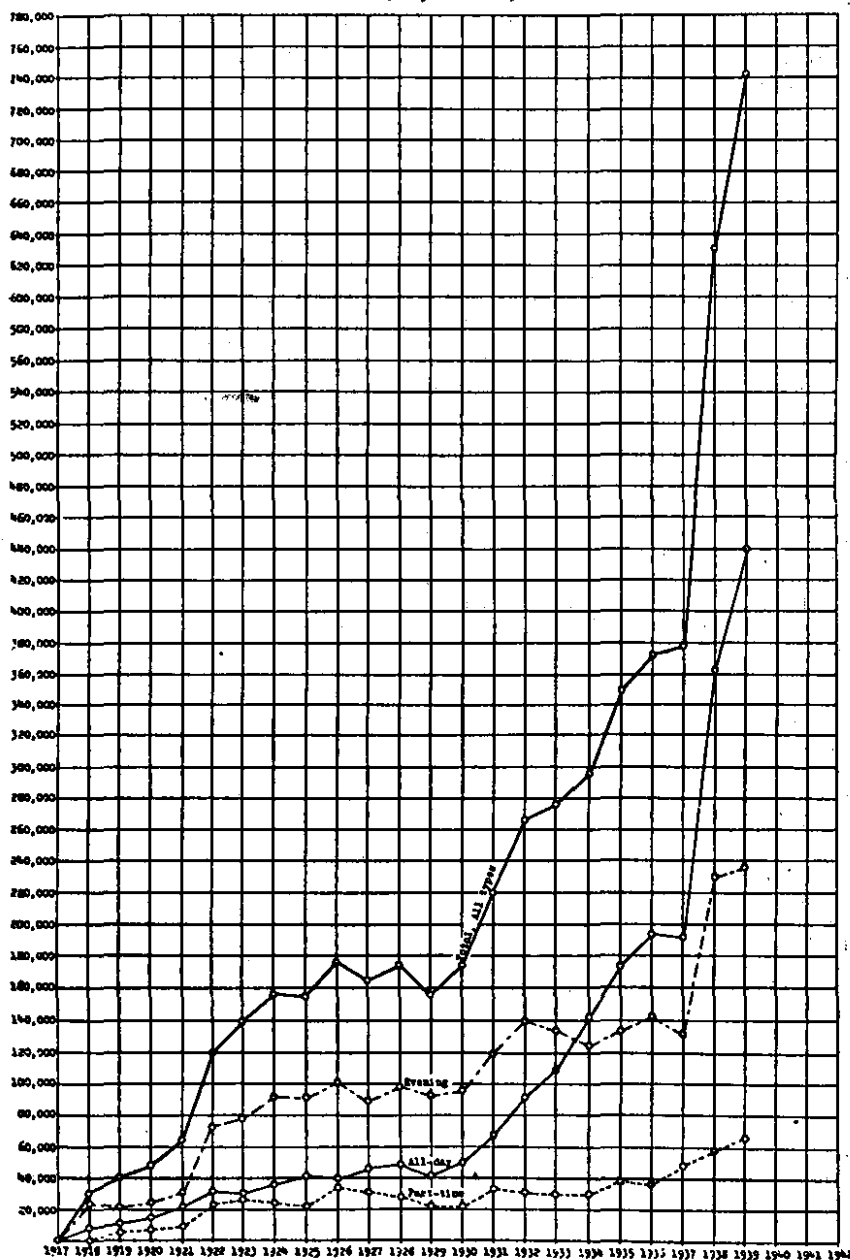
Enrolment in Federally Aided Trade and Industrial Classes, by Years, 1918-1939



From Digest of Annual Reports of State Boards for Vocational Education to the U. S. Office of Education 1919, p. 36.

EXHIBIT No. 2718

Enrolment in Federally Aided Home Economics Departments or Schools, by Years, 1918-1939



From Digest of Annual Reports of State Boards for Vocational Education to the U. S. Office of Education 1939, p. 43.

EXHIBIT 2719

[Submitted by the U. S. Office of Education]

COOPERATIVE PART-TIME DIVERSIFIED OCCUPATIONS PROGRAM ¹

C. E. Rakestraw, Federal Agent, Industrial Education

It was a typical May-day high school graduation in a small community in one of the southern states. On that day some twenty boys received their high school diplomas. The Superintendent of Schools, whom we shall call Mr. Smith, wondered just what would become of these boys since he knew that only five would have the financial opportunity to go to college. The other fifteen would have to secure employment in the community or elsewhere in the state or country. Mr. Smith also knew that the education which these boys had received did not prepare them for employment in any special field of work. All that he could hope was that their high school education would afford a sufficient background to permit them to succeed in learning any occupation in which they might become engaged. The tragedy he knew lay in the fact that not one of the boys had had sufficient counseling and occupational information to enable him to make an intelligent choice of a life work. Mr. Smith, with this problem weighing heavily on his mind, sought advice from his local school board and the vocational division of the state department of education. Representatives of the state department of vocational education, with one from the United States Office of Education, conferred with him regarding the boys. All were agreed that the solution of the problem would be to provide some form of vocational training for the youth of the community before sending him out into the work-a-day world.

Of course, it was out of the question for Mr. Smith's community to provide a vocational school manned and equipped to teach more than one or two occupations. Even the cost of this small effort would be prohibitive. The representatives of the state department of vocational education stressed the fact that all programs should be closely adapted to the social and economic needs of the community, employers, and employees. With this in mind a study was made of local employment opportunities in the community, and then Mr. Smith and his school board established a program, based on a plan which is known as the Cooperative Part-Time Program in Diversified Occupations.

WHAT IS THE PROGRAM?

Briefly stated, the Cooperative Part-Time Diversified Occupations Program operates as follows: High school students of employable age are enrolled in the program and spend one-half of each school day in bona fide employment in their chosen trades or occupations for the purpose of securing organized instruction on the job as student-learners. Two periods of the remaining one-half day of the high school time are devoted to directed and supervised study of technical and related subjects pertinent to the trades or occupations in which the students are engaged. The technical subjects, which are studied on an individual basis, are those subjects which have been approved by a craft or occupational committee as being pertinent. Related subjects are those which are taught on a group basis and include such social subjects as economics, civics, health, safety. Stress is also placed upon the development of good work habits and attitudes. The remaining school time is devoted to the study of regular academic subjects. The pupils included in this type of program are usually high school juniors and seniors, although boys and girls of sixteen years of age and over who can profit from the training are not excluded.

REQUIRED CREDITS

Those who wish to do so may graduate from high school with a regular diploma which will permit college entrance. To do this, however, it is necessary for the student upon entering high school to arrange his subjects in such a manner as to gain eight required credits during the first two years. The remaining required two credits plus six electives may be earned during the junior and senior years. Credit is allowed on a vocational basis for time spent in employment and time devoted to the study of technical and related subjects. Since high school credit

¹ Reproduced by permission from *Occupations, the Vocational Guidance Magazine* for March, 1940. (Copyright, 1940.) Published by the National Vocational Guidance Association, 426 West 123rd Street, New York City.

requirements vary in the various states, the above statement cannot be applied to all; and space will not permit describing the various plans for allowing credits.

Cooperative Part-Time Diversified Occupational training has grown from a few programs in 1934 to some six hundred at the close of the last school year. Each of the states in the Southern Region now has programs of this type, varying in number from five to thirty, with an approximate total enrollment of 5,000.

STANDARDS SET

The State Supervisors of Trade and Industrial Education in the Southern Region, realizing that all programs of vocational training should be organized on a sound basis, adopted the following standards for Cooperative Part-Time Programs in Diversified Occupations at their regional conference in Little Rock, Arkansas, in April, 1939:

Field Training.—Any trade, industrial, distributive, commercial, or service occupation eligible for inclusion in the training program for student-learners shall be one the preparation for which requires 2,000 hours, or more, of organized instruction and organized work experience on the job, as determined by an occupational committee.³

Agreement.—A written training agreement or memorandum shall be required for each student and shall include a schedule of processes to be learned on the job, related instruction to be given in school, wages and length of training period, type and degree of responsibility of parties concerned, provision for school credit, hours of work and related instruction, provision for job progression, probationary period and termination of agreement.

Representative Advisory Committees.—(1) State: The program of training shall be conducted under the general oversight of a representative state advisory committee, such committee to consist of equal representation from employers and labor, together with a representative of the state department of education.

(2) Local: The program of training shall be conducted under the general oversight of a representative local advisory committee, such committee to consist of equal representation from employers and labor, together with a representative of the local department of education.

(3) Craft or occupational committees shall be formed for the purpose of assisting the coordinators in developing the schedules of processes, approving outlines of related instruction, and assisting in organizing the individual student's training plan for a particular occupation. Such a committee may be composed of one or more members of each craft or occupation.

Rates of Pay.—Provisions shall be made for a progressively increasing scale of wages on an hourly basis over the period of training, which should average approximately 50 percent of that paid a regular worker.

Hours of Work and Study.—All student-learners shall be required to spend one-half of the regular school day, which shall be not less than fifteen hours per week (three consecutive clock hours per day), in organized work experiences on the job under the joint supervision of the school and the employer. In addition to the required time spent in acquiring job experience, each student-learner shall devote, each day, two of the regular school periods to the study of technical and related subject matter on a correlated basis, under a qualified coordinator-instructor or a qualified related-subjects teacher, in segregated classes.

Selection of Student-Learners.—Student-learners shall be enrolled in this program with the approval of the local advisory committee on the basis of their ability to profit from the training and only after they have received advisement and guidance from trained coordinators or counselors.

Schedule of Processes.—The schedule of processes to be learned on the job and the related subject content to be taught each student-learner in school shall be outlined and approved by representative occupational or craft committees.

Equipment and Instructional Materials.—The local school authorities shall provide adequate funds to secure necessary equipment and instructional materials, including reference material, textbooks, bulletins, pamphlets, trade journals, correspondence courses, etc., to insure that pertinent, practical, and current occupational practices may be taught in the two school periods per day devoted to technical and related study.

High School Credit.—Provision shall be made by state and local school authorities to enable the student-learners to receive high school credit for the satisfactory

³ By student-learner is meant a student enrolled in a public high school who has satisfactorily completed at least eight units of credit toward graduation, or equivalent, is at least 16 years of age, and has been accepted for occupational training on a cooperative basis under a written agreement, approved by a representative advisory committee, among the school, employer, student, and parent.

completion of the schedule of organized work experiences and related instruction, making high school graduation possible. (Such an arrangement has been made and accepted by the Southern States and approved by the Southern Association of Colleges and Secondary Schools.)

Ratio of Student-Learners.—Due consideration will be given to the ratio of student-learners to regularly employed workers in any occupational field, and shall be determined by the local advisory committee.

Job Progression.—Provision will be made for the student-learners to be transferred from one job process to another upon reaching the proficiency level required for satisfactory performance in the occupation.

Placement and Follow-up.—Consideration will be given to final placement and follow-up, and in cases of occupations requiring more time for training than can be given during the period the student is enrolled in high school, arrangements for the completion of training on a full-time basis will be made in cooperation with the Federal Committee on Apprenticeship.

That such a program as the cooperative part-time diversified occupational training is needed is shown by the following facts: There are enrolled in the public high schools throughout the country approximately 6,500,000 students. The traditional high school course is designed largely to prepare students for college entrance. Since only a small percentage of the graduates enter college, it became apparent many years ago that some form of vocational training should be provided in the public school system. In the larger industrial communities vocational schools have been organized to provide such training for the boys and girls residing there. But vocational schools are expensive to build, equip, and maintain, and many communities cannot offer any such advantages for their youth. The only program possible for these small communities to organize is the cooperative part-time type which, in reality, uses the equipment in the business and industrial establishments of the community as a laboratory. This plan does not in any sense supplant the regular apprentice-training program, but, as has been shown in many communities, actually stimulates the development of apprenticeship.

That the Cooperative Part-Time Diversified Occupations Program proved successful from the first is indicated from the fact that 36 percent of the first graduating class in one of the first communities to establish this program continued in permanent employment with the business or industrial establishment where training was received, 32 percent received employment in other business or industrial establishments in the occupations for which their training had prepared them, and the remainder of the group, although not receiving immediate employment, could state that, in addition to their high school diploma, they had acquired 2,000 hours of practical working experience in a definite trade or occupation.

Employers in the communities where these programs have been organized have accepted the responsibility of cooperating with the schools from the standpoint of their duty, as citizens, to provide an opportunity for youth to prepare for useful employment. A study of the employment records of graduates indicates that the employers have provided continued employment for these students without displacement of regular workers. In other words, many are retained after they finish their course because they have made themselves valuable to the employer and not because the employer feels the need of additional workers. The local authorities and the coordinators have been urged not to seek placement of students in any occupation where so doing would mean displacement of regular workers. However, since it is necessary for the student-learner to receive work experiences in accordance with the approved schedule of processes, it is not possible for him to replace a regular worker in any phase of an occupation and at the same time achieve the objectives of the training. The employees and labor groups have accepted the program on the same basis, realizing also that in such a program the danger of training more workers than the occupations can absorb is eliminated. School authorities have accepted the program enthusiastically because it provides a means of offering to their students occupational training which could not otherwise be provided in their communities.

CONCENTRATION OF ECONOMIC POWER

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EXHIBIT No. 2720

[Submitted by the U. S. Office of Education]

Number of Pupils Enrolled in Specified Vocational Schools, Federally aided, by Type of Class: Fiscal Years Ended June 30, 1918-1939

Type of class and year	Number Enrolled				
	In all schools	In agricultural schools	In trade and industrial schools	In home economics schools	In distributive occupations schools
All classes:					
1939	2,085,427	538,588	715,239	741,508	90,099
1938	1,810,082	460,878	635,804	637,394	36,008
1937	1,344,728	384,802	580,990	377,436	
1936	1,255,841	342,809	537,151	374,901	
1935	1,178,896	325,985	503,865	349,346	
1934	1,051,000	284,150	466,999	297,851	
1933	1,032,429	264,131	489,900	278,398	
1932	1,077,844	252,196	560,160	265,496	
1931	1,055,370	236,328	591,876	228,166	
1930	981,882	188,811	618,604	174,967	
1929	880,839	168,434	563,515	154,890	
1928	858,466	144,901	537,611	175,944	
1927	784,986	124,637	495,629	164,420	
1926	763,418	109,528	466,685	177,205	
1925	676,677	93,115	429,071	154,491	
1924	652,594	85,984	409,843	156,767	
1923	536,528	71,268	325,889	139,341	
1922	475,828	60,236	296,884	118,708	
1921	324,247	43,252	217,500	63,395	
1920	265,068	31,301	184,819	48,938	
1919	194,895	19,933	135,548	39,414	
1918	164,183	16,450	117,934	30,799	
Evening classes:					
1939	657,603	181,962	156,464	236,684	88,143
1938	569,708	158,813	163,319	216,168	32,408
1937	380,131	120,626	125,376	134,129	
1936	860,907	107,517	120,216	142,174	
1935	398,713	109,970	154,362	134,391	
1934	353,875	99,293	130,901	122,681	
1933	343,059	81,715	123,807	137,637	
1932	376,427	87,138	151,042	141,247	
1931	378,773	85,688	168,822	124,263	
1930	323,154	60,462	165,317	97,375	
1929	371,836	47,288	131,103	93,450	
1928	247,968	35,192	114,629	98,147	
1927	212,377	26,227	97,674	88,576	
1926	210,238	19,239	89,694	101,205	
1925	194,300	15,825	85,563	92,922	
1924	193,774	15,227	84,973	93,074	
1923	157,874	9,319	69,856	78,699	
1922	133,835	1,333	66,477	66,025	
1921	84,918	1,139	51,823	31,956	
1920	73,122		48,354	24,768	
1919	66,176		43,485	22,691	
1918	68,698		46,333	22,360	
Part-time classes:					
1939	496,551	51,593	362,410	65,592	6,956
1938	438,993	42,900	338,282	54,211	3,600
1937	373,466	29,096	295,844	48,526	
1936	329,214	20,830	271,304	37,080	
1935	277,650	21,083	217,933	38,634	
1934	256,026	11,719	212,613	31,694	
1933	299,535	13,558	255,247	31,730	
1932	359,001	10,792	315,708	32,501	
1931	382,539	6,485	342,513	33,541	
1930	407,285	4,164	381,898	21,223	
1929	393,048	5,118	367,674	20,351	
1928	398,917	4,488	365,548	28,916	
1927	383,144	3,622	347,939	31,583	
1926	369,186	2,716	332,192	34,278	
1925	327,410	2,330	303,852	21,228	
1924	321,191	2,143	291,608	27,440	
1923	253,728	2,090	221,932	29,706	
1922	228,655	5,942	199,017	23,695	
1921	160,963	1,450	140,635	8,878	
1920	122,974		115,241	7,733	
1919	77,677		78,399	4,478	
1918	63,005		58,005	(C)	

¹ Included in trade and industrial part-time enrollment.

CONCENTRATION OF ECONOMIC POWER

Number of Pupils Enrolled in Specified Vocational Schools, Federally aided, by
Type of Class: Fiscal Years Ended June 30, 1918-1939—Continued

Type of class and year	Number Enrolled				
	In all schools	In agricultural schools	In trade and industrial schools	In home economics schools	In distributive occupations schools
All-day classes:					
1939	941, 278	305, 031	196, 365	439, 877	
1938	801, 381	259, 183	184, 203	358, 015	
1937	591, 131	236, 530	159, 770	194, 781	
1936	556, 740	216, 462	145, 631	195, 647	
1935	502, 533	194, 632	131, 580	176, 321	
1934	441, 099	175, 138	123, 485	142, 476	
1933	339, 835	169, 858	110, 846	109, 131	
1932	339, 416	164, 299	93, 400	91, 747	
1931	294, 058	143, 155	80, 541	70, 362	
1930	261, 443	123, 685	71, 389	59, 369	
1929	221, 960	116, 038	64, 838	41, 089	
1928	211, 571	105, 251	67, 439	48, 881	
1927	189, 465	95, 088	50, 116	44, 261	
1926	173, 094	87, 573	44, 799	41, 622	
1925	154, 907	74, 960	39, 666	40, 341	
1924	138, 129	68, 614	33, 262	36, 253	
1923	124, 026	59, 889	34, 101	30, 926	
1922	113, 338	52, 961	31, 390	28, 987	
1921	88, 366	40, 763	25, 042	22, 561	
1920	68, 962	31, 301	21, 224	16, 437	
1919	51, 042	19, 933	18, 664	12, 445	
1918	42, 485	15, 450	18, 596	8, 439	

EXHIBIT No. 2721

(Submitted by the U. S. Office of Education)

Amount Expended from Federal, State and Local Money for Vocational Education,
by Field of Service and by Years Ended June 30, 1918 to 1939

Type of Service	Amount expended			
	Total	From Federal money	From State money	From Local money
All services:¹				
1939	\$52, 668, 491. 12	\$19, 434, 553. 96	\$10, 947, 861. 94	\$22, 286, 075. 22
1938	44, 944, 537. 22	17, 737, 117. 78	9, 445, 752. 24	17, 810, 667. 20
1937	26, 399, 285. 42	10, 013, 668. 89	5, 907, 389. 47	11, 478, 227. 06
1936	33, 427, 833. 76	9, 748, 924. 62	8, 606, 400. 49	15, 072, 508. 65
1935	29, 289, 922. 08	9, 371, 979. 33	6, 782, 425. 57	13, 135, 517. 28
1934	28, 188, 416. 75	6, 950, 944. 70	7, 093, 203. 01	14, 144, 269. 04
1933	30, 126, 888. 12	7, 728, 245. 02	8, 204, 515. 56	14, 194, 127. 54
1932	33, 402, 402. 59	8, 414, 833. 75	9, 036, 174. 82	15, 951, 394. 02
1931	32, 143, 192. 37	7, 978, 729. 20	8, 858, 973. 05	15, 305, 489. 52
1930	29, 908, 898. 72	7, 404, 223. 18	8, 233, 148. 77	14, 271, 526. 77
1929	27, 474, 305. 86	6, 878, 529. 71	7, 471, 858. 30	13, 123, 917. 85
1928	25, 715, 790. 46	6, 821, 451. 75	7, 028, 986. 81	11, 865, 321. 90
1927	24, 552, 116. 08	6, 730, 314. 24	6, 504, 592. 45	11, 317, 209. 38
1926	23, 181, 700. 46	6, 548, 657. 46	6, 149, 081. 99	10, 483, 961. 01
1925	20, 919, 858. 76	5, 614, 550. 14	5, 771, 975. 23	9, 533, 330. 39
1924	18, 845, 350. 92	4, 832, 880. 34	5, 174, 831. 06	8, 837, 639. 52
1923	17, 132, 446. 09	4, 308, 865. 68	4, 574, 532. 11	7, 949, 028. 30
1922	14, 812, 988. 70	3, 850, 118. 78	4, 523, 939. 39	6, 438, 930. 53
1921	12, 618, 262. 55	3, 357, 494. 23	4, 074, 500. 73	5, 186, 267. 59
1920	8, 535, 163. 84	2, 476, 502. 83	2, 670, 284. 76	3, 388, 376. 25
1919	4, 951, 776. 75	1, 560, 008. 61	1, 566, 627. 06	1, 825, 141. 09
1918	3, 039, 061. 15	832, 426. 82	1, 024, 930. 48	1, 181, 703. 85
Agricultural service:				
1939	15, 428, 166. 61	6, 638, 379. 62	2, 442, 135. 76	6, 347, 651. 23
1938	13, 600, 313. 96	6, 107, 589. 59	2, 188, 732. 07	5, 303, 991. 40
1937	10, 842, 818. 17	3, 966, 715. 84	2, 168, 014. 59	4, 708, 087. 74
1936	10, 327, 234. 34	3, 862, 900. 90	2, 039, 897. 13	4, 424, 536. 31
1935	8, 885, 608. 90	3, 715, 954. 23	1, 499, 005. 11	3, 660, 648. 56

¹ Amounts expended for all services, combined, include expenditures from State money for administration which are not distributed by type of service as follows: 1939, \$13,642.10; 1937, \$5,839.32; 1936, \$1,665.17; 1934, \$4,602.21; 1933, \$3,960.40; 1932, \$3,966.14; 1929, \$6,923.64; 1928, \$6,013.72.

CONCENTRATION OF ECONOMIC POWER

17491

Amount Expended from Federal, State and Local Money for Vocational Education, by Field of Service and by Years Ended June 30, 1918 to 1939—Continued

Type of Service	Amount expended			
	Total	From Federal money	From State money	From Local money
Agricultural service—Con.				
1934.....	\$8,333,669.45	\$3,006,949.51	\$1,629,191.50	\$3,697,528.47
1933.....	9,468,535.68	3,364,441.31	1,979,739.11	4,124,355.26
1932.....	10,212,810.78	3,688,513.47	2,123,443.05	4,400,854.26
1931.....	9,982,628.94	3,461,542.87	2,068,542.68	4,432,543.39
1930.....	8,743,382.05	3,173,623.55	1,737,246.80	3,782,511.70
1929.....	8,418,981.20	2,903,959.92	1,703,948.63	3,811,072.65
1928.....	7,608,913.76	2,844,464.24	1,539,861.36	3,224,788.16
1927.....	7,469,295.39	2,801,591.57	1,509,065.78	3,158,638.04
1926.....	7,164,460.45	2,656,886.13	1,571,426.97	2,936,147.36
1925.....	6,146,124.01	2,262,542.88	1,370,964.90	2,512,616.23
1924.....	5,253,912.85	1,897,807.50	1,203,486.62	2,152,618.74
1923.....	4,647,042.04	1,669,698.75	1,108,461.22	1,868,882.07
1922.....	4,058,440.36	1,435,475.22	1,039,487.89	1,583,477.25
1921.....	3,393,088.21	1,192,131.17	968,674.16	1,232,282.88
1920.....	2,437,286.06	889,886.29	678,824.43	868,575.34
1919.....	1,413,938.49	528,679.13	399,962.80	485,276.56
1918.....	739,933.27	273,282.06	220,713.98	245,937.21
Trade and Industrial Service:				
1939.....	20,832,644.20	6,301,254.30	4,612,056.39	9,919,333.51
1938.....	18,115,847.31	6,046,141.86	4,175,218.97	7,894,486.48
1937.....	17,312,562.22	3,553,812.68	4,178,082.83	9,580,666.71
1936.....	15,006,127.80	3,429,772.81	4,232,635.26	7,343,719.73
1935.....	13,177,443.06	3,291,901.48	3,211,770.68	6,673,770.90
1934.....	13,446,691.91	2,098,241.17	3,622,824.00	7,725,626.74
1933.....	13,714,762.16	2,288,675.92	3,956,253.51	7,459,832.73
1932.....	15,525,723.79	2,546,899.95	4,370,487.57	8,608,336.27
1931.....	14,808,542.29	2,578,544.29	4,230,256.30	7,999,741.70
1930.....	14,330,079.59	2,509,530.68	4,098,033.83	7,727,515.08
1929.....	12,746,710.62	2,467,217.11	3,568,066.20	6,711,427.31
1928.....	12,020,055.81	2,454,445.05	3,378,574.19	6,187,036.57
1927.....	11,374,555.34	2,426,685.97	3,074,573.53	5,873,395.84
1926.....	10,650,837.79	2,403,773.71	2,791,708.97	5,455,355.11
1925.....	9,577,893.35	1,973,684.12	2,551,117.74	5,053,141.49
1924.....	8,555,484.55	1,589,524.44	2,281,706.64	4,684,253.47
1923.....	7,513,120.51	1,345,911.72	2,178,352.74	3,988,865.05
1922.....	6,419,777.32	1,170,907.05	1,888,173.64	3,358,696.63
1921.....	5,291,761.72	1,006,570.56	1,558,828.72	2,726,362.44
1920.....	3,396,726.65	699,644.75	999,847.48	1,697,234.42
1919.....	2,002,473.50	491,192.65	610,885.63	900,395.22
1918.....	1,536,438.95	307,374.57	497,988.39	731,075.99
Home Economic Service:				
1939.....	11,565,398.70	4,124,088.81	2,106,433.68	5,334,876.21
1938.....	9,135,325.57	3,670,804.51	1,558,301.95	3,906,219.11
1937.....	5,890,064.56	1,442,322.66	1,547,285.59	2,900,456.31
1936.....	5,806,760.57	1,428,800.59	1,358,614.27	3,019,345.71
1935.....	5,030,603.39	1,365,403.94	1,136,304.35	2,528,895.10
1934.....	4,331,977.91	958,579.29	929,526.05	2,443,872.57
1933.....	4,677,657.49	1,116,077.13	1,258,537.59	2,303,042.77
1932.....	5,129,039.10	1,130,398.29	1,402,952.55	2,595,688.26
1931.....	4,751,274.46	676,890.91	1,365,280.90	2,509,102.65
1930.....	4,382,036.65	678,225.71	1,286,530.07	2,417,280.87
1929.....	3,903,118.66	481,192.67	1,125,456.08	2,296,469.91
1928.....	3,721,132.23	492,158.26	1,073,784.28	2,155,189.69
1927.....	3,337,827.71	486,126.06	907,289.56	1,944,412.09
1926.....	3,137,391.82	499,631.33	810,624.49	1,827,136.00
1925.....	2,943,524.30	400,120.15	816,222.02	1,727,182.13
1924.....	2,744,635.63	331,600.81	740,318.18	1,672,456.64
1923.....	2,748,947.42	285,968.57	649,631.92	1,813,446.93
1922.....	2,118,562.96	245,885.87	671,382.76	1,201,294.33
1921.....	1,822,347.97	192,387.21	585,326.04	1,034,634.72
1920.....	1,064,489.05	155,768.24	329,633.53	569,087.28
1919.....	554,195.42	115,952.01	155,636.88	282,706.53
1918.....	334,548.49	67,773.82	114,790.69	161,983.98
Teacher Training:				
1939.....	4,010,999.46	1,883,778.45	1,628,872.91	498,348.10
1938.....	3,500,020.26	1,664,371.13	1,407,661.05	427,988.08
1937.....	2,348,001.15	1,050,817.71	1,008,167.14	289,016.30
1936.....	2,286,045.88	1,027,450.32	974,088.66	284,506.90
1935.....	2,213,475.57	998,720.18	932,553.67	282,201.72
1934.....	2,071,476.24	887,174.73	907,059.25	277,241.26
1933.....	2,261,982.39	949,050.76	1,006,034.85	306,896.78
1932.....	2,530,872.78	1,049,022.04	1,135,335.51	346,515.23
1931.....	2,600,746.68	1,001,761.13	1,174,893.77	354,101.78
1930.....	2,453,400.43	1,042,843.24	1,066,338.07	344,219.12
1929.....	2,396,571.74	1,026,160.01	1,065,463.75	304,947.98
1928.....	2,359,044.94	1,030,384.19	1,030,953.27	297,707.48

CONCENTRATION OF ECONOMIC POWER

Amount Expended from Federal, State and Local Money for Vocational Education, by Field of Service and by Years Ended June 30, 1918 to 1939—Continued

Type of Service	Amount expended			
	Total	From Federal money	From State money	From Local money
Teacher Training—Continued.				
1927.....	\$2,370,437.64	\$1,016,010.64	\$1,013,663.59	\$340,763.41
1928.....	2,229,010.39	985,366.29	975,321.56	268,322.54
1929.....	2,252,314.10	978,252.99	1,033,670.57	240,390.54
1924.....	2,291,317.88	1,013,687.59	949,319.62	328,310.67
1923.....	2,223,327.12	1,007,306.64	938,186.28	277,834.25
1922.....	2,218,208.06	997,850.64	924,895.10	295,462.32
1921.....	2,111,064.65	966,405.29	951,671.81	192,987.55
1920.....	1,646,662.08	731,203.55	661,979.32	253,479.21
1919.....	981,169.34	424,184.82	400,221.74	156,762.78
1918.....	428,140.44	193,996.35	191,437.42	42,706.67
Distributive Occupations:				
1939.....	817,640.05	487,052.78	144,721.10	185,866.17
1938.....	643,030.12	248,210.69	116,837.20	277,982.13

“EXHIBIT No. 2722” appears facing p. 17158

“EXHIBIT No. 2723” appears facing p. 17159

“EXHIBIT No. 2724” appears in text on p. 17160

“EXHIBIT No. 2725” appears facing p. 17164

“EXHIBIT No. 2726” appears in text on p. 17161

“EXHIBIT No. 2727” appears in text on p. 17162

“EXHIBIT No. 2728,” introduced on p. 17167, is on file with the committee

EXHIBIT No. 2729

EXPENDITURE OF FUNDS

FOR

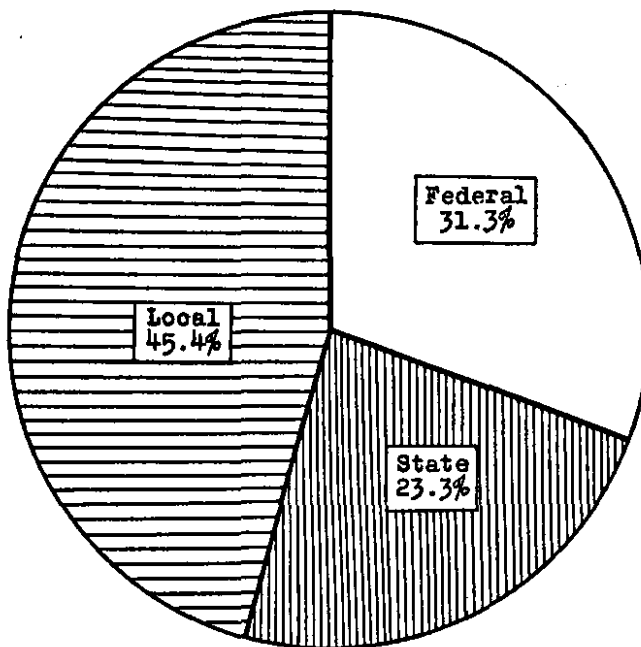
TRADE AND INDUSTRIAL EDUCATION

Fiscal year ended June 30, 1939

(Including expenditures for teacher-training)

Federal Funds	\$ 6,954,988.56
State Funds	5,166,593.24
Local Funds	10,083,230.03
Total	\$22,204,811.83

DIVISION OF EACH DOLLAR EXPENDED



EACH FEDERAL DOLLAR MATCHED

By	\$0.74	- State Money
	1.45	- Local Money
Total	\$2.19	- State and Local money

EXHIBIT No. 2730

COOPERATIVE PART-TIME DIVERSIFIED OCCUPATIONS PROGRAM¹

C. E. Rakestraw, Federal Agent, Industrial Education

It was a typical May-day high school graduation in a small community in one of the southern states. On that day some twenty boys received their high school diplomas. The Superintendent of Schools, whom we shall call Mr. Smith, wondered just what would become of these boys since he knew that only five would have the financial opportunity to go to college. The other fifteen would have to secure employment in the community or elsewhere in the state or country. Mr. Smith also knew that the education which these boys had received did not prepare them for employment in any special field of work. All that he could hope was that their high school education would afford a sufficient background to permit them to succeed in learning any occupation in which they might become engaged. The tragedy he knew lay in the fact that not one of the boys had had sufficient counseling and occupational information to enable him to make an intelligent choice of a life work. Mr. Smith, with this problem weighing heavily on his mind, sought advice from his local school board and the vocational division of the state department of education. Representatives of the state department of vocational education, with one from the United States Office of Education, conferred with him regarding the boys. All were agreed that the solution of the problem would be to provide some form of vocational training for the youth of the community before sending them out into the work-a-day world.

Of course, it was out of the question for Mr. Smith's community to provide a vocational school manned and equipped to teach more than one or two occupations. Even the cost of this small effort would be prohibitive. The representatives of the state department of vocational education stressed the fact that all programs should be closely adapted to the social and economic needs of the community, employers, and employees. With this in mind a study was made of local employment opportunities in the community, and then Mr. Smith and his school board established a program, based on a plan which is known as the Cooperative Part-Time Program in Diversified Occupations.

WHAT IS THE PROGRAM?

Briefly stated, the Cooperative Part-Time Diversified Occupations Program operates as follows: High school students of employable age are enrolled in the program and spend one-half of each school day in bona fide employment in their chosen trades or occupations for the purpose of securing organized instruction on the job as student-learners. Two periods of the remaining one-half day of the high school time are devoted to directed and supervised study of technical and related subjects pertinent to the trades or occupations in which the students are engaged. The technical subjects, which are studied on an individual basis, are those subjects which have been approved by a craft or occupational committee as being pertinent. Related subjects are those which are taught on a group basis and include such social subjects as economics, civics, health, safety. Stress is also placed upon the development of good work habits and attitudes. The remaining school time is devoted to the study of regular academic subjects. The pupils included in this type of program are usually high school juniors and seniors, although boys and girls of sixteen years of age and over who can profit from the training are not excluded.

REQUIRED CREDITS

Those who wish to do so may graduate from high school with a regular diploma which will permit college entrance. To do this, however, it is necessary for the student upon entering high school to arrange his subjects in such a manner as to gain eight required credits during the first two years. The remaining required two credits plus six electives may be earned during the junior and senior years. Credit is allowed on a vocational basis for time spent in employment and time devoted to the study of technical and related subjects. Since high school credit requirements vary in the various states, the above statement cannot be applied to all; and space will not permit describing the various plans for allowing credits.

¹ Reproduced by permission from *Occupations, the Vocational Guidance Magazine* for March, 1940. (Copyright, 1940.) Published by the National Vocational Guidance Association, 425 West 123rd Street, New York City.

Cooperative Part-Time Diversified Occupational training has grown from a few programs in 1934 to some six hundred at the close of the last school year. Each of the states in the Southern Region now has programs of this type, varying in number from five to thirty, with an approximate total enrollment of 5,000.

STANDARDS SET

The State Supervisors of Trade and Industrial Education in the Southern Region, realizing that all programs of vocational training should be organized on a sound basis, adopted the following standards for Cooperative Part-Time Programs in Diversified Occupations at their regional conference Little Rock, Arkansas, in April, 1939:

Field Training.—Any trade, industrial, distributive, commercial, or service occupation eligible for inclusion in the training program for student-learners shall be one the preparation for which requires 2,000 hours, or more, of organized instruction and organized work experience on the job, as determined by an occupational committee.¹

Agreement.—A written training agreement or memorandum shall be required for each student and shall include a schedule of processes to be learned on the job, related instruction to be given in school, wages and length of training period, type and degree of responsibility of parties concerned, provision for school credit, hours of work and related instruction, provision for job progression, probationary period, and termination of agreement.

Representative Advisory Committees.—(1) State: The program of training shall be conducted under the general oversight of a representative state advisory committee, such committee to consist of equal representation from employers and labor, together with a representative of the state department of education.

(2) Local: The program of training shall be conducted under the general oversight of a representative local advisory committee, such committee to consist of equal representation from employers and labor, together with a representative of the local department of education.

(3) Craft or occupational committees shall be formed for the purpose of assisting the coordinators in developing the schedules of processes, approving outlines of related instruction, and assisting in organizing the individual student's training plan for a particular occupation. Such a committee may be composed of one or more members of each craft or occupation.

Rates of Pay.—Provisions shall be made for a progressively increasing scale of wages on an hourly basis over the period of training, which should average approximately 50 percent of that paid a regular worker.

Hours of Work and Study.—All student-learners shall be required to spend one-half of the regular school day, which shall be not less than fifteen hours per week (three consecutive clock hours per day), in organized work experiences on the job under the joint supervision of the school and the employer. In addition to the required time spent in acquiring job experience, each student-learner shall devote each day, two of the regular school periods to the study of technical and related subject matter on a correlated basis, under a qualified coordinator-instructor or a qualified related-subjects teacher, in segregated classes.

Selection of Student-Learners.—Student-learners shall be enrolled in this program with the approval of the local advisory committee on the basis of their ability to profit from the training and only after they have received advisement and guidance from trained coordinators or counselors.

Schedule of Processes.—The schedule of processes to be learned on the job and the related subject content to be taught each student-learner in school shall be outlined and approved by representative occupational or craft committees.

Equipment and Instructional Materials.—The local school authorities shall provide adequate funds to secure necessary equipment and instructional materials, including reference material, textbooks, bulletins, pamphlets, trade journals, correspondence courses, etc., to insure that pertinent, practical, and current occupational practices may be taught in the two school periods per day devoted to technical and related study.

High School Credit.—Provision shall be made by state and local school authorities to enable the student-learners to receive high school credit for the satisfactory completion of the schedule of organized work experiences and related instruction,

¹ By student-learner is meant a student enrolled in a public high school who has satisfactorily completed at least eight units of credit toward graduation, or equivalent, is at least 16 years of age, and has been accepted for occupational training on a cooperative basis under a written agreement, approved by a representative advisory committee, among the school, employer, student, and parent.

making high school graduation possible. (Such an arrangement has been made and accepted by the Southern States and approved by the Southern Association of Colleges and Secondary Schools.)

Ratio of Student-Learners.—Due consideration will be given to the ratio of student-learners to regularly employed workers in any occupational field, and shall be determined by the local advisory committee.

Job Progression.—Provision will be made for the student-learners to be transferred from one job process to another upon reaching the proficiency level required for satisfactory performance in the occupation.

Placement and Follow-up.—Consideration will be given to final placement and follow-up, and in cases of occupations requiring more time for training than can be given during the period the student is enrolled in high school, arrangements for the completion of training on a full-time basis will be made in cooperation with the Federal Committee on Apprenticeship.

That such a program as the Cooperative Part-Time Diversified Occupational Training is needed is shown by the following facts: There are enrolled in the public high schools throughout the country approximately 6,500,000 students. The traditional high school course is designed largely to prepare students for college entrance. Since only a small percentage of the graduates enter college, it became apparent many years ago that some form of vocational training should be provided in the public school system. In the larger industrial communities vocational schools have been organized to provide such training for the boys and girls residing there. But vocational schools are expensive to build, equip, and maintain, and many communities cannot offer any such advantages for their youth. The only program possible for these small communities to organize is the cooperative part-time type which, in reality, uses the equipment in the business and industrial establishments of the community as a laboratory. This plan does not in any sense supplant the regular apprentice-training program, but, as has been shown in many communities, actually stimulates the development of apprenticeship.

That the Cooperative Part-Time Diversified Occupations Program proved successful from the first is indicated from the fact that 36 percent of the first graduating class in one of the first communities to establish this program continued in permanent employment with the business or industrial establishment where training was received, 32 percent received employment in other business or industrial establishments in the occupations for which their training had prepared them, and the remainder of the group, although not receiving immediate employment, could state that, in addition to their high school diploma, they had acquired 2,000 hours of practical working experience in a definite trade or occupation.

Employers in the communities where these programs have been organized have accepted the responsibility of cooperating with the schools from the standpoint of their duty, as citizens, to provide an opportunity for youth to prepare for useful employment. A study of the employment records of graduates indicates that the employers have provided continued employment for these students without displacement of regular workers. In other words, many are retained after they finish their course because they have made themselves valuable to the employer and not because the employer feels the need of additional workers. The local authorities and the coordinators have been urged not to seek placement of students in any occupation where so doing would mean displacement of regular workers. However, since it is necessary for the student-learner to receive work experiences in accordance with the approved schedule of processes, it is not possible for him to replace a regular worker in any phase of an occupation and at the same time achieve the objectives of the training. The employees and labor groups have accepted the program on the same basis, realizing also that in such a program the danger of training more workers than the occupations can absorb is eliminated. School authorities have accepted the program enthusiastically because it provides a means of offering to their students occupational training which could not otherwise be provided in their communities.

CONCENTRATION OF ECONOMIC POWER.

17497

EXHIBIT No. 2731

Number of Pupils Enrolled in Specified Vocational Schools, Federally aided, by Type of Class: Fiscal Years Ended June 30, 1918-1939

Type of class and year	Number Enrolled				
	In all schools	In agricultural schools	In trade and industrial schools	In home economics schools	In distributive occupations schools
All classes:					
1939	2,085,427	538,588	715,289	741,503	90,099
1938	1,810,082	480,876	685,804	627,394	36,008
1937	1,844,728	394,802	580,990	377,436	
1936	1,255,861	343,809	537,181	374,901	
1935	1,178,866	325,686	503,865	349,346	
1934	1,051,000	286,150	466,999	297,851	
1933	1,032,429	264,131	489,900	278,398	
1932	1,077,844	252,199	560,150	265,495	
1931	1,065,370	235,328	591,876	228,166	
1930	981,882	188,311	618,604	174,967	
1929	886,839	168,434	563,515	154,890	
1928	858,466	144,901	537,611	175,944	
1927	784,986	124,937	495,629	104,420	
1926	753,418	109,528	466,685	177,205	
1925	676,677	93,115	439,071	154,491	
1924	652,594	85,984	409,843	156,767	
1923	536,528	71,298	325,889	139,341	
1922	475,828	60,236	296,884	118,709	
1921	324,247	43,352	217,500	63,395	
1920	265,058	31,301	184,819	48,938	
1919	194,895	19,933	135,548	39,414	
1918	164,183	15,450	117,934	30,799	
Evening classes:					
1939	657,608	181,062	156,464	236,034	83,143
1938	569,708	158,813	163,319	215,108	32,408
1937	380,131	120,626	125,376	134,129	
1936	369,907	107,617	120,216	142,174	
1935	368,713	109,970	154,352	134,391	
1934	353,875	99,293	130,901	123,681	
1933	343,059	81,715	123,807	137,537	
1932	379,427	87,138	151,042	141,247	
1931	378,773	85,688	168,822	124,263	
1930	323,154	60,462	165,317	97,376	
1929	271,836	47,283	131,103	93,450	
1928	247,968	35,192	114,629	98,147	
1927	212,377	26,227	97,574	88,576	
1926	210,238	19,239	89,694	101,305	
1925	194,300	15,825	85,553	92,922	
1924	193,274	15,227	84,973	93,074	
1923	157,874	9,319	69,856	78,699	
1922	133,835	1,333	66,477	66,025	
1921	84,918	1,139	51,823	31,956	
1920	73,122		48,354	24,768	
1919	66,176		43,485	22,691	
1918	68,693		46,333	22,360	
Part-time classes:					
1939	496,551	51,593	362,410	65,592	6,956
1938	438,993	42,900	338,282	54,211	3,600
1937	373,466	29,096	295,844	48,526	
1936	329,214	20,830	271,304	37,080	
1935	277,650	21,083	217,933	38,634	
1934	256,026	11,719	212,613	31,694	
1933	299,535	12,558	255,247	31,780	
1932	359,001	10,792	315,708	32,501	
1931	382,539	6,485	342,513	33,541	
1930	407,285	4,164	381,898	21,223	
1929	393,043	5,118	367,574	20,351	
1928	398,917	4,458	365,543	28,916	
1927	383,144	3,622	347,939	31,583	
1926	369,186	2,716	332,192	34,278	
1925	327,410	2,330	303,852	21,228	
1924	321,191	2,143	291,608	27,440	
1923	253,728	2,090	221,932	29,706	
1922	228,655	5,942	199,017	23,696	
1921	150,963	1,450	140,635	8,878	
1920	122,974		115,241	7,733	
1919	77,677		73,899	4,278	
1918	53,005		53,005	(1)	

¹Included in trade and industrial part-time enrollment.

17498

CONCENTRATION OF ECONOMIC POWER

*Number of Pupils Enrolled in Specified Vocational Schools, Federally aided, by
Type of Class: Fiscal Years Ended June 30, 1918-1939—Continued*

Type of class and year	Number Enrolled				
	In all schools	In agricultural schools	In trade and industrial schools	In home economics schools	In distributive occupations schools
All-day classes:					
1939.....	941,273	305,031	196,365	439,877	.....
1938.....	801,391	259,163	184,203	358,015	.....
1937.....	591,181	236,580	159,770	194,781	.....
1936.....	558,740	215,462	145,631	195,647	.....
1935.....	502,533	194,632	131,580	176,321	.....
1934.....	441,099	175,138	122,485	142,476	.....
1933.....	389,835	169,858	110,846	109,131	.....
1932.....	339,416	154,269	93,400	91,747	.....
1931.....	294,058	143,155	80,541	70,362	.....
1930.....	251,443	123,686	71,389	66,369	.....
1929.....	221,960	116,033	64,838	41,089	.....
1928.....	211,571	105,251	57,439	48,881	.....
1927.....	189,465	95,086	50,116	44,261	.....
1926.....	173,994	87,573	44,799	41,622	.....
1925.....	154,967	74,960	39,666	40,341	.....
1924.....	136,129	66,614	33,262	36,253	.....
1923.....	124,926	59,889	34,101	30,936	.....
1922.....	113,338	52,961	31,390	28,987	.....
1921.....	88,366	40,763	25,042	22,561	.....
1920.....	68,962	31,301	21,224	16,437	.....
1919.....	51,042	19,933	18,664	12,445	.....
1918.....	42,485	15,450	18,596	8,439	.....

EXHIBIT No. 2731-A

DIAGRAM VI.—Enrollment in Federally Aided Home Economics Departments or Schools, by Years, 1918-39

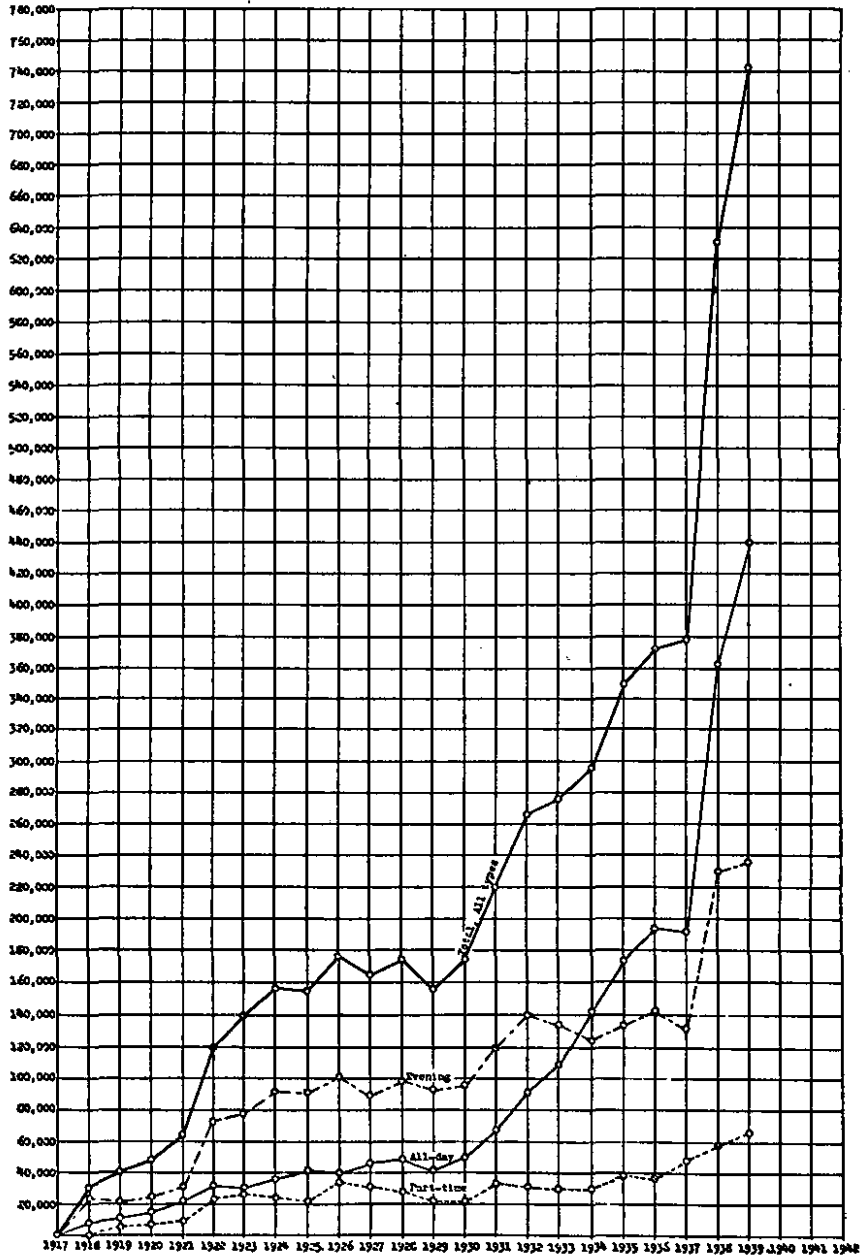
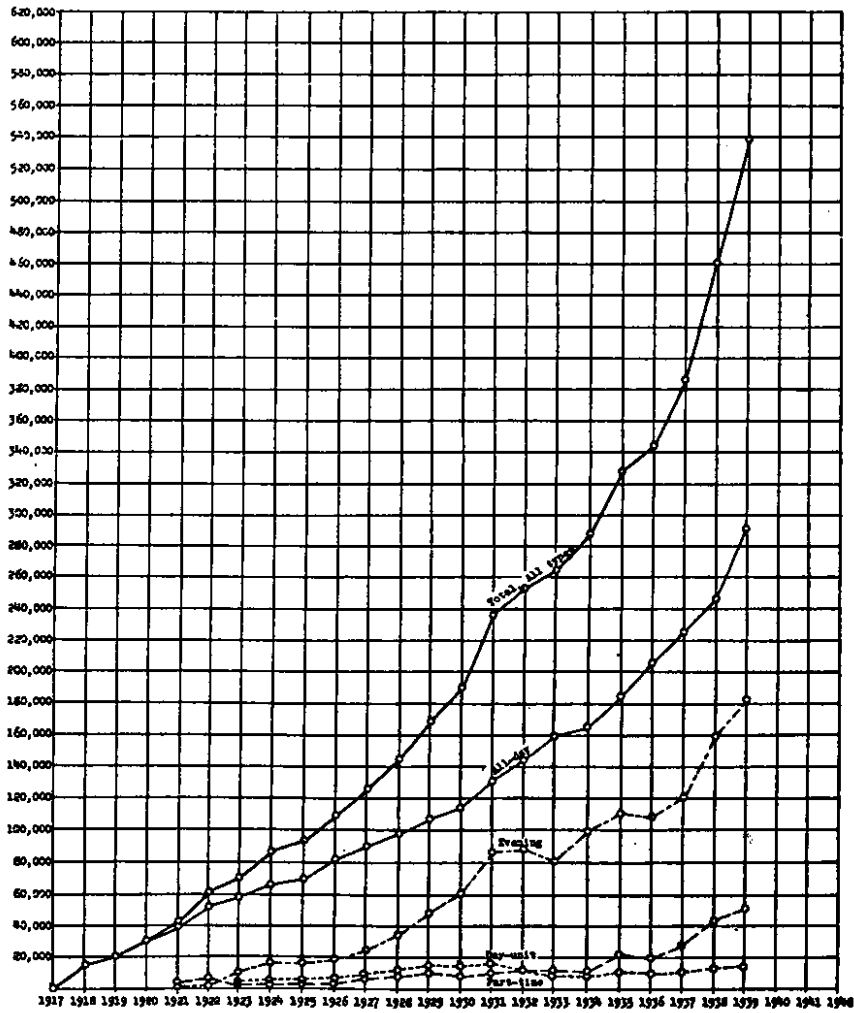


EXHIBIT No. 2731-B

DIAGRAM IV.—Enrollment in Federally Aided Agricultural Departments or Schools, by Years, 1918-39



CONCENTRATION OF ECONOMIC POWER

17501

EXHIBIT No. 2732

Amount Expended from Federal, State and Local Money for Vocational Education, by Field of Service and by Years Ended June 30, 1918 to 1939

Type of Service	Amount expended			
	Total	From Federal money	From State money	From Local money
All services: ¹				
1939	\$52,668,491.12	\$19,434,553.96	\$10,947,861.94	\$22,286,076.22
1938	44,944,637.22	17,737,117.78	9,446,752.24	17,810,667.20
1937	36,390,285.42	10,013,668.89	8,907,389.47	17,478,227.06
1936	33,427,833.78	9,748,924.82	8,606,400.49	15,072,508.65
1935	29,289,922.68	9,371,979.83	6,782,425.57	13,135,517.28
1934	28,188,416.75	6,950,944.70	7,093,203.01	14,144,269.04
1933	30,126,888.12	7,728,245.02	8,204,515.56	14,194,127.54
1932	33,402,402.59	8,414,833.75	9,036,174.82	15,951,394.02
1931	32,143,192.37	7,978,729.20	8,858,973.65	15,305,489.52
1930	29,008,898.72	7,404,223.18	8,233,148.77	14,271,526.77
1929	27,474,305.86	6,878,529.71	7,471,858.30	13,123,917.85
1928	26,715,760.48	6,821,451.75	7,028,986.81	11,865,321.90
1927	24,552,116.08	6,730,314.24	6,504,692.46	11,317,299.38
1926	23,181,700.48	6,548,857.46	6,149,051.99	10,483,961.01
1925	20,919,855.78	5,614,550.14	5,771,975.23	9,533,330.39
1924	12,845,350.92	4,832,880.34	5,174,831.06	8,837,639.52
1923	17,132,446.09	4,308,884.68	4,874,532.11	7,949,029.30
1922	14,812,988.70	3,850,118.78	4,523,939.39	6,438,930.53
1921	12,618,262.55	3,367,494.23	4,074,500.73	5,186,267.59
1920	8,535,163.84	2,476,502.83	2,670,284.78	3,388,376.23
1919	4,681,776.75	1,560,008.61	1,866,027.05	1,255,741.09
1918	3,039,061.16	832,426.82	1,024,630.48	1,181,703.86
Agricultural Service:				
1939	15,428,166.61	6,638,379.82	2,442,135.78	6,347,651.23
1938	13,600,313.66	6,107,589.69	2,158,732.97	5,303,991.40
1937	10,842,818.17	3,968,715.84	2,168,014.69	4,708,087.74
1936	10,327,254.34	3,862,900.90	2,039,397.13	4,424,956.31
1935	8,805,608.90	3,715,054.28	1,499,065.11	3,600,449.50
1934	8,333,669.48	3,006,949.51	1,629,181.50	3,697,528.47
1933	9,408,635.68	3,304,441.81	1,979,789.11	4,124,355.26
1932	10,212,810.78	3,688,513.47	2,123,443.05	4,400,854.26
1931	9,882,628.94	3,461,542.87	2,088,542.68	4,332,543.39
1930	8,743,882.05	3,178,623.65	1,787,240.80	3,782,511.70
1929	8,418,981.29	2,903,959.92	1,703,949.63	3,811,072.66
1928	7,608,913.76	2,844,464.24	1,639,661.36	3,224,788.16
1927	7,469,295.39	2,801,691.67	1,509,065.78	3,159,538.04
1926	7,164,460.46	2,656,896.13	1,571,426.97	2,936,147.36
1925	6,146,124.01	2,262,542.88	1,370,964.90	2,512,616.23
1924	5,253,912.86	1,897,807.50	1,203,480.62	2,152,618.74
1923	4,647,042.04	1,669,698.75	1,108,461.22	1,869,882.07
1922	4,058,440.36	1,435,475.22	1,039,487.89	1,583,477.25
1921	3,393,089.21	1,192,181.17	968,674.16	1,232,232.88
1920	2,437,289.06	889,886.29	678,824.43	868,575.34
1919	1,413,938.49	528,679.13	399,982.80	485,276.56
1918	739,933.27	273,282.08	220,713.98	245,937.21
Trade and Industrial Service:				
1939	20,832,644.20	6,301,254.80	4,612,056.89	9,919,333.51
1938	18,115,847.31	6,046,141.66	4,176,218.97	7,894,486.68
1937	17,312,562.22	3,853,812.68	4,178,082.83	9,280,666.71
1936	15,008,127.80	3,429,778.81	4,232,635.26	7,343,719.73
1935	13,177,443.06	3,291,901.48	3,211,770.68	6,673,770.90
1934	13,446,691.91	2,998,241.17	3,622,824.00	7,225,626.74
1933	13,714,762.16	2,298,676.92	3,956,253.51	7,459,832.73
1932	16,826,723.79	2,546,899.95	4,370,487.57	8,908,336.27
1931	14,808,842.29	2,578,844.29	4,230,256.30	7,999,741.70
1930	14,330,079.59	2,509,630.68	4,093,683.83	7,727,315.08
1929	12,746,710.62	2,467,217.11	3,568,066.20	6,711,427.31
1928	12,020,656.81	2,454,445.05	3,378,574.19	6,187,636.57
1927	11,374,553.34	2,426,586.97	3,074,573.53	5,873,395.84
1926	10,650,837.79	2,408,778.71	2,791,708.97	5,450,350.11
1925	9,677,893.35	1,973,684.12	2,551,117.74	5,063,141.49
1924	8,555,484.65	1,589,524.44	2,281,708.64	4,684,253.47
1923	7,613,129.51	1,345,911.72	2,178,352.74	4,088,865.03
1922	6,419,777.32	1,170,907.05	1,888,173.64	3,358,696.63
1921	5,291,761.72	1,006,670.66	1,558,828.72	2,726,262.44
1920	3,396,726.65	699,644.75	999,847.48	1,697,234.42
1919	2,002,473.50	491,192.65	610,885.63	900,395.22
1918	636,438.98	307,374.87	497,988.39	731,076.99

¹ Amounts expended for all services, combined. Include expenditures from State money for administration which are not distributed by type of service as follows: 1939, \$13,642.10; 1937, \$5,839.32; 1936, \$1,665.17; 1934, \$4,602.21; 1933, \$3,950.40; 1932, \$3,956.14; 1929, \$5,923.64; 1928, \$6,013.72.

Amount Expended from Federal, State and Local Money for Vocational Education,
by Field of Service and by Years Ended June 30, 1918 to 1939—Continued

Type of Service	Amount expended			
	Total	From Federal money	From State money	From Local money
Home Economics Service:				
1939.....	\$11,665,398.70	\$4,124,088.81	\$2,106,433.68	\$5,334,876.21
1938.....	9,135,325.57	3,670,804.51	1,558,301.95	3,906,219.11
1937.....	5,890,064.56	1,442,322.66	1,547,285.59	2,900,456.31
1936.....	5,806,760.57	1,428,800.69	1,358,614.27	3,019,345.71
1935.....	5,030,603.39	1,365,403.94	1,136,304.35	2,528,895.10
1934.....	4,331,977.91	958,579.29	929,526.05	2,443,872.57
1933.....	4,677,657.49	1,116,077.13	1,258,537.59	2,303,042.77
1932.....	5,129,039.10	1,130,398.29	1,402,952.55	2,595,688.26
1931.....	4,751,274.46	876,890.91	1,365,280.90	2,509,102.65
1930.....	4,382,038.05	678,226.71	1,286,530.07	2,417,280.87
1929.....	3,903,118.66	481,192.67	1,125,456.08	2,296,469.91
1928.....	3,721,132.23	492,158.26	1,073,784.28	2,155,189.69
1927.....	3,337,827.71	486,126.06	907,289.56	1,944,412.09
1926.....	3,137,391.82	499,631.33	810,624.49	1,827,136.00
1925.....	2,943,524.30	400,120.15	816,232.02	1,727,182.13
1924.....	2,744,635.63	331,660.81	740,318.18	1,672,456.64
1923.....	2,748,947.42	286,968.57	649,531.92	1,813,446.93
1922.....	2,118,562.96	245,885.87	671,882.76	1,201,294.33
1921.....	1,822,247.97	192,387.21	595,326.04	1,034,634.72
1920.....	1,054,469.05	155,769.24	329,633.53	569,067.28
1919.....	554,195.42	116,952.01	155,536.88	282,706.53
1918.....	334,548.49	57,773.82	114,790.69	161,983.98
Teacher Training:				
1939.....	4,010,999.46	1,883,778.45	1,628,872.91	498,348.10
1938.....	3,500,620.26	1,664,371.13	1,467,661.05	427,968.08
1937.....	2,848,001.15	1,050,817.71	1,008,167.14	289,016.30
1936.....	2,286,045.88	1,027,450.82	974,088.66	284,506.90
1935.....	2,213,475.67	908,720.18	922,563.67	282,201.72
1934.....	2,071,475.24	887,174.73	907,059.25	277,241.26
1933.....	2,261,862.39	949,050.76	1,006,034.85	306,896.78
1932.....	2,530,872.78	1,049,022.04	1,136,335.51	345,515.23
1931.....	2,600,746.68	1,061,751.13	1,174,893.77	364,101.78
1930.....	2,453,400.43	1,042,843.24	1,066,338.07	344,219.12
1929.....	2,396,571.74	1,026,180.01	1,065,463.75	304,947.98
1928.....	2,559,044.94	1,030,384.19	1,030,953.27	297,707.48
1927.....	2,370,437.64	1,016,010.64	1,013,663.59	340,763.41
1926.....	2,229,010.39	888,366.29	975,321.56	265,322.54
1925.....	2,252,314.10	978,282.99	1,033,070.57	240,960.54
1924.....	2,291,317.88	1,013,687.59	949,319.62	328,310.67
1923.....	2,223,327.12	1,007,306.64	838,185.23	277,834.25
1922.....	2,218,208.06	997,850.64	924,895.10	295,462.32
1921.....	2,111,064.65	906,406.29	951,671.51	192,987.55
1920.....	1,646,662.08	731,203.55	661,979.32	253,479.21
1919.....	981,169.34	424,184.82	400,221.74	156,762.78
1918.....	428,140.44	193,996.35	191,437.42	42,706.67
Distributive Occupations:				
1939.....	817,640.05	487,052.78	144,721.10	185,866.17
1938.....	643,030.13	248,210.69	116,837.80	277,982.13

CONCENTRATION OF ECONOMIC POWER

17503

EXHIBIT No. 2733

DIAGRAM I.—Number and Percentage of Persons Employed in Different Age Groups, as Painters, Glaziers, and Varnishers, According to United States Census, 1930

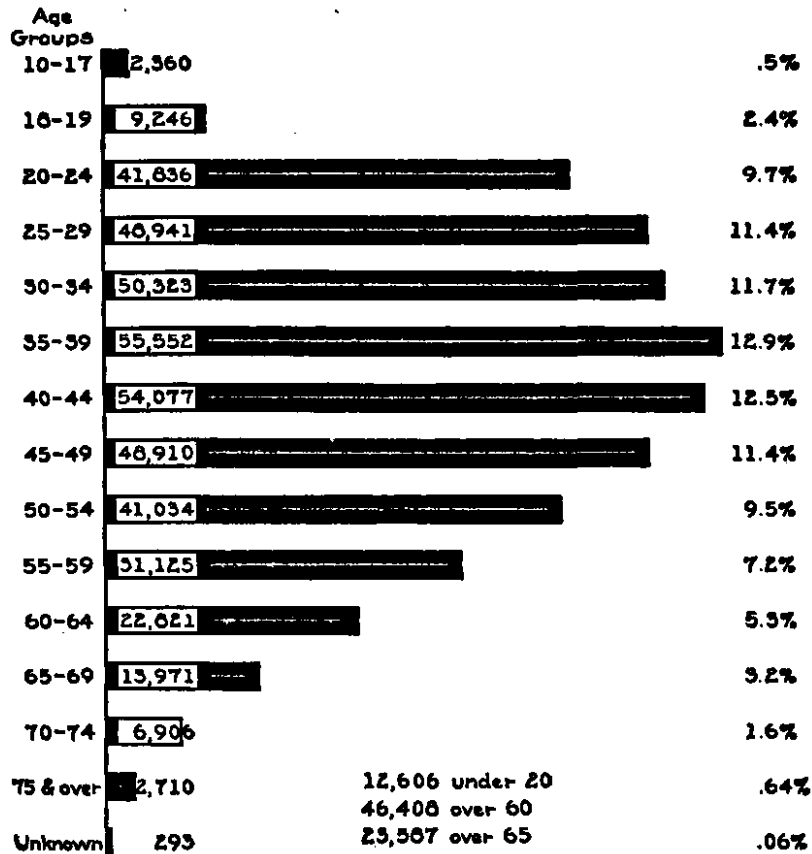


EXHIBIT No. 2734

Distributive workers—Census 1930

Managers:	
Owners, Operators, Contractors.....	3,196,259
Officials.....	517,164
Supervisors.....	49,250
Agents:	
General.....	186,248
Purchasing.....	28,669
Sales.....	500,512
Salespeople:	
Selling in stores.....	2,102,509
Commercial travellers.....	223,050
Canvassers.....	63,252
Demonstrators.....	7,533
Apprentices.....	2,444
Clerks in stores.....	401,991
Deliverymen.....	604,812
Service.....	1,853,426
Total.....	9,737,119

EXHIBIT No. 2735

EXAMPLES OF STUDY UNITS ON ECONOMIC PROBLEMS FROM AMERICAN SECONDARY SCHOOLS¹

AGRICULTURE:

"Adjusting Agricultural Life To Meet the Conditions Created by the Power Age." Section II. *Materials of Instruction Suggested for the Second Year of the Core Curriculum of Virginia Secondary Schools*. Richmond, Va.: State Board of Education, October 1933. p. 75. (Mimeo.)

BUSINESS CYCLES:

"The American People Have Tried To Evolve an Economic System Which Provides the Greatest Good for the Greatest Number." Unit II. Eleventh Grade Social Studies. Benjamin Franklin High School, Rochester, N. Y. Problem 6, p. 37-39. (Mimeo.)

CONSERVATION:

Summary of a ninth grade project. Memorandum from Hazel Sample. Norris School, Norris, Tenn. January 31, 1939. 3 p. (Mimeo.) Also 3-page typewritten statement entitled: "Ninth Grade Report Section B."

CONSUMER PROTECTION AND EDUCATION:

"Social Problems." Senior course. Eugene High School, Eugene, Oregon. (Mimeo.)

"Consumer Education." Sacramento High School, Sacramento, Calif. p. 32-33. (Mimeo.)

ECONOMIC ORGANIZATION:

"The Origin and Development of Our Democratic Institutions." Unit III. New York City Public Schools. p. 6. (Mimeo.)

"A Comparison of Modern Forms of Government." Contemporary Problems (XI A & B-II). Social Studies. Central High School, Tulsa, Okla., 1938. p. 14. (Mimeo.)

INCOME DISTRIBUTION:

"Proposed Means of Bringing about a Better Distribution of Wealth." Unit III. Curriculum Record 1938-39. Grade 12. P. K. Yonge School, Gainesville, Fla. (Mimeo.)

"Current Economic Problems." Grade 12, South Pasadena High School, South Pasadena, Calif. p. 15-17. (Mimeo.)

LABOR RELATIONS:

"Employer and Employee." Modern Problems Unit No. 7. Grade 12. Cleveland, Ohio: Board of Education, Division of Social Studies, October 1938. p. 11-12. (Mimeo.)

"Labor in America." (for use in B11 American Life and Institution.) Los Angeles, Calif.: City School District, Division of Instruction and Curriculum, Secondary Curriculum Section, November 1938. p. 16-17. (Mimeo.)

MONEY—CONTROL AND ISSUANCE:

"The American People Have Tried To Evolve an Economic System Which Provides the Greatest Good for the Greatest Number." Unit II. Eleventh Grade Social Studies. Benjamin Franklin High School, Rochester, N. Y. Problem 3, p. 27-30. (Mimeo.)

PUBLIC FINANCE:

"Governmental Expenditures and Income." Unit 4, Section I. Social Civics. Grade 12. Senior High School, Springfield, Mo. p. 10. (Mimeo.)

PUBLIC UTILITIES:

"Exchanging Products." Nine A, Social Studies. Unit II. Tentative Outline. Cleveland, Ohio: Department of Social Studies, Cleveland Public Schools, September 8, 1935. p. 67-68. (Mimeo.)

REGULATION OF INDUSTRY:

"The Development of the United States After the Civil War." 11B History (Special). Guide Sheet 1. South Philadelphia High School for Girls, Philadelphia, Pa. (Mimeo.)

SOCIAL SECURITY:

"Social Security." Modern Problems Unit No. 9. Grade 12. Cleveland, Ohio: Board of Education, Division of Social Studies, September 1939. p. 4-5. (Mimeo.)

TRANSPORTATION PROBLEMS:

"American Economic Life." Benjamin Franklin High School, New York, N. Y. p. 15-16. (Mimeo.)

EXAMPLE OF A UNIT ON BUSINESS CYCLES

"The American People Have Tried To Evolve an Economic System Which Provides the Greatest Good for the Greatest Number." Unit II. Eleventh Grade Social Studies. Benjamin Franklin High School, Rochester, N. Y. Problem 6, p. 37-39. (Mimeo.)

The business cycle is the topic of Problem 6. The following material is included:

A. Economic Ideas and Terms You Should Know:

Business cycle

Difference between "panic" and "depression"

Theories regarding the causes of this cycle

The use of index number to measure the cycle

The stages of a "normal" cycle.

B. Guide Posts:

Although the business cycle seems to operate in accordance to certain "laws" it must be remembered that these are not "natural laws," but are laws brought about by man-made conditions.

It seems certain that the business cycle operates only as it does because society previously establishes, or fails to remove, certain conditions which bring it about.

Therefore, depressions may be called "man made." This seems to indicate that they can be "man controlled."

¹ Supplement to Statement, "Education and Economic Literacy," by William G. Carr, presented before the Temporary National Economic Committee, April 25, 1940.

CONCENTRATION OF ECONOMIC POWER 17505

One must always distinguish between two conditions which have similar outward appearances; namely, "overproduction" and "underconsumption."

Depressions are apparently a symptom of an ill in the "social body." To prevent depressions something must be done, but this requires some modification of economic conditions as they now are.

A modification of capitalism does not necessarily mean a change to socialism or communism.

EXAMPLE OF A UNIT ON REGULATION OF INDUSTRY

"The Development of the United States after the Civil War."
11B History (Special). Guide Sheet 1. South Philadelphia
High School for Girls, Philadelphia, Pa. (Mimeo.)

Part III of the outline for this history class is headed, "The Growth of Big Business and Consequent Attempts at Regulation." The topics included are shown below:

- A. List the reasons for the prosperity of the North during the Civil War.
- B. Describe the economic rebuilding of the South after the Civil War.
- C. The Consolidation of Industry:
 1. Causes.
 2. Extent of consolidation.
 3. Types.
 4. The disadvantages and advantages.
- D. Governmental Regulation of Big Business:
 1. The railroads.
 - a. Why was regulation desired?
 - b. Types:
 - (1) Evaluate attempts at State regulation.
 - (2) Chart all the Federal Acts regulating the railroads, giving names of act; date; terms; importance; attitude of courts (if expressed).
 2. Big Business:
 - a. Review the disadvantages of big business to determine the causes for regulation.
 - b. Chart the laws regulating big business as you charted railroad regulations.
 - c. What new ideas of regulation have been developed in the present administration?

EXAMPLE OF A UNIT ON AGRICULTURE

"Adjusting Agricultural Life to Meet the Conditions Created by the Power Age." Section II. *Materials of Instruction Suggested for the Second Year of the Core Curriculum of Virginia Secondary Schools*. Richmond, Va.: State Board of Education, October 1938. p. 75. (Mimeo.)

The following outline is suggested for discussion of the farm tenancy question:

Combating the Evils of Farm Tenancy

Suggested Content

- I. Contributing causes to share-cropping and other forms of farm tenancy:
 - A. The difficulty experienced by many farmers in retaining possession or operating a farm successfully due to:
 1. Original failure to recognize the necessity of providing public education.
 2. Original unequal distribution of land.
 3. The relatively small income from farming.
 4. The relative insecurity of farm returns.
 5. The relatively high cost of production.
 6. Lack of crops suitable to soil areas.
 7. Tendency to engage in single-crop farming.
 - B. Concentration of land and capital in the hands of a few.

- II. Concomitants of tenancy:
- A. Economic insecurity of most tenants.
 - B. Unsatisfactory standards of living.
 - C. Impoverishment of soil.
 - D. Inefficient farming practice.
 - E. Transient farm population.
 - F. Maladjustments of personality:
 1. Apathy.
 2. Servility.
 - G. Non-participation in civic life.
 - H. Large families.
- III. Aids that may help in combating the evils of tenancy:
- A. More education.
 - B. Government subsidy.
 - C. Improved tenant-owner relationships.
 - D. Attraction of the more capable to the farm.
 - E. Application of scientific research.
 - F. Growing crops suitable to the soil and climate.

EXAMPLE OF A UNIT IN CONSERVATION

Summary of a ninth grade project. Memorandum from Hazel Sample, Norris School, Norris, Tenn. January 31, 1939. 3 p. (Mimeo.) Also 3-page typewritten statement entitled: "Ninth Grade Report-Section B."

Excerpts from the memorandum on the selection and development of the topic, "Game Conservation," follow:

"After due consideration the class selected the topic of Game Conservation and proceeded to make specific plans for the work. So far, there have been three steps to this unit: The first step was the preparation of charts giving all the necessary information concerning cover, food, habitat, predators, range and present supply of animals, fish and game birds of this area * * *

"The purpose of the next step of the unit was to find out what agencies, Government or private, are connected with the work of conservation and what they have done and are doing * * * Various committees in the group worked on the following topics as set up by the class: the history of conservation, the government agencies that deal with conservation, the government projects, such as C. C. C., T. V. A., Boulder Dam, United States Bureau of Fisheries, and National Forests and Parks * * *

"The third step in the unit was the practical one of actually taking part in a project for game conservation. For the use of this class, Mr. Varnell by recommendation of the Forestry Department secured the allotment of one hundred acres of land for school use by this group and others which may follow. Members of this class have done a good practical job of surveying and staking this section of land * * * The class has also divided the strip of land into five units so that each of the five committees of the class will have the full responsibility of planning and executing the improvements to the land in the light of their purpose of taking part in all the activities which go into providing a game refuge * * *

From the typewritten report comes the following supplementary information:

"Type of activities done on the plot: planting of game food, identification of game food, reforestation, erosion work, thinning of trees, rabbit retreats, clearing of fire lanes, clearing of debris from two old dwellings, grafting of fruit and nut trees, identification of wild flowers and their conservation, making of propagation beds, correct method of pressing and mounting wild flower specimens, and the possibility of pasturing certain sections advantageously."

EXAMPLE OF A UNIT ON TRANSPORTATION PROBLEMS

"American Economic Life." Benjamin Franklin High School, New York, N. Y. p. 15-16. (Mimeo.)

The problems of transportation and communication are taken up in Section F of this unit, in the part entitled, "The United States without a Frontier 1890 * * *." The outline follows:

- A. Railroads:
1. Consolidation into great systems.
 2. Expansion of the powers of the Interstate Commerce Commission:
 - a. Hepburn Act.

- b. Mann-Elkins Act.
- c. Esch-Cummings Act—1920.
- 3. Elements of strength and weakness in the present economic position of railroads:
 - a. Competing means of transportation.
 - b. Debt burden.
 - c. Increasing efficiency.
 - d. Government aid.
 - e. New policy toward consolidation.
- 4. Shall the United States government own and operate the railroads?
- B. Automobile and its influence:
 - 1. on the railroad.
 - 2. on road building.
 - 3. on rural life.
 - 4. on problem of Federal regulation of automobile traffic.
- C. Water transportation:
 - 1. Development of internal water transportation.
 - 2. Panama Canal.
 - 3. Proposed St. Lawrence Canal.
 - 4. Merchant marine:
 - a. continued decline to 1914.
 - b. effect of World War.
 - c. attempts to preserve World War gains.
 - d. value of merchant marine.
- D. Air Transport.
- E. Post office—its expanding activities.
- F. Radio:
 - 1. a factor in American economic life.
 - 2. problem of control—Federal Communication Commission.

EXAMPLE OF A UNIT ON PUBLIC UTILITIES

"Exchanging Products." Nine A, Social Studies. Unit III. Tentative Outline. Cleveland, Ohio: Department of Social Studies, Cleveland Public Schools. September 8, 1936. p. 67-68. (Mimeo.)

In part III, which pertains to the relations between business and government, government aids to business and government restraint of business are discussed. Public utilities and public control are included in section C, having to do with restraint of business, as follows:

Government Restraint of Business

- 1. Laissez-faire.
- 2. Government control or regulation:
 - a. Zoning.
 - b. Bank inspection.
 - c. Pure food laws.
 - d. Blue sky laws.
 - e. Others.
- 3. Control of public utilities:
 - a. Reasons for control:
 - (1) Vital service rendered by utilities.
 - (2) Supposed to be available to everybody on equal terms.
 - (3) Can operate only by special authority of government.
 - b. Provisions for control:
 - (1) Interstate Commerce Act, 1887.
 - (2) State Utilities Commissions.
 - (3) Federal Trade Commission.
 - (4) New Deal legislation—T. V. A., Holding Company Act, etc.
 - (5) Others.
- 4. Anti-trust laws:
 - a. Sherman Anti-Trust Act.
 - b. Clayton Anti-Trust Act.
 - c. Federal Trade Commission Act.
 - d. Recent government action.

EXAMPLE OF A UNIT ON LABOR RELATIONS

"Employer and Employee." Modern Problems Unit No. 7. Grade 12. Cleveland, Ohio: Board of Education, Division of Social Studies, October 1938. p. 11-12. (Mimeo.)

Topic VI of this unit is entitled "What Causes Strikes? How Can Strikes Be Settled?" The following outline is suggested:

1. Causes of strikes.
2. When strikes occur:
 - a. Principal industries involved.
 - b. Comparison in periods of depression and prosperity.
3. Types of strikes:
 - a. "Sit-down."
 - b. General.
 - c. Sympathetic.
4. Strike tactics:
 - a. Use of violence.
 - b. Picketing.
 - c. Attitude toward "scabs."
5. Employer tactics:
 - a. Use of strikebreakers.
 - b. Use of company guards.
 - c. Appeal to state for National Guard.
 - d. Appeal to courts.
6. Cost of strikes:
 - a. To the workers.
 - b. To the employer.
 - c. To the public.
7. Possible methods of settling labor disputes:
 - a. Conciliation.
 - b. Mediation.
 - c. Arbitration.
 - d. Laws preventing strikes.

EXAMPLE OF A UNIT IN LABOR RELATIONS

"Labor in America." (For use in B11 American Life and Institutions.) Los Angeles, Calif.: City School District, Division of Instruction and Curriculum, Secondary Curriculum Section, November 1938. p. 16-17. (Mimeo.)

Section B of the subject matter outline for the course "Labor in America" deals with the rise of the problem of capital vs. labor. Organizations of labor are discussed within this section, as follows:

Organizations of Labor

- A. Labor unions:
 1. History—legality—Knights of Labor, etc.
 2. Two chief labor unions today.
 - a. A. F. of L., Gompers, Green.
 - b. C. I. O., John L. Lewis, Martin, Beck.
 3. Methods:
 - a. Collective bargaining.
 - b. Strike—walkout—sit down.
- B. Company unions:
 1. Purpose—to keep workers satisfied.
 2. Methods:
 - a. Profit sharing.
 - b. Compensation—unemployment.
 - c. Pension plans.

EXAMPLE OF A UNIT ON INCOME DISTRIBUTION

"Proposed Means of Bringing about a Better Distribution of Wealth." Unit III. Curriculum Record 1938-39. Grade 12. P. K. Yonge Laboratory School, Gainesville, Florida. (Mimeo.)

The following is part of the outline worked out for the unit on the distribution of wealth:

- A. Meaning of wealth:
 1. Social wealth vs. individual wealth.
 2. Meaning of money and its functions.
- B. The wealth of the United States:
 1. Raw materials:
 - a. Agricultural land.
 - b. Minerals unmined, estimated.
 - c. Forest lands still standing.
 2. Manufacturing plants for:
 - a. Food production.
 - b. Textile and clothing production.
 - c. Automobile and tire production.
 - d. Paper making, printing and publishing.
 - e. Iron and steel.
 - f. Other manufactures.
 3. Services:
 - a. Electric power utilities facilities.
 - b. Transportation facilities.
 - c. Merchandising stores.
 - d. Money and credit establishments.
 - e. Labor—number of workers, estimated value in production.
- C. Distribution and use of wealth in United States:
 1. Growth of total income.
 2. Sources of total income (use same division as in listing producing agencies).
 3. Geographical distribution of wealth.
 4. Family division of national income.
 - a. Per capita division.
 5. Distribution of income by size of income per person.
- D. Means of increasing wealth and effecting a better distribution:
 1. Application of science and invention to means of production.
 2. Increase of plant facilities.
 3. Improvement of distributive system of commodities.
 4. Increase wealth of lower income groups:
 - a. Lower prices.
 - b. Higher wages.
 - c. Income tax on upper groups.
 - d. Economic security for lower group in old age.

EXAMPLE OF A UNIT ON INCOME DISTRIBUTION

"Current Economic Problems." Grade 12. South Pasadena High School, South Pasadena, California. p. 15-17. (Mimeo.)

Among the units of this course is Unit V, entitled, "Where the Return from Production Goes." The outline of this unit follows:

Problems of the Unit

1. What is distribution? How is distribution related to income?
 - a. How could the income of the average American family be increased?
 - b. How do progressive taxes affect distribution?
 - c. Why do we have poverty?
2. How is distribution related to production?
 - a. What is the enterpriser's responsibility relative to distribution?
 - b. Do we have an "economy of abundance" in the U. S.? Explain.
3. How is the amount of rent agricultural land will return determined? urban land?
 - a. Why is the farmer's distribution problem so serious? How has government sought to aid the farmer?
 - b. How has cooperative marketing aided California growers?
4. Do those who supply the capital for industry obtain a fair return?
 - a. Why is interest paid for loans?
 - b. How are interest rates determined?
 - c. How is saving motivated?

5. What is the place of the business man in industry?
 - a. Is the business man fairly rewarded for his services? Why doesn't labor carry the risks of business? Would you choose business as a career? Why or why not?
 - b. What are the sources of profits from which the income of management is drawn? How does competition affect profits?
6. How is government paid for its services to business and industry?
 - a. Is government overpaid?
7. How is the share of income going to labor determined?
 - a. How are wage rates determined? How do money wages and real wages differ?
 - b. What is a fair wage? How may the efficiency of labor be increased?
 - c. What is collective bargaining? How does it work?
 - d. How do industrial unions differ from craft unions?
 - e. Should labor be allowed to strike?
 - f. Should labor unions be compelled to incorporate? Why is the public vitally concerned in capital labor conflicts?
 - g. Should the Wagner Act be modified?
 - h. How do you think labor disputes should be settled?

EXAMPLE OF A UNIT ON SOCIAL SECURITY

"Social Security." Modern Problems Unit No. 9. Grade 12. Cleveland, Ohio: Board of Education, Division of Social Studies, September 1939. p. 4-5. (Mimeo.)

Topic I suggested in this study of social security is "Need for Social Security." The outlined proposed follows:

1. Relief prior to 1933:
 - a. Local poor relief.
 - b. State action on relief.
2. Break-down of the local relief system:
 - a. Economic changes.
 - b. Reasons for breakdown of local relief.
 - c. Federal action in 1932 on relief.
3. Relief under F. E. R. A. and C. W. A.:
 - a. Diversity of relief problems.
 - b. Nature of work relief.
 - c. The Civil Works Program.
 - d. Direct relief before 1935.
 - e. Funds appropriated to these agencies.
4. Permanence of the relief problem:
 - a. Probable permanence of destitution.
 - b. Our economic instability.
 - c. Seasonal variations in employment.
 - d. Technological improvement and unemployment.
 - e. Increase in the number of aged in the United States.
5. Some other plans proposed to bring about Social Security:
 - a. The "Share-our-Wealth" movement.
 - b. The Townsend Old-Age Pension Plan.
 - c. The National Union for Social Justice.

EXAMPLE OF A UNIT IN CONSUMER PROTECTION AND EDUCATION

"Social Problems." Senior course. Eugene High School, Eugene, Oregon. (Mimeo.)

As part of the Social Problems course, pupils take up the problems of the consumer. Section A and the first part of Section B are quoted from the suggested study and discussion problems on consumer exploitation and the cooperative movement:

- A. *Statement of the Main Problem:* How can the consumer be protected from exploitation?
 1. Who is the Consumer?
 2. What is exploitation?
 3. What is consumer exploitation?
- B. *Analysis of the Problem:*
 1. Where is the problem of consumer exploitation located?
 2. When did the problem start?

3. How serious is the problem? To what extent does each of the following contribute to the seriousness of the problem:
- a. The changing nature of human wants?
 - b. False and misleading advertisements and testimonials?
 - c. Inability of consumers to judge quality of goods?
 - d. Wide price variations for the same or similar quality. (Dumping)?
 - e. Confusion of labels and brands?
 - f. Short weights: Honest versus intentional errors?
 - g. Intentionally cheapened quality of products?
 - h. Artificial scarcity and planned destruction?
 - i. Needless wastes of depressions, unemployment, duplication, cut-throat competition, swift changes in style, etc.
 - j. Increased price of product far beyond that which wage cost increases justify?
 - k. Low incomes and inadequate levels of living?
 - l. Inadequate pure food and drug laws?
 - m. Indifference to Consumer Welfare?
 - n. Exploitation by middlemen?

EXAMPLE OF A UNIT ON CONSUMER PROTECTION AND EDUCATION

"Consumer Education." Sacramento High School, Sacramento, Calif. p. 32-33. (Mimeo.)

In division III on the improvement of buying, Unit III pertains to protection and aid for consumer by law and other organizations. The following outline is offered for the study of federal control:

Problems and Suggested Procedure

Content

PROBLEM I

Some legislation has been enacted for the purpose of protecting the consumer-buyer against misrepresentation.

What are the federal laws protecting the consumer?

PROCEDURE

1. Explain the control exercised by the Federal Trade Commission.
2. Examine the Commission's Annual Report.
3. Discuss the labeling of furs prior to the rules set and adopted by the fur industry at the suggestion and force of the Federal Trade Commission.
4. What are the present rules for labeling of furs?
5. What trade practice was adopted in the knit underwear industry in 1930 due to the Commission?
6. Discuss other instances of control exercised by the Commission for the advantage of the consumer.
7. What new powers have been granted the Federal Trade Commission under the Wheeler-Lea Bill?
8. Discuss the Commission's present ruling regarding "rayon" labeling.
9. Review the Federal Food and Drug Act as studied in the unit on labels.

1. FEDERAL CONTROL

- a. Federal Trade Commission:
 1. Issues orders to "cease and desist" questionable business practices.
 2. Practices include adulteration, misleading as to quality, origin, weight and composition.
 3. Limitations of the powers of the Commission to protect the consumer.
 4. Penalties.
- b. Federal Food and Drug Act:
 1. A mislabeling act.
 2. Punishes attempt to mislead and deceive the purchaser through the statements or devices that appear on the label.
 3. Sets up relatively few positive requirements as to what information must be given.
 4. Operates primarily to protect the consumer's pocketbook, and only to an uncertain and limited degree as a protection to health.

*Problems and Suggested Procedure**Content*

PROCEDURE

10. Ask the students to look for the purple stamp, "U. S. Inspected and Passed," on meat purchased for the home. Discuss the purpose of such control. What events prior to the enactment of this legislation brought about this need?
11. Discuss the advantages to our business system of uniformity in weights and measures. Mention some new weights and measures adopted after exhaustive research work has been done such as the measurement of electricity, radium, light, radio, etc.
12. Read "Weighed and Found Wanting" by R. Littell, *Reader's Digest*, March 1938.

1. FEDERAL CONTROL

5. Limitations of the act give no control over advertising of foods and medicines either in the press, billboards, poster or radio.
6. Many loopholes in which the manufacturer is able to evade control, such as the distinctive name clause "misleading and fraudulent," etc.
- c. Federal and State Meat Inspection:
 1. Inspect at slaughtering and meat packing establishments.
 2. Meat found unsound, unhealthful, unwholesome is rejected and cannot be sold as food.
- d. Regulations of weights and measures:
 1. Standard weights and measures uniform throughout U. S.
 2. Bureau of Standards created in 1901 to take over the work of the office of weights and measures.
 3. Investigation, education and research carried on in problems of measurement.

EXAMPLE OF A UNIT ON MONEY—CONTROL AND ISSUANCE

"The American People Have Tried To Evolve an Economic System Which Provides the Greatest Good for the Greatest Number." Unit II. Eleventh Grade Social Studies. Benjamin Franklin High School, Rochester, N. Y. Problem 3, p. 27-30. (Mimeo.)

Problem 3 pertains to the nature and origin of the American money system. The following material is included:

A. Economic Ideas and Terms You Should Know:

The superiority of money over barter.
 Qualifications of good money.
 Bi-metalism, mono-metalism, and Gresham's Law.
 The quantity theory of money and the meaning of inflation.
 The United States Constitution; Article I, Sec. 8.
 Credit.

B. Outline of Content:

History of "hard" money:
 The multiplicity of money types up to 1792.
 The establishment of the decimal system.
 Law of 1792; the 15-1 ratio.
 Law of 1834; gold dollar fixed at 23.2 grains of gold.
 Law of 1837; new ratio 16-1.
 Discovery of gold—1849.
 The fight over bi-metalism versus mono-metalism:
 "The crime of '73."
 Bland-Allison Act—1878.
 Sherman Silver Purchase Act and its repeal—1890-'93.
 The presidential campaign of 1896.
 The Gold Standard Act of 1900.
 The Pittman Act of 1918.
 Effects of the depression of 1929:
 General effects.
 Gold Repeal Resolution—1933.
 Gold Reserve Act of 1934.
 Silver Purchase Act of 1934.
 The stabilization fund.

History of paper money:

Paper money before the Constitution:

Colonial paper issued before the Revolutionary War.
"Continental."

The redemption of colonial currency.

Bank Credit 1791-1861.

First and Second U. S. Banks.

Bank credit of "wild cat" and "pet banks."

Effects of the depression of 1837.

Effects of the "Specie Circular."

Establishment of the National Banks.

Issuance of "Greenbacks."

The reason.

Redemption Act of 1875.

The Federal Reserve System and its credit money.

Types of money in the U. S. today:

An analysis of descriptive nature should be undertaken for each of the following types:

Coin.

Certificates.

Credit (government, bank, and private).

Fiat (if any).

C. Guide Posts:

Money is a means and not an end; it is a "go-between."

Money is essential under any highly organized economic system.

The value of money changes, even when we have a fixed metal coin.

Changes in the value of money bring hardships to one group or another; therefore, a dollar of stable value would be desirable.

The replacement of government bonds by paper money would not necessarily mean inflation, as the money might only be used as a reserve for more bank loans.

Money is a commodity. It responds in value to the laws of supply and demand like other commodities.

(At least until 1933 money was considered and treated as a commodity, but recently there has been a tendency to consider it purely as a medium of exchange.)

EXAMPLE OF A UNIT IN PUBLIC FINANCE

"Governmental Expenditures and Income." Unit 4, Section I.
Social Civics. Grade 12. Senior High School, Springfield, Mo.
p. 10. (Mimeo.)

Point 5 in this section of the Social Civics unit on governmental financing pertains to the payment of taxes. The pupils take up various theories of taxation, as indicated in the following outline:

*Theories of Taxation***1. Equal distribution:**

a. Club dues are equally distributed.

b. Persons who have no children in school may pay as much or more in taxes than those who send children to school.

c. Burden would fall too heavily on people with low incomes.

2. Benefit theory:

a. It is hard to apportion taxes according to the benefit received.

b. Many persons who are poor receive great benefits from the government, but cannot pay taxes.

3. Ability to pay:

a. This leads to progressive taxation—the tax rate increases as the income increases.

b. The proportional tax is also used—the rate is the same for all persons.

c. At times the regressive plan is used to tax business. The license tax decreases as the business increases.

4. Single tax:

a. According to this theory all social progress increases the value of land.

b. People are wealthy because they appropriate the economic rent of land.

- c. Persons are able to hold land for speculation.
- d. The unearned increment belongs to society.
- e. Does all social progress increase the value of land?
- f. If we tax only land value, is the tax flexible enough?
- g. If land values fall, how would the income of the government be affected?
- h. The tax would lead to nationalization of land.

EXAMPLE OF A UNIT ON TYPE OF ECONOMIC ORGANIZATION

"The Origin and Development of Our Democratic Institutions."
Unit III. New York City Public Schools. p. 16. (Mimeo.)

In Section V, "Democracy in Crisis," of Unit III, one of the topics considered is the challenge of other political systems of our day. The following outline is used:

1. The democracies of England and France compared to ours:
 - a. Cabinet vs. presidential systems of government; their respective merits.
 - b. Unitary vs. federal system; their respective merits.
2. Communist dictatorship in Russia; a challenge to democracy founded on the ideals of private ownership and private gain. The challenge lies in ideals, influences, or achievements, such as the following:
 - a. Socialization of wealth.
 - b. Control by the proletariat.
 - c. Planned economy.
 - d. A comprehensive program of social security.
 - e. Political changes: occupational representation, limited suffrage, restrictions on civil liberties.
 - f. Attitude toward religion.
3. Fascist dictatorship in Italy and Germany: a challenge to parliamentary government, to democracy founded on the ideals of individual freedom and laissez-faire, to the alleged cumbersomeness and inefficiency of democratic government. The challenge lies in ideals, influences, or achievements, such as the following:
 - a. Spread of fascism to other countries; fear of fascism in America.
 - b. Planned economy.
 - c. Control by the bourgeoisie.
 - d. Rigid government control of private industry and of capital-labor relations.
 - e. Aggressive nationalism.
 - f. Dictatorship.
 - (1) Practical disappearance of government (local).
 - (2) Practical disappearance of constitutional and parliamentary government.
 - (3) Restrictions on civil liberties.
4. Democracy's answer to the challenge of communism and fascism.

EXAMPLE OF A UNIT ON TYPE OF ECONOMIC ORGANIZATION

"A Comparison of Modern Forms of Government." Contemporary Problems (XI A & B-II). Social Studies. Central High School, Tulsa, Okla. 1938. p. 14. (Mimeo.)

The following are among the topics for study suggested in this course, which compares and contrasts democracy, fascism, nazism, and communism:

1. What were the conditions under which each form of government originated?
2. How do the forms of government compare?
 - a. Executives.
 - b. Legislatures.
 - c. Who is allowed to vote?
 - d. What party system is used?
 - e. Police power.
3. What is the attitude of each toward industry, public utilities, ownership of property?
4. What is the attitude toward classes and race prejudices?
5. What are the living conditions under which people live?
 - a. Houses.
 - b. Food.
 - c. Clothing.
 - d. Luxuries, etc.

6. What is the situation in regard to laboring conditions and unemployment?
 - a. What are the conditions of women workers?
7. What is the position of freedom of press, speech, religion, all individual liberties, education, etc.?

EXHIBIT No. 2736

SUMMARY OF TESTIMONY RELATING TO EDUCATION ¹

By William G. Carr, Secretary, Educational Policies Commission

Education, provided it is right in amount, distribution and kind, can and will improve the economic welfare of the American people. The evidence in support of this conclusion was drawn in part from the recent report of the Educational Policies Commission on *Education and Economic Well-Being in American Democracy* and in part from a nationwide study of citizenship training, recently completed by the Commission.

In applying this generalization the following bill of particulars was developed by the evidence before the Committee.

1. The American people should encourage qualified youth to remain in school, beyond the legal school-leaving age, by:
 - a. Development of technical and vocational schools at the upper high-school and junior-college levels.
 - b. Provision of scholarships, private and public.
 - c. Adapting the course of study to individual needs.
2. We ought at once to remove youth from the labor market by:
 - a. Approval of the Federal Child-Labor Amendment.
 - b. Fixing the school-leaving age at 16 years, at least, in every State.
 - c. Improve the enforcement of school attendance laws, especially for children in industrialized agriculture and street-trades.
3. We should encourage the revision and vitalization of economic education by:
 - a. Better vocational guidance, based on community surveys of occupational information.
 - b. Better vocational training—utilizing public schools, industry, labor and private efforts.
 - c. Better consumer education.
 - d. Conservation education.
 - e. Health education.
 - f. Vocational retraining for workers displaced by illness, accident or technological changes.
4. Education for economic citizenship may be improved by:
 - a. Giving public support to the discussion of important economic issues in secondary schools, colleges, and adult forums.
 - b. Improving the preparation of teachers in economics and the other social sciences.
 - c. Supplying much better teaching materials, and more of them, including textbooks, recordings, pamphlets, photographs and moving pictures.
5. We should use free education as one of the means to improve the nation's economic well-being by:
 - a. Removing the artificial and financial barriers which now bar many youth of real ability from advanced training which would greatly benefit them and society.
 - b. Destroy the monopoly, or partial monopoly, in certain occupations by opening up training opportunities.
6. Let America proceed to make good on the claim that the United States is a land of equal opportunity by:
 - a. State equalization of educational opportunity among school districts.
 - b. Federal equalization of educational opportunity among states.
 - c. Effectively free education.
7. Many factors affect economic well-being; education is only one factor, but a highly important one.
8. Education has many other highly important values which are not primarily economic in nature. Emphasis on the economic values of education in no way ignores or minimizes these other important values.

¹ Presented before a meeting of the Temporary National Economic Committee (TNEC) held in Washington, D. C., April 25-26, 1940.

EXHIBIT No. 2737

STATEMENT SUBMITTED BY CHARLES O'NEILL, PRESIDENT, UNITED EASTERN COAL SALES CORPORATION, NEW YORK CITY

It is difficult to add anything new to a discussion about the bituminous coal industry beyond that which is now known to government. The bituminous coal industry has been under investigation almost continuously since 1917. These investigations have been conducted at different times by hearings before House and Senate Committees, by Commissions established by the President and by the Congress, also in numerous investigations into the regulations and charges for transportation conducted by the Interstate Commerce Commission and more recently by the detailed investigations conducted by the N. R. A., the National Bituminous Coal Commission, now the Bituminous Coal Division under the Department of the Interior.

These latter investigations conducted by the Bituminous Coal Division as to marketing practices, distribution, quality, cost of production and fair minimum prices developed a record of nearly 35,000 pages of transcript and nearly 3,000 exhibits. It is my understanding that the Findings of Fact of these questions which are now in the process of being released by the Examiners for the Division will cover 4,000 pages, containing with the findings, rules and regulations, descriptions of marketing areas, classification of coals, denomination of sizes of coal and prescription of minimum prices.

In inviting me to appear before this committee I was informed that you were seeking the facts with respect to "The combination of changes in the techniques of management, trade, finance, production, processing and distribution, by which the productivity of labor is considerably increased"; and * * * "determining the influences which prevent the expansion of the national income and purchasing power of the people"; and * * * "the role played by technology in economic and business concentrations."

I shall attempt to do no more than bring to the attention of this committee some of the salient facts pertaining to the mining of coal, its place in our national economy and the labor relations within our industry and the competitive situation which confronts coal, a situation over which the producers of coal have comparatively little control. In so far as these facts fall short of satisfying this committee's search for knowledge, I respectfully refer you to the voluminous records obtained in the multitudinous investigations of our industry previously mentioned.

Most of the technological changes in the mining of coal come under the general heading of mechanization. A discussion of the actual progress of recent developments of mechanization in the industry should be ascertained in detail from mining men in different sections of the country. This is because of the wide dispersion of bituminous coal and lignite and the varying natural conditions under which coal is to be extracted in different parts of the country. The application of machinery and power to mining coal varies greatly, depending upon location, and like the industry itself is local in character. There is no such thing as a national coal mine. The output of any particular mine is usually marketed in certain well defined but limited territory. Testimony as to mechanization in its detailed application to any particular field must necessarily come from those who are personally familiar with and responsible for the mining operations in the various localities.

But I have no hesitation in asserting the broad and fundamental proposition that mechanization in the coal industry to date has been a matter of necessity rather than a matter of choice. It has come about not for the purpose of reducing employment, nor for the purpose of increasing the producers' margin of profit. It has been in order to enable the producer to remain in business and to keep his mines open. It is obvious that coal cannot be mined for any great length of time if it fails to return to the producers the cost of production. If competitive conditions, either within the industry or with other fuels and other sources of energy preclude an increased price, a price that will return the cost of production and a profit, then the alternative is either to find some way of reducing the cost of production or else go out of business. Mechanization in that aspect of the matter has been the means of keeping mines open and therefore keeping men employed, both at the mines and in transportation and trade. It is my belief that if there were no mechanization within our industry, unemployment would be greater than it is today rather than less because less coal would be sold and fewer mines would be open.

Resources of bituminous coal are very large and widely distributed. The United States Geological Survey estimates the total reserves of bituminous coal

and lignite in excess of 3,500,000,000,000 tons. An estimate of the amount of bituminous coal actually recoverable in 1923, placed the amount in excess of 1,600,000,000,000 tons. At a normal rate of production of 500,000,000 tons a year, this lower estimate indicates that the available supply will last well over 3,000 years.

Bituminous coal is mined in commercial quantities in 31 states. The states are nearly coterminous with the Union, from Pennsylvania in the east to the State of Washington in the west. Coal is found in great quantities in the Middle West, Southwest, Northwest, South and in the Northeast. Millions of tons of coal are mined in these different sections of the country that are not affected in any way, directly or indirectly, by competition of the coal produced in other faraway sections of the country. Real competition in coal is local.

The bituminous coal industry is composed of many relatively small units. In 1937 there were 6,548 producing mines in the United States, exclusive of wagon and truck mines producing less than 1,000 tons each per year. Only 212 of these mines produced over 500,000 tons each in that year. The largest company produced only about 3 percent of the total output. This is one of the basic facts which account for the too highly competitive situation in the industry.

Since 1923 the industry has had highly competitive conditions. During this period the industry has suffered large financial losses and has lost greatly its proportion of the total energy produced in the country, because of inroads upon its business made by competitive fuels and other sources of energy. The shrinkage in tonnage reflected in loss of business has not tended to "business concentration in coal." Indeed, it has intensified the struggle between competitors to remain in business. In addition to the 6,548 producing mines heretofore mentioned, there are thousands of so-called "wagon" or "truck" mines operating. The last account of the rail, river and truck bituminous coal Code member producers under the Bituminous Coal Act of 1937 was given by the Division as over 13,000.

The principal factors that have affected employment in the bituminous coal industry are:

(a) Improvement in the utilization of coal through improvement in burning equipment; improvement in the preparation of coal at the mines and more careful selection of adaptable coal to plant and equipment by the buyer has resulted in lessening the quantity of coal used each year in the production of an equivalent amount of power and heat. These economies have tended to lessen the total consumption of coal, hence to diminish the mine output and the volume of employment.

(b) The substitution of fuel oil, natural gas and hydro-generated electricity for coal formerly used has likewise tended to labor displacement in the coal industry.

(c) The enhancement of the opportunity for fuel oil, natural gas and hydro-generated electricity to make severe inroads in the markets formerly supplied by coal because of the great increases in rail freight rates for transportation of coal occurring since June 30, 1917. These increases have yielded earnings so high as to be termed "unconscionable" by Interstate Commerce Commissioners and, in my judgment, outrage all sense of decency. Taking June 30, 1917, as 100, the increases in freight rates in existence today for the carriage of coal by rail are shown by the following index numbers: Eastern group, 193; Southern group, 173; Western group, 186; Mountain-Pacific group, 173.

(d) The increasing cost of production at the mines due to increases in wages, increases in general and social welfare taxes, and the increasing cost of supplies add to the industry's competitive difficulties.

(e) The progression of the industry from the ancient hand tools, sledge, wedge, pick, shovel and barrows to the use of explosives, mining cars drawn on tracks by animals, and with the perfection of transmission of compressed air and electricity, to locomotives and mining machines that cut and shear the coal. The only hand tool that has survived to a large extent is the shovel and now it is gradually being replaced by loading machinery.

Great strides have been made in the mechanization of bituminous coal mines since the World War. Some mechanization had occurred before that time. It is not my purpose to attempt to minimize the growth of mechanization of the industry or its effect on labor. The more rapid rate of mechanization which is now apparent in the industry is the result of the effect of the conditions growing out of (a), (b), (c), and (d) heretofore stated. The effect of (a) and (e) has been to keep some of the present portion of bituminous coal production and employment in existence, that had these results not been obtained, would also have shifted with the other millions of tons that have gone to competitive fuels and other sources of power.

I do not believe that mechanization of the mines has generally displaced men from employment. This is not a denial of the fact that workers have been thrown out of employment at bituminous mines as the result of the installation of labor-saving devices. It should be repeated that the installation of mechanical devices in coal mines has made it possible for those mines to continue in operation in competition with rival sources of power and heat and thereby made possible the retention of considerable labor on railroads, boats and trucks employed in transporting the coal to the point of consumption. Improvements in the processes of production of coal and in combustion practice have actually saved many men employment.

The statistics of income published by the Bureau of Internal Revenue show the huge losses sustained by the industry every year since 1925 and tend to prove that (a) and (e) are all that saved what remains of the industry.

The trouble in the industry is that coal loading mechanization comes late and not soon enough to prevent great losses to capital and labor. Increased production per man by the use of labor-saving devices, together with the economies effected in the more efficient burning of coal, have enabled the industry to survive in its present state.

INCREASING ECONOMIES IN COAL CONSUMPTION

While economy in the use of coal is not a form of mechanization in bituminous mines, I wish to briefly point out what has happened in this respect since the World War, and during which time such great progress has been made in decreasing the amount of coal required to do a given amount of work. These economies have been taking place in all lines of coal consumption, but are capable of exact measurement in only a few lines. Tables 1, 2, 3 and 4, attached hereto, show the effect of such economies in detail for the years 1920 through 1938. Recent statistics indicate that further progress was made in 1939.

The tables show that in 1920 the average number of pounds of coal per thousand gross ton miles in freight service on steam railroads was 172; in 1938 the figure was only 115, a reduction of 33.1 percent, or a reduction in use of 25,998,982 tons for the year 1938.

Pounds of coal per passenger train car mile between 1920 and 1938 were reduced from 18.8 to 14.9, a reduction of 20.7 percent, or a reduction in use of 5,546,165 tons for the year 1938.

In electric public utility power plants 3 lbs. of coal were required to generate a kilowatt hour of electricity in 1920; in 1938 only 1.41 lbs. were required, a decrease of 53 percent, or a reduction in use of 57,047,000 tons for the year 1938.

In 1920 in the manufacture of iron and steel, the number of pounds of coking coal required per ton of pig iron was 3,421—in 1938 it was reduced to 2,865, a reduction of 16.3 percent, or a reduction in use of 5,325,551 tons for the year 1938.

These economies have played an important role in retaining the markets for coal and have supplemented the efforts that are being made to further reduce cost by the use of labor-saving devices in the mines.

COMPETITIVE FUELS

The three competitors of coal are fuel oil, natural gas, and hydro-generated electricity, much of the latter being generated in plants built by Government funds.

Fuel Oil.—Exports of coal from the United States, never large, have now practically disappeared, with the exception of shipments into neighboring Canada. (The present European war may temporarily change this condition.) American coals are now facing severe competition in the Canadian market, brought about partly by the action of the Canadian government in absorbing a large portion of the freight rates on Nova Scotia coals to distant industrial centers in Canada, and partly by preferential duties on British coal. In some instances the subventions, or subsidies, range as high as \$2.00 or \$2.50 a ton; the duty is 40 cents a ton less on British than on American coal.

With our normal export situation in this condition, coal produced in this country must find an outlet in the energy markets within the confines of our own borders. These markets, once available almost exclusively to bituminous coal, have now become centers of competition between the four major sources of heat and power, namely, coal, oil, natural gas and hydro-generated electricity.

Competition of coal with the other three sources of energy was but slight in 1918 when coal's share of the total energy market of the country was 70 percent. In the years following, however, production of fuel oil, natural gas and electricity

generated by water power has shown an almost uninterrupted increase, until in 1938 the aggregate production of the three for that single year was equivalent, in B. t. u. content, to nearly 200,000,000 tons of coal.

Fuel oil is used in both the industrial and the domestic field, and its consumption has increased both in periods of prosperity and in periods of depression.

Without considering gasoline and other lighter products of petroleum distillation and their effect upon the declining market for coal, fuel oil—a residual product—is coal's greatest competitor from a quantitative point of view. Its consumption in 1938 was equal to over 102,000,000 tons of bituminous coal on an energy basis.

That most, if not all, of this increased use of fuel oil was made possible through lost markets for bituminous coal is seen by a comparison of the year 1923 with the year 1938. In the latter year, consumption of fuel oil exceeded that in the former year by a coal equivalent of over 35,000,000 tons, while bituminous coal consumption in 1938 was over 178,000,000 tons below that of 1923. (See Table 5.)

That this increased consumption of fuel oil is reflected in unemployment in the coal mining industry, not offset by a counter-balancing increase of employment in the petroleum industry (the petroleum and fuel oil industries employ a relatively small number of men in the production branch compared with coal) is shown by figures covering man years eliminated. The increased use of fuel oil in 1937, over 1923, eliminated a year's work for 48,041 men engaged in bituminous coal mining.

The encroachment of fuel oil upon the bituminous coal market is in no small measure due to the methods in which fuel oil is marketed. Fuel oil is the residual product of petroleum distillation and as such is put on the market at whatever price will enable the producer to dispose of it. This is forcibly illustrated by the fact that according to the figures published annually by the eminent petroleum authority, Joseph E. Pogue, fuel oil sells at the Oklahoma refineries for less than the same refineries pay for the crude petroleum from which the fuel oil is produced. The refiners' losses on fuel oil are recovered from consumers of gasoline, lubricating oil, and other refined products.

Natural Gas.—While the tonnage lost by bituminous coal to natural gas since 1923 has not been as large as the loss to fuel oil, the percentage increase in consumption of natural gas is much greater than the percentage increase in fuel-oil consumption. The coal equivalent of the increase in natural-gas consumption in 1938 over 1923 amounted to 38,075,000 tons, or 137 percent of the 1923 equivalent, and in the previous year 1937, the increase was even more pronounced, amounting to slightly less than 43,000,000 tons, or 154 percent. (See Table 6.)

The effect of the increase in natural gas consumption on coal mine employment is likewise shown by figures covering man years eliminated. The increase in 1937 over 1923, eliminated a year's work for 46,732 men engaged in coal mining. While natural gas is sometimes looked upon as primarily a domestic household fuel, its industrial use accounts for by far the greater proportion of total consumption. This increasing industrial use is in no small degree attributable to the low "dumping" rates at which producers offer gas to industrial users in order to secure an equalized outlet for their pipe-line load. On the average, these "industrial" gas rates are about $\frac{1}{4}$ or $\frac{1}{2}$ of the rates charged domestic or household users, and in some localities the domestic rate is as much as ten times the industrial rate.

Hydro-electricity.—The increased generation of electricity by water power in 1938 over 1923, displaced in that single year 17,562,000 tons of bituminous coal, an increase of 76 percent in coal displacement over the year 1923, and this displacement was made notwithstanding the improvement in efficiency in the generation of electricity by steam. While sufficient data are not available to make complete comparisons of 1938 with 1923, the increased output of electricity generated by water power in 1937 over 1923 had the effect in that single year of eliminating one year's employment for 18,888 men engaged in bituminous coal mining.

This increasing encroachment of hydro-generated electricity on the bituminous coal market is to a great extent made possible by the erection of many large hydro plants, either directly by the government or with the aid of government funds. Their output is sold at prices which bear no relation to the cost of production, since a large portion of the cost of construction is charged to the other factors, such as navigation, irrigation or flood control.

COMBINED EFFECTS OF COMPETITIVE FUELS

A summary of the competitive situation is outlined in Tables 5 and 6. Table 6 shows the combined effect of the encroachment of the three competitive sources of energy on the bituminous coal market.

While most of the calculations have been based upon the theory that the consumption of coal's competitors had been frozen at the 1923 rate, it is by no means to be inferred that these rivals do not have a proper right to their proportionate share of the total energy market. The fact that demands attention is that the output or use of these fuels has increased in a proportion far exceeding the industrial or economic growth of the nation, and the tables show that such increase has been accompanied by a proportionate loss in the market for bituminous coal.

The increased demand for gasoline and the light oils and lubricants refined from crude petroleum has forced an excessive amount of fuel oil on the market at depressed prices. Imports of crude petroleum and gas and fuel oils coming into this country at the rate of between 50,000,000 and 60,000,000 barrels a year on a duty of only $\frac{1}{4}$ cent per gallon (applicable on only part of the imports) have further aggravated the already severe competitive situation. In December, 1939, the Venezuela Reciprocal Trade Agreement reduced the duty to $\frac{1}{4}$ cent per gallon. This implies a greater quantity of foreign oil will be imported.

Sales of natural gas to industrial consumers at unjustifiably low prices have seriously affected the use of bituminous coal. Generation of electricity by water power has in recent years in large degree been financed or subsidized by the federal government.

The importation of foreign oil amounting to about 50,000,000 barrels in 1938, only a part of which was taxed at $\frac{1}{4}$ cent per gallon, caused the displacement of approximately 10,000,000 tons of coal on the Atlantic and Gulf coasts. Under the lower rate more oil will come in.

To the railroads this meant a loss in gross freight receipts of over \$23,000,000 and to the producers of coal, at an average realization of \$1.85 per ton, it resulted in a loss of approximately \$18,500,000 in gross receipts, or a total of over \$40,000,000 in gross receipts to both railroads and coal producers.

For every ton of coal displaced, some employee dependent on the coal industry, either directly or indirectly, loses a day's work. Coal mine labor receives approximately 60 cents out of every dollar received by the coal producers. Railroad laborers receive 45 cents out of every dollar received by the railroads for handling freight.

There are many persons employed indirectly by the coal industry who are adversely affected by the loss of coal tonnage. Tariff protection against the flood of this imported oil, which comes in primarily from Venezuela and the Dutch West Indies, is essential not only to the coal industry but to the American oil industry itself.

The displacement of coal by fuel oil and natural gas, in both of which the employment of labor is very small as compared with coal, and by the generation of electricity by water power, in which the employment of labor is infinitesimal, is an angle of the employment problem to which the public has been seemingly blind.

The fact is that each ton of bituminous coal mined in the United States brings to the mine workers an average of \$1.27 in wages. The labor cost in the production of 4 barrels of fuel oil (fuel equivalent to 1 ton of coal) is about 68 cents. The labor cost in the production of 20,000 cubic feet of natural gas (fuel equivalent to a ton of coal) is about 8 cents. The labor cost in the production of 2,000 KWH of hydro-electric power (energy equivalent to that produced by a ton of coal) is less than one cent.

These figures require no comment. They emphasize their own moral—and the moral is that displacement of coal by substitute fuels is one of the major factors in the country's present unemployment problem.

Three remedies, if applied, would at least partially aid the coal industry and in turn relieve the unemployment situation of the nation. These remedies are: (1) A substantial protective duty on imports of crude petroleum and gas and fuel oils; (2) Regulation by law of the dumping of industrial gas at rates that have no relation to costs, and (3) Withdrawal of the federal government from competition with private industry in the production and sale of electrical energy.

The tabulations which accompany this statement give a detailed picture of the losses sustained by bituminous coal in the past two decades in the share which it has had of the total fuel and energy requirements of the nation.

Table 5 shows the consumption of bituminous coal, fuel oil, natural gas, and the output of hydro-electric power on the basis of coal equivalents, for the years since 1923, as well as the percentage each fuel constitutes of the total. Note how the coal percentage has gone down while the percentages of other fuels have gone up.

The heading on Table 6 is self-explanatory.

Also attached is a statement, Table 7, showing per capita production of bituminous coal, petroleum, natural gas and hydro-generated electricity for certain years since 1910. This is another indication of the effect of these rival fuels and other sources of energy on the coal mining industry.

TRANSPORTATION CHARGES OF BITUMINOUS COAL

Transportation Factors.—Few mines are located at the points of consumption. Of all bituminous coal sold, 85 percent is shipped by rail. Many of these shipments are over considerable distances. On the average, less than half of the price paid by carload consumers of bituminous coal goes to the mine owner and laborer who produce it and more than half goes to the railroads which transport it. Hence the delivered cost of coal is often more affected by changes in freight rates than by changes in cost of mine operation.

Although in recent years competitive forms of transportation, such as motor trucks and waterways, have made appreciable inroads in the movement of coal by railroads, the great preponderance of coal transported is still moved by the rail carriers. The inter-dependence of the railroads and the bituminous industry is shown in the following facts: bituminous coal furnishes the roads with approximately $\frac{1}{4}$ of their total freight tonnage and accounts for 20 cents of every dollar received by them in freight revenue. In turn the railroads are the most important single class of consumers of bituminous coal for industrial purposes, using for locomotive fuel and other purposes approximately one-fifth of all coal produced. Bituminous coal is one of the few commodities or classes of freight where freight rate exceeds the value of the commodity at point of production.

On the revenue coal traffic which the railroads handled during the period from 1928 through 1937, inclusive, the revenue received by the railroads for handling that tonnage exceeded the revenue received by the coal industry for producing and selling the same tonnage slightly in excess of \$1,491,000,000. From a gross revenue standpoint, the transportation of bituminous coal fares far better than the producing branch of the coal industry. It is readily apparent that the relative level of freight rates on bituminous coal is an important factor governing the delivered price of the product to the ultimate consumer.

Since 1922 the general freight rate structure on bituminous coal has been relatively stationary with the exception of intermittent temporary additions to the present rates which have now been made permanent by the Interstate Commerce Commission, but between 1917 and 1922 there were several increases in railroad freight rates on bituminous coal and only one small decrease. As a result of these changes a conservative estimate of the average rate of increase between those two years is 50 percent. As freight charges constituted approximately half of the delivered cost of carload coal shipments, this freight rate increase resulted in an increase of about 25 percent in the delivered cost of coal. This was in addition to the increase in labor cost which, on the basis of delivered prices, amounted to approximately 35 percent. The consumer's price, therefore, had to advance at that time by an average of approximately 60 percent.

Because transportation charges constitute so large a factor in the delivered price of coal, a reduction in freight rates on bituminous coal could do much to enable the industry to check the inroads of competitive sources of energy and to recover for the railroads at least a part of the tonnage already lost by them through the curtailment of coal as a fuel by consumers.

These high rail freight rates, coupled with the construction of improved highways, have encouraged in recent years the movement of bituminous coal by truck. A commodity formerly considered adaptable to rail and water transportation, bituminous coal is now being transported by truck in an amount well in excess of 30,000,000 tons, and official figures available for the year 1936 show a percentage growth in the movement of coal by truck in that year over 1933 of 80.6 percent.

In the year 1936 there were loaded at mines for shipment by water slightly less than 25,000,000 tons of bituminous coal. This was an increase of 91 percent over the 13,000,000 tons so loaded in 1933. In this figure I have not included the substantial tonnage of coal moved from rail mines to river ports for water shipment beyond, nor the large tonnage moved by rail to lower Lake Erie ports for transshipment beyond by water. Neither does it include the coastwise waterborne coal.

In 1936 there were over 52,000,000 tons of coal moved by trucks and waterways, and had this coal been moved by railroad, the gross revenue of the railroads would have been increased over \$92,000,000, of which railroad labor would have received almost one-half. This is estimated by use of average rates.

In order to emphasize these facts as to high rates on bituminous coal, the 27 railroads that in the year 1938 handled 325,537,446 tons of revenue bituminous coal, or 76 percent of the total handled, and which originated 92 percent of all of said coal originated by Class I roads in that year, show for the first 10 months of 1939 the following, quoted from a National Coal Association Bulletin:

"Official figures for the last 2 months of 1939 are not as yet available, but it will be noted that for the first 10 months of 1939 the net railway operating income

of these 27 roads amounted to \$247,368,419, an increase of slightly less than 50 percent over the corresponding 10 months of 1938. After fixed charges had been deducted, these same roads had a net income for the 10 months of 1939 of \$64,393,969, compared with a deficit in 1938 of \$17,679,524, an increase for the 1939 period over that of 1938 undeterminable in percentage, but in dollars amounting to \$82,073,493. Reports for Class I railroads of the United States in the first 10 months of 1939 show a net income of \$23,245,000. Thus the 27 large coal-carrying roads showed a net income of almost 3 times that of the total for all Class I railroads, thus proving that the profits of the large coal-carrying roads are offset against the deficits of the roads that carry little or no coal, and that the net income figure for Class I roads as a whole is in no way representative of the profits derived by the railroads in the handling of bituminous coal traffic."

A tabulated summary of the railroad freight changes affecting bituminous coal since June 30, 1917, as measured by index numbers, is herewith submitted. It is marked Table 8. It shows since June 30, 1917, an increase in the rates in the Eastern group—from 100 to 193—and a little less, but not a great deal less, in the rates in other groups.

INCREASED LABOR COST

The amount wages of coal mine labor have been increased can be obtained by comparing the present scale of base wages with that of 1933. These increases have been of a dual character; first, by an increase in the actual wages paid per day, and secondly, in a reduction of the number of hours in the work-day. On April 1, 1934, the hours of work per day were decreased from 8 to 7 hours, and at the same time the basic inside day wage was increased from \$4.60 to \$5.00. On an hourly basis the increase amounted to 24 percent. Piece work rates were increased by an amount more than sufficient to provide the workers with the same daily earnings for 7 hours work they had received for 8 hours. Between May, 1933 and April, 1937, labor cost per ton increased from 63 cents to \$1.27, an increase of 102 percent, and during the same period the average hourly earnings of bituminous miners increased from 45 cents to 85 cents, an increase of 94 percent. During this same time the cost of living increased only 11 percent, so that real wages of the miners increased practically 75 percent during this period. It is worthy of note that of the 122 industries for which the Bureau of Labor Statistics published average hourly earnings, for December, 1939, only 6 showed higher hourly earnings than did bituminous coal mining. Another factor which has increased the cost of production since 1933 is the indirect labor cost items such as old age and unemployment insurance taxes which are paid by the employer and actually constitute a part of the cost of labor. These costs, which were not in force in 1933, amounted in the year 1938 to approximately 5 cents per ton of coal produced.

The following table shows the changes in wage scales since May, 1933. There has been no change in the wage scale since the April, 1937 wage scale. Therefore, the cost shown, ascertained by the Bituminous Coal Division, of \$1.273 would be approximately correct today.

	Labor Cost Per Ton in Cents	Index No.	Hourly Earnings of Mine Workers in Cents	Index No.
May, 1933.....	63.1	100	45.2	100
October, 1933.....	90.2	143	58.9	130
April, 1934 ¹	109.4	173	71.3	158
October, 1935.....	116.0	184	80.6	178
April, 1937 and subsequent.....	127.3	202	87.8	197

¹ Changed to 7-hour day, 35-hour week.

This statement is not a criticism of these wage levels per se.

LABOR RELATIONS

Everyone is aware of the troubled history of labor relations in the coal mines. In 1933, during the period of the National Recovery Administration, the Appalachian Wage Agreement was concluded simultaneously with the industry's Code of Fair Competition. The Agreement covered all mines in the Appalachian area, including Ohio, and excepting Alabama. It changed the status of 325,000 men and 70 percent of the tonnage production from a non-union to a union basis. It

may be said that this agreement also had a compelling influence on the structure and consummation of agreements in the remaining 30 percent of the industry. Since then, except for 6 weeks' suspension beginning April 1, 1939, there has been peace in the industry.

The Agreement provides for the specification of wages, hours, rules and regulations usually contained in an agreement of this kind. Several features are called to your attention: it provides "That the right to hire and discharge, the management of the mine, and the direction of the working force is vested exclusively in the operator and the United Mine Workers of America shall not abridge these rights." This important clause is strongly enforced by the operators, and it may be added, respected by the United Mine Workers. The Agreement does not provide for, and gives no recognition to, seniority rights. This is considered important, both as to efficiency and safety. It is a union shop agreement, but the union must accept for membership anyone employed by the operators, except one who has already been expelled by the union, which is very rare. It provides for the "check-off" (deduction of dues from payroll), and limits the monthly amount of dues to \$1.50, the maximum initiation fee to \$10 and a maximum national assessment that can be levied in 1 year to \$3.00.

So far as is within my knowledge, and certainly so far as the Central Pennsylvania district is concerned, I believe it may be said that these joint relations have been satisfactory and have been of beneficial influence toward stabilization of the industry. I believe that there is greater cooperation between management and worker in the bituminous coal industry today than at any time in its history, and probably better cooperation than in any other American industry.

Our industry pioneered the 7-hour day, 35-hour week, which went into effect in April, 1934. It is sometimes suggested that it would be desirable from the standpoint of labor in our industry to substitute a 6-hour day, 30-hour week. This has been advocated as a means of spreading employment and making more jobs. The real fact is that such a change would spread unemployment instead of relieving it. The theoretical effect of such a change would be to pay the miners more money for less work and perhaps in periods of peak production at the mines, the temporary employment of some additional men. This would be the theoretical effect, but the practical result would be reduced output per man per day, increased labor cost per ton and collateral increases in almost all the other phases of mining operations. This inevitably would mean increased prices for coal and increased fuel cost to consumers who continued their present rate of coal consumption. The effect in the long run would be an increased incentive to the invention and adoption of still higher efficiencies in the utilization of coal so as to use less, and the more rapid replacement of coal by other sources of energy. It would put an increased premium on mechanization as a means of offsetting the higher labor cost. Taking it all in all, the 6-hour day, 30-hour week, in our industry would inevitably result in less demand for coal, less business for the operator and less employment for labor.

MECHANIZATION OF THE BITUMINOUS COAL INDUSTRY

Table 9 shows that output per man per 7-hour day in all bituminous mines in the United States has increased from 3.88 tons in 1923 to 4.68 tons in 1937, an increase of 20.6 percent. As explained in the table, all figures on output per man per day have been converted to a 7-hour day basis, as the industry, since April, 1934, has been on that basis. In deep mines only, the output increased from 3.84 tons in 1923 to 4.46 tons in 1937, an increase of 16.1 percent. In 1923 the output in strip mines was 6.51 tons; in 1937 it was 14.04 tons, an increase of 115.7 percent.

CUTTING MACHINES AND STRIP MINING

Table 10 shows how the use of cutting machines has increased from 1896 to 1936, the percentage of total production cut by machine increasing from 11.9 to 79.3 and the percentage of underground production from 11.9 to 84.8. Information on stripping is not available before 1914. The percentage of the total production mined by stripping in that year was 0.3—in 1937 it was 7.1. The percentage of total production cut by machine increased between 1914 and 1936 from 51.7 to 79.3 and the percentage of underground production cut by machine increased from 51.8 to 84.8 between the same two years. The table also shows a great drop in percentage mined by all other methods.

MECHANICAL LOADING

Statistics on mechanical loading are not available prior to the year 1923. Table 11 shows that the percentage of underground production mechanically loaded by

all types of equipment increased from 0.3 in 1923 to 20.2 in 1937. There is a breakdown in the table showing amounts and percentages loaded by different types of equipment.

MECHANICAL CLEANING

Mechanical cleaning is a type of mechanization which tends to increase rather than decrease labor requirements. For a good many years there has been an increasing demand for clean coal. Table 12 shows that the percentage of the national production cleaned by wet and pneumatic methods at the mines increased from 2.7 in 1906 to 12.8 in 1937. As will be noted from the table, beginning in 1927, information is available as to the quantity of coal washed at central plants operated by consumers. The grand total of all coal cleaned at the mine and at central washing plants and the percentage of the grand total mechanically cleaned are shown in the last two columns of the table. It will be noted that the latter percentage increased from 5.3 in 1927 to 14.6 in 1937.

MONEY LOSSES

Table 13, "Statistics of Income in the Bituminous Coal Mining Industry", published by the Income Tax Unit, is attached hereto and shows huge losses since 1925, and furnishes in part a compelling necessity for reducing costs of production in this industry.

MINE REALIZATION

The best information ascertainable of the average mine realization for bituminous coal for the years since 1925 is as follows:

Year	Realization	Year	Realization
1925	\$2.04	1932	\$1.31
1926	2.06	1933	1.34
1927	1.99	1934	1.75
1928	1.86	1935	1.77
1929	1.78	1936	1.76
1930	1.70	1937 (includes selling expense)	1.95
1931	1.54		

It will be noted that in 1927 the average mine realization was \$1.99. In no year subsequent thereto, as shown by table 12, has the bituminous industry operated in the black, deficits ranging from \$10,000,000 to almost \$52,000,000 yearly. In 1936 mine realization was \$1.76, or 23 cents below the \$1.99 realization in 1937.

A saving in the price of coal to the domestic consumer naturally leaves such consumer with that saving in money to be used in purchasing other materials, necessaries and luxuries of life, in which the labor factor, while not determinable, is an important factor.

In the case of the industrial consumer, a saving in the cost of coal is reflected in reduced operating costs, and that saving is either passed on to the consumer in a lower priced article, is used in the purchase of other materials in larger quantities or is disbursed to stockholders, and in either event goes into the purchasing power of the nation, thus making for employment in other lines of endeavor.

It is comparatively simple to show by figures that a certain number of coal miners have been displaced or their working opportunities reduced by technologic development, but it is not so simple—in fact impossible—to show by figures, although it is equally true, that such development has retained jobs for miners, due to the fact that such development has enabled coal to hold at least some of its markets, which it would have otherwise lost had some effort not been made to reduce operating and production costs.

It may be true that the "combination of changes" affecting bituminous coal production and distribution has reduced the number of men employed in bituminous coal mining, which is one of the largest labor-employing industries in the country and to which 60 percent of the cost of production is applied in the payment of wages, but there has been some offset in labor employed in other industries or in other occupations, such as in the manufacture of machinery and in the operators of trucks for the carriage of coal formerly transported by railroads.

It is my belief that a greater number of men are employed to haul a given amount of coal by truck than would be employed in carrying the same quantity of coal by rail.

Mechanization in burning coal and in producing coal is the main thing that has enabled the coal industry to retain as much of its market as it now possesses.

I do not wish to be understood as asserting that bituminous coal should have the monopoly of the fuel market. We understand that competitors have a perfect right to take business away from our industry under fair competition. We do feel, however, that it should be on fair prices and not on dumping prices as we believe has been the case from time to time with fuel oil and natural gas. We also believe that government should not subsidize hydro-electric power plants from public funds, taking away business from the bituminous coal industry and throwing miners out of employment, especially when electricity nine times out of ten can be generated as cheaply by coal as it can by water.

We believe the coal industry is essential to the nation's welfare, and even with a further decline in production, will continue to be the most important supplier of the nation's energy.

Failure to stop losses from competitive conditions that sell coal continuously below cost of production will bring impoverishment of workers, bankruptcy of owners, abandonment of mines, equipment and communities, and inevitably produce chaos and labor strife. When it has reached such a state, the cost to consumers and the public is much greater than under stable and rational conditions.

The public must have coal and if it does not "pay as it goes" for the cost of the product, it will pay much more than the accumulated difference between prices and cost of production in rehabilitation charges, relief costs and in exasperating and costly interruptions to industry and transportation, as well as to the depressing occurrences that are part and parcel of great coal strikes or lockouts. In other words, if the industry is not maintained in an efficient and prosperous condition to serve the people at all times, with coal at a reasonable price, the total cost, when settlement is made, will be much greater to all concerned.

It may be that it is one of the insoluble problems of our generation. However, many men in the coal industry are hoping that the present developments as to mechanization; movements designed to lower transportation rates on coal, stabilization of coal prices through marketing agencies and federal regulation, attempts to enlarge coal markets, eliminations of unfair competition by other fuels and sources of energy, or imports of foreign oil, continuing improvement in relations between management and workers, will bring about a solution of the problem and a stabilization of employment in the bituminous coal industry.

TABLE 1.—Estimated reduction in coal consumption through increased economy in utilization

RAILROADS (FREIGHT SERVICE) 1920-1938

Year	Gross Freight Ton Miles 000,000 Omitted	Current Rate of Consumption Lbs. of Coal Per M. Freight Ton Miles	Amount of Coal—Net Tons		Reduction Net Tons
			Current Rate	1920 Rate	
	1	2	3	4	5
1920	1,046,756	172	90,021,016	90,021,016	
1921	869,419	162	70,303,231	74,770,034	4,466,753
1922	929,025	163	75,694,179	79,896,150	4,201,971
1923	1,123,970	161	90,263,240	96,661,420	6,398,180
1924	1,085,860	149	81,024,424	93,383,990	12,359,536
1925	1,162,154	140	81,316,056	89,485,868	8,169,802
1926	1,246,532	137	85,096,497	107,201,752	22,106,255
1927	1,232,232	131	80,426,500	105,971,952	25,545,452
1928	1,252,138	127	79,312,487	107,683,868	28,371,381
1929	1,294,412	125	80,864,049	111,319,432	30,455,383
1930	1,142,943	121	69,148,052	96,263,068	29,145,046
1931	959,539	119	57,092,570	82,520,354	25,427,784
1932	758,011	123	46,617,676	65,188,946	18,571,270
1933	788,624	121	47,711,752	67,821,664	20,109,912
1934	856,576	122	52,190,136	73,579,536	21,389,400
1935	882,204	120	52,932,240	75,860,544	22,927,304
1936	1,029,486	119	61,254,417	88,535,796	27,281,379
1937	1,084,643	117	63,451,616	93,279,298	29,827,682
1938	912,245	115	52,454,068	78,463,070	25,998,982
Totals			1,317,173,276	1,679,936,748	362,763,472

Authority: Column 1—Interstate Commerce Commission.
Column 2—Association of American Railroads.
Other columns computed.

APRIL 20, 1940.

TABLE 2.—Estimated reduction in coal consumption through increased economy in utilization

RAILROADS (PASSENGER SERVICE) 1920-1938

Year	Passenger Train Car Miles 000 Omitted	Current Rate of Consumption Lbs. of Coal Per Passenger Train Car Mile	Amount of Coal Net Tons		Reduction Net Tons
			Current Rate	1920 Rate	
1		2	3	4	5
1920	3,583,935	18.8	33,717,341	33,717,341	
1921	3,464,981	17.7	30,744,115	32,570,821	1,826,706
1922	3,404,560	17.9	30,430,460	32,002,864	1,572,404
1923	3,576,843	18.1	32,286,984	33,622,324	1,335,340
1924	3,631,650	17.0	30,805,224	34,137,510	3,332,286
1925	3,717,014	16.1	29,909,520	34,939,932	5,030,412
1926	3,738,442	15.8	30,015,198	35,658,355	5,643,157
1927	3,789,464	15.4	28,989,801	35,432,962	6,443,161
1928	3,718,459	15.0	27,853,493	34,953,515	7,070,022
1929	3,758,111	14.9	27,556,488	35,326,243	7,769,755
1930	3,503,193	14.7	25,667,998	33,494,014	7,826,016
1931	3,143,056	14.5	22,787,166	29,544,726	6,757,570
1932	2,709,424	14.9	20,855,709	29,314,596	5,458,877
1933	2,565,986	15.2	19,501,493	24,120,268	4,618,775
1934	2,647,405	15.2	20,120,278	24,885,607	4,765,329
1935	2,683,020	15.5	20,793,475	25,220,473	4,426,998
1936	2,841,990	15.3	21,741,224	25,714,706	4,973,482
1937	3,004,031	15.1	22,680,430	25,237,891	5,557,461
1938	2,844,187	14.9	21,189,193	25,735,358	5,546,165
Totals			497,675,580	587,629,496	89,953,916

Authority: Columns 1 and 2—Bureau of Railway Economics, Association of American Railroads. Other columns computed.

APRIL 20, 1940.

TABLE 3.—Estimated reduction in coal consumption through increased economy in utilization

STEAM-GENERATED ELECTRICITY 1920-1938

Year	Kilowatt Hours Generated 000,000 Omitted	Consumption of Coal and Coal Equivalent			
		Per Kilowatt Hour (Pounds)	Total Consumption at Current Rate (Net Tons)	Estimated Consumption at 1920 Rate (Net Tons)	Reduction (Net Tons)
1	2	3	4	5	6
1920	27,405	3.0	41,420,000	41,420,000	
1921	26,005	2.7	35,240,000	39,007,500	3,767,500
1922	30,447	2.5	38,000,000	45,670,500	7,670,500
1923	36,322	2.4	43,522,000	54,483,000	10,961,000
1924	39,044	2.2	43,130,000	58,566,000	15,436,000
1925	43,514	2.1	44,780,000	65,271,000	20,491,000
1926	47,602	1.95	45,856,000	71,403,000	25,547,000
1927	50,330	1.84	45,910,000	75,495,000	29,585,000
1928	53,154	1.76	46,887,000	79,731,000	33,844,000
1929	62,723	1.68	52,674,000	94,084,500	41,510,500
1930	62,915	1.62	50,654,000	94,372,500	43,718,500
1931	61,126	1.55	47,134,000	91,089,000	44,555,000
1932	49,055	1.50	36,600,000	73,582,500	36,982,500
1933	50,574	1.47	37,153,000	76,011,000	38,858,000
1934	57,092	1.45	41,286,000	85,638,000	44,372,000
1935	59,430	1.46	43,364,000	89,145,000	45,781,000
1936	72,665	1.44	52,319,000	98,997,500	46,678,500
1937	77,348	1.43	55,304,000	110,022,000	60,718,000
1938	71,747	1.41	50,574,000	107,621,000	57,047,000
Total			851,217,000	1,458,210,000	606,993,000

Authority: Columns 2, 3 and 4—U. S. Geological Survey and Federal Power Commission "Monthly and Annual Production of Electricity, etc." Columns 5 and 6—Computed.

APRIL 20, 1940.

TABLE 4.—Estimated reduction in coal consumption through increased economy in utilization

MANUFACTURE OF PIG IRON 1920-1933

Year	Production of Pig Iron Including Ferro-Alloys 000 Omitted (Gross Tons)	Pounds of Coke per Gross Ton Pig Iron	Yield of Coke from Coal (%)	Pounds of Coal per Gross Ton Pig Iron	Coal Consumption (Net Tons)		Reduction (Net tons)
					Current Rate	1920 Rate	
	1	2	3	4	5	6	7
1920	36,926	2,305.6	67.4	3,420.8	63,158,230	63,158,230	
1921	16,688	2,209.6	68.0	3,236.2	27,002,853	28,543,135	1,540,282
1922	27,220	2,176.3	68.3	3,185.4	43,869,904	46,557,088	3,190,184
1923	40,361	2,245.3	67.5	3,323.4	67,667,874	69,033,454	1,965,580
1924	31,406	2,214.0	68.1	3,248.2	51,000,485	53,716,822	2,710,337
1925	36,701	2,150.4	68.8	3,125.6	57,356,323	62,773,390	5,417,067
1926	39,373	2,091.2	68.6	3,048.4	60,012,327	67,343,679	7,331,252
1927	36,566	2,122.3	68.6	3,093.7	56,562,117	62,542,486	5,980,369
1928	38,156	2,088.5	68.4	3,053.4	58,252,765	65,262,022	7,009,257
1929	42,614	2,058.6	69.0	2,983.5	63,569,435	72,886,986	9,317,551
1930	31,752	2,046.8	68.7	2,978.5	47,286,666	54,308,621	7,021,955
1931	18,426	2,016.1	68.9	2,923.2	26,831,442	31,516,830	4,684,388
1932	8,731	1,988.1	68.3	2,910.8	12,779,868	15,019,022	2,239,154
1933	13,346	1,975.6	68.7	2,875.7	19,189,546	22,826,988	3,637,442
1934	16,135	2,026.3	69.2	2,926.7	23,611,152	27,597,304	3,986,152
1935	21,373	1,975.1	69.6	2,837.8	30,326,150	36,556,379	6,230,229
1936	31,029	2,036.2	70.2	2,900.6	46,001,359	53,072,002	8,070,643
1927	37,153	2,050.3	70.3	2,916.5	54,178,362	63,546,491	9,368,129
1928	19,167	2,017.1	70.4	2,868.1	27,467,686	32,783,237	5,325,551
Total					834,017,544	929,043,076	95,025,532

Authority: Columns 1, 2, 3 and 4—Minerals Yearbooks. Other columns computed.

APRIL 20, 1940.

TABLE 5.—Consumption of bituminous coal, coal equivalent of fuel oil and natural gas and output of hydro-electric power reduced to coal equivalent 1923-1938

[Thousands of Net Tons]

Year	Bituminous Coal consumed (net tons)	Percent of Total	Fuel Oil consumed coal in equivalent (net tons)	Percent of Total	Natural Gas consumed in coal equivalent (net tons)	Percent of Total	Output of Hydro-Electric power ¹	Percent of Total	Total
1923	518,993	81.5	66,599	10.5	27,740	4.4	23,212	3.6	636,544
1924	484,004	79.4	74,038	12.2	29,577	4.8	21,666	3.6	609,285
1925	499,193	78.1	85,287	13.3	31,227	4.9	23,474	3.7	639,181
1926	532,581	78.5	85,319	12.6	35,217	6.2	26,534	3.7	678,651
1927	499,801	76.5	88,450	13.5	37,585	5.8	27,485	4.2	653,321
1928	498,828	74.7	97,519	14.6	40,967	6.1	30,532	4.6	667,836
1929	519,555	74.3	102,403	14.7	47,563	6.8	29,262	4.2	698,783
1930	454,990	73.4	90,532	14.6	47,593	7.7	26,747	4.3	619,862
1931	371,869	70.8	83,667	15.9	45,874	8.8	23,717	4.5	525,127
1932	306,917	67.8	77,039	17.0	42,836	9.5	25,574	5.7	452,366
1933	321,617	68.5	79,086	16.8	43,608	9.2	25,624	5.4	489,935
1934	347,043	68.6	85,093	16.8	49,029	9.7	25,033	4.9	506,198
1935	360,292	67.3	91,681	17.1	54,395	10.2	29,177	5.4	535,545
1936	422,796	68.4	102,660	16.6	62,931	10.2	29,475	4.8	617,862
1937	428,496	66.9	110,589	17.3	70,532	11.0	31,028	4.8	640,648
1938	340,785	63.1	102,304	18.9	65,814	12.2	31,295	5.8	540,148
Total	6,907,710		1,422,266		732,478		428,785		9,491,189

¹ Reduced to coal equivalent on basis current efficient rate for steam generation (net tons).

Authority: Coal, Bureau of Mines and Bituminous Coal Division; Fuel Oil and Natural Gas, Bureau of Mines; Electricity, Geological Survey and Federal Power Commission.

APRIL 20, 1940.

TABLE 6.—Statement showing consumption of fuel oil and natural gas and production of hydro-generated electricity and coal tonnage displaced and employment displaced by increased consumption and production of those sources of fuel and energy for years 1923–1938, inclusive

FUEL OIL				
1	Consumption (Bbls. of 42 Gallons) 000 omitted	Equivalent in Coal Tonnage 000 omitted	Excess Over 1923 (Bbls. of 42 Gallons) 000 omitted	Coal Equivalent of Excess (Net Tons) 000 omitted
	2	3	4	5
1923.....	266,395	66,599		
1924.....	296,154	74,038	29,759	7,440
1925.....	341,148	85,287	74,753	18,688
1926.....	341,276	85,319	74,881	18,720
1927.....	353,799	88,450	87,404	21,851
1928.....	390,078	97,519	123,683	30,921
1929.....	409,612	102,403	143,218	35,805
1930.....	362,128	90,532	95,733	23,933
1931.....	334,668	83,667	68,273	17,068
1932.....	308,157	77,039	41,782	10,441
1933.....	316,344	79,086	49,949	12,487
1934.....	340,371	85,093	73,976	18,494
1935.....	366,728	91,681	100,328	25,082
1936.....	410,641	102,660	144,246	36,061
1937.....	442,355	110,589	175,980	43,990
1938 ¹	409,214	102,304	142,819	35,705
Total.....	5,689,064	1,422,266	1,426,744	356,686

NATURAL GAS				
1	Consumption (Cubic Ft.) 000,000 omitted	Equivalent in Coal Tonnage 000 omitted	Excess Over 1923 (Cubic Ft.) 000,000 omitted	Coal Equivalent of Excess (Net Tons) 000 omitted
	6	7	8	9
1923.....	554,795	27,740		
1924.....	591,531	29,577	36,736	1,637
1925.....	624,549	31,227	69,754	3,438
1926.....	704,344	35,217	149,549	7,477
1927.....	751,701	37,585	195,907	9,845
1928.....	819,144	40,957	264,349	13,217
1929.....	951,261	47,563	368,456	19,822
1930.....	951,854	47,593	367,059	19,853
1931.....	917,488	45,874	362,693	18,135
1932.....	856,720	42,836	301,925	15,096
1933.....	872,159	43,606	317,364	15,868
1934.....	960,573	49,029	425,778	21,289
1935.....	1,087,898	54,395	533,103	26,655
1936.....	1,258,629	62,921	703,834	35,192
1937.....	1,410,636	70,532	855,841	42,792
1938 ¹	1,316,285	65,814	761,490	38,075
Total.....	14,649,567	732,478	5,772,848	288,642

See footnote at end of table.

CONCENTRATION OF ECONOMIC POWER

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TABLE 6.—Statement showing consumption of fuel oil and natural gas and production of hydro-generated electricity and coal tonnage displaced and employment displaced by increased consumption and production of those sources of fuel and energy for years 1923-1938, inclusive—Continued

HYDRO-GENERATED ELECTRICITY

1	Output in Kilowatt Hrs. 000,000 omitted	Coal Consumed per Kilowatt Hr. (Pounds)	Coal Required to Generate Equivalent by Steam (Net Tons) 000 omitted	Excess in Kilowatt Hrs. Over 1923 000,000 omitted	Coal Required to Generate Equivalent of Excess Kilowatt Hrs (Net Tons) 000 omitted
	10	11	12	13	14
1923.....	19,343	2.4	23,212		
1924.....	19,696	2.2	21,666	353	388
1925.....	22,356	2.1	23,474	3,013	3,164
1926.....	26,189	1.95	25,534	6,846	6,675
1927.....	29,875	1.84	27,485	10,532	9,689
1928.....	34,696	1.76	30,532	15,353	13,511
1929.....	34,629	1.69	29,262	15,286	12,917
1930.....	33,021	1.62	26,747	13,678	11,076
1931.....	30,603	1.55	23,717	11,260	8,727
1932.....	34,098	1.50	25,574	14,755	11,066
1933.....	34,727	1.47	25,524	15,384	11,307
1934.....	34,058	1.47	25,033	14,715	10,816
1935.....	39,968	1.46	29,177	20,625	15,057
1936.....	40,937	1.44	29,476	21,694	15,548
1937.....	43,702	1.42	31,028	24,359	17,295
1938 ¹	44,078	1.42	31,296	24,735	17,662
Total.....	521,976		428,735	212,489	164,798

RECAPITULATION

1	Total tonnage Lost (5+9+14) (Net Tons) 000 omitted	Average Mine Realization Price	Loss to Bituminous Coal Industry 000 omitted	Loss in Wages to Bituminous Coal Miners (60% of 17) 000 omitted	Man Days Eliminated	Man Years Eliminated
	15	16	17	18	19	20
1923.....		\$2.68				
1924.....	9,665	2.20	\$21,263	\$12,758	2,119,518	12,395
1925.....	25,340	2.04	51,694	31,016	5,606,194	28,750
1926.....	32,872	2.06	67,716	40,630	7,304,889	33,976
1927.....	41,385	1.99	82,356	49,414	9,095,605	47,621
1928.....	57,049	1.86	107,227	64,336	12,187,949	60,039
1929.....	68,545	1.78	122,010	73,206	14,132,989	64,634
1930.....	54,862	1.70	93,265	55,959	10,354,151	58,044
1931.....	43,930	1.54	67,652	40,591	8,273,070	51,708
1932.....	26,003	1.31	47,950	28,770	7,012,069	48,028
1933.....	39,662	1.34	53,147	31,888	8,297,489	49,686
1934.....	50,599	1.75	88,548	53,129	11,499,773	64,605
1935.....	66,794	1.77	118,225	70,935	14,843,111	89,622
1936.....	86,801	1.76	152,770	91,662	18,788,095	94,401
1937.....	104,077	² 1.95	202,950	121,770	22,050,212	113,661
1938 ¹	91,342	(³)				
Total.....	810,126		\$1,276,773	\$766,064	152,065,114	810,368

Authority: Col. (2)—Annual Report of U. S. Bureau of Mines, on "Crude Petroleum and Petroleum Products."

Col. (3) & (5)—Computed on basis of 4 barrels of fuel oil equal to 1 ton of coal.

Col. (6)—Annual Report of U. S. Bureau of Mines on "Natural Gas." (Consumption in field and in manufacture of carbon black omitted.)

Col. (7) & (9)—Computed on basis of 20,000 cu. ft. equal to 1 ton of coal.

Col. (10) & (11)—Annual reports of U. S. Geological Survey on "Production of Electricity for Public Use."

Col. (12) & (14)—Computed using Col. (11) as conversion factor.

Col. (16)—U. S. Bureau of Mines and National Bituminous Coal Commission.

Other columns computed.

¹ Preliminary or estimated.

² Selling expense included. Prior years, selling expense excluded.

³ Not available.

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TABLE 7.—Per capita production of bituminous coal, petroleum, natural gas, and hydro-generated electricity 1910, 1919, 1920, 1930, 1936, 1937, and 1938

POPULATION AND PRODUCTION

Year	Population Continental United States (in thousands)	Bituminous Coal (thousands of net tons)	Petroleum (thousands of barrels of 42 gallons)	Natural Gas (millions of cubic ft.)	Hydro-generated Electricity (thousands of KWH.)
	(1)	(2)	(3)	(2)	(3)
1910.....	91,972	417,111	209,557	509,155	.....
1919.....	105,003	455,860	378,387	745,916	14,606,000
1920.....	105,711	568,667	442,929	798,210	16,150,000
1930.....	122,775	467,526	898,011	1,943,421	33,021,000
1936.....	¹ 128,429	439,088	1,099,687	2,187,802	40,937,000
1937.....	¹ 129,267	442,455	1,279,190	2,370,000	43,707,000
1938 ²	¹ 130,215	342,407	1,213,264	2,500,000	43,847,000

PER CAPITA PRODUCTION AND INDEX NUMBERS

[1910 equals 100]

	Bituminous Coal		Petroleum		Natural Gas		Hydro-Generated Electricity	
	Quantity (tons)	Index No.	Quantity (barrels)	Index No.	Quantity (millions cubic ft.)	Index No.	Quantity (thousands of KWH)	Index No.
1910.....	4,535	100	2,279	100	5,536	100	(?)	(?)
1919.....	4,437	98	3,603	158	7,172	130	139,101	110
1920.....	5,379	119	4,190	184	7,551	136	152,775	119
1930.....	8,808	24	7,314	321	18,829	286	268,955	193
1936.....	3,419	75	8,563	379	16,879	305	318,752	229
1937.....	3,423	75	9,596	434	18,336	331	338,140	243
1938 ³	¹ 2,630	58	9,317	409	19,199	347	336,728	242

¹ As of July 1.² 1919 equals 100.³ Preliminary.

Authority: (1) Bureau of the Census.

(2) U. S. Bureau of Mines.

(3) U. S. Geological Survey and Federal Power Commission.

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TABLE 8.—Changes in railroad freight rates on bituminous coal 1917–1938 index numbers

	Eastern Group	Southern Group	Western Group	Mountain Pacific Group
1910 to June 30, 1917	100	100	100	100
July 1, 1917 to June 24, 1918: Fifteen Percent Case, 45 I. C. C. 303	115	115	115	115
June 25, 1918 to August 25, 1920: General Order No. 28 of Director Gen. of Railroads	145	145	145	145
August 26, 1920, to June 30, 1922: Ex Parte No. 74, 58 I. C. C. 220	203	181	196	181
July 1, 1922, to January 3, 1932: Reduced Rates Case, 68 I. C. C. 676	183	163	176	163
January 4, 1932, to September 30, 1933: Ex Parte No. 103, 178, I. C. C. 539; 179 I. C. C. 215; 191 I. C. C. 361	189	169	182	169
October 1, 1933, to April 17, 1935: Expiration of 6¢ Surcharge	183	163	176	163
April 18, 1935, to June 30, 1936: Ex Parte 115 (208 I. C. C. 4) (which provided a scale of surcharges ranging from 3¢ on rates 75¢ or less to 15¢ for rates over \$1.50)	198	178	191	178
July 1, 1936 to December 31, 1936: Ex Parte 115 (215 I. C. C. 439) (Limited above increases to a maximum of 10¢)	193	173	186	173
January 1, 1937 to November 14, 1937: Expiration of above surcharges	183	163	176	163
November 15, 1937: Ex Parte 115 (223 I. C. C. 657)	¹ 193	¹ 173	¹ 186	¹ 173

¹ Surcharges were made permanent on this date.

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TABLE 9.—Production, employment, and labor output in bituminous coal industry 1923–1938

Year	Net Tons Produced	Average No. Men Employed	Average No. Days Worked	Output Per Man Per Day ¹		
				All Mines	Strip Mines	Deep Mines
1923	564, 564, 662	704, 793	179	3.88	6.51	3.84
1924	483, 698, 538	619, 604	171	3.96	7.62	3.90
1925	520, 052, 741	588, 493	195	3.92	9.22	3.85
1926	573, 866, 935	593, 647	215	3.90	8.20	3.83
1927	517, 763, 352	593, 918	191	3.94	8.64	3.86
1928	500, 744, 970	522, 150	203	4.10	9.76	3.99
1929	534, 988, 593	502, 993	219	4.20	11.27	4.09
1930	467, 528, 299	493, 202	187	4.38	12.04	4.26
1931	282, 089, 396	450, 213	160	4.59	13.67	4.44
1932	309, 709, 872	406, 380	146	4.51	13.54	4.31
1933	333, 630, 533	418, 703	167	4.15	11.08	4.00
1934	359, 368, 022	458, 011	178	4.24	11.66	4.07
1935	372, 373, 122	462, 403	179	4.49	11.18	4.31
1936	439, 067, 903	477, 204	199	4.61	12.56	4.41
1937	445, 531, 449	491, 864	193	4.68	14.04	4.46
1938	² 344, 630, 000	² 435, 000	(³)	(³)	(³)	(³)

¹ As bituminous industry has been on a 7-hour day since April 1934, all figures have been converted to equivalent 7-hour day.

² Preliminary.

³ Not available.

⁴ Authority: Bureau of Mines and Bituminous Coal Division.

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TABLE 10.—Growth of cutting machines and of strip mining in bituminous coal industry, 1896-1937

Year	Total Production	Underground Production	Methods of mining				Per Cent of Total	Stripping	Per Cent of Total	All Other Methods ¹	Per Cent of	
			Cut by Machine	Per Cent of		Total					Underground	
				Total	Underground							
1896	137,640,276	137,640,276	16,424,932	11.9	11.9	11.9	(3)	(3)	121,215,344	88.1	88.1	
1897	147,617,519	147,617,519	22,649,220	15.3	15.3	15.3	(3)	(3)	124,968,299	84.7	84.7	
1898	166,693,622	166,693,622	32,413,144	19.5	19.5	19.5	(3)	(3)	134,280,478	80.5	80.5	
1899	183,323,187	183,323,187	43,963,933	23.9	23.9	23.9	(3)	(3)	149,359,254	77.3	77.3	
1900	212,316,112	212,316,112	52,784,523	24.9	24.9	24.9	(3)	(3)	159,531,589	75.1	75.1	
1901	224,838,149	224,838,149	57,843,335	25.7	25.7	25.7	(3)	(3)	167,004,814	74.4	74.4	
1902	260,618,844	260,618,844	69,671,582	26.7	26.7	26.7	(3)	(3)	191,000,262	73.2	73.2	
1903	283,749,848	283,749,848	77,974,804	27.5	27.5	27.5	(3)	(3)	205,775,044	72.4	72.4	
1904	278,693,689	278,693,689	76,606,987	27.5	27.5	27.5	(3)	(3)	202,086,702	72.5	72.5	
1905	315,097,783	315,097,783	103,396,453	32.8	32.8	32.8	(3)	(3)	211,701,330	67.2	67.2	
1906	342,874,897	342,874,897	116,847,687	34.1	34.1	34.1	(3)	(3)	226,027,210	64.5	64.5	
1907	364,736,944	364,736,944	136,947,823	37.6	37.6	37.6	(3)	(3)	227,789,121	62.5	62.5	
1908	382,573,944	382,573,944	152,183,334	39.8	39.8	39.8	(3)	(3)	230,390,610	60.2	60.2	
1909	379,744,257	379,744,257	174,012,263	45.8	45.8	45.8	(3)	(3)	205,731,994	54.2	54.2	
1910	417,111,142	417,111,142	174,012,263	41.7	41.7	41.7	(3)	(3)	243,098,879	58.3	58.3	
1911	405,907,059	405,907,059	178,186,236	43.9	43.9	43.9	(3)	(3)	227,720,823	56.1	56.1	
1912	460,104,982	460,104,982	210,538,822	45.8	45.8	45.8	(3)	(3)	249,566,160	54.2	54.2	
1913	478,435,297	478,435,297	242,121,713	50.7	50.7	50.7	(3)	(3)	236,313,584	49.3	49.3	
1914	425,703,970	425,703,970	212,399,287	50.0	50.0	50.0	(3)	(3)	213,304,683	49.9	49.9	
1915	445,624,426	445,624,426	243,257,551	54.6	54.6	54.6	(3)	(3)	199,366,875	44.7	44.7	
1916	502,519,683	502,519,683	283,691,476	56.5	56.5	56.5	(3)	(3)	218,828,207	43.5	43.5	
1917	561,790,543	561,790,543	306,366,127	54.5	54.5	54.5	(3)	(3)	255,424,416	45.5	45.5	
1918	576,385,820	576,385,820	323,931,133	56.2	56.2	56.2	(3)	(3)	252,454,687	43.8	43.8	
1919	463,890,038	463,890,038	276,019,799	59.5	59.5	59.5	(3)	(3)	187,870,239	40.5	40.5	
1920	662,666,693	662,666,693	359,907,130	54.3	54.3	54.3	(3)	(3)	302,759,563	45.7	45.7	
1921	415,921,050	415,921,050	272,702,369	65.6	65.6	65.6	(3)	(3)	143,218,681	34.4	34.4	
1922	422,295,099	422,295,099	297,032,931	69.9	69.9	69.9	(3)	(3)	125,262,168	29.7	29.7	
1923	664,661,692	664,661,692	377,435,543	56.6	56.6	56.6	(3)	(3)	287,226,149	43.4	43.4	
1924	483,686,538	483,686,538	336,271,335	69.5	69.5	69.5	(3)	(3)	147,415,203	30.5	30.5	
1925	520,052,741	520,052,741	366,725,756	70.5	70.5	70.5	(3)	(3)	153,326,985	29.5	29.5	
1926	517,783,852	517,783,852	410,912,680	79.4	79.4	79.4	(3)	(3)	106,871,172	20.6	20.6	
1927	578,266,986	578,266,986	409,355,186	70.8	70.8	70.8	(3)	(3)	168,911,800	29.2	29.2	
1928	500,744,970	500,744,970	374,040,637	74.7	74.7	74.7	(3)	(3)	126,704,333	25.3	25.3	
1929	534,985,693	534,985,693	403,606,717	75.4	75.4	75.4	(3)	(3)	131,378,976	24.6	24.6	
1930	467,526,290	467,526,290	362,426,163	77.5	77.5	77.5	(3)	(3)	105,100,127	22.5	22.5	
1931	382,089,390	382,089,390	302,292,746	79.1	79.1	79.1	(3)	(3)	79,796,644	20.9	20.9	
1932	308,709,872	308,709,872	243,654,770	79.0	79.0	79.0	(3)	(3)	65,055,102	21.1	21.1	
1933	333,630,535	333,630,535	266,999,985	80.0	80.0	80.0	(3)	(3)	66,630,550	19.9	19.9	
1934	369,368,022	369,368,022	294,676,715	79.8	79.8	79.8	(3)	(3)	74,691,307	20.2	20.2	
1935	373,373,122	373,373,122	293,664,268	78.7	78.7	78.7	(3)	(3)	79,708,854	21.3	21.3	

1926.....	439,087,903	410,962,046	348,332,330	79.3	84.8	28,125,857	6.4	62,629,716	14.3	18.2
1927.....	446,631,449	413,780,596	(¹)	(²)	(²)	31,750,853	7.1	(²)	(²)	(²)

¹ Mined by hand, shot off solid, and not specified.

² Not available.

Authority: Geological Survey, Bureau of Mines and Bituminous Coal Division.

APRIL 20, 1940.

TABLE 11.—Growth of mechanical loading in bituminous coal mines, by types of equipment, 1923-1937

[All tonnage figures in thousands of net tons]

Year	Under-ground Production	Mechanical Loading by Types of Equipment											
		Mechanical Loading		Mobile Loaders		Scrapers		Duckbills and Self-loading Conveyors		Pit-Car Loaders		Hand-Loaded Face Conveyors	
		Total Tons	Per Cent of Under-ground Production	Tons	Per Cent of Total Tons Loaded	Tons	Per Cent of Total Tons Loaded	Tons	Per Cent of Total Tons Loaded	Tons	Per Cent of Total Tons Loaded	Tons	Per Cent of Total Tons Loaded
1923.....	552,825	1,680	0.3	1,852	87.9	103	5.5	—	—	8	0.4	117	6.2
1924.....	470,080	3,450	0.7	2,998	88.9	247	7.2	—	—	5	0.1	200	5.8
1925.....	503,182	6,644	1.3	5,239	78.8	828	12.5	—	—	388	5.9	188	2.8
1926.....	550,444	11,253	2.0	8,035	71.4	1,492	13.3	495	4.4	507	4.5	724	6.4
1927 ¹	496,385	—	—	—	—	—	—	—	—	—	—	—	—
1928.....	480,956	21,428	4.5	11,781	54.9	1,548	7.2	1,200	5.6	4,117	19.2	2,802	13.1
1929.....	514,720	37,362	7.3	16,232	43.6	1,550	4.1	1,309	3.5	14,679	39.3	3,592	9.8
1930.....	447,684	46,994	10.5	20,073	42.7	1,637	3.5	1,628	3.5	19,116	40.7	4,540	9.6
1931.....	363,157	47,562	13.1	19,407	40.8	1,471	3.1	1,811	3.8	19,172	40.3	5,701	12.0
1932.....	290,069	35,817	12.3	14,825	41.4	1,132	3.2	1,630	4.5	12,590	35.2	5,640	15.7
1933.....	315,380	37,820	12.0	17,865	47.2	990	2.6	1,656	4.4	11,413	30.2	5,896	15.6
1934.....	338,678	41,433	12.2	20,750	50.1	1,004	2.4	2,082	5.0	11,089	26.8	6,508	15.7
1935.....	348,726	47,177	13.5	24,675	52.3	1,118	2.4	2,595	5.5	11,098	23.5	7,691	16.3
1936.....	410,962	66,977	16.3	40,970	61.2	1,273	1.9	3,240	4.8	10,538	15.7	10,956	16.4
1937.....	413,781	83,500	20.2	56,000	67.1	1,300	1.6	3,600	4.3	8,200	9.8	14,400	17.2

¹ Data on mechanical loading not available.

Authority: Bureau of Mines and Bituminous Coal Division.

APRIL 20, 1940.

TABLE 12.—Growth of bituminous coal mechanically cleaned, 1908–1937

[No canvass was made in 1911, 1922, 1924, 1925 and 1926]

Bituminous coal cleaned by wet and pneumatic methods at mines				Percent of National Production	Washed at Central Plants Operated by Consumers	Grand Total Mechanically Cleaned	Percent of National Production
Year	Wet Methods	Pneumatic Methods	Total				
1906	9,251,946		9,251,946	2.7	(1)	(1)	
1907	11,269,518		11,269,518	2.9	(1)	(1)	
1908	11,870,438		11,870,438	3.6	(1)	(1)	
1909	14,443,147		14,443,147	3.8	(1)	(1)	
1910	16,035,387		16,035,387	3.8	(1)	(1)	
1912	17,538,572		17,538,572	3.9	(1)	(1)	
1913	22,069,691		22,069,691	4.6	(1)	(1)	
1914	20,264,141		20,264,141	4.8	(1)	(1)	
1915	20,873,727		20,873,727	4.7	(1)	(1)	
1916	22,922,218		22,922,218	4.6	(1)	(1)	
1917	25,483,696		25,483,696	4.6	(1)	(1)	
1918	22,017,293		22,017,293	3.8	(1)	(1)	
1919	16,884,062	(1)	(1)	¹ 3.6	(1)	(1)	
1920	17,934,289	(1)	(1)	² 3.3	(1)	(1)	
1921	13,628,724	(1)	(1)	³ 3.4	(1)	(1)	
1923	20,140,385	(1)	(1)	³ 3.8	(1)	(1)	
1927	21,119,441	3,650,584	24,770,025	4.8	2,922,022	27,892,047	5.3
1928	21,188,911	3,786,185	24,975,096	5.0	3,807,943	28,783,039	5.7
1929	26,427,971	5,843,979	32,271,950	6.1	4,527,170	36,799,120	6.9
1930	27,794,648	7,895,109	35,689,757	7.6	3,109,862	38,799,619	8.3
1931	25,063,165	8,514,638	33,577,803	8.8	2,594,570	36,172,373	9.5
1932	20,818,509	6,539,090	27,357,599	8.8	2,920,770	30,278,369	9.8
1933	22,992,590	7,573,839	30,566,429	9.2	3,991,782	34,558,211	10.4
1934	27,555,730	8,297,984	35,853,714	10.0	3,972,845	39,826,559	11.1
1935	31,006,643	8,504,533	39,511,176	10.6	5,849,845	45,361,021	12.2
1936	42,795,529	10,590,948	53,386,477	12.2	7,708,499	61,094,976	13.9
1937 ⁴			57,000,000	12.8	7,866,369	65,000,000	14.6

¹ Not available.² Pneumatic cleaning began in 1919 but no statistics are available for 1919 to 1923. Tonnages in those years were small but estimates are included in percentages of national production.³ Preliminary.

Authority: Geological Survey, Bureau of Mines and Bituminous Coal Division.

April 20, 1940.

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TABLE 13.—Net income and income taxes of the bituminous coal mining industry as shown by income tax returns

Year	Number of Companies	Number Reporting Net Income	Number Reporting No Net Income	Net Income	Deficit	Net Income of Industry	Tax	Industry's Profit or Loss
1917	1, 234	1, 149	85	\$204, 564, 196	-\$645, 678	\$203, 918, 518	\$70, 961, 656	\$132, 956, 862
1918	1, 234	1, 106	128	150, 094, 603	-1, 247, 971	148, 846, 632	65, 763, 960	83, 082, 672
1919	1, 234	817	417	73, 202, 962	-9, 943, 268	63, 259, 694	12, 934, 424	49, 325, 270
1920	1, 234	1, 152	82	251, 025, 514	-1, 658, 135	249, 367, 379	76, 225, 563	173, 143, 816
1921	1, 234	803	731	59, 164, 092	-30, 274, 905	28, 889, 184	10, 559, 444	18, 329, 760
1925	3, 650	1, 065	2, 585	40, 462, 955	-62, 826, 452	-22, 363, 497	4, 517, 057	-26, 850, 554
1928	2, 982	863	1, 842	33, 477, 073	-57, 885, 403	-24, 408, 330	3, 441, 860	-27, 950, 190
1929	2, 646	934	1, 635	40, 068, 844	-51, 690, 877	-11, 622, 033	4, 000, 019	-15, 824, 052
1930	2, 356	781	1, 458	25, 077, 232	-57, 148, 274	-32, 071, 042	2, 637, 057	-44, 708, 099
1931	2, 207	532	1, 513	9, 957, 000	-57, 702, 000	-47, 745, 000	1, 039, 000	-46, 706, 000
1932	1, 897	289	1, 575	3, 956, 000	-57, 123, 000	-51, 167, 000	777, 000	-51, 944, 000
1933	1, 917	396	1, 455	7, 243, 000	-54, 792, 000	-47, 549, 000	1, 029, 000	-45, 578, 000
1934	2, 071	660	1, 357	23, 634, 000	-31, 218, 000	-7, 584, 000	3, 308, 000	-10, 892, 000
1935	2, 012	591	1, 384	19, 566, 000	-35, 142, 000	-15, 576, 000	2, 750, 000	-18, 326, 000
1936 ¹	1, 995	590	1, 355	19, 902, 000	-32, 304, 000	-12, 402, 000	3, 214, 000	-15, 616, 000
1937 ²	1, 853	539	1, 276	18, 390, 000	-26, 952, 000	-7, 662, 000	3, 208, 000	-10, 870, 000

¹ Deficit.

² The figures for 1936 and 1937 are presented in a form directly comparable with previous years by excluding from net income the dividends received on stocks of domestic corporations and interest on government obligations, and by adding to net income the amount of contributions or gifts. In this form the data more nearly reflect the income obtained from coal-mining operations and are comparable with other years.

NOTE.—The years included in the table are the only years for which separate figures for the bituminous-coal industry are available. The data for the years 1917 to 1921, inclusive, are taken from tables prepared by Edward White, Head of the Statistical Division of the Income Tax Unit, for the use of the U. S. Coal Commission. The figures are based on the income-tax reports of all companies making such reports for all five years. The anthracite figures for the year 1925 were furnished by the Assistant Secretary of the Treasury upon request of the National Coal Association; the bituminous figures for the same year were obtained by subtracting the anthracite figures from those of the two branches of the industry combined, as shown in the Statistics of Income of 1925. In 1928 the Bureau of Internal Revenue first published separate figures for the two branches of the coal industry, and the data shown for the years 1928 to 1937, inclusive, are taken from the yearly reports of the Bureau entitled, "Statistics of Income."

National Coal Association, February 20, 1940.

EXHIBIT No. 2738

ENGINEERING DEPARTMENT MONOGRAPH NO. 9

TECHNOLOGICAL DISEMPLOYMENT IN THE COAL INDUSTRY

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MOTIVES RESULTING IN DISEMPLOYMENT

All reasons for the wide and fast spread of mechanization in the mines on one side, and technological means for reducing coal consumption on the other, may be reduced to one common motive: increased financial returns on operation. When rationalized, they may appear in a variety of garbs: One company claims that without conveyors they would be forced out of business—that is, financial returns must be increased to make it profitable; another corporation admits that unless they produce the required tonnage within a short season their total annual output will be too small to carry on—that is, speed of production within a busy season enhances financial returns. On the consumer's side, a manufacturer claims that unless he reduces coal consumption per unit of output in his plant he cannot meet competition. Landlord, hotel keeper, railroad manager—all clamor for reduced coal bills. Therefore, technicians of combustion, of insulation, of heat convection, of processing do their bidding by getting more B. t. u.'s from every pound of coal, and less tonnage is necessary.

These financial incentives to mechanization affect the various members of the industry in special ways:

1. *The manufacturer of machines* and mine equipment, attempting to increase his volume of sales, not only advertises his product but, in order to expedite installations, he is frequently willing to finance the buyer. By the time the first payment is made a number of coal miners are laid off as unnecessary.

2. *The coal operator* reduced the cost of production per ton and reduces the payroll, but increases the fixed charges. As a result of \$10,000 invested in a mobile loader some 18 families lose a wage earner. Around 78,000 miners have lost their jobs to machines in this way within the last 15 years.

3. *The coal user* welcomes technological means for reducing coal bills for necessary heat, power, and light—for lowering the amount of coal necessary per unit of his output, be it steel ingots, pulp and paper, sugar, canned goods, etc. Within the last 15 years some 34,000 miners lost jobs on account of such technological "perfection".

4. *The oil refinery and gas well operators*, on the other hand, in order to increase their financial returns, are quick to make alluring offers to reduce the consumer's coal bill by selling him fuel oil or natural gas. These substitute fuels eliminated at least 75,000 jobs in coal mines between 1923 and 1938.

Each of these groups, by attaining their goal of increased financial returns, displace men in the coal mining industry, in rail transportation, in trucking, and in gas works. Each man thus dispossessed of job contributes from \$800 to \$1,200 a year to the business! In return, each of the 81,842 miners who were on relief

rolls in March 1935 received a pittance ranging at the present rate from \$41.88 in West South Central part of the United States to a maximum in Pennsylvania of \$61.77 for *full-time* WPA work.

And when disemployed miners, as all other unemployed, can no longer buy what they need, industry slows down and uses still less coal. So technological unemployment caused a net reduction of another 86,000 jobs in and around mines. This is over and above the jobs lost because of increased productivity of miners and the shrinking consumption of coal.

ECONOMY IN MECHANIZATION

Mr. Percy Tetlow, formerly Chairman of the National Bituminous Coal Commission, said at the 36th Constitutional Convention of the United Mine Workers of America:

"On the technical side, the bituminous coal industry is making every effort to reduce costs by the spread of mechanization. * * * In 1934 it was 12.2 per cent of the total production; in 1938, about 25 per cent. * * * Mechanical loading underground trend will continue upward. * * * The effect upon employment will be pronounced."

From the figures for Illinois alone it is obvious that the reduction in costs, due to mechanization, is very substantial. Compared with hand loading, the production cost per ton of mechanically loaded coal is 43.36 cents, or nearly 20 per cent, below the cost of hand loaded coal. In the case of strip mines the cost is 74.74 cents, or 34 per cent, below the cost of coal hand loaded. The estimate of a mobile loading machine manufacturer places the saving at a more conservative figure of 41 cents per ton.

The Engineering Department of the United Mine Workers of America made a special study of net savings on labor costs per ton in 9 Districts, allowing for explosives furnished by the company and for maintenance and depreciation of machinery. The results indicate a difference varying from a few cents to over 80 cents per ton in the cost per ton of mechanically loaded and hand loaded coal.

Grouping the findings according to Districts the advantages are reduced by the inclusion of unprofitable installations. Differences among Districts vary from 7.25 cents to 39.13 cents per ton. A comparison of the findings of the Engineering Department of the United Mine Workers and the reports of the National Bituminous Coal Commission shows a very close similarity:

Difference in Labor Cost per Ton in 9 District, Mechanically Loaded and Hand Loaded:	
United Mine Workers of America, Engineering Department...	25.47 cents.
National Bituminous Coal Commission ¹	26.10 "

¹ Crude average for nearly corresponding areas.

ECONOMIC SIGNIFICANCE

An inevitable consequence of these financial advantages is the displacement of men by machines. A typical case is reported by a Personnel Director of a large coal operation: "We mine bituminous coal and employ 6,000 men. When we are fully mechanized we will have laid off about 1,000 men." This is a conservative estimate—one out of 6 men displaced. Generally for every 12 men on a mobile loading machine crew about 18 men become unnecessary to produce the same tonnage in a given time.

Now, consider that an average modern mobile loading machine costs \$10,000. It means that for the construction of the machine the labor of some 13,000 man-hours is necessary. And with this investment the labor of 18 miners is eliminated. If miners work 200 7-hour days, a total of 1,400 hours, per year, the eliminated mine labor amounts to 25,200 man-hours for every year of the life of the machine. This means that each year the mining community is deprived of \$16,000 in payroll because of one mobile loading machine. Suppose that the machine is not junked for 5 years. This means that as a result of that \$10,000 investment, the community lost \$81,000 in purchasing power. In other words, business loses *net* \$70,000 of sales in the 5 years of operating that mobile loader and, in addition, pays taxes to support relief agencies.

Obviously, such an economic set-up in an industry producing a non-elastic commodity, such as coal, the use of which cannot be expanded by "creating a desire" to burn more coal than what will do the work, is not sound and, in the long run, ruins not only the industry but the business of the community as a whole.

The recent report of the Bureau of Mines reviewing the catastrophe at Bartley, West Virginia, unequivocally said: "While hand loading methods may not be as efficient as the conveyors used in this mine, there is no doubt that hand loading would be safer . . ." Here, as in the point in question, a million dollars of property damage occurred in addition to the sacrifice of 91 lives for the sake of a few pennies saved per ton of coal—illustrating the perversity of such economics.

The lesson to be learned from this wanton destruction of human lives (which is going on slowly by mechanization and rapidly by explosions) is that *the only sound function of a machine is to reduce the hours of toil and strain involved*; or, in economic terms, it is to improve the standard of living in the community through participation in the accrued benefits.

Instead, the actual numerical shrinkage of employment in bituminous and anthracite mines, according to the U. S. Bureau of Mines, mounted within 15 years (1923–1937) to the staggering total of 272,680 men, and by the end of 1938 reached a still higher peak of 297,250 men.

SHRINKAGE OF DEMAND AND EMPLOYMENT

The demand for coal in the United States grew rapidly until 1920. Since then it has gradually diminished on account of technological advances made in more efficient use of coal, and the use of other fuels instead of coal due to the development in petroleum and natural gas engineering.

If we consider the consumption of coal per capita, we see that between 1870 and 1920—that is, during the end of the machine age and early in the power age—the per capita consumption rose nearly sevenfold (685 per cent), but since then it declined 61.5 per cent by 1937, as is seen from the following table:

TABLE 1.—Coal consumption per capita in the U. S. A.

Year:	Tons per Capita	Year—Continued.	Tons per Capita
1870	0. 90	1920	6. 17
1880	1. 49	1930	4. 36
1890	2. 50	1934	3. 28
1900	3. 54	1937	3. 82
1910	5. 43		

The actual tonnage of coal produced reached a peak in 1923¹ when 564,565,000 tons of bituminous coal were mined by 704,793 men, and the mining of 93,339,010 tons of anthracite gave employment to another 157,743 men. By 1938 bituminous tonnage dropped 38.8 per cent (to 345,400,000 tons) and anthracite shrank by 39.8 per cent (to 46,099,027 tons). The drop in coal production and the increase in labor productivity between 1923 and 1937 made *unnecessary the work* of 214,022 miners in the bituminous field and 58,558 miners in the anthracite field—a total drop of employment in 15 years of 272,680 men. By 1938 the loss of jobs in both fields reached 297,251 men, of which 235,790 men were laid off in bituminous fields and 61,461 men in Pennsylvania anthracite.

It is significant that during these 15 years (between 1923 and 1937) while the output dropped only 20.8 per cent, employment shrank much faster, namely 30.0 per cent. This fact illustrates that, as a whole, the productivity of coal mine labor has rapidly increased, reaching the point where 4 men are doing the work of 5.

In the Pennsylvania anthracite field tonnage production was reduced 39.8 per cent from 1923 to 1938, and employment went down 38.9 per cent. Yet the daily productivity of anthracite miners has increased 36.2 per cent despite shorter hours. This means that 5 men are now doing the work that required 7 men in 1923.

CAUSES OF DISEMPLOYMENT

Such are the gross figures of the ravages of disemployment in the coal industry. Let us now consider in some detail the nature and extent of disemployment caused by technological changes affecting the coal industry. The chief of these are:

- a. Increased productivity of labor;
- b. Improved technique of coal utilization;
- c. Technological development of fuel oil and natural gas;
- d. General business depression.

To apportion precisely the disemployment due to these four causes is not possible because of lack of exact data covering all cases. It is possible, however, to determine with sufficient accuracy the *increase in labor productivity* and therefore the labor displacement by extended mechanization and changes in the manage-

¹ A still higher production was recorded in 1926 due to exceptional conditions and export.

ment technique. The balance of the displaced labor is due to the reduced tonnage resulting from the combined effect of the improved technique in combustion and utilization of power, by the technology of substitute fuels, and by diminished industrial and transport activities and more frugal use of coal for domestic heating during the depression. Of these three causes only the *displacement of employment by substitute fuels* can be calculated with some accuracy. The *economy in coal utilization* may be estimated with less accuracy because of the lack of data from all industries, and the shrinkage of employment due to economic set-back is to be reckoned merely as the remaining balance.

SECTION A. ENGINEERING ESTIMATE OF DISEMPLOYMENT DUE TO INCREASED PRODUCTIVITY OF LABOR

GROWTH OF MECHANIZATION

With the spread of loading machines in the mines since 1923, intensity of work and hourly productivity increased, although perhaps not at a uniform rate since, obviously, the first mechanical loaders were installed experimentally, and new skill and new management technique improved with use. The next period of mechanization had the advantage of experience and loading machines were largely introduced in the most suitable mines. Later installations were made, however, not only in less suitable mines but occasionally in mines definitely not suitable for mechanical loading because of low or weak roof, impurities or bands in the seam, gassy condition, or other factors. Likewise the installment payments, credit extended to operators by machine manufacturers, and high-pressure salesmanship resulted in slightly diminished advantages from loading machines installed in the more recent years. The growth of installation of different loading devices is shown in the following table:

TABLE 2.—Mechanical loading equipment

Year	Mobile Loaders	All Self-Load Conveyors	Scrapers	Increase—Percentage		
				M. L.	Conveyors	Scrapers
1936.....	980	1,170	106	100	100	100
1937 ¹	931	1,053	61	95	90	85
1938 ¹	292	835	18			
1938 ¹	241	749	6			
1939 ¹	295	1,095	28			
Total in 3 years.....	826	2,679	45	88.9	264.4	73.8
Grand total.....	1,808 1,769	3,849 3,732	151 90	179.5	318.9	84.9

¹ Sale.

² Allow in discard in 3 years.

Concurrently with the larger number of loading machines in use, the tonnage loaded mechanically has increased by leaps and bounds since 1923³ as follows:

TABLE 3.—Tonnage mechanically loaded

Year	Bituminous Tons	Percentage of Increase from Preceding Year	Anthracite Tons	Percentage of Increase from Preceding Year
1923.....	1,880,000			
1929.....	37,862,000		3,470,188	
1930.....	46,984,000	+24.1	4,467,780	+28.7
1931.....	47,562,000	+1.2	4,384,780	-1.9
1932.....	35,817,000	-24.7	5,433,340	+23.9
1933.....	37,821,000	+2.1	6,557,267	+20.7
1934.....	41,433,000	+9.6	9,284,486	+41.5
1935.....	47,177,224	+13.9	9,279,057	-0.6
1936.....	66,976,872	+42.0	10,827,946	+16.7
1937.....	83,500,000	+24.7	10,683,837	-1.3

³ We are referring in this analysis to year 1923 as a base year for the following reasons: (1) It was a year of deflection point on the curve between the depression of 1920 and prosperity in the later 20's; (2) It was a year of maximum employment; (3) "The year 1923 witnessed the first widespread attention to a machine which promises even greater results—the underground loader." (Coal in 1923, p. 588, U. S. Geological Survey).

It is also significant that during the past 2 years (1938 and 1939), for which no final record of tonnage is yet available, the number of new machines sold was greatly increased (75.6 percent). Therefore, it may be expected that the percentage of mechanically loaded coal went up and employment correspondingly went down.

Mechanically loaded tonnage in 1937 was 2.2 times greater than in 1929 in bituminous fields, and over 3 times greater in anthracite. Such was the effect of the depression years, in the effort of the operators to reduce pay rolls.

DISEMPLOYMENT DUE TO INCREASED PRODUCTIVITY OF LABOR

The Engineering Department of the United Mine Workers of America has carried on for nearly 3 years exhaustive studies of the effects of mechanization (specifically, of mechanical loading) in the Appalachian Region. These studies were based on mine-to-mine examinations of checkweigh sheets and pay slips in over 90 percent of the mechanized and partly mechanized mines at the time of the study.

From these studies the productivity of loading crews, operating different types of equipment, was determined and compared with the productivity of hand loading in the same mines or adjoining mines in the same seam of coal. Then, comparisons were made of the productivity of the entire personnel in both types of mines, determining all-around productivity per man-day with and without the aid of machines. Similarly, labor costs per ton were computed for both types of mining. Substantially, these field studies disclosed the following *increases* in the intensity of work and hourly (or daily) productivity of men in the loading crews:

TABLE 4.—*Productivity per man-shift (in 204 mines in Appalachian region by types of loading)*

	Hand Loading in Non-Mech- anized Mines	Hand Loading in Partly Mech- anized Mines	Loading on All Types of Conveyors	Mobile Loading
Tons per Man-Shift.....	5.80	7.43	9.04	18.28
Index Number of Men Needed.....	315	246	202	100

Consequently the average output per man in and around mines (*not* loading crew only) has also increased; but what is equally important and significant is the fact that, in the mines which are only partly mechanized, the hand-loading speed also increased as men spurred their production in the race with machines. Thus we notice that the daily output of hand-loaders in partly mechanized mines becomes 28 per cent higher than it is in the neighboring mines in the same seam of coal where *no* mechanized loaders are used.

A similar effect of mechanized portions of work has been observed even in clerical operation, for instance, in bookkeeping by hand in offices where part of the staff did identical work with the aid of machines.

TABLE 5.—*Speeding up of manual work alongside of the mechanized work*

[Insurance Audit]

Year	Manual transactions per man-hour	Mechanized transactions per man-hour	Year	Manual transactions per man-hour	Mechanized transactions per man-hour
1928.....	1.08	None	1933.....	1.31	1.74
1929.....	1.14	"	1934.....	1.40	1.86
1930.....	1.09	"	1935.....	1.40	1.82
1931.....	(¹)	(¹)	1936.....	1.42	1.79
1932.....	1.27	1.71			

¹ Transition of portion of clerks to mechanical work.

In this case the entire force of 608 clerks did manual accounting until 1931, with average transactions per man-hour of 1.09. In 1931 one group of clerks was provided with machines and their daily output increased to 1.78 as an average

of 5 years. This result had a repercussion on the remainder of the clerks who were still without machines, and their average output per man-hour for an average of 5 years went up to 1.36, or 24.77 percent higher than it was before any machines were used by the company. Professor T. North Whitehead (Harvard University, Cambridge, Massachusetts) reported similar results from experiments conducted among a group of factory operatives, in "Social Relationships in the Factory"—The Human Factor, Vol. IX, No. 11, November 1935.

From the studies of the Engineering Department of the United Mine Workers of America, some definite relationships between disemployment per loading device of each type were established as follows:

TABLE 6.—Average loss of jobs per loading machine

	<i>Men</i>
Mobile loaders.....	18.9
Scrapers.....	7.47
Self-loading conveyors.....	0.50
Pit car loaders and hand-loaded conveyors.....	0.48

Similarly, for any given relation in the use of these devices the loss of employment per 1,000 tons was computed:

TABLE 6-A.—Average loss of employment per 1,000 tons loaded by various machines

	<i>Men</i>
Mobile loaders.....	0.812
Scrapers.....	0.529
Self-loading conveyors.....	0.566
Pit car loaders and hand-loaded conveyors.....	0.465
Weighted average.....	0.693

On the basis of these test data it appears that in 1936 we had labor displacement by types of loaders as follows:

TABLE 7.—Loss of employment in bituminous coal mines

Mobile loaders:	
Tonnage loaded, 40,969,625 tons.	
Number of men needed to load it by hand, 44,532 men.	
Actual employment, 11,252 men.	
Men displaced, 33,270.	
Conveyors (duckbills):	
Tonnage loaded, 3,240,411 tons.	
Number of men needed to load it by hand, 3,522 men.	
Actual employment, 1,688 men.	
Men displaced, 1,834.	
Scrapers:	
Tonnage loaded, 1,272,466 tons.	
Number of men needed to load it by hand, 1,383 men.	
Actual employment, 710 men.	
Men displaced, 673.	
Pit car loaders and hand-loaded conveyors:	
Tonnage loaded, 21,494,370 tons.	
Number of men needed to load it by hand, 23,363 men.	
Actual employment, 14,060 men.	
Men displaced, 9,303.	
Total displacement by loading machines in 1936:	
	<i>Men</i>
Mobile loaders.....	33,270
Self-loading conveyors.....	1,834
Scrapers.....	673
Pit car loaders and conveyors.....	9,303
Total.....	45,080

Displacement of men on the basis of 1937 tonnage mechanically loaded would be about 56,163 men. This estimate does not include the strip mining responsible for large additional disemployment.

STRIPPING

Stripping operations are characterized by very high labor productivity, as shown in the table below:

TABLE 8.—*Labor productivity in strip mines*

Year	Bituminous		Anthracite	
	Per Man-Day	Per Man-Year	Per Man-Day	Per Man-Year
1936.....	12.60	<i>Tons</i> 2,330	6.68	<i>Tons</i> 1,330
1937.....	14.08	2,548	6.75	1,242

On this basis, to produce the difference between 11,940,134 tons stripped in 1923 and 32,074,557 tons stripped in 1937 (bituminous coal), would have required 22,100 men working at the average underground rate of production, but actually only 2,548 men were required to produce this additional tonnage of stripping. Therefore, the loss of employment in bituminous coal was 19,552 men by 1937.

DISEMPLOYMENT IN ANTHRACITE

Considering the loss of employment in the anthracite operations, we must note that the great increase in labor productivity (40.1 percent per man-hour, from 1923 to 1937) has been nearly balanced by the reduction of working time. The number of working days per year was reduced 35.8 percent and the working hours were cut to 7 per day. In this way the technological displacement in the anthracite deep mines was compensated by reduced working time.

In other words, to produce the tonnage of 1937 (51,856,433 tons) would have required the labor of 99,057 men with the productivity prevailing in 1923, but, with shorter time and greater labor productivity, the actual requirement was for 99,085 miners. A small gain of 28 men—less than three hundredths of one percent.

At the same time the expanded stripping operations in the anthracite field caused some disemployment.

ANTHRACITE STRIPPING

Tonnage stripping in open pits in Pennsylvania increased between 1923 and 1937 by 3,675,395 tons (from 2,020,623 in 1923 to 5,696,018 in 1937). With the labor productivity actually existing in deep mining, the recovery of this tonnage would have required the employment of 7,040 miners. Actually, however, the stripping of 5,696,018 tons in 1937 was done by 4,585 men. Thus the "labor saving" in anthracite strip mining was equal to 2,455 men.

TOTAL DISEMPLOYMENT IN ANTHRACITE

We can now combine the gain in deep mining and the loss due to stripping as reflected in computed disemployment of anthracite miners, as follows:

TABLE 9.—*Loss of employment in anthracite*

Deep mines—gain.....	<i>Men</i> 28
Strip mines—loss.....	2,455
Total loss.....	2,427

TOTAL DISEMPLOYMENT DUE TO MECHANIZATION

Combining the disemployment figures for the bituminous coal fields, based wholly on our field observations and study of mechanization with those computed for the Pennsylvania anthracite, we get a total of disemployment resulting from increased productivity of labor due to mechanization and such managerial methods as go with it, as follows:

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TABLE 10.—Disemployment due to mechanization, etc.

	<i>Men</i>
Bituminous deep mines.....	56,163
Bituminous strip mines.....	19,552
Total.....	75,715
Anthracite deep mines—gain.....	28
Anthracite strip mines—gain.....	2,455
Anthracite total.....	2,427
Grand total.....	78,142

¹ It is important to note that this engineering computation compares with statistical calculations based on Bureau of Mines data of labor productivity within one quarter of one percent (75,905 and 75,715).

INFLUENCE OF MACHINES ON SEASONAL UNEMPLOYMENT

Several studies illustrate the effect of the mechanical loaders on employment in slack seasons. Inasmuch as the installments and interest on the investment have to be paid even while idle men are off the payroll, the management seeks to use machinery more uniformly and lay off hand-loading men. Thus in our studies we have a record comparing man-days worked by mechanical crews and hand and pick miners during high and low production months:

TABLE 11.—Effect of slack operation on character of employment

	Full Month	Slack Month
Hand loading and pick mining.....	1,200	300
Mechanical operation.....	2,830	2,570

The above shows that while in dull seasons only 25 percent of hand miners are employed, nearly 91 percent of mechanized operations are still going on.

ACTUAL VS. STATISTICAL MEN

Because of uneven distribution of employment throughout a year, and more particularly because of the widespread practice of sharing the work among miners, the computed number of men are not necessarily wholly out of work. In other words, some of the 78,140 men are undoubtedly sharing some work with those regularly employed. As a result they work per week generally less than 5 days.

SECTION A-1. STATISTICAL BASIS FOR ESTIMATE OF DISEMPLOYMENT

SHORTCOMINGS OF STATISTICAL DATA

Obviously, statistical compilations can never be as reliable and as detailed as engineering estimates based on test data. Statistical errors may, however, sometimes cancel each other.

To use the statistics of the Bureau of Mines for determination of displacement of miners by increased mechanization requires several adjustments. The Bureau itself admits that "until the American coal industry arranges to keep an accurate record of the man-days or man-hours of employment, all computations . . . will remain subject to qualification." (Minerals Yearbook, 1939, p. 790.)

Moreover, the Bureau of Mines statistical method does not recognize the principle of dimensionality and adds together manual production and mechanical production in its attempt to determine the "average" rate of productivity. Therefore, the Bureau of Mines had no knowledge of relative productivity of different types of mining equipment. Furthermore, part-time employment is not taken into account when an attempt is made to compute the total man-hours of work and base on it the labor productivity.

Therefore, in order to compute the displacement of labor by mechanization we must not only accept admittedly incomplete records of the Bureau of Mines, but

also lump together: (1) psychological effect on the efficiency of manual operations; (2) productivity of all types of mechanical loading confounded with productivity of hand mining; and (3) consider *all* operations in and around mines as a whole. And after that we must correct year-by-year records for (a) variations in tonnage; (b) variations in number of days worked per year; (c) variations in number of hours per day, and leave as an indeterminate factor all changes in management technique, in the use of explosives, personnel relations, etc., etc.

TOTAL INCREASE OF LABOR PRODUCTIVITY

Statistics of the Bureau of Mines determine the productivity of labor by dividing the total tonnage output reported for the year by the average number of miners employed. This tonnage per man is then divided by the reported number of days (average) worked at the tippie, and this result is accepted as the rate of productivity per man-day in the mine.

Even with so crude an approximation of labor productivity, its rise is definitely noticeable. In 1923 the Bureau of Mines (Geological Survey) made note of the appearance of the underground loading machine. Since then the portion of tonnage mechanically mined and loaded has steadily reflected its influence on Bureau of Mines records.

The productivity of mechanized mines influences the average productivity of all mines in the country, and the intensification of work is clearly seen from the rapid increase of productivity per man-hour. Since 1923 it has grown as follows:

TABLE 12.—Hourly productivity of mine labor

Year	Output in Tons		Percentage of Increase	
	Bituminous Per Hour	Anthracite Per Day ¹	Bituminous	Anthracite
1923	0.555	2.21	0.0	0.0
1929	0.602	2.17	+8.4	-1.8
1930	0.632	2.21	+4.9	+1.8
1931	0.659	2.37	+4.3	+7.2
1932	0.645	2.54	-2.1	+7.2
1933	0.596	2.60	-7.6	+6.1
1934	0.590	2.53	+0.5	+2.6
1935	0.642	2.68	+7.7	+5.9
1936	0.658	2.79	+2.5	+4.1
1937	0.672	2.77	+2.1	-0.7
1938 ²	0.655	2.79	-2.5	+0.7
Total Increase			+18.01	+26.24

¹ No reliable record of hours worked in anthracite mines is available.

² The data for 1938 are questionable.

This increase of hourly productivity of a miner from 0.555 tons in 1923 to 0.666 tons per man-hour for an average of the last 3 three years indicates the intensification of labor by 20 percent—that is, 4 men do the work previously done by 5 men.

DECREASE OF WORKING DAYS PER YEAR

With such increase in productivity per man-hour the total output would increase in proportion if the work time remained unchanged. Since, however, the demand for coal was declining while labor productivity was rising, the industry had two possible courses of action: either to dismiss a large number of men or to reduce working time. Actually, both courses were taken. By 1938, the bituminous mines reduced the number of *working days per year* to 73 percent, and anthracite mines to 76 percent, of the days worked in 1929.

TABLE 13.—Reduction of working days per year in U. S. mines

Year	Bituminous	Anthracite	Year	Bituminous	Anthracite
1923	179	268	1934	178	207
1929	219	226	1935	179	187
1930	187	208	1936	199	192
1931	160	181	1937	196	185
1932	145	162	1938	160	171
1933	167	182			

¹ Bureau of Mines—Pennsylvania Anthracite.

But the drop in tonnage was even greater than the reduction in the number of days worked. Thus 1938 bituminous tonnage was 64.5 percent of the 1929 output, and 1938 anthracite tonnage was 70 percent of the 1929 output. This situation, together with the steadily increasing productivity of labor, led to wholesale dismissals of miners.

REDUCTION OF HOURS PER DAY

To counteract this gradual starvation of miners through loss of jobs, the United Mine Workers of America secured a shorter working day to provide work for more men. This reduction of working hours per week in the bituminous coal industry was as follows:

TABLE 14.—Working hours per week—Bituminous coal

Year	Hours per Week	Percentage	Year	Hours per Week	Percentage
1913.....	51.6		1936.....	35.1	72.5
1929.....	43.4	100.0	1937.....	35.1	72.5
1934.....	40.0	82.6	1938.....	35.02	72.3

Stated differently, the average number of hours a miner worked in 1929 was 1,774, and in 1938 the average was 1,120 hours—a reduction of 36.9 percent in annual time.

PRODUCTIVITY PER MAN-YEAR

Balancing in this manner the intensification of labor (per hour) against reduced working time (per year), we find that the reduction in working time was inadequate to balance the increased labor productivity, and the net annual productivity per man rose between 1923 and 1937 by 13.1 percent in bituminous operations. In the anthracite field, however, the balance was apparently reached.

TABLE 15.—Productivity per man per year

Year	Bituminous		Anthracite (Tons per Man-Year)	Year	Bituminous		Anthracite (Tons per Man-Year)
	Tons per Man-Year	Hours per day			Tons per Man-Year	Hours per day	
1923.....	801	8.06	592	1936.....	920	7.02	535
1932.....	762	8.10	411	1937.....	906	7.01	522
1934.....	785	7.27	473	1938.....	736		478

¹ Estimate.

This indicates a net annual increase in bituminous coal output per miner under the existing conditions of 13.1 percent.

COMPUTED DISEMPLOYMENT—BITUMINOUS

Consequently, leaving for the time being out of consideration the effect of technology on coal demand, we see that the disemployment of miners due exclusively to *changed method of production* is 13.1 percent. In total numbers this represents a loss of jobs for 67,300 men between 1923 and 1937.

ADJUSTMENT FOR TIME AND LABOR INTENSITY

A more dependable method of determining the displacement of miners by means of their increased productivity would be to adjust the Bureau of Mines records to uniform 7-hour day and to the uniform number of days, and then to compute the labor requirements and actual employment in order to determine the number of jobs permanently eliminated by the recorded intensification of labor.

Thus, if in 1923 men worked 7 hours per day and 179 days with the same productivity as they worked in 1938, then the man-year production would have been 820.7 tons. Again, if in 1938 labor productivity was as low as it was in 1923, the productivity per man-year would have been only 621.6 tons.

Therefore, under old efficiencies, to produce 345,400,000 tons would have required per year 555,305 men as against the actual employment of 469,000 men, representing the disemployment in 1938 of 86,305 men.

By the same method of calculation we find that disemployment due to increased labor productivity has changed as follows:

1936.....	89,028 men
1937 ¹	75,905 "
1938.....	86,305 "

¹ Year comparable with the field study of the Engineering Department, United Mine Workers of America, to determine labor productivity by types of machines and mining.

TOTAL DISPLACEMENT OF LABOR DUE TO INCREASED LABOR PRODUCTIVITY

Recapitulating now the results of our field tests and the Bureau of Mines statistics, we can state with reasonable accuracy the extent of destroyed opportunities for employment due to increased productivity of labor modified by reduced working time.

TABLE 16.—Disemployment due to increased labor productivity with mechanical and managerial developments—1923-1937

Class of Labor	Number of Jobs Eliminated	Computed on Basis of Bur. of Mines data
Bituminous:		
Deep mines.....	56,163	
Stripping.....	19,652	
Total.....	75,715	75,905
Anthracite:		
Deep mines.....	428	
Stripping.....	2,455	
Total.....	2,427	2,427
Grand Total.....	78,142	78,332

Inasmuch as total shrinkage of employment, 1923-1937, was 272,680 men (214,022 in bituminous and 58,658 in anthracite), of which the disemployment due to mechanization, managerial technique, and general increase of labor productivity was 78,142 men, the loss of employment by the balance of 194,538 miners is to be accounted for as the result of (1) increased efficiency of combustion, (2) technological progress in the use of substitute fuels, and (3) general business depression.

SECTION B. TECHNIQUE OF COAL UTILIZATION

FUEL INDICES

The technological progress has affected the demand for coal as the efficiency of combustion has been gradually increasing through more scientific combustion control, automatic stokers, pulverized coal burners, and the use of pre-heaters and economizers in boiler-room practice, and the perfected design of steam turbines, locomotives, kilns and other power- and heat-utilizing equipment.

The most accurate index of this progress is to be found in the records of the Electric Utilities Control Stations (Federal Power Commission and Edison Institute). Thus the generation of one kilowatt hour of electric energy requires less and less coal, as can be learned from the following table:

TABLE 17.—Coal consumption per kilowatt hour

ELECTRIC CENTRAL STATIONS

Year	Pounds per kw. hr.	Year	Pounds per kw. hr.
1902.....	6.40	1934.....	1.45
1917.....	5.47	1936.....	1.44
1923.....	2.40	1937.....	1.43
1929.....	1.69	1938.....	1.41
1933.....	1.47		

This record indicates a reduction of coal consumption since 1923 to 1937 of 40.4 percent per kilowatt hour.

A similar reduction of coal consumption per unit of output was recorded in transportation (R. R., Class I). There coal consumption per thousand ton-miles of freight dropped as follows:

TABLE 18.—Coal consumption

Year	Per M. Ton-Miles Freight Pounds	Per Passenger Car-Mile	Year	Per M. Ton-Miles Freight Pounds	Per Passenger Car-Mile
1920	174	18.8	1934	122	15.2
1923	150	18.1	1936	119	
1929	125	14.9	1937	117	
1933	121	15.2	1938	116	

This record indicates a reduction of coal consumption in 15 years (1923-1937) by 22.0 percent in freight service and at least 14.3 percent in passenger service.

In the study of engineering progress in the cement industry (which is especially significant because one-third of the total labor needed to produce cement is the labor of coal miners), we notice the extended use of Lepol Kilns and numerous other innovations which cut the consumption of coal by about 2 tons per thousand barrels produced. In terms of labor elimination this fuel efficiency appears as follows:

TABLE 19.—Decrease in coal-mine labor due to increased fuel efficiency in cement plants, 1927-35

	1927	1935	Percentage of Decrease
Average number of man-hours consumed in coal per 1,000 barrels of cement—coal mines and railroads	257.7	199.8	22.7%
Mine labor per 1,000 barrels of cement	249.0	200.0	20.0%

In other industries, notably steel and iron, paper and pulp, food products, etc., a considerable fuel economy has likewise been attained in the last decade or two. Thus, in blast furnace practice fuel consumption dropped from 3,325 pounds per ton of pig in 1923 to 2,838 pounds in 1935, or 14.6 percent reduction.

Likewise, domestic heating has been made more efficient, partly through the use of stokers, automatic controls, and improved heating equipment, and partly to better insulation of houses.

To compute the actual number of miners displaced by this advanced technology is not simple because some industries (public utilities) continue to grow, and what is lost due to efficiency is gained due to increased business. Other industries (railroad) are shrinking, and increased efficiency is applicable to a smaller proportion of fuel demand. In other words, while theoretically the potential loss of employment in producing coal for the electric public utilities would have been over 30,000 people, the increased business of public utilities reemployed almost all those displaced by higher efficiency, and the resulting net loss of employment is but 8,000 men.

On the other hand, the total decrease in coal consumption depends not only upon the efficiency of coal utilization but also upon the tonnage used in each industry.

The average consumption of bituminous coal between 1919 and 1935 was distributed as follows:

Electric power stations	8.4%
Railroads, Class I	23.4%
Iron blast furnaces	10.1%
Cement plants	1.6%
	43.5%

It is somewhat hazardous to compute the total effect upon less than a 50% sample, but revising the figures in the light of 1937 technical reports and coal consumption, and then translating the tonnage of coal saved into man-years of eliminated work, we get a reasonable approximation.

LOSS OF EMPLOYMENT DUE TO HIGHER EFFICIENCY OF COAL UTILIZATION

Such an adjusted estimate of jobs lost due to increased efficiency in the utilization of heat, light, and power appears to be:

TABLE 20.—Loss of employment due to increased efficiency in uses of coal

Electric utilities.....	7, 870 men
Steam railroads.....	5, 895 "
Manufacturing and domestic uses.....	20, 195
Total.....	33, 960 men

SECTION C. TECHNOLOGICAL DISEMPLOYMENT DUE TO SUBSTITUTE FUELS

GENERAL DEVELOPMENTS

The last score of years witnessed a rapid advance in technique of recovery of petroleum and natural gas. Coupled with the progress in the field, there was notable expansion and change in the technique of refining and the transportation of gas and oil by pipe lines. Widespread motor vehicle transportation caused an increased demand for gasoline; hence the by-product of the refineries—fuel oil and Diesel oil—appeared on the market in great quantities. The price was juggled so that the main portion of production cost was borne by the consumers of gasoline, who in this way subsidized fuel oil and made it a competitor of coal. Furthermore, the development of the Diesel engine and its widespread adaptation to transportation, municipal and public works had its effect. While in 1929 only 430,000 horse power of Diesel engines were sold, the sale of Diesels in 1939 exceeded 2,144,000 horse power, making total installations by 1940 of 15,265,000 horse power using heavy oil, partly instead of gasoline but largely replacing coal.

Similarly, natural gas, through long transport pipes, reached remote parts of the country and, with the aid of technical improvements in pumping stations, automatic heaters, metallurgical processes, etc., became a competitor of coal and manufactured gas.

DISPLACEMENT OF COAL BY OTHER ENERGY SOURCES

National consumption of coal has steadily declined after it passed the peak in 1920, but the total consumption of all fuels and water power is still increasing:

TABLE 21.—Energy consumption in U. S. A.

[In trillions of B. t. u.]

Year	Trillions B. t. u.	B. t. u. per capita	Year	Trillions B. t. u.	B. t. u. per capita
1896-1900.....	6, 690	88. 0	1934.....	20, 431	161. 8
1921-1925.....	21, 308	192. 0	1935.....	21, 615	169. 5
1932.....	18, 022	144. 2	1936.....	24, 367	189. 7
1933.....	19, 317	153. 5	1937.....	25, 739	199. 0

As we have nearly reached the index of physical production of 1929 we have increased the per capita energy consumption, and the total quantity of fuels used is 21 per cent higher in 1937 than it was in 1923, while the total coal consumption within the same period dropped 24 per cent.

INCREASE IN FUEL OIL USE

In 1923 we consumed 261,388,000 barrels of fuel oil; in 1937 our consumption was:

Gas oil and distillate fuels.....	116,841,000 barrels
Fuel oil (residual).....	315,514,000 "

Thus the increase in the use of fuel oil alone was 64,126,000 barrels, which is equivalent (1 ton of bituminous coal=4.37 barrels) to 14,674,140 tons of coal. To mine this quantity at the rate prevailing in 1937 would have required the work of 16,000 miners.

INCREASE IN NATURAL GAS USE

The growth of natural gas uses in industry and in homes was likewise rapid, and even more disastrous to the coal industry. Since 1923 the uses of natural gas have increased as follows:

<i>Class of Service</i>	<i>Increase</i>
Domestic consumption.....	211,016,000,000 cu. ft.
Industrial.....	319,635,000,000 "
	530,651,000,000

This quantity is equivalent (1 ton of coal=24,372 cu. ft. of gas) to 21,772,977 tons of bituminous coal. This tonnage, if needed, would have provided employment to 23,900 men in the coal mines.

INCREASE IN HYDRO-ELECTRIC POWER

In addition to the use of these substitute fuels made possible by the advance in fuel technology and power engineering, the capacity of power dams, hydro-turbines, and hydro-electric plants increased rapidly. The hypothetical displacement of miners by the hydro-electric power is shown in the following table:

TABLE 22.—Hydro-electric output and equivalent displacement

Year	Hydro-Electric Output 1,000 kw. hrs.	Equivalent Tons of Coal ¹	Equivalent Requirement of Miners ²
1920.....	15,278,872	22,018	} 23,390
1925.....	21,494,119	22,568	
1930.....	30,941,508	25,063	} 26,440
1935.....	38,381,384	28,018	} 34,800
1937.....	43,702,000	31,465	} 34,640

¹ Efficiency of each given year.
² Productivity per man-year for given year.

POTENTIAL EMPLOYMENT IN LIEU OF SUBSTITUTE FUELS

In this manner we can visualize fairly well the employment necessary to produce coal which was replaced by substitute fuels.

TABLE 23.—Loss of employment due to substitute fuels

Fuel oil equivalent to.....	16,100 men
Natural gas ".....	23,900. "
Hydro-electric power ".....	34,540 "
Total.....	74,540 men

SUMMARY OF TECHNOLOGICAL DISEMPLOYMENT

While the items reviewed above are not strictly additive, they indicate the relative role each type of technological displacement of labor plays.

TABLE 24.—Recapitulation
 LOSS OF EMPLOYMENT BY CAUSES

	Men	Percent- age
A. Increased labor productivity (including mechanization, etc.).....	78,140	28.7
B. Increased efficiency of utilization.....	33,950	12.4
C. Technology of substitute fuels.....	74,540	27.3
Total.....	186,640	68.4
D. Shrinkage of market.....	86,040	31.6
Actual shrinkage of employment (1937).....	272,680	100.0

CONCENTRATION OF ECONOMIC POWER

TABLE 24.—Recapitulation—Continued
GROWTH OF MECHANIZATION AND DISEMPLOYMENT
BITUMINOUS COAL

Year	Tonnage Produced	Total Employed	Percentage Unemployed to Given Year	Production Per Man			Percentage Mechanically Loaded
				Per Year	Per Day	Per Hour	
1923.....	564,565,000	704,793	0.0	801	4.47	0.555	0.3
1929.....	534,989,000	502,993	40.1	1,064	4.85	.602	2.1
1930.....	487,536,000	493,202	42.0	948	5.06	.632	7.4
1931.....	382,089,000	450,213	56.5	849	5.30	.659	10.5
1932.....	309,710,000	406,380	73.4	762	5.22	.645	12.1
1933.....	333,631,000	418,703	68.3	797	4.78	.696	12.3
1934.....	359,368,000	458,011	53.9	785	4.40	.699	12.0
1935.....	372,373,000	462,403	52.4	805	4.60	.642	12.2
1936.....	439,000,000	477,204	47.7	920	4.62	.658	13.5
1937.....	447,047,000	490,771	43.6	911	4.72	.672	16.3
1938 ¹	345,400,000	469,000	50.3	738	4.60	.655	18.9
1939.....							20.5
							26.0

¹ Average day worked in 1923, 5.05 hours.

² National Bituminous Coal Commission, G. H. Wells.

³ Estimate, Bureau of Mines.

CHANGE 1923-1937/1938

	1937	1938 ²
Tons produced, Reduced.....	Percent	Percent
Men employed, Reduced.....	20.8	-38.8
Days worked, Reduced.....	30.4	-33.5
Tons per man-year, Reduced.....	27.9	-40.3
Tons per man-day, Increased.....	+13.7	8.1
Tons per man-hour, Increased.....	+5.6	2.9
	+21.1	18.0

GROWTH OF MECHANIZATION AND DISEMPLOYMENT

PENNSYLVANIA ANTHRACITE

Year	Tonnage Produced	Total Employed	Percentage Unemployed to Given Year	Production Per Man			Percentage Mechanically Loaded
				Per Year	Per Day	Per Hour	
1923.....	1 93,339,010	187,743	0.0	592	2.21	0.272	5.3
1929.....	65,918,031	151,501	4.1	487	2.17		7.2
1930.....	61,930,747	160,804	4.6	460	2.21		7.4
1931.....	59,645,662	139,431	13.1	428	2.37		10.9
1932.....	49,855,221	121,243	30.1	411	2.54		13.2
1933.....	49,541,344	104,633	50.7	473	2.60		16.2
1934.....	57,188,291	109,050	44.7	524	2.53		17.8
1935.....	53,158,783	103,269	52.7	505	2.68		19.8
1936.....	54,579,535	102,081	54.5	535	2.79		20.6
1937.....	51,856,433	99,085	59.2	522	2.77	.381	22.0
1938.....	46,099,027	96,282	63.8	478	2.79	.398	
1939.....							

¹ Net tons.

CHANGE 1923-1937/1938

	1937	1938
Tons produced, Reduced.....	Percent	Percent
Men employed, Reduced.....	-44.4	-39.8
Days worked, Reduced.....	-37.2	-38.9
Tons per man-year, Reduced.....	-29.5	-35.8
Tons per man-day, Increased.....	-11.8	-19.1
Tons per man-hour, Increased.....	+25.3	+36.3
	+40.1	+46.3

EXHIBIT No. 2739

TECHNOLOGICAL CHANGES IN BITUMINOUS COAL MINING AND THEIR SOCIAL-ECONOMIC CONSEQUENCES

By Walter M. Polakov, Director, Engineering Dept., United Mine Workers of America

The coal industry has been technologically backward from its beginning in 1720 until the end of the last century.

The first issue on machine mining arose in 1901 when, at the 12th Annual Convention of the United Mine Workers of America, it was pointed out that 12,000,000 tons more of bituminous coal were produced by the cutting machine in 1899 than in 1898. During that Convention the contention of the miners was stated for the first time that "If machine mining is to be the system through which coal is to be produced in the future and if the cost of production is thereby lessened, labor is entitled to and should receive a reasonable portion of the financial advantages".

To understand the revolutionary changes brought about by the mechanization of mining it may be advantageous to visualize the labor process in coal mining. Coal deposits are generally deep underground. To reach the seam of coal it is necessary to sink a shaft to the level of the coal deposit or make an entry into the outcropping seam as a drift or slope from the surface. Then a tunnel is dug (called an entry) from which tunnels (called rooms) branch off, from which coal is removed to the main tunnel and then to the surface.

In the manual operation the miner using a pick undercuts the layer of coal (an operation called "kerfing"); then drills holes with a breast auger, places explosives into these holes, and blasts the "face". The fallen, broken coal is then loaded with shovels into cars. These cars are pushed by men to the main haulage way from which they are taken out by mules or horses to the surface, or to the base of the shaft and then hoisted to the surface.

Obviously, working underground, the first requirement is fresh air to breathe. In former days it was furnished from the main entry by creating a draft by means of an air shaft at the end of the mine, on top of which fire was built to create a sort of chimney draft effect. With deeper mines and longer tunnels it became necessary to force the air to men underground by means of fans. Both fans and hoists were driven by a steam engine on the surface as the presence of explosive gas and coal dust inside the mine precluded the use of boilers and steam locomotives inside the mine.

When the first attempts at mechanization underground were made, electricity was not yet available. So the early machines, few in number, were driven by compressed air. But when electricity ceased to be only a source of illumination and means were discovered to generate electric power, the mechanization of mines became feasible to a greater extent.

The first step in mechanization was made when coal cutting machines were introduced to displace hand kerfing. By 1930, 81 percent of coal mined underground was already cut by machines, and in 1936 the percentage was 84.8.

It is noteworthy that in non-union areas a much larger percentage of coal was mined by pick than in unionized areas (Central Competitive Field) where most of the coal was mined by machine.

Thus the 1923 record shows:

	<i>Pick Mined Percentage to Total</i>
Non-Union Area:	
Northwest Maryland.....	83.5
Northwest Colorado.....	48.2
Tennessee.....	31.6
West Virginia.....	20.0
Fayette and Westmoreland Co., Pa.....	50.0
Union Area:	
Ohio.....	2.7
Illinois.....	5.5
Indiana.....	7.3
Pennsylvania.....	33.1

This placed upon union miners the first brunt of the displacement of men by machines.

As a result of this first stage of mechanization, employment in the West declined by 25 per cent between 1923 and 1929, while total tonnage was only 4 per cent

lower, and in the Southern Appalachian Region 44,500 tons more coal were produced in 1929 than in 1923 with 25,500 fewer workers.

Mass disemployment was aggravated by the receding coal market in 1923 when 1,745 mines were shut down and some 85,000 men were squeezed out of employment.

As the use of coal cutting machines became general, the electrification of mines revolutionized also the haulage method. Mules were practically displaced by 1924, when 3,585 mines producing 88 per cent of the total tonnage used locomotives. This change displaced mule drivers, stable men and others by a few motor-men.

Mechanical loading devices, while known and experimented with for some time, did not play any important part until about 1923. In that year President John L. Lewis of the United Mine Workers of America called a conference of union leaders to discuss loaders and conveyors and to work out a set of principles with reference to them. This awoke the statisticians of the Bureau of Mines, who made the first reference to this type of mechanical loading in the report on coal for 1923.

The decision reached at the conference called by Mr. Lewis ruled: "That it be the understanding in this matter that in districts where coal loading machines are in operation, the Mine Workers will insist upon the appointment of a joint commission in their respective districts to determine exactly what the machine will do, and that all data on the subject secured in the respective districts through the negotiations of commissions, be submitted to the International Union and that in all districts where it is necessary to make arrangements governing the operations of these machines . . . and that the respective districts shall adopt such *day wage scale* for temporary purposes as they may deem necessary to protect their membership."¹

In the interim the widespread introduction of loading machines displacing the most numerous group of mine labor, the loaders, became so threatening to employment that in the 1937 Appalachian Wage Agreement a special clause was included calling for a Joint Committee on Mechanized Mining, whose duty it shall be to study "the problems arising from mechanization of bituminous coal production by the use of conveyors and mobile loading machines for the area covered by the Appalachian Joint Wage Agreement, including the problem of displacement of employees."

Despite this contractual agreement, the operators consistently refused for over two years to cooperate in such a joint study and even refused, with only two exceptions, to have union representatives obtain data from their mines.

At that time the only official study in existence was that of the Bureau of Labor Statistics, "Employment in Relation to Mechanization in the Bituminous Coal Industry" (Monthly Labor Review, Vol. 36, December 1933, p. 264). At that time some mines in Illinois, Pennsylvania, and Wyoming already had mechanical loaders and conveyors in use.

These mines produced about 5,650,000 tons of coal in 1931 and employed some 4,000 miners. Some of these mines were selected for the study which disclosed that mechanical loading increased the average output per man per day by 46.8 per cent for all mines in the sample (partly and fully mechanized).

The fully mechanized mines *alone* showed the increase in productivity of 65.7 per cent.

Such a reduction of labor force by displacement of two out of every three men was indeed serious, but at that time (1931) the mechanical loading of all bituminous coal mined extended only over 13.1 per cent of the total tonnage.

Since then the steadily and rapidly increasing mechanization of mines fully warranted the concern expressed by Mr. John L. Lewis in 1923 and further emphasized the point in the Appalachian Wage Agreement on the joint study of the effects of mechanization. This clause was again incorporated in the 1939 Appalachian Wage Agreement, but so far the operators have taken no steps to fulfill their obligation of the *joint* study.

Consequently the Engineering Department of the United Mine Workers of America has carried on the study unaided and against the obstacles or non-cooperation and disregard of the contractual agreement. Its study covered 204 mines in the Appalachian Region, and since no factual data were available for the fully mechanized mines where union check weighmen do not keep production records, the findings of necessity are understatements. Yet the comparison of the United Mine Workers' computations of their field studies differ from the official records of the Bureau of Mines by only a fraction of one per cent, showing that 78,140 miners are displaced due to increased productivity of labor alone.

¹ Quoted from "Labor Agreements in the Coal Mines," by Louis Bloch, 1931, p. 187.

While the Bureau of Mines statistics of productivity of labor lumped together all forms of mechanical loading, methods, and equipment underground with hand loading, the United Mine Workers data clearly differentiates the labor-eliminating effects of each of the principal types of loading equipment as well as the effect of mechanization on speed up of hand work.

This detailed study indicates that with the use of mobile loading machines two-thirds of hand loaders are no longer needed to load the same tonnage as by hand, and, with all types (average) of conveyors, one-third of the jobs is eliminated.

Since the coal loaders constitute the most numerous class of mine labor, the devastating effects of such mechanization on employment is evident.

Yet the introduction of mechanical loading equipment affects the method of mining in many other respects. Thus, *loading coal on conveyors*, whether by hand or automatically, reduces the work of laying tracks from the loading point to the point where these conveyors discharge coal into cars. In some mines the so-called "face" conveyors discharge coal not in cars but on gathering conveyors, and these in turn feed the main conveyors that bring the coal to the surface, totally eliminating all jobs of track laying, maintenance, switching, locomotive crews, and repair. This method makes unnecessary such jobs as trip riders, spraggers, car repair men, etc., and provides employment for a much smaller number of men to take care of conveyors at the loading point and for maintenance.

With the old type of *mobile loaders* tracks were necessary, but more recent models of these machines are mounted on the caterpillar track-laying tractors, eliminating the work of trackmen, etc. Later development has introduced rubber-tired machines for drilling holes (Sullivan) and so-called shuttle-cars which are automatically loaded by mobile loaders or self-loading conveyors, and deliver and discharge coal on the main transport belt or on a main haulage train. A number of completely trackless mines are now in operation in different parts of the country.

With such technological changes the output per man per day has risen to an unprecedented high. A man on the loading crew in some West Virginia mines handles up to 40 tons per shift. A recent account in "Coal Age" (April 1940, p. 63) describes a mine in Logan County, West Virginia, where, working in a 40-inch seam of coal and removing 14 inches of impurities (rash and draw-slate), performance reached 13.2 tons per man per shift underground.

To further expedite the work of men as well as to improve the quality of coal as to size and to save on time, ventilation, and safety measures, a new technique of blasting is being introduced.

While the Bureau of Mines has spent many years and a huge sum of money on testing explosives and prescribing "permissible" practice, powder and dynamite are being slowly replaced by liquid carbon dioxide (cardox) and hydraulic breaking units. By rapid expansion of liquefied gas, coal is broken into larger fragments without emission of flame or noxious gases. In hydraulic breaking, rubber tubes 3 to 7 feet long are encased in protective steel braiding and expanded by oil pumps to the pressure of 2,000 pounds per square inch. This tube is inserted into a drilled hole and, when expanded, breaks the coal without shock or jar.

With resulting increases of labor productivity the cumulative effects of new technology in coal mining, besides its direct result of disemploying superfluous men, is evident in several other respects:

First of all, the nature of mechanized mining calls for greater strain, both muscular and nervous. The machine must run without interruption. It creates noise, it demands constant attention, and it calls for prompt adjustments and movements to avoid damage or personal injury.

Because the employers realize this added intensity they seek to eliminate the older men of greater experience. Mr. Frank E. Christopher, president of the coal company bearing his name, recently told the American Mining Congress that "mechanization of coal mines calls for a higher type of worker in industry".

Second, as the productivity of labor rose tremendously in mechanized operations, the payment by the hour, irrespective of the output of a man, took the place of the piece-rate or payment per ton basis.

Thus the labor cost per ton went down approximately 45 cents per ton in mechanized mining, but part of the saving on the payroll went to the manufacturers of equipment as payment for machines, patents, rights, supplies, etc.

Third, the labor employed in building mining machines does not equal that displaced by machines. This is obvious as otherwise the investment would hold little or no incentive for the operators. As a matter of fact, a mobile loading machine costing \$10,000 requires not over 16,000 man-hours to build it. Yet this machine eliminates the employment of some 12 miners for the life of the machine. Thus in 10 years 168,000 man-hours are rendered idle as against 16,000 engaged

in the production of a machine. A *net loss* of employment is therefore equal to 152,000 man-hours per machine. With the average pay of \$5.60 per day for mine labor, the net loss of purchasing power is thus equal to \$121,000 for the life of the machine.

Fourth, the increased hazards to life and limb are created by the fact that loading machines and conveyors produce deafening noise, drowning all sounds of warning as the roof or coal is "working" and ready to fall. Accidents due to falls of roof and coal constitute some 60 per cent of total mine accidents. Another source of mine hazards is the fact that with no illumination in the working place save a dim cap light (which is sometimes obstructed by coal dust to such an extent that a man has to touch his buddy before he can see his lamp), working around fast-moving, *unprotected* machine parts is by no means safe. Furthermore, as most of the mining machinery is electrically driven, the electric cables, trolley wires, etc. create an additional hazard of explosion. A recent report of the Bureau of Mines on the Bartley Mine explosion said, "While hand loading methods may not be as efficient as the conveyor used in this mine, there is no doubt that hand loading would be safer, especially in a mine as dangerously gassy and dusty as this one * * *. The operation of numerous pieces of electrical equipment * * * is too great a risk to take in extremely gassy mines".

Of all forms of mechanization strip mining has the lowest labor content per ton of coal produced. Essentially it consists of removing the top soil and the rest of the so-called overburden to expose the coal deposits close to the surface. This work is done by large steam or electric shovels and the top soil together with the under soil is mixed and thrown promiscuously in heaps, thus destroying farm and forest land for centuries. Then the exposed coal is similarly removed from the open pit by steam shovels, loaded into the cars or trucks, and delivered to washeries for preparation.

The tonnage of coal thus mined increased between 1923 and 1934 by 9,000,000 tons, while employment increased only by 360 men. Within the last 15 years the expanded strip operations have displaced 19,550 miners, computed on the basis of labor requirements for the average deep mining. Thus, besides the great destruction of employment opportunities, strip mining destroys thousands and thousands of acres of fertile land. With proper methods of mining, however, not only the reclamation of land is feasible, but the employment of a larger number of men is claimed not to increase the cost of operation (Edward O. Keator method).

The *economic consequences* of such changed technique in mining are grave and far-reaching. With 78,000 men who lost their jobs in mines due to mechanization within 15 years, and with a total of 187,000 men displaced by all forms of changed technology, the industry and the Nation is faced with a problem of what to do with these men and their dependents—a total of well over 1,000,000 people.

One Director of Personnel of a typical coal company wrote to us: "We mine bituminous coal and employ 6,000 men. When we are fully mechanized we will have laid off about 1,000 men. I realize that the general thought is that these men will be employed in other industries as there will be more men employed in the manufacturing of these machines. But, to start with, this type of labor and the age of these men will make it practically impossible for them to even do this type of work, and besides the automobile and steel plants and machine shops are reducing their personnel and have the same problem. Industry is using the best talent and research for improving its machinery so as to lower their costs and in many instances to just maintain their present business. Of course, no corporation can afford to maintain these extra men, and if industry doesn't take care of these men the government must—and in the end the industry must pay for this in the way of taxes.

"These men cannot go "Out West" because there is no "West" any more. There is plenty of land on which these men could raise everything they need for themselves and their families, but a bricklayer today earns more in an hour than a farmer does in 12 hours.

"It is estimated that there are 9,000,000 people unemployed right now. It is very difficult to give any specific plan as to how we are going to keep labor employed while we modernize our plants. Man created the machine to be his servant, but sometimes I feel that the man becomes the servant of the machine. I know many people say "We will discover new industries". For instance, what will they be? Should industry give more attention to the men replaced by machinery or should that be government's responsibility?"

The United Mine Workers of America have favored the introduction of a 6-hour day, 30-hour week, with 200 days a year of guaranteed work ever since Mr. John L. Lewis proposed this measure at the 1933 Bituminous Coal Code hearings ("Brief Supporting General Coal Code", John L. Lewis, United Mine Workers Journal, September 15, 1933, p. 9).

And at its next convention the Resolutions Committee of the United Mine Workers of America pointed out that the introduction of machinery had "brought grave economic problems", and proposed "rather than object to mechanization of industry * * * to devote our efforts toward the shorter work day and work week".

When the 7-hour day, 35-hour week was finally secured, it was obvious that this measure was no longer adequate to absorb the technological displacement, and again at the wage negotiations in April 1939 the 30-hour week was sought, but without success.

Miners themselves, rather than see their neighbors and their children starve, frequently demand that local management reduce the number of working days for all instead of laying off completely the men whose jobs are eliminated by machines. "Work together, starve together" seems to be a motto in most of the mining camps. And the work for 2 or 3 days a week instead of 5 is frequent in many localities. The United Mine Workers of America exonerates from the payment of dues those members who work 5 or less days a month.

In other words, in such closely knit and mutually supporting communities as we find among miners, disemployment appears in two forms: *direct* displacement by technology and *indirect* underemployment created by the sharing of unemployment. How great is this indirect disemployment is difficult to estimate, but it is certain that it is at least half as large as the direct disemployment; that is, it affects not less than 40,000 families.

The economic plight of both of these groups injured by mechanization is further aggravated by their economic dependence and frequent indebtedness to the former employer. This situation gives rise to two dastardly abuses: the high cost of goods in company stores and the exchange rate of the company's scrip.

A group of photographs taken from the files of the Farm Security Administration, Federal Works Agency, and of our Engineering Department portray the dismal consequences of technology in its lop-sided application. Destitution inadequately stayed off by the food distributed by the Federal Surplus Commodity or meager WPA pay checks on one side and the scores of ghost towns with business blocks delapidated, stores and banks closed on the other.

In Illinois, where mechanization of mines is far advanced, WPA conducted a census in three counties: Williamson, Saline, and Franklin. It was found that "a large part of the working population is completely stranded * * * Coal miners constitute the great bulk of the worker population * * * Mine operators have mechanized the loading of coal to the point where thousands of hand loaders have been eliminated * * * Employment in the coal mines has declined much more than has coal production, and the decline in employment opportunities in the mines is so pronounced that a large part of the worker population is permanently unemployed * * *"

One of the most telling effects of mechanization was recorded in the town of West Frankfort, Illinois. In 1930 the population of West Frankfort was 14,683; in 1939 it was 12,733—a decline of 13 per cent. During 1926 the average output per man-day of the town's 6,000 mine workers was 5.46 tons. By 1937 efficiency increased so that one man working one day produced 8.91 tons. An increase of 63.2 per cent.

"To equal the all-time record of coal production West Frankfort operators need to rehire only 700 men of the 3,000 miners displaced."

Another case is reported at Ziegler, Illinois. "At the time of the census (December 11-17, 1938) there were 3,017 persons living in Ziegler. * * * 774 of them were engaged in private employment, either in the service industries or at the mines * * * 269 persons were on WPA, NYA, or in CCC camps * * * 107 persons were without work of any kind * * * Thus a total of one-third of all Ziegler workers were without private employment during the census week. The full gravity of the situation will be realized when it is remembered that these figures show unemployment in one of the most active coal towns in Illinois during the peak of the year's activity." (Social Security Board, Technical Publications Digest, April 4, 1940, pp. 1, 9, 11.)

In West Virginia the district north of Morgantown (Scott's Run) and the southern part of the State (Logan County) are perhaps even more desperately hit. A special report prepared by the National Research Project (WPA) describing the plight brought in by machines is so shocking that it is not even released for publication.

In Pennsylvania both central Pennsylvania coal fields and the anthracite region offer many similar exhibits of deterioration, ghost towns, and population wholly without economic background.

With such and similar ghastly results of mechanization introduced without regard to social and economic consequences, the question arises whether the limit

of mine mechanization and resulting disemployment is in sight. To that query the answer is an emphatic NO.

With only 25 per cent of the underground coal loaded mechanically and with immediate possibility of using labor-saving equipment in mining more than half of the coal output, the mechanization of loading did not reach the midstream. Considering that in 1935 only 13.5 per cent of coal tonnage was mechanically loaded and in 1939 25 per cent was so loaded, we may expect within the next five years to double the mechanical tonnage. This would throw out of employment some 80,000 more mine employees.

This estimate takes into account merely the *existing state of technique* and projects it into the future. Yet we are reasonably sure that further steps in technology will be of even more drastic nature. Recent reports indicate the successful operation of coal mines on a wholly different basis. In Russia, for example, we are informed that some mines are sealed and set afire, which is maintained by a regulated supply of air and steam to produce "water gas" underground. This gas is then cooled and purified in the scrubbers and piped to distant points of consumption at a cost said to be one-fourth of the cost of gas generated from the mined coal. Such a process requires indeed a very small crew of gas workers on the surface, thus virtually eliminating all mine labor as such.

* * * * *

From this sketchy review of technological changes in bituminous deep coal mining, certain general observations are in order. Essentially there are two kinds of inventions:

The *first* kind is the discovery of some fundamental principle upon which the new technology is later developed. Discoveries of Faraday, Clerk Maxwell, Guy Lussac, Roentgen, Marconi, and others gave us new technologies and new industries—electrical, liquefaction of gases, refrigeration, X-ray, wireless, radio, etc.

The *second* kind of discoveries consist of the application of the already discovered principles to the technology of production, such as design of labor-saving equipment, improvements of processes and other forms of inventions comprising the body of technological improvements.

The applied technological developments with which we are here concerned fall into four main groups:

1. Developments increasing productivity of labor, leading to disemployment;
2. Developments leading to intensification of labor and resulting in greater strain and hazards to workers;
3. Developments eliminating unnecessary fatigue and hazards;
4. Improvements in the quality of the product itself.

In the coal industry we readily find all of these types.

Mechanization of mines clearly falls into the first two classifications resulting in both disemployment and increased hazards. Use of non-explosive means for breaking coal belongs in the third group, while such technical processes and equipment as are used for dedusting of coal, washing, sizing, preparation, packaging, by-product extraction, etc. are clearly serving to improve the quality of the product.

From a purely engineering standpoint the coal industry has ample opportunities for economic resurrection:

1. Reduction of accidents, averaging 1,800 fatalities and 73,000 non-fatal injuries would give a saving of upward of 10 cents per ton of coal mined—some \$40,000,000 annually.

2. Multiple production of coal by-products, liquefaction, etc. will not only reduce the freight charges, now about equalling the cost of coal, but will also help to recapture the market lost to petroleum and natural gas because of a higher state of technology in these competing industries. This technique can re-employ a greater part of the 40,000 men disemployed by the use of substitute fuels.

Against this last possibility the fact that the coal industry is in a weak financial position strongly mitigates. Indeed bituminous coal industry consists of a large number of small concerns, notorious for their economic weakness—the largest unit produces less than 3 per cent of the total annual tonnage.

It might be presumptuous at this point to indicate the general theory of unemployment of which the coal industry is but a special case. The operating economy is attained by the transfer of a portion of the labor cost to fixed charges account (depreciation, insurance, obsolescence, interest and upkeep). While through the introduction of automatic machines a portion of the fixed charges on labor-saving equipment goes to payrolls in other industries (capital goods), it is much smaller than the portion of the direct labor cost eliminated by the labor-saving devices.

Therefore, the net economy in production may appear either in the dividends of the industry or in the reduced price of the product.

But the economy attained by the reduction of labor costs (direct labor and capital goods industry labor) reduces total payroll and consequently the purchasing power of the wage earners shrinks.

If the reduction of selling price be as great as the reduction of payrolls, the industry remains stagnant.

If the reduction of selling price is *not* as great as the saving on the payroll, the remaining purchasing power becomes inadequate to consume the full output of industrial products, and industry shivers.

Consequently, the money saved on labor cost cannot be reinvested into expansion of industry as there is no corresponding expansion of consumers' demand.

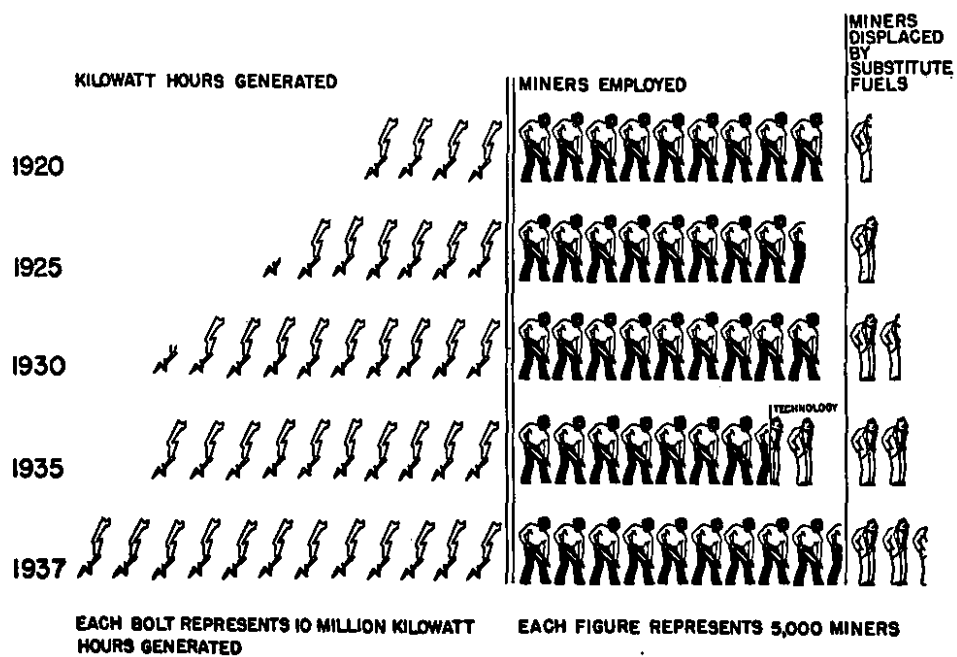
The special case of the coal industry differs from the general case insofar as the coal is an inelastic commodity and no amount of advertising can create a desire to overheat a house, run trains twice the distance to their destination, or otherwise consume more coal. Hence, no decrease in price could stimulate consumption to any appreciable degree, particularly when the competing fuels are already sold below the cost of production—fuel and gas oil being subsidized by overpriced gasoline. The saving on coal miners' payrolls through technological increase of labor productivity reduces the purchasing power of wage earners of this industry to such an extent that it seriously affects all consumer goods industries which are gradually losing the market among the 3,000,000 members of the families of coal miners. Further reduction of miners' purchasing power is being made by means of company stores and camp commissaries often trading at greatly advanced prices (up to 40 and more percent), or making unscrupulous profit on the issue of tokens or scrip money with average discount of some 25 percent. This excessive price increase or discount on the scrip totals well over \$130,000,000 on the volume of business carried annually by the National Industrial Stores Association.

The conclusion is therefore inescapable that the solution to the disemployment problem in the coal industry cannot be attained as long as the employees do not fully participate in the financial advantages of new technology.

"Exhibit No. 2740" appears in text on p. 17201.

EXHIBIT No. 2741

DISPLACEMENT OF COAL MINERS BY SUBSTITUTE FUELS, TECHNOLOGY AND BUSINESS DEPRESSION IN ELECTRIC UTILITIES



UNITED MINE WORKERS OF AMERICA

WALTER H. POLANSKY,
DIRECTOR, ENGINEERING DEPT.

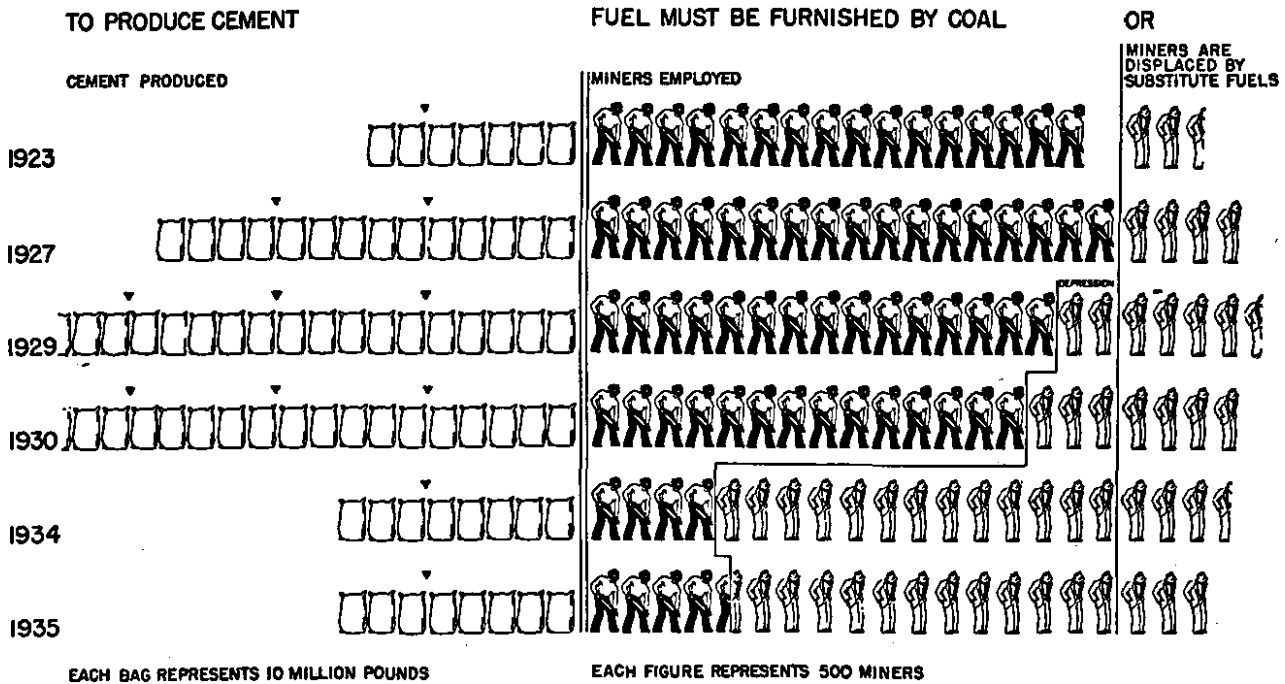
17558

CONCENTRATION OF ECONOMIC POWER

EXHIBIT No. 2742

DISPLACEMENT OF COAL MINERS

BY SUBSTITUTE FUELS, TECHNOLOGY, AND BUSINESS DEPRESSION IN CEMENT INDUSTRY



UNITED MINE WORKERS OF AMERICA

WALTER B. POLARDY
DIRECTOR, ENGINEERING DEPT.

CONCENTRATION OF ECONOMIC POWER 17559



DISPLACEMENT OF COAL MINERS BY SUBSTITUTE FUELS,
TECHNOLOGY, AND BUSINESS DEPRESSION ON CLASS I STEAM RAILWAYS

17560

CONCENTRATION OF ECONOMIC POWER

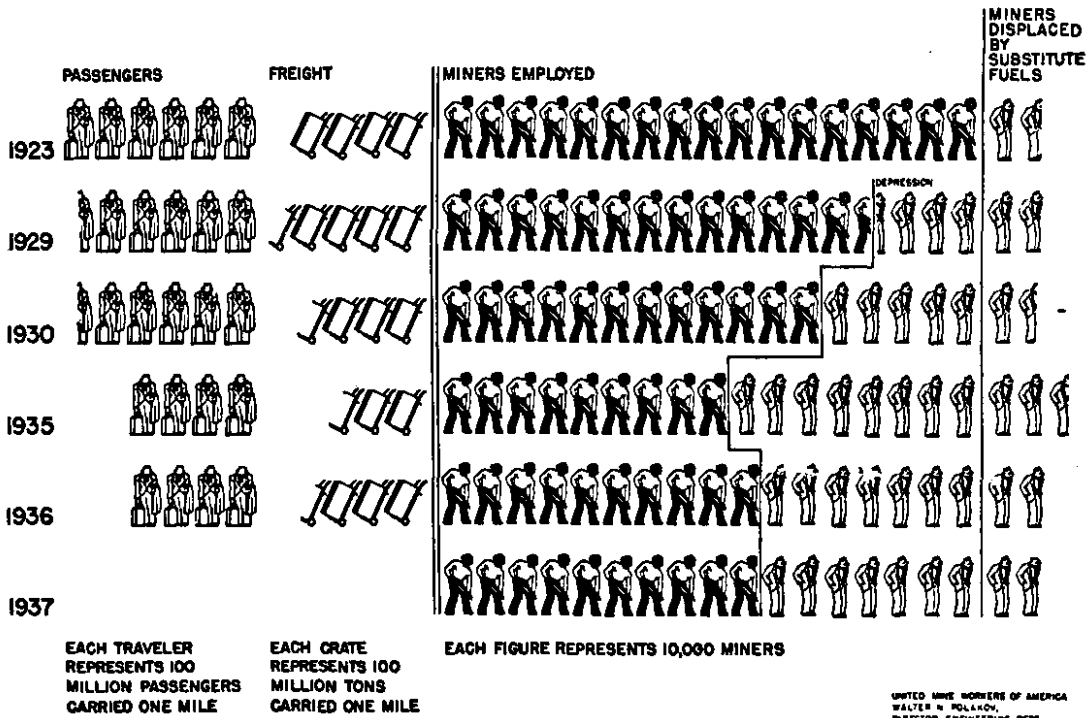
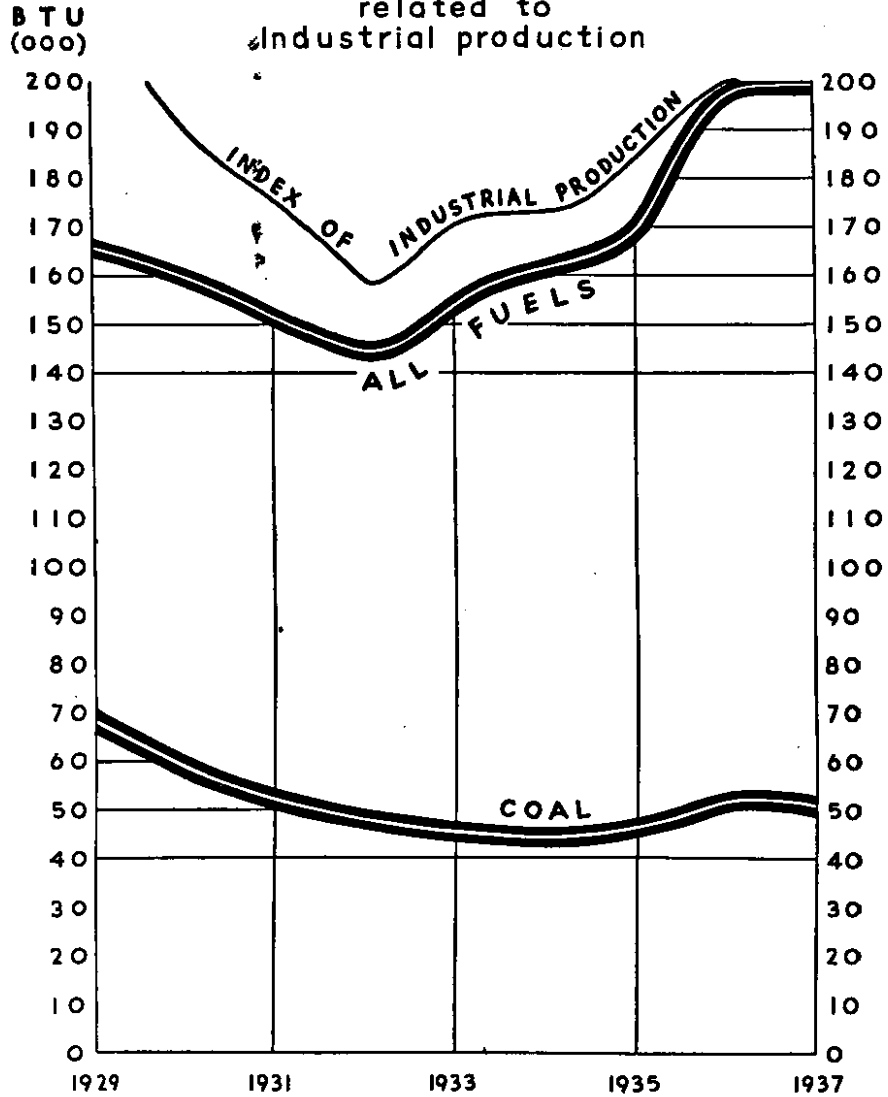


EXHIBIT No. 2744

ENERGY CONSUMPTION

per capita
provided by
Coal and other fuels
related to
Industrial production



Source:
U.S. Bureau of Mines
and Federal Reserve Board

Engineering Dept., UMWA
Walter M. Polakov, Director

EXHIBIT No. 2745

Indices of
EMPLOYMENT & PRODUCTIVITY
OUTPUT & MAN-HOURS WORKED
in
BITUMINOUS COAL INDUSTRY

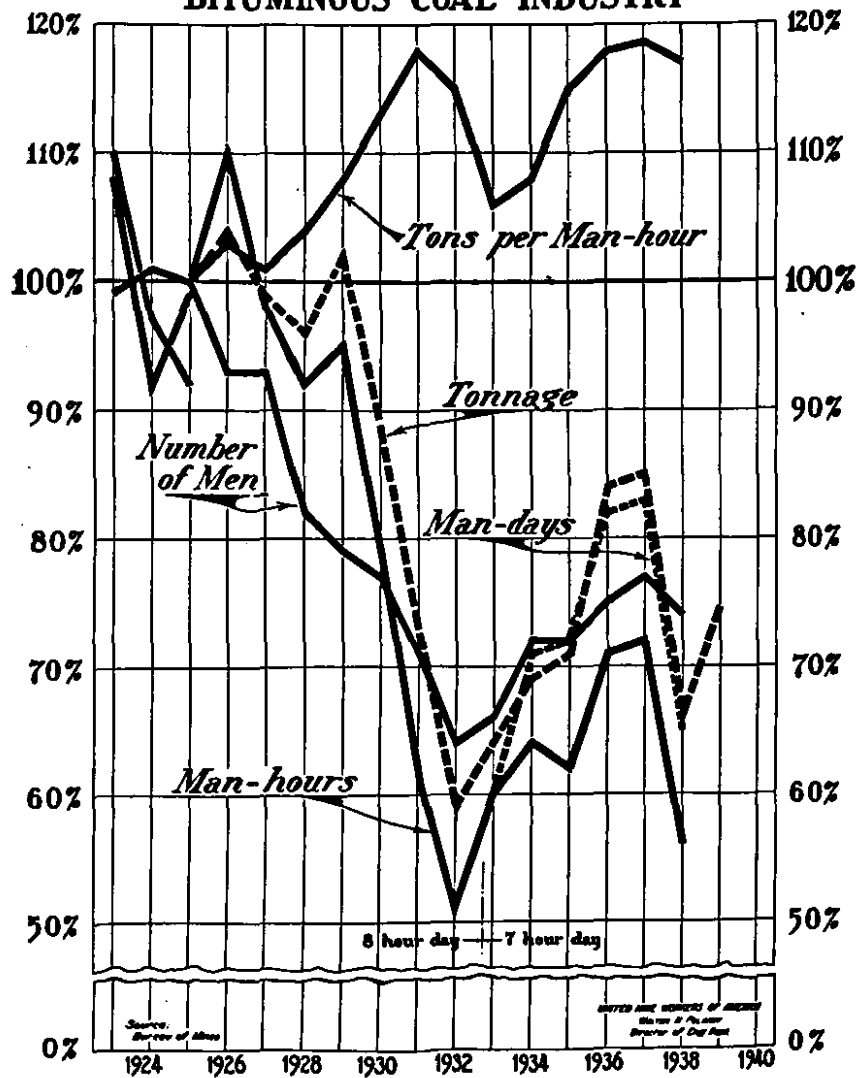
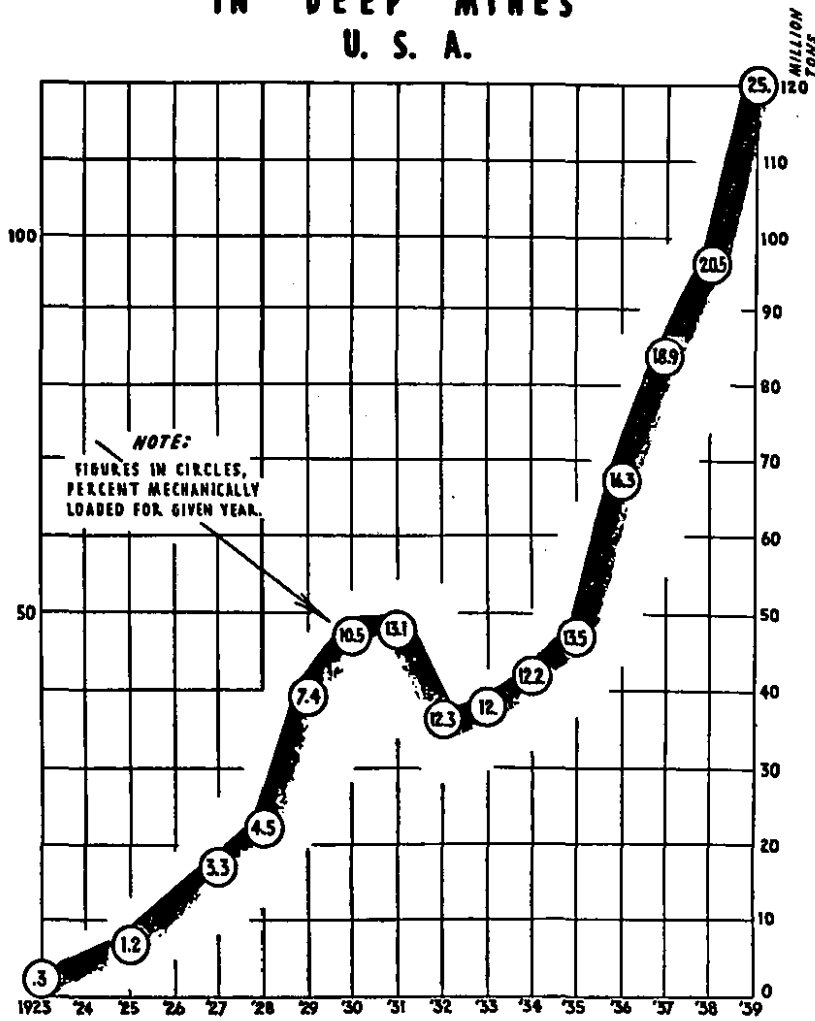


EXHIBIT No. 2746

TONNAGE OF BITUMINOUS COAL MECHANICALLY LOADED IN DEEP MINES U. S. A.

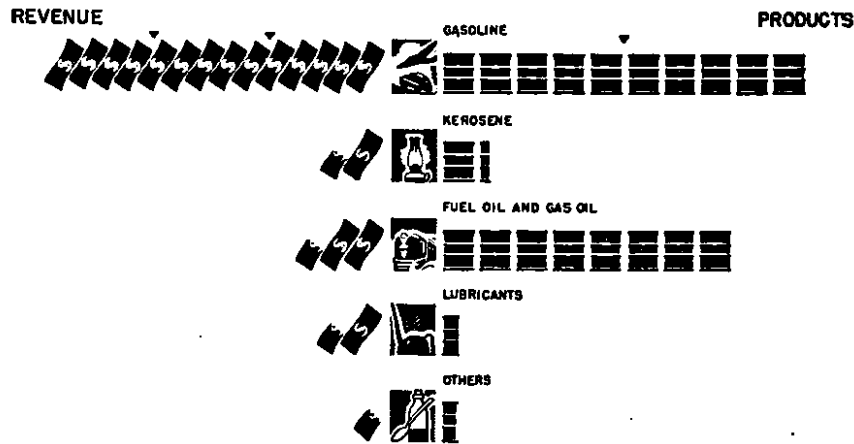


SOURCE:
U.S. Bureau of Mines

UNITED MINE WORKERS OF AMERICA
WALTER N. POLAKOV, DIRECTOR ENGR. DEPT.

EXHIBIT No. 2747

PETROLEUM PRODUCTION AND REVENUES IN 1937 BY DIFFERENT PRODUCTS OF CRUDE



EACH SYMBOL REPRESENTS 5 PERCENT OF GROUP SHOWN

UNITED MINE WORKERS OF AMERICA

WALTER H. POLAKOV,
DIRECTOR, ENGINEERING DEPT.

"EXHIBIT No. 2748," Displacement of Miners by Mechanization, is on file with the Committee

EXHIBIT No. 2749

TECHNOLOGICAL UNEMPLOYMENT AND DECENTRALIZATION IN THE RUBBER INDUSTRY

Statement of Thomas F. Burns, Vice-President of the United States Rubber Workers of America

The rubber industry is one which has been characterized during recent years by tremendous technological gains and increased value for the consumer. Unfortunately, this progress has resulted, for many of those depending on the rubber industry for their livelihood, not in improved, but in worse conditions.

The workers employed in this industry and the union which represents them, the United Rubber Workers of America, have been facing for the past few years the problem of technological unemployment—the problem of thousands of skilled and able-bodied workers who have been driven from the rubber industry. The issue of decentralization looms large in this story of loss of jobs in the rubber industry.

Employing 149,148 workers in 1929, this industry in 1939 employed only about 113,800 workers. (Figures from U. S. Census of Manufactures and U. S. Bureau of Labor Statistics.)

What has happened to the jobs of these 35,000 American workers? An examination of developments in the tire and tube branch of the industry will tell part of the story.

Back in 1923, approximately 74,000 workers were employed in the tire and tube industry. (U. S. Census of Manufactures figures.) Some 45,259,000 tires were produced in that year. (Figure from *Survey of Current Business*, U. S. Dep't. of Commerce, May, 1939.) In 1939, about 57,078,000 tires were produced. (Figure from *Rubber Age*, February, 1940.) But in 1939, only 52,100 workers were employed in the rubber industry. (Estimate by Bureau of Labor Statistics.) In other words, production increased some 26 percent, but employment fell by about 30 percent.

The extent of speed-up and technological advance in the tire industry is suggested by one representative tire plant. This plant was built in 1918. It was designed at that time to employ a maximum of 10,000, and to produce 10,000 tires a day. In 1939, that plant employed 6,000, and produced an average of 36,000 tires a day. From 1 tire per man in a day, to 6 tires per man—that is the kind of progress we have been seeing in the rubber industry.

General figures for the industry show this to be no isolated example of increased productivity. Figures for the tire and tube industry issued by the National Research Project of WPA, give the most reliable estimate of increased productivity here. Because the National Research Project determines production levels on the realistic basis of the number of pounds of tires and tubes turned out, rather than on the absolute number of tires or tubes, a fuller picture is given of value created for the consumer. Because they do not include mechanical goods production of large Akron plants in the tire and tube total, as the Census of Manufactures does, National Research Project statisticians have given a much clearer picture of developments in our industry, than any other economic authority.

These figures show productivity per man-hour in the tire industry rising from an index of 46.5 in 1921 to 100 in 1929, and 200.3 in 1938. That is, man-hour productivity increased by over 300 percent between 1921 and 1939, and by some 100 percent between 1929 and 1938.

The sharpest increases have come since the 1929 depression. The biggest yearly increase was in the year 1931, when man-hour productivity jumped 18 points, or some 13 percent. We have statistical proof here of the belief of many rubber workers that speed-up, etc., is pushed through when people are scared about losing their jobs, and are, therefore, less inclined to resist the change; and that rationalization coming in most intense form just as unemployment is deepening helps, in turn, to intensify the unemployment crisis.

The preliminary figure for 1939 indicates an increase in man-hour productivity which almost touched that of 1931, namely, an increase of 1939 of 12.1 percent. This means that in the one year 1939, roughly 1 out of every 8 tire workers were rationalized out of the factories.

The National Research Project figures further reveal that in 1938 63.5 percent of 1929 tire production was obtained with 31.7 percent of 1929 man-hours, and that in spite of decreased hours per employed tire worker, output per wage earner rose from an index of 46.9 in 1921 to 100 in 1929, to 145.6 in 1937, and 132.6 in 1938 when very short time was general in the tire shops.

In 1937, with a production level of 93.3 (1929=100), employment was only 64.1, and man-hours worked, 45.4. It would be fair from this to estimate that even with 1929 levels of production, the tire and tube industry can absorb only about 50 percent of 1929 hours of labor.

This is what speed-up and technological change mean in statistics. What they mean in practice, rubber workers have learned very well. They know that this level of efficiency has been obtained not only through the introduction of new machinery and improved methods, but through an intensification of the physical and nervous demands upon the worker.

POSSIBLE SOLUTIONS

In glossing over the effects of speed-up and technological change in employment, certain compensating factors are sometimes referred to, such as: (1) the development of new branches of the industry; (2) an increase in demand for products manufactured at lower prices.

Figures for the development of what is known as the "other rubber goods" industry since 1929 indicate that diversification and the development of new products will not solve the problem which we are facing in the rubber industry. Other rubber goods include all products other than tires and tubes. In spite of the fact that there has been some diversification in the production of other rubber goods since 1929, with new products entering the market, total man-hours for that branch of the industry fell from a total of 226,013,000 in 1929 to a total of 121,800,000 in 1938. Output per man-hour increased from 1929 to 1937 from 100 to 126.3, with a fall in man-hours of 100 to 73.8. (1937 is the most recent year for which production figures in this branch of the industry have been calculated.)

Diversification and new production, in other words, has fallen very short of taking up the slack caused by speed-up and technological change. In spite of the fact that rubber consumption in long tons, according to the *Wall Street Journal* of January 16, 1940, stood at an all-time high in 1939 of 577,591; employment in the entire industry in 1939 was 12.2 percent under 1937 and 23.7 percent under

1929. Consumption of crude rubber, on the other hand, had gone up 6.2 percent over 1937 and 23.6 percent over 1929.

New products have not solved and will not solve the problem of technological unemployment in the rubber industry, nor is an expansion of the market for rubber goods likely to be stimulated by lower unit prices. For tires and tubes in particular, the market is limited very definitely by the usage of motor vehicles. It is doubtful whether even a 50 percent cut in the price of tires would increase to any considerable degree the sales of tires and tubes. Those sales are definitely tied down to the level of motor vehicle utilization.

One reservation to the last statement should be made. Technological improvements in tires and tubes have increased tremendously their average life expectancy. For that reason, although there has been a tremendous increase in motor vehicle mileage since the early 20's, there has been no appreciable increase in the number of tires and tubes sold.

A comparison of gasoline consumption with tire shipments will indicate the truth of this statement. Gas consumption increased about 43 percent between 1929 and 1938, while tire shipments decreased 31.8 percent in this same period. (Basic figures from U. S. Dep't of Commerce publications.)

It is clear from these figures that technological improvements in the tire itself have more than compensated for any increase in motor vehicle mileage in recent years.

Only one force operating to preserve employment can be pointed out in the rubber industry, and that is the organized labor movement. Organized labor in the rubber industry, has, by its efforts to maintain a shorter work day at a decent wage, saved tens of thousands of rubber workers as solvent members of their respective communities.

In 1929, for instance, the average tire worker worked 44.2 hours per week to make a weekly wage of \$29.95. In 1939, the average tire worker had a weekly income of \$33.36, and worked 35 hours.

The work of the union in making it possible for workers to be retained in the industry at their normal or somewhat increased wage, in spite of reduced man-hours, should be made clear by this evidence. Further verification of the union's contribution is seen in the contrast between man-hours worked and total employment in the rubber tire and tube industry, as stated by the National Research Project. In 1938, for instance, man-hours worked had fallen 68.3 percent since 1929, whereas employment had fallen 52.1 percent. For the industry as a whole, employment fell only 32.6 percent between 1929 and 1938, whereas man-hours worked fell 54.4 percent. If employment had fallen as steeply as man-hours, only some 68,000 rubber workers would have been employed in 1938, in contrast to the 100,482 who were actually employed in that year.

In other words, some 32,000 jobs for rubber workers were saved by the union's policy of shorter hours and higher wages.

It is clearly recognized by the URWA, however, that action beyond its power, or the power of any single union, must be taken, if employment of a large section of the rubber industry's labor force is to continue. This problem is one which we share with all forward-looking agencies of government. It is one which strikes close to the roots of our national well-being. Action to solve this problem of unemployment in our country is the most pressing need of the day.

SOME RECENT DEVELOPMENTS

Something should be said about the methods which have been employed in our industry to bring about the results outlined above. For those who are interested in an exhaustive treatment of this subject, Mr. Boris Stern's *Labor Productivity in the Automobile Tire Industry*, Bulletin of the U. S. Bureau of Labor Statistics No. 585, should be recommended. Mr. Stern has analyzed and laid out very fully and clearly the changes in the tire industry which have resulted in its tremendously increased productivity. Mr. Stern shows that increased productivity in the tire industry is due to the "so-called evolutionary small changes in production", and that this process goes on "quite irrespective of the trend in the total production", and is, in fact, swiftest in years of depression.

Below are just a few examples of what has been going on in the industry during the past few years. Though necessarily incomplete, these examples will indicate what is behind the National Research Project figures quoted above.

1. The method of operating calendars in a Pennsylvania tire plant was changed last year. It resulted in a 33 percent cut in the amount of labor required per unit of production.

2. In 1938, in one Akron tire plant, a change from the core to the flat top crown method of truck tire building, with certain other minor modifications in the operation, resulted in the elimination of 150 jobs in a department previously employing 525.

3. Another Akron plant recently changed over from the pot heater method of vulcanizing tires, to the automatic watch case mold. The labor cost of curing 100 tires (600X16) was reduced by this change from \$13.50 to \$6.00. Man-hour productivity was increased from 9.9 tires to 21.3 tires. Watch case molds are now operating or are being introduced in all efficient plants.

4. In the compound and mill room of another Akron plant, production was increased by 15 percent in 1938, without any changes in machinery or methods of operation. Many changes have taken place in machinery and methods of operations, which, without basically changing the process, are intended simply to secure the more efficient utilization of labor.

5. An example of this is the conveyor method of building tires. Ordinarily, the tire builder works at a single machine, performing all the necessary operations for building a tire. By the conveyor method of building tires, however, the individual tire builder performs only one part of the whole operation, on a number of machines. Tire machines are fixed on either a rotary or straight line conveyor, and the individual worker is responsible for performing continuously only one of the numerous operations involved in tire building.

Information from our local unions indicates that this method, although it involves no basic change whatever in the construction of the tire, has increased tire builders' productivity by at least 43 percent. This method, with its much intensified demands on the nervous energy and endurance of the workers, is being introduced in nearly all the more efficient tire plants.

6. Two changes in tire building machines in the Goodyear Akron plant since 1934 have increased a tire builder's production from about 38 per 6-hour day to around 92, an increase of over 2½ times in four years.

7. An example of the increased productivity through simple intensification of effort is to be found in a recent episode in the curing room of the Firestone Tire and Rubber Co. There, in October, 1938, the time for curing tires was shortened from 90 to 60 minutes. This made it possible for the workers to increase the number of heats cured per 6-hour shift considerably. Employees in that department were informed one morning as they came into work that they were expected to increase the number of heats they cured on their shift from 54 to 67. They were informed that unless they did this, their work would be moved to Firestone plants outside of Akron.

At that time, a considerable propaganda campaign on the issue of decentralization had been developed at the instigation of the companies, which coincided with the recession and layoffs of 1938. In this situation, this group of Firestone employees refused to accept the advice of union committeemen, and insisted on complying with the company's demands.

For some days they succeeded in meeting the new level of production, that is, 67 heats per shift, but in subsequent weeks, they found it physically impossible to meet the increased production requirements. As a consequence, daily wages were considerably reduced. It may be added here that work in the pit is recognized as one of the heaviest and most disagreeable jobs in the rubber industry. Temperatures in this department range up to 130 degrees.

It will be understood what constant labor without a minute's respite under these conditions meant to the welfare and health of the rubber workers. These Firestone employees reported to local union officials that frequently it was impossible for them to eat a meal until they had had a number of hours rest following shift end.

Examples given so far are drawn from a great number available in the tire and tube industry. They are typical, also, of situations in the other rubber goods industry.

8. For instance, in one highly efficient plant, manufacturing mats for automobiles and other mechanical goods, a number of changes were made in the mill-room during 1936. As a result, a 30 percent increase in man-hour labor productivity was obtained, and the working force of that department proportionately reduced.

9. In the compound room of the same plant, a similar increase in the man-hour productivity was obtained, simply by demanding increased effort from the workers employed. Subsequent action by the local union in defense of the health of these employees brought some reduction in the total output expected, although they were still considerably speeded up over previous levels.

10. And, to give one final example, in a boot and shoe plant, where the local union has no direct speed-up to report, a change in the method of construction of shoes took place. This resulted in the displacement of 150 workers out of 500 formerly employed in the building department.

WAGE INCENTIVE SYSTEMS

The rubber industry, like most mass production industries at the present time uses a number of different wage incentive systems. It is not our purpose to go into any exhaustive analysis of the complexities of these systems. There are a number of points in connection with them, however, which bear directly upon this inquiry.

It will be agreed, in the first place, that the underlying purpose of the wage incentive systems—time study, Bedaux, etc., is to increase man-hour labor productivity, without further investment in productive equipment or basic change in productive methods. All rubber workers know what these systems have meant to their working conditions. As the plans are applied generally, a base is determined upon the productive record of the average employee on a given operation. He is then offered a series of bonuses upon production exceeding the base rate established. He is persuaded and induced by every means to increase his production, and he is instructed by time study experts upon more efficient methods of attaining this end.

Rubber workers have found, of course, that as their general level of production increases, the base or minimum expected of them is likewise increased. They are forced, therefore, to put forth more and more intensive efforts, in order to maintain a stable level of hourly earnings.

Champions of these wage incentive schemes assure us that when properly applied, they result in no greater physical demands upon the worker. Speaking from the almost universal experience of the rubber workers, however, we testify that the intensity and speed of the physical effort involved has definitely been increased with the introduction of wage incentive systems throughout the rubber industry. Whether this increase in physical effort is to be attributed to an improper method of applying wage incentive systems, or to the very nature of the system itself, we are not in a position to say. Whatever may have been the cause, the result in increased effort for rubber workers is clearly apparent.

On this general question of new machinery and intensified physical effort, we quote from a statement made by Mr. George Dirks, in his pamphlet entitled *Time Study in a Union Shop*. Mr. Dirks is manager of the Time Study and Standards Department of the Service Divisions of the B. F. Goodrich Co. In commenting on this problem arising from the creation of "surplus help," Mr. Dirks has a number of interesting points to make. (Surplus help, of course, is help made surplus by new equipment and intensified methods of work.)

"1. Consideration should be given to the handling of surplus help previous to the installation of the new equipment. Transfers of course to other operations should be made whenever possible. When layoffs are necessary they should all be made before the new equipment is installed. By handling the problem in this way the layoff can be handled as a separate and distinct problem and not made a part of the problem of introducing the new equipment to the remaining crew.

"2. The hourly earnings of the workmen in the remaining crew should not be reduced. Often it is found that by conscientious attention to details during the design stage of the new equipment, ways and means are found whereby the man power as well as the machine can be arranged for maximum usefulness and the hourly earnings of the men thereby actually increased.

"3. Job improvements affecting a large number of employees can best be handled during periods of low production. Later, when production increases, it often is found that the available working force can adequately handle the increased production.

"4. Large projects can sometimes be handled on a so-called piece meal basis. That is, by installing certain self-contained units one at a time, and then working out the individual problems on each unit. By handling the problem in this gradual way, the possibilities of the Corporation absorbing some of the surplus workers are enhanced, particularly if the changes occur during a period of rising activity."

Mr. Dirks deserves congratulations on his very clever methods of sugar-coating for rubber workers the bitter pill of technological displacement. But we fear that methods such as his will not help us very much in approaching the basic problems of our industry, and our economy as a whole. Concealing the effects of new machinery and intensified methods of work will not give jobs to the unemployed.

QUESTION OF DECENTRALIZATION

The tremendous drive toward increased productivity in the rubber industry is related very closely to recent developments in the shifting of production. Experience in other industries has shown that where an industry has operated for a number of years in a given locality, certain definite standards of wages and effort are established.

The textile industry, in particular, has shown that where new techniques come in, bringing new efforts to intensify labor, there is a tendency to shift production to new localities, where a raw labor supply will more likely yield to the demands of industry.

There are often other factors in cheaper costs. Lower freight rates, which we understand have sometimes taken the form of differentials favoring particular localities, lower taxes, cheaper power, and control over public officials frequently come into the picture.

To understand the full implications of developments in shifting production in the rubber industry, the strategy of decentralization must be clear. One of the most important elements in the so-called decentralization from Akron is its use as a threat against labor standards, and, indeed, general standards of living in the community.

Decentralization offers the possibility of lower costs in outside, less highly industrialized communities, and at the same time can be used as a lever against the older community, Akron, to bring down costs there. One large factor in bringing down costs is the use of machinery and new processes to increase labor productivity and lower labor costs. To be most effective in achieving lower costs for the companies, these changes must be introduced exactly as the companies want them. A union which, for instance, insists on maintaining a shorter work week and higher hourly rates, in order to alleviate unemployment resulting from increased productivity, such a union may seem to be a nuisance to the companies. Perhaps the most potent weapon which can be used to dishearten a labor group is the threat of losing jobs.

The experience of Akron, Ohio will indicate the possibilities of the power to decentralize, or to threaten to do so. This is indeed a strong weapon in the hands of employers who may choose to disregard the well-being of communities.

The rubber industry, in its history, has seen two distinct tendencies in the movement of production from state to state: (1) the early movement from New England and the East Coast to the state of Ohio, and to Akron in particular; (2) the more recent tendency toward partial decentralization of production from Akron.

In 1899, out of 36,566 rubber workers employed throughout the country, 2,677 or 7.3 percent were employed in Akron. Out of a total wage bill in the rubber industry of \$15,426,573, Akron workers received \$1,005,405, or 7 percent. (These figures are from *Rubber Industry of the United States, 1839-1939*, published by the U. S. Department of Commerce.)

By 1935, however, 64.2 percent of workers in the tire and tube industry were concentrated in the Akron industrial area. Akron rubber workers received wages of over \$78,000,000 in 1935, 69.9 percent of the United States total. (Figures from U. S. Census of Manufactures.)

The predominance of Akron in the rubber industry came with the growth of the automobile industry, with its mounting demands for pneumatic tires, in the first 20 years of this century. By 1919 Ohio, including Akron, reported 48.5 percent of the total value of production, and 40.2 percent of the total wage earners in the rubber industry. (Figures from the Department of Commerce study mentioned above.)

This tendency toward concentration in Akron continued with the rising power of the Big Three—Goodrich, Firestone and Goodyear—whose production facilities during the early 20's were almost entirely concentrated in Akron.

This tendency was strengthened, not primarily through the actual movement of production by companies from one state to another, but by the growing domination of the larger companies throughout the industry. With the development of intense competition during the late 20's, and in the depression period of the 30's, many smaller companies located outside of Akron fell by the wayside.

During the 20's, on up to 1936, productive capacities for 38,000,000 tires a year were closed down throughout the industry. (Excess capacity, in spite of this, was "almost 40 percent".) (Information from *Rubber* by Howard and Ralph Wolf, p. 464.) A large share of the wreckage took place outside of Akron. The big companies, with their tremendous financial resources, their partial command over raw material supplies, and their highly developed research and engineering staffs, were able to ride out depression conditions, intensified by bitter price wars.

The smaller companies, dependent upon the declining replacement market for all sales, were hard put to it to live through this period, especially in face of the cut-throat price wars instigated by the giants of the industry.

Even the powerful United States Rubber Co. had a narrow escape from extinction during the early 30's. All of these factors combined to produce a tendency toward concentration in Akron's more efficient plants.

The trend toward concentration is demonstrated in the decline in the number of tire and tube establishments. The number fell from 178 in 1921 to 46 in 1937. (U. S. Census of Manufactures.) We estimate that the number of tire companies in 1937 was only about 30. (*Rubber Red Book, 1937.*) (Many of the companies have several different plants, which accounts for the difference in the 2 figures.)

It has been estimated that in 1935 about 90 percent of the tire business was in the hands of the Big Four tire companies. This estimate was made by *Fortune* and published in the November, 1936 issue.

In the rubber industry as a whole we also find a high degree of concentration. In 1935, 4.3 percent of the corporations owned 80.4 percent of the assets. These figures are based on the fact that the 25 companies which had assets of \$5,000,000 or more apiece, had total assets of \$762,443,000. The remaining 553 companies, those with less than \$5,000,000 apiece in assets, had a total of \$190,369,000. (Figures from U. S. Dept. of Commerce, Bureau of Internal Revenue.)

By 1936, however, the tendency toward concentration in Akron, through the mounting power of the Big Three, was met increasingly by a counter-tendency, that of decentralization. *Business Week* for April 18, 1936, states, "Decentralization of the rubber industry, which has gone forward quietly for the past 10 years, was brought into the open last week by rubber manufacturers as a threat and a promise." The nature of that threat and promise we will refer to later.

The movement away from Akron served to diminish somewhat the level of concentration in Ohio, during the depression period previously referred to. It should be noted, however, that in the tendency away from Akron, a major part was played by the establishment of branch plants of the major rubber corporations, rather than the development of new and competitive plants.

The first move toward decentralization by the Big Three took place in 1920, with the establishment by the Goodyear Tire and Rubber Co., of a branch plant in Los Angeles, California. This plant, employing 1800 workers was established apparently to give the Goodyear savings on transportation and distribution costs.

The other major rubber companies were not long in following Goodyear's example. Firestone opened its Los Angeles plant, employing 1,700, in 1927, and Goodrich, with an employment of 750, in 1928. In 1929, at the request of Sears, Roebuck and Co., Goodyear established in Gadsden, Alabama, another tire and tube plant, employing about 1,600.

It is not without interest that during these years, also, the major rubber companies were establishing for themselves branches and subsidiaries outside of the United States. Without question, one important factor in the establishment of these foreign plants was the desire to overcome tariff barriers established over the world during the 1920's. We estimate as 10,000 the total number of jobs in the rubber industry moved out of the country by the Big Four, including U. S. Rubber, of the industry, during the 1920's. Accurate totals, however, are not available to us.

Another factor, however, in the location of foreign plants is suggested by the Goodyear plant now operating in Java, and employing approximately 750. This plant set up to give Goodyear an entry into the Japanese market, pays its tire builders at the rate of from 3 to 8 cents per hour. In this plant, and in certain others, it is probable that the desirability of low wage rates has been an important factor.

Representative of the tendency followed in the location of plants outside of the United States is the history of the Goodyear Tire and Rubber Co.'s expansion. Goodyear's plants are now located in Canada, England, Java, Australia, Argentina, Brazil and Sweden.

These plants employ, according to our estimates, the following number of workers: England, 2,696; Java, 1,217; New Toronto, Canada, 1,443; Australia, 1,226; Argentina, 997; Bowmanville, Canada, 489; Sweden and Brazil, 200 each. (The last 2 are a very rough estimate, based on newspaper reports.)

(The above estimates are based on a report of man-hours per year in Goodyear plants, published in *India Rubber World*, December, 1939, p. 68. It was assumed that 1600 hours per year represented one job in all plants. 1600 is a liberal estimate of the number of hours worked per year by Akron Goodyear employees.)

Thus, the Goodyear Co., for various reasons, decentralized not from Akron, but from America, some 8,400 jobs since 1920.

So far as its American operations are concerned, Goodyear has found it advantageous to shift part of its production outside of the main Akron plant during recent years. The establishment of the Gadsden plant in Alabama in 1929, at the request of Sears, Roebuck and Co., with which Goodyear had a contract, the taking over of the bankrupt Kelly-Springfield Tire and Rubber Co. at Cumberland, Maryland in 1935, together with the establishment of plants in Jackson, Michigan and Windsor, Vermont in 1937, and St. Mary's Ohio in 1940, have indicated a recent trend of company policy.

The Firestone Tire and Rubber Co., also, during recent years, has established branch plants outside of Akron. This development took place almost entirely within the year 1937. At that time, according to our estimate productive capacity, sufficient to employ in the neighborhood of 4,000 workers was established by Firestone in the cities of Memphis, Tennessee, Fall River, Massachusetts, and Wyandotte, Michigan. A good share of this outside productive capacity was established, apparently, to take the place of production formerly carried on at the company's main plant in Akron, Ohio. Before 1937, Firestone had established only 1 outside plant, employing 1700 workers, in Los Angeles, California.

The Goodrich Tire and Rubber Co., in the same year, established outside of Akron productive facilities to employ 750 rubber workers. A mechanical rubber goods plant in Cadillac, Michigan, and a highly efficient tire plant in Oaks, Pennsylvania were established in 1937 by this company. For 1940, the company is announcing the opening of a mechanical goods plant in Clarksville, Tennessee. In 1928, Goodrich established a tire plant in Los Angeles, to employ 750, and in 1929 took over the Hood Rubber plant in Watertown, Massachusetts, for the employment (at capacity) of 4,500.

These facts will indicate what *Business Week* was writing of when it described decentralization as a threat and a promise. The threat was to Akron, and its industrial employees, the promise to any community willing to meet demands laid down by the rubber corporations. Since decentralization has been made a prominent issue, through the publicity of the rubber companies, the certain so-called "community agencies," analysis of the causes and effects of these moves is of considerable importance.

COMMUNITY BLACKMAIL

On February 28, 1936, Mr. L. Hurley of the Goodyear Tire and Rubber Company wrote to E. S. Cowdrick of the Special Conference Committee concerning the strike then in progress at Goodyear's Akron plants:

"While McGrady says he has a plan, it is very similar to the one he put in down at Toledo, and as you know, this has not put a permanent end to this sort of labor difficulties. Just off the record, you know that General Motors is doing everything possible to move all of their operations out of Toledo, and an agreement to a plan such as this would mean that we would eventually move our operations to other parts of the country."

This was not the first time the threat of decentralization had been used in an attempt by the Goodyear Company to wring concessions from the citizens and workers of Akron.

Since the emergence of the union as an active force in Akron rubber plants, the threat of decentralization has been thrown constantly at rubber workers and the community.

For the most part, the companies have been content to allow the proclamations of disaster to be issued by various so-called "citizens' committees." For a number of months in late 1937 and 1938, the Greater Akron Association paid for regular radio programs and newspaper ads, in which the cupidity of the rubber workers and the CIO was held responsible for making Akron a "ghost town". The Akron Chamber of Commerce also prophesied civic disaster.

Although it was first to open fire with the decentralization propaganda, Goodyear has not carried recent decentralization so far as at least one other big company, the Firestone Tire and Rubber Co. The two Goodyear plants established since 1936 at Jackson, Michigan and Windsor, Vermont employ an approximate total of 1,845. Firestone, since 1936, has set up plants at Fall River, Massachusetts, Memphis, Tennessee, and Wyandotte, Michigan, to employ a total of about 4,000.

Off-the-record gossip from sources close to rubber company management is that most of the decentralization planned since 1929 by the big tire companies is completed. It was the relative prosperity of 1936, rather than excessive union demands, which stimulated the burst of decentralization that saw close to 5,000 new jobs established outside of Akron.

Only with tire sales up, the industry stabilized through an armistice to price wars, and profits increasing, did the big companies feel justified in launching on their program of decentralization.

Recent investments by Goodyear and Firestone for the "modernization" of their Akron plants indicate that major steps in the direction of more decentralization are not to be undertaken in the immediate future.

The extent to which decentralization has taken place from Akron is difficult to determine in the atmosphere of gossip and hysteria which has attended the moves.

In 1929, 61.4 percent of tire workers, or 51,135 workers, were employed in Akron; in 1938, 49.4 percent, or 25,100. If the 1929 percentage of jobs in Akron had prevailed in 1938, the Akron 1938 employment in the tire industry would have been 29,042. This indicates that around 4,000 jobs had been decentralized from Akron since 1929. It should be remembered that this does not represent, necessarily, the movement of jobs and equipment outside of the city. Had the capacity of outside plants been utilized at top levels, and Akron allowed to absorb the full impact of the depression in the form of reduced output and employment, figures for 1938 would have little real meaning in terms of shifted productive facilities.

At any rate, it is clear that enough jobs have been moved from Akron to make rubber workers and Akron people fear the threat of decentralization.

How the B. F. Goodrich Co. attempted to use this threat in an effort to force through a heavy wage cut was shown in the spring of 1938. At that time, the company announced that competition would force it to move 5,000 jobs out of Akron unless the union agreed to reduce labor costs by taking a general wage-cut, ranging up to 17½ percent.

Following an impartial study of the company's position by a representative of the U. S. Dep't. of Labor, which failed to establish the necessity for a cut, the union rejected the company's proposal. In the meantime, various "civic groups", playing on the prospect of an income loss to the city, through a fade out of 5,000 jobs, had been bringing to bear upon the union membership intense pressure for acquiescence to the company's demands. A crowd led by the Secretary of the Chamber of Commerce, now Administrator of Unemployment Compensation for the State of Ohio, surrounded and threatened union negotiators on company property on at least one occasion during the controversy.

However, the union was able to bring its position before a large section of the public, and no violence materialized out of the whole situation.

Though subsequent movement of 400 jobs in mechanical goods production to a new plant in Clarksville, Tennessee has scarcely served to vindicate the company's threat of 5,000 jobs lost, enemies of the union in Akron still charge it with "driving jobs out of Akron." This experience demonstrates very clearly that in its power to threaten decentralization, a modern corporation may easily establish the impetus to vigilante movements threatening the law and order of an entire community.

In February, 1940, Goodrich announced plans to build a new \$70,000 factory using machinery to cost \$100,000 in Akron. This announcement coming less than 2 years after the drive to "Keep Goodrich in Akron" by lowering wages has particular significance.

The whole "strategy" of decentralization should be clear. Since 1935, the Big Three in the rubber industry have been seeking to reintroduce the 8-hour day in their Akron plants, and to drive their workers to higher and higher levels of production. Cuts in hourly rates to bring wage levels for the 8-hour day down to those prevailing for the 6-hour day, were included in the program of the companies.

The direct frontal attack to put over this program failed when Goodyear workers fought for their standard of living (and the community's) in the strike of 1936.

Taking a new course, the companies undertook a war of attrition and flank movement in 1937. In this campaign, "decentralization" was the basic munition.

By taking advantage of the general program of decentralization worked out during the early thirties, the companies covered their move into low wage areas with indictments of the union.

Objects of this propaganda were apparently:

(a) *To break the unity of employee resistance to lower standards of pay and intensified production standards.*—The outright discharge of a section of organized workers and their replacement by workers pledged against unionism would have been a clear violation of the Wagner Act. The transfer of production from organized plants to new plants where organization was rendered intensely diffi-

cult, could be expected to accomplish the same purpose, without obvious violation of the Act. Workers could be deprived of employment because of union activities without any redress under the law.

Workers in the new outside plants have accepted the speed-up, the 8-hour day, and wage levels below standard for the industry, because organization and collective bargaining have been denied them. Some examples of how this is accomplished are described below. This has made the defense of union standards difficult in Akron, Detroit and other organized sections of the industry.

Wage levels in plants set up since 1936 under the decentralization schemes of the major companies are almost without exception below the wage levels of the industry. Average hourly wages for the tire and tube industry have stood at about 96 cents in recent years, while in the other rubber goods industry 60 cents has been the average. (U. S. Bureau of Labor Statistics figures.)

At Goodyear's Gadsden tire plant, workers receive, according to reliable estimates, an average of 75 cents an hour. At Firestone's Memphis plant, 75 cents is the highest paid wage. Work for other skilled employees ranges from 54 cents to 72 cents an hour. Common labor is paid under 40 cents.

The mechanical goods plant of the Goodrich Company at Cadillac, Michigan, pays an average of 40 cents per hour, according to information which we believe to be reliable.

(b) *Further object of this decentralization, anti-union propaganda was to identify the union publicly with the evil social effects of industry's ruthless policies.*—Alleged "excesses" of the CIO were blamed for decentralization policies which were in operation 15 years ago in the rubber industry, long before labor was organized. Nation-wide publicity was given this brazen falsehood. It is used to intimidate workers all over the country, and bring the vigilante spirit to communities unfamiliar with the labor movement.

By and large, the city of Akron sympathized with the struggle of the Goodyear workers to protect their hours and wages in 1936. Decentralization scares sought to substitute antagonism and hostility in the place of this sympathy. As a result, some Akron storekeepers and businessmen were placed in the anomalous position of supporting sharp reduction in their customers' purchasing power under the threat of this social blackmail.

(c) *Another object of this propaganda was to establish private industrial control of public political power.*—In the struggle to shift production from community to community, bidding by communities is intense. Many inducements are offered. Among them, too often, is an offer of control over, or at least "cooperation" with, local governments in the interests of the company. Civil rights of the workers and local democratic institutions and processes are sacrificed to the zeal for securing "new industry."

In commenting on this issue, the Citizens' Fact Finding Movement of Georgia (Series III, No. 3, P. 13) states:

"In many cases where the wooing of outside industry has been too eager, the community has been committed in advance to a policy of maintaining a force of cheap and docile labor. Commitments of this kind have always been implied, if not verbal. The result is the effective suppression of personal rights and civil liberties in these communities."

This tendency to sacrifice civil liberties and democratic rights is not confined to any one section of the country. In St. Mary's, Ohio, the Goodyear Tire and Rubber Co. recently completed the erection of a plant for the manufacture of pliofilm and miscellaneous rubber goods. Albert M. Koch, Mayor of St. Mary's, was recently quoted in the *Akron Beacon Journal* to the following effect:

"There's a strong feeling against them (labor organizers) here, and I dread the thought of what might happen if they come in." (November 19, 1939.)

Mayor Koch's "dread" has been realized. A citizens' committee came together recently in his own office, to drive out of town AF of L organizers who had attempted to bring unionism to construction workers on the Goodyear plant.

The experience of the URWA in Gadsden, Alabama illustrates the completeness with which an industrial company may dominate a community's agencies of government. The situation is described in the reports of the hearings before the La Follette Committee. (Part 8, pp. 3002, ff.)

Examples of this kind could be endlessly multiplied from the general experience of the labor movement. It is apparent that with communities vying with each other for location of new industry, and conniving at the violation of civil liberties and the maintenance of a "docile" labor supply, the whole foundation of American democracy is imperiled.

OTHER POSSIBLE CAUSES OF DECENTRALIZATION OF THE RUBBER INDUSTRY

(1) *Decentralization may be in search of lower costs of distribution and transportation.*—This will apply, we believe, to the establishment of such plants as the Goodyear plant in Gadsden, Alabama in 1929, and to the California plants of the Big Four rubber companies. The policy, also, of such large automobile manufacturers as Ford and General Motors, with their decentralization of production, has tended to force like decentralization in the automobile tire and tube industry. Here transportation costs bulk as a major factor.

(2) *Shifting of production from less to more efficient plants has taken place to some extent in the rubber industry.*—As well as decentralization, the United States Rubber Co. offers an outstanding example of this tendency in the rubber industry. When this corporation was taken over by Du Pont interests in 1928, it was made up of a large number of plants, operating in different localities, many of them at a very low level of efficiency. In an intense effort to meet competitive costs, U. S. Rubber management was forced to close down plant after plant throughout the country, and to centralize production in its most efficient plants. In those plants, naturally, higher and higher levels of productive efficiency were obtained, with no substantial increase in the labor force.

From 1928 to 1935, 19 of the 44 plants were closed down, and production consolidated in the remaining 25. It must be noted here that the U. S. Rubber Co. made considerable efforts to secure new employment for its laid-off workers, and that older employees were partially compensated for their loss of work by dismissal pay.

(3) *Unscrupulous bidding for new industries by many communities has resulted in many serious shifts in production.*—During depression years, with the failure of industrial production to expand naturally into new territories, there has been a tremendous development in competitive bidding for the industrial production available, as we pointed out before. Without seeking to go fully into this problem, which concerns the steel, auto, textile, hosiery, shoe and other industries, we should like to give something of the experience in rubber. There we have seen various communities in the North and South seeking to entice to themselves new plants, by offering a whole range of favors and special dispensations. The presentation of free plant sites, the provision of capital for the construction of factories, absolution from payment of taxes, or special slashes in tax rates, and other special favors are offered to companies by the representatives of states or communities.

The city limits of Memphis, Tennessee, for instance, were swung around the Firestone plant established there in 1937, so as to allow the rubber company to pay the county rate, rather than the city tax rate. This made a difference between \$3.09 per thousand in the city, and 96 cents per 1,000 in the county, in favor of the company. A similar situation prevails in Gadsden, Alabama, where the Goodyear plant, having been provided with a free site, was placed outside the limits of the city. In Cumberland, Maryland, by action of the city council, the Goodyear Co. will pay no taxes until 1945.

The Goodyear plant in St. Mary's, Ohio is being built on a 21-acre farm, bought by popular subscription of \$23,000 by local citizens. In Windsor, Vermont, the machinery, capital stock, and personal buildings of the corporation are tax exempt for ten years.

The State of Mississippi has authorized local units of government to issue bonds for the erection of manufacturing plants. The Armstrong Rubber Co., of West Haven, Connecticut, has taken advantage of this offer, and has built in Natchez, Mississippi, a plant which will furnish employment to about 400. It may be added that the Armstrong Rubber Co. is not organized by any labor union, and has, nevertheless, seen fit to "decentralize".

It is assumed by the rubber companies that their choice of location for operation is a private matter, for decision according to the immediate interests of management. It must be remembered, however, that both the community and the nation have a vital interest in the economic forces determining their very life. The city of Akron is a city built for and by the rubber industry. Experiencing a rise in population from 69,000 in 1910 to 250,000 in 1930, this city has no substantial economic base outside the rubber industry. (In 1929, some 76 percent of the employed industrial workers of Summit County were tire and tube workers; total number of wage earners was 67,298, and total wages, \$107,253,929. In 1937, these totals had dropped to 52,888, and \$80,701,916. In the latter year, some 67 percent of the industrial workers were tire and tube workers.) (Figures from the U. S. Census of Manufactures.)

SOCIAL EFFECTS OF DECENTRALIZATION

Akron citizens invested from 1914 to 1929 over 97½ million dollars in homes. Without the rubber industry, the value of these homes and the value of Akron real estate would be reduced to practically nothing.

Civic improvements have been made for the rubber companies and paid for from tax money. For example, the \$1,500,000 Mogadore dam which is nearing completion was started at the insistent demand of the Goodyear Co. The company said that it would have to move some production from Akron unless its water service was improved. Early in 1938, however, long after the project had been undertaken, Mr. Litchfield, President of the Goodyear Co., blandly declared that Goodyear no longer needed the water from this dam. Large public investments, as well as rubber workers, seem to be at the mercy of rubber company whims.

Decentralization of the industry seemed to threaten disaster, therefore, to the full security of Akron's middle and commercial classes. The loss of 5,000 or more jobs to Akron would mean the loss of something like \$7,500,000 in yearly income and cash circulating through the veins of the city's economic life. In comparison to it, the social consequences of a major air raid would be incidental.

At the same time, Akron's middle class has come more and more to realize that surrender to the companies' campaign of longer hours and shorter wages would have equally disastrous results. That campaign, too, meant the loss of jobs and the loss of basic income to the community. Thus, this community seemed to be facing strangulation—loss of income through increased shifting of jobs, or through increased exploitation of its workers.

From these circumstances, it is clear that the tremendous economic power of corporations over the communities in which they operate must be subjected to some kind of regulation, for the public good. If stable community and civic enterprise is to be built up, if the investment of a lifetime of saving and endeavor is to be secured, there must be some guarantee that powerful corporations will not be allowed freely to overthrow the economic life of a community. If American society is to be stabilized, the responsibility of corporations to the community and to the nation at large must be established.

It should be clear that what we are discussing is not simply an Akron problem, that what we are interested in is not simply the welfare of Akron. The unregulated power to decentralize and shift production, without consideration of its social consequences, is a thing which threatens the security of every community and state in the nation today.

It is difficult to estimate the full social cost of speed-up and decentralization in the rubber industry upon such a city as Akron, Ohio. From January of 1938 to January of 1939, the number on WPA in Summit County increased from 8,356 to 19,876 (From WPA Administrator Roose.) Although WPA authorities have no information to give on the number of rubber workers in this group, they are generally estimated to make up the large bulk of those securing WPA employment.

By January, 1940, WPA rolls in Akron have been cut from the high point of January, 1939 to 9,919. It must be added that in January approximately 4,000 employable workers were on city relief, where they are living on a relief quota providing 4½ cents for each meal. The level of production in the rubber industry is, very roughly, equal to what it was in the middle of 1937, when 6,000 were on WPA, and only 362 employables on city relief. It would be correct, then, to estimate that in Akron there are at least 6,000 rubber workers whose jobs at present levels of production have been wiped out by the combined forces of technological advance and decentralization.

The total loss which this represents to the community is by all estimates tremendous. Even assuming the continuance of adequate WPA and city relief (a very large assumption, indeed, these days), buying power of these 6,000 employable workers is cut by more than half. Akron WPA workers receive \$57.20 a month; rubber workers, about \$140.00.

A series of interviews with a group of former rubber workers now on WPA indicates something of what this means to their standard of living, and to their buying habits. Everyone interviewed had been forced to cut their rent by 50 or 60 percent. Incidental expenses, such as entertainment, automobile travel, etc., were entirely eliminated. Expenditures for clothes of these workers and their families in the past two years averaged from \$20 to \$30, and in no case reached over \$50.

Stories presented were of unpaid doctors, grocery and insurance bills, of cars no longer operated because the rubber workers could not buy tires, and of a general reduction of living standards to the most meagre level of subsistence.

Investors in the rubber industry may look with some wonderment on the expansion of facilities, even if the ostensible reason for such expansion is to get greater "efficiency" from operations.

The rubber industry has been notorious for its excess capacity. In NRA days, the Rubber Manufacturers Association estimated by a most conservative method that there was excess capacity in the tire industry of some 37 percent in the years 1927-1933, and felt "quite confident that this information conclusively demonstrated the desirability of limiting the creation of additional productive capacity". (From *The Rubber Industry Study* put out by the NRA Division of Review.) At that time, it was estimated that the industry had to count on carrying between \$35,000,000 and \$40,000,000 in fixed assets which were idle.

We estimate that 5 tire plants built since 1933, when these remarks were made about the seriousness of excess capacity, account for capacity for about 9,500,000 more tires a year.

Investors, if the facts were revealed to them, might well join the rubber workers in looking with disfavor on the building in the name of greater efficiency of more and more plants, in an industry already overbuilt.

THE NATIONAL PROBLEM OF DECENTRALIZATION

Decentralization has brought, perhaps, certain temporary advantages to the communities in which new factories have been erected, but it has brought also, to those communities, ever-increasing speed-up in the factories, an unparalleled flouting of civil liberties, and no secure guarantee of economic welfare. It results, indeed in an economic debasement, eventually, which threatens our vaunted American standard of living.

Unrestricted decentralization is as much a threat to the new as to the old community. Gadsden, Alabama, for instance, is told by the Goodyear company union that union organization will drive jobs out of Gadsden back into Akron.

Looking at the whole problem on the national scale, it is clear that the issues have been intensified by our present economic difficulties. The failure of industry to expand in the past decade has intensified competition among communities and states for a larger and larger share of already existing production.

Autarchy has been criticized as an economic doctrine in its application to the life of modern nations at large. The idea that a nation may live outside the sweep of the world economic system has proved false. The effect of the unrestricted power to decentralize has been to establish throughout this country tendencies toward autarchy, or economic isolation, on a regional, state or even community-wide basis. Tire dealers in the South advertise, "Buy Southern Made Tires". On the other side, there is a strong tendency among Ohioans to demand Akron or Ohio made tires. This kind of sectional economic rivalry is surprising and disconcerting in our country, whose greatness has been established upon the unity and cooperative endeavor of all sections in the building of a common economic life.

Few other issues in the life of our country today seem to us more in need of investigation than this. Our experience has been but a small part of general developments. We believe that we are expressing not the interest of any single community or any single region in saying that the threat to American living standards, implicit in the power of shifting production at will, is one which requires an early and thorough investigation looking to the framing of appropriate legislation.

SOME CONCLUSIONS

We submit, in the first place, that we have no panacea to offer for the immediate solution of the problems which we have outlined. A constantly rising power of production has brought with it in our industry, as in many others, a constantly declining power of consumption. As immediate steps toward a solution of this problem which threatens the foundation of our American way of life, we have the following suggestions:

(1) The recognition of labor's contribution to the stabilization of our economy, together with continued guarantees of labor's right to organize and bargain collectively with employers. Labor alone, during the past few years of intense technological advance and unemployment, has taken steps to check this fatal tendency. We have gladly accepted the new efficiency of machines, but we have striven to maintain the yearly income of our workers, in spite of reduced hours. This, in our industry, has meant the salvation, as we estimated before, of approximately 32,000 jobs. The CIO has made a similar contribution in the country at large. We have striven to protect the communities in which we have members

against the evil results of irresponsible decentralization—but it is obvious that we cannot cope with this problem single-handed.

(2) More definite support from government agencies for the union's attempt to maintain the living standards of America's industrial workers. The legislative program of the CIO stands as the clearest expression of necessary steps for the attainment of this end, and for American economic stability, at the present time.

(3) A thorough-going investigation of the problems whose main features we have endeavored to describe. Both technological unemployment and the question of decentralized or shifted production are closely related, one to the other. They stand out as subjects upon which thorough investigation by authorities having access to all the necessary information should be carried out within the immediate future. We are confident that once the facts are completely known to the American public, it will be possible to enact legislation necessary on these vast social problems.

We are convinced that intelligent action on the part of our government will be necessary to check and regulate the ruthless exploitation of men and communities by powerful corporations. Action along these lines, action to preserve the living standards of the unemployed, is, in our opinion, action to secure the future of this country.

Respectfully submitted.

THOMAS F. BURNS,
Vice-President, United Rubber Workers of America.

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“EXHIBIT No. 2750” appears in text on p. 17222

“EXHIBIT No. 2751” appears in text on p. 17224

EXHIBIT No. 2752

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WORK PROJECTS ADMINISTRATION, NATIONAL RESEARCH PROJECT

David Weintraub, Director

REPORTS PUBLISHED AS OF APRIL 1940

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EXHIBIT No. 2753

*Indexes of production, employment, man-hours, and productivity in manufacturing, 1919-39*¹

[1929=100]

Year	Production	Employment	Man-hours	Production per—	
				Wage earner	Man-hour
1919	63.4	68.4	99.9	64.4	63.5
1920	67.3	100.6	100.5	67.0	67.0
1921	64.3	78.8	75.9	68.9	71.5
1922	70.4	91.7	91.5	76.8	76.9
1923	81.7	100.7	100.7	81.1	81.1
1924	77.4	94.8	92.1	81.6	84.0
1925	86.1	98.2	97.5	87.7	83.3
1926	90.2	98.8	98.7	91.3	91.4
1927	88.5	95.6	95.7	92.6	92.5
1928	93.0	96.3	96.0	96.6	96.9
1929	100.0	100.0	100.0	100.0	100.0
1930	80.8	86.3	80.1	93.6	100.9
1931	68.0	73.2	65.2	92.9	104.3
1932	53.4	64.4	51.8	82.9	103.1
1933	62.1	72.6	67.7	85.5	107.6
1934	67.1	84.0	60.5	79.9	110.9
1935	77.9	86.9	65.7	89.6	118.6
1936	89.3	90.9	73.3	98.2	121.8
1937	95.7	101.5	79.2	94.3	120.8
1938	73.8	83.8	61.8	88.1	119.4
1939	92.2	90.5	70.6	101.9	130.6

¹ Data for 1919-36 cover 59 industries that in 1929 accounted for 51 percent of the employment and 56 percent of the value of products of all manufacturing industries; the data are from Harry Magdoff, Irving H. Siegel, and Milton E. Davis, *Production, Employment, and Productivity in 59 Manufacturing Industries, 1919-36* (WPA National Research Project, Report No. 8-1, May 1939), Part One, p. 66. The figures for 1937-39 are estimated from incomplete data and are preliminary.

EXHIBIT No. 2754

*Indexes of production, employment, man-hours, and productivity in the railroad industry, 1919-39*¹

[1929=100]

Year	Production	Employment	Man-hours	Production per—	
				Wage earner	Man-hour
1919	98.1	114.8	118.4	81.1	78.6
1920	101.9	121.4	128.8	83.9	79.4
1921	77.5	99.6	97.2	77.8	79.7
1922	82.5	97.6	100.3	84.5	82.3
1923	97.4	111.6	114.9	87.3	84.8
1924	91.9	105.5	105.6	87.1	87.0
1925	96.5	105.0	105.3	91.9	91.6
1926	101.8	107.1	107.9	95.1	94.3
1927	98.0	104.4	104.3	93.9	94.0
1928	97.6	99.6	99.2	98.0	98.4
1929	100.0	100.0	100.0	100.0	100.0
1930	85.8	89.5	86.0	95.9	99.8
1931	69.4	75.6	69.1	91.8	100.4
1932	52.7	62.0	53.8	85.0	98.0
1933	55.2	58.3	50.6	94.7	109.1
1934	59.7	60.7	54.3	98.4	109.9
1935	62.4	59.8	53.8	104.3	114.9
1936	75.2	64.5	61.1	116.6	123.1
1937	80.4	67.9	64.8	118.4	125.0
1938	70.5	57.3	53.5	123.0	131.8
1939	80.0	60.3	57.2	132.7	139.9

¹ Data refer to Class I Steam Railroads. Production data for 1919-37 and employment data for 1921-37 are from M. L. Jacobsen, "Employment, Compensation, and Productivity of Railroad Labor" (WPA National Research Project in cooperation with Railroad Retirement Board, in preparation). In preparing the production index, data on revenue passenger miles and revenue ton miles as published by the Interstate Commerce Commission were combined by means of weights of 3 and 1, respectively. Production figures for 1938 and 1939 were computed from Interstate Commerce Commission data published in the *Survey of Current Business* (United States Bureau of Foreign and Domestic Commerce). The employment index is based on data of the Interstate Commerce Commission.

CONCENTRATION OF ECONOMIC POWER

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EXHIBIT No. 2755

Indexes of production, employment, man-hours, and productivity in the electric light and power industry, 1917-39¹

(1929=100)

Year	Production	Employment	Man-hours	Production per—	
				Employee	Man-hour
1917	29.8	39.9	39.5	74.7	75.4
1922	45.9	55.4	54.3	82.9	84.5
1923	54.2	54.7	53.3	99.1	101.7
1924	57.9	62.2	60.7	93.1	95.4
1925	64.7	70.0	68.3	92.4	94.7
1926	73.5	77.7	74.2	94.6	99.1
1927	82.2	85.5	83.3	96.1	98.7
1928	89.6	90.2	89.7	99.3	99.9
1929	100.0	100.0	100.0	100.0	100.0
1930	99.3	103.0	103.7	96.4	95.8
1931	95.1	95.6	96.4	99.5	98.7
1932	84.2	83.0	78.0	101.4	108.7
1933	86.5	78.7	71.5	109.0	121.0
1934	92.9	83.6	69.6	111.1	139.5
1935	100.7	84.5	71.1	119.2	141.6
1936	116.1	90.0	77.5	129.0	149.8
1937	127.4	95.0	81.8	134.1	165.7
1938	120.8	91.7	78.4	181.7	164.1
1939	136.0	91.4	77.8	148.8	178.9

¹ Data for 1917-37 are based on Harry Magdoff, Irving H. Sigel, and Milton B. Davis, *Production, Employment, and Productivity in 59 Manufacturing Industries, 1919-38* (WPA National Research Project, Report No. S-1, May 1939), Part Three, p. 149 (figures for years following 1929 were adjusted to trends indicated by the 1937 census of electrical industries conducted by the United States Bureau of the Census); figures for 1938 and 1939 are preliminary extensions of the indexes for earlier years.

EXHIBIT No. 2756

Indexes of production, employment, man-hours, and productivity in the mineral extractive industries, 1880-1939¹

(1929=100)

Year	Production	Employment	Man-hours	Production per—	
				Wage earner	Man-hour
1880	10.5	-----	34.4	-----	30.5
1890	23.6	-----	66.6	-----	35.4
1900	32.4	-----	69.7	-----	46.5
1910	66.5	-----	105.4	-----	63.1
1919	71.8	104.3	103.2	71.2	70.9
1920	82.4	115.5	111.4	74.4	74.0
1921	65.3	87.8	84.6	77.8	77.2
1922	68.4	84.7	83.1	82.6	82.3
1923	93.4	112.4	110.6	85.2	84.4
1924	87.2	101.5	100.5	87.3	86.8
1925	88.8	100.0	99.2	89.6	89.5
1926	98.0	109.5	107.9	91.0	90.8
1927	95.1	102.5	101.7	93.4	93.5
1928	93.5	96.4	96.1	97.3	97.3
1929	100.0	100.0	100.0	100.0	100.0
1930	87.7	87.8	84.1	100.3	104.3
1931	72.1	69.2	65.4	105.1	110.2
1932	67.0	66.3	51.3	103.2	111.1
1933	62.0	64.0	55.1	98.3	112.5
1934	68.4	78.1	58.8	88.9	116.3
1935	72.1	80.3	69.5	90.3	121.2
1936	85.7	91.3	69.8	93.0	122.8
1937	90.5	94.3	72.7	94.9	124.5
1938	74.4	78.4	60.8	92.1	122.4
1939	82.0	74.1	63.6	107.4	128.9

¹ Data for 1880-1938 are from Vivian E. Spencer, "Production, Employment, and Productivity in Mineral Extraction" (WPA National Research Project, in preparation). The chief sources used are the annual reports of the United States Bureau of Mines, reports of the United States Bureau of the Census, and "Mineral Technology and Output per Man Studies" of the WPA National Research Project made in cooperation with the United States Bureau of Mines. Figures for 1939 are preliminary extensions of the indexes for earlier years.

CONCENTRATION OF ECONOMIC POWER

EXHIBIT No. 2757

*Indexes of production, employment, and productivity in the telephone industry, 1919-39*¹

[1929=100]

Year	Production	Employment	Production per employee	Year	Production	Employment	Production per employee
1919.....	52.8	62.6	84.3	1930.....	96.1	96.5	99.6
1920.....	55.4	70.4	78.7	1931.....	91.5	86.2	107.4
1921.....	58.7	68.9	85.3	1932.....	81.6	77.8	104.9
1922.....	64.7	72.6	89.1	1933.....	74.8	70.0	105.9
1923.....	70.3	79.4	88.5	1934.....	76.6	70.2	109.1
1924.....	73.9	83.5	88.5	1935.....	79.5	69.4	114.6
1925.....	79.5	84.4	94.2	1936.....	86.3	72.2	119.5
1926.....	84.9	86.3	98.4	1937.....	90.5	77.5	116.8
1927.....	88.4	87.3	101.3	1938.....	88.6	74.4	108.3
1928.....	93.7	92.0	101.8	1939.....	96.2	75.1	128.1
1929.....	100.0	100.0	100.0				

¹ Data for 1922, 1927, 1932, and 1937 are based on the quinquennial censuses of electrical industries conducted by the United States Bureau of the Census. Production and employment data for other years except 1938 and 1939 were interpolated or extrapolated on the basis of relationships existing between figures for the foregoing years and indexes for the Bell system appearing in Harry Magdoff, Irving H. Siegel, and Milton B. Davis, *Production, Employment, and Productivity in 59 Manufacturing Industries, 1919-36* (WPA National Research Project, Report No. S-1, May 1939), Part Three, p. 161. Figures for 1938 and 1939 are extensions of the indexes for earlier years and are based on statistics from annual reports of the American Telephone and Telegraph Company. The employment index covers salaried as well as wage workers.

EXHIBIT No. 2758

*Indexes of production, employment, and productivity in agriculture, 1919-38*¹

[1929=100]

Year	Production	Number of workers	Production per worker	Year	Production	Number of workers	Production per worker
1919.....	87	98.3	88.5	1929.....	100	100.0	100.0
1920.....	95	100.6	94.4	1930.....	97	98.9	98.1
1921.....	81	101.0	80.2	1931.....	107	98.8	108.3
1922.....	88	101.3	86.9	1932.....	100	98.0	102.0
1923.....	90	100.8	89.3	1933.....	95	97.6	97.3
1924.....	92	100.6	91.5	1934.....	80	96.1	83.2
1925.....	98	101.3	96.7	1935.....	94	98.9	95.0
1926.....	102	102.1	99.9	1936.....	88	97.4	90.3
1927.....	96	99.6	96.4	1937.....	107	95.9	111.6
1928.....	101	100.0	101.0	1938.....	102	94.8	107.6

¹ Production data for 1919-36 are from Raymond G. Bressler, Jr., and John A. Hopkins, *Trends in Size and Production of the Aggregate Farm Enterprise, 1909-36* (WPA National Research Project, Report No. A-6, July 1938), p. 20; figures for 1937 and 1938 are preliminary extensions of the indexes for earlier years. Data for number of workers include operators, hired workers, and family workers and for 1919-36 are from Eldon E. Shaw and John A. Hopkins, *Trends in Employment in Agriculture, 1909-36* (WPA National Research Project, Report No. A-8, Nov. 1938), p. 11; figures for 1937 and 1938 are extensions of the indexes for earlier years made by the United States Bureau of Agricultural Economics.

EXHIBIT No. 2759

*Investment and operating costs of three sizes of petroleum-refining equipment, 1939*¹

Capacity of unit (barrels per day)	Relative investment per unit of capacity	Relative operating costs per unit of capacity
1,000.....	100	100
5,000.....	41	44
10,000.....	31	36

¹ The data refer to naphtha reforming units and were obtained by the WPA National Research Project from a large manufacturer of this equipment.

CONCENTRATION OF ECONOMIC POWER

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EXHIBIT No. 2760

*Cost of instrumentation of three sizes of petroleum-refining equipment, 1939*¹

Capacity of unit (barrels per day) and relative cost of instruments per unit of capacity:

5,000.....	100
15,000.....	41
25,000.....	29

¹ Data refer to combination units and were obtained by the WPA National Research Project from a large manufacturer of this equipment.

EXHIBIT No. 2761

*Industrial-instrument expenditures per \$1,000 worth of machinery and equipment*¹

Year:	Dollars
1919.....	\$3. 8
1929.....	10. 6
1939.....	14. 4

¹ Data represent total industrial-instrument sales per \$1,000 worth of all industrial machinery and equipment produced and are from George Perazich, Herbert Schimmel, and Benjamin Rosenberg, *Industrial Instruments and Changing Technology* (WPA National Research Project, Report No. M-1, Oct. 1938), p. 33. The figure for 1939 is estimated from recently available data.

EXHIBIT No. 2762

*Trend toward automatic-control instruments*¹

Year and percent that sales of control instruments are of sales of all instruments:

1923.....	7. 7	1931.....	23. 0
1925.....	12. 5	1933.....	29. 9
1927.....	19. 6	1935.....	33. 0
1929.....	21. 6		

¹ Data refer to dollar values of sales and are based on George Perazich, Herbert Schimmel, and Benjamin Rosenberg, *Industrial Instruments and Changing Technology* (WPA National Research Project, Report No. M-1, Oct. 1938), p. 39.

EXHIBIT No. 2763

*Automatic control of heat treating of steel*¹

Year and percent of new installations equipped with controlling instruments:

1924.....	26	1929.....	85
1925.....	39	1930.....	89
1926.....	57	1931.....	92
1927.....	74	1932.....	95
1928.....	81		

¹ Data are based on sales of one type of electric heat-treating furnace and are from George Perazich, Herbert Schimmel, and Benjamin Rosenberg, *Industrial Instruments and Changing Technology* (WPA National Research Project, Report No. M-1, Oct. 1938), p. 42.

17586

CONCENTRATION OF ECONOMIC POWER

EXHIBIT No. 2764

*Concentration of industrial research, 1938*¹

Size of staff	Companies		Research employees	
	Number	Percent	Number	Percent
All companies.....	1,722	100.0	44,292	100.0
Companies having staffs of—				
501 or more persons.....	12	0.7	14,444	32.6
51-500 persons.....	108	6.3	14,226	32.1
1-50 persons.....	1,602	93.0	15,622	35.3

¹ Data are from George Perazich and Philip M. Field, *Industrial Research and Changing Technology* (WPA National Research Project, Report No. M-4, Jan. 1940), p. 66. There were in addition about 150,000 industrial corporations which reported no organized research activities.

EXHIBIT No. 2765

*Concentration of research in various industries, 1938*¹

Industry	Quartile of companies having largest research staffs		
	Number of companies	Research employees	
		Number	Percent of total
All industries.....	430	36,215	81.8
Blast-furnace, steel-works, and rolling-mill products.....	5	462	59.3
Electrical machinery, apparatus, and supplies.....	18	2,459	82.2
Industrial chemicals.....	13	4,632	88.3
Motor vehicles, bodies, and parts.....	7	1,737	89.0
Petroleum.....	13	4,275	85.0
Radio apparatus and phonographs.....	5	924	82.8
Rubber products.....	8	2,022	90.0
Textiles and their products.....	11	209	56.9
Utilities (gas, light, and power).....	4	785	78.5

¹ Data for each industry are for the 25 percent of the companies conducting research that employed the largest research staffs and are from George Perazich and Philip M. Field, *Industrial Research and Changing Technology* (WPA National Research Project, Report No. M-4, Jan. 1940), p. 10. The data are based upon a survey of 1,722 companies made by the National Research Council, and it is believed that coverage of the large companies is quite complete.

EXHIBIT No. 2766

Labor requirements per unit of output for large and small operations

Industry and unit labor requirements of large operations as a percent of those of small operations:

Brick and tile: ¹	
Stiff-mud process.....	56
Soft-mud process.....	55
Cement: ²	
Wet process.....	89
Dry process.....	82
Crushed stone: ³	
Limestone.....	50
Basalt.....	75
Beet Sugar ⁴	54
Flour ⁵	65
Iron ore ⁶	30

¹ Small operations have an annual capacity of less than 15 million common-brick equivalents; large operations have an annual capacity of 30 million or more. Data are from Miriam E. West, *Productivity and Employment in Selected Industries: Brick and Tile* (WPA National Research Project in cooperation with National Bureau of Economic Research, Report No. N-2, Feb. 1939), p. 120.

² Small operations have an annual capacity of less than 1.0 million barrels; large operations have an annual capacity of 1.5 million or more. Data are from George Ferzich, S. Theodore Wool, and Herbert Schimmel, *Mechanization in the Cement Industry* (WPA National Research Project, Report No. M-3, Dec. 1939), p. 28.

³ Small operations produce less than 100,000 tons per year; large operations produce 100,000 or more. Data are from Harry S. Kantor and Geoffrey A. Saeger, *Changes in Technology and Labor Requirements in the Crushed-Stone Industry* (WPA National Research Project in cooperation with U. S. Department of the Interior, Bureau of Mines, Report No. E-8, Feb. 1939), p. 87.

⁴ Small operations have a daily capacity of less than 1,100 short tons; large operations have a daily capacity of 2,000 or more. Data are from Raymond E. Adamson and Miriam E. West, *Productivity and Employment in Selected Industries: Beet Sugar* (WPA National Research Project in cooperation with National Bureau of Economic Research, Report No. N-1, Oct. 1938), p. 100.

⁵ Small operations have an annual capacity of 200-349 thousand barrels; large operations have an annual capacity of 1,000 thousand or more. Data are from WPA National Research Project files, and are based on field survey data covering the years 1928-36.

⁶ Small operations have an annual capacity of less than 1 million tons of ore; large operations have an annual capacity of 1 million or more. Data are from N. Yaworski, O. E. Kiessing, and Others, *Technology, Employment, and Output per Man in Iron Mining* (WPA National Research Project in cooperation with U. S. Department of the Interior, Bureau of Mines, in preparation).

EXHIBIT No. 2767

PRODUCTIVITY AND EMPLOYMENT IN AGRICULTURE ¹

Over the years the volume of agricultural employment has been declining. From 1909 to 1929 the output per person working in agriculture increased 37 percent. This increased productivity made it possible for 7.5 percent fewer persons to produce an agricultural output which was 27 percent greater in 1929 than in 1909. The increased productivity reflects increased mechanization and other changes in agricultural techniques and such other factors as a shift of some marketing functions from agriculture to other industries. Although the average fertility of the soil has certainly not increased and although efforts toward a higher quality of agricultural products have tended to increase labor requirements, the improved techniques of production have nonetheless cut the total number of persons working in agriculture in spite of an increased output. For instance, it is estimated that since 1920 the combined harvester-thresher has displaced most of the 100,000 to 200,000 migratory harvest hands who used to find employment every summer in the wheat belts of the Great Plains; more recently many tenants and sharecroppers have lost their homes as well as their jobs when land owners in Texas and other southern States bought tractors and consolidated their holdings into larger, power-farmed units; and most recently the mechanization of corn harvesting appeared likely to wipe out in a few years the customary full employment of many thousands of corn huskers.

¹ Based on letter of transmittal of Eldon E. Shaw and John A. Hopkins, *Trends in Employment in Agriculture, 1909-30* (WPA National Research Project, Report No. A-8, Nov. 1935).

EXHIBIT No. 2768

EFFECTS OF TRACTOR AND MOTOR VEHICLES ON FARM LABOR REQUIREMENTS ¹

The widespread adoption of the tractor, supplanting draft animals as a source of power, has been by far the most important technological change in agriculture during the past 25 years. Not only has the tractor proved to be in many respects a more efficient power unit than the draft animal, but it also has made feasible the use of larger field implements and harvesting equipment which have reduced the labor time required to produce the country's crops. In many ways the automobile and the truck, too, have brought about outstanding changes in the farm economy. They have not only quickened and cheapened transportation on and off the farm but have also widened the area in which the farmer may advantageously buy supplies and sell his produce.

A major feature of the adoption of automotive equipment in agriculture has been the resultant decline in the number of horses and mules on farms. It is estimated that about 5.6 million mature draft animals have been displaced since 1909, with the tractor accounting for half and the truck and automobile for the other half. Without taking into account the tremendous increase in the amount of transportation which mechanical motive power has made feasible, the total saving in labor in the fields and in raising feed and caring for the animals which would have been required in the absence of tractors, trucks, and automobiles comes to about 1 billion man-hours per year. Against this must be set about 1¼ billion man-hours of work in nonfarm areas needed to produce the automotive equipment, to replace the worn-out units and parts, and to supply the necessary fuel and oil. This balance in favor of work created as against labor saved does not, however, tell the story of displacement on the farms, the migrations in search for new sources of income, and the unemployment which precedes the new job, if indeed it is found. In some parts of the country "tractored off" has therefore become synonymous with "displaced" and "technologically unemployed."

Continued adoption of tractors, trucks, and automobiles is anticipated. In 1937 there was 1 tractor to about 280 crop acres. Even if the number of farm tractors in use doubled during the next two decades, that number would provide only about half the farms of 50 acres or more with tractors. A particularly rapid rate of tractor adoption is to be looked for in the cotton-growing States, although, relative to some other areas, the number of tractors used in this region will probably be small for several years. Some increase in the use of automobiles and of trucks by farmers is also to be expected.

EXHIBIT No. 2769

EFFECTS OF CHANGES IN FIELD IMPLEMENTS ON FARM LABOR REQUIREMENTS ²

It is notable that few of the types of implements now widely used are entirely new since 1909, the beginning date for this study. New kinds of equipment have been developed for some purposes, especially for the harvesting of particular crops, but in most cases these new implements have been adopted by relatively few farmers. A much more important change in the last 25 or 30 years has been the adoption of larger or more efficient implements of types already existing. There has been a general increase in working widths, improvement in construction, and change in designs to permit work at higher operating speeds.

The National Research Project study of field implements shows that in almost all cases the labor required per crop-acre decreased progressively as the size of implements in use increased. This was true for each of the 26 implements studied and in all of the seven major farming areas in which the field survey was conducted. Where the motive power of tractors was substituted for that of horses, the productivity of labor using the same size of implement was usually much greater.

Although increased size of implement has been a general development, it has by no means affected all agricultural regions in equal degree. Thus in the eastern cotton areas farmers have been slow to shift to larger implements and larger power units. Tractors and larger equipment had been adopted on a few farms, but the implements most often found in 1936 were horse-drawn and of the same sizes as those most commonly reported in use more than a quarter of a century ago. In

¹ Based on letter of transmittal of Eugene G. McKibben and R. Austin Griffin, *Changes in Farm Power and Equipment: Tractors, Trucks, and Automobiles* (WPA National Research Project, Report No. A-9, Dec. 1938).

² Based on letter of transmittal of Eugene G. McKibben and Others, *Changes in Farm Power and Equipment: Field Implements* (WPA National Research Project, Report No. A-11, Aug. 1929).

the major wheat-producing areas, on the other hand, the implements most frequently in use 25 or 30 years ago had by 1936 been almost entirely replaced by larger-capacity equipment. Moreover, they were tractor-drawn and performed the operations of seedbed-preparation, planting, and harvesting in about three-tenths of the time required by the equipment that was typical before the World War.

Other areas fall between the extremes represented by the cotton and wheat areas. But even in the wheat region the equipment most commonly used in 1936 was considerably less effective than the most up-to-date types available and in use on some farms. This difference between implements used and improved implements available points to the existence of a broad physical basis for substantial further increases of labor productivity in agriculture.

EXHIBIT No. 2770

LABOR REQUIREMENTS IN COTTON PRODUCTION ¹

Of the country's five major crops, cotton requires much the greatest amount of labor, both in total and per acre. This crop also, more than most others, has resisted the tendency toward mechanization in agriculture, although recently there have been indications of an introduction of power farming in some of the major cotton-producing areas.

Between the periods 1907-11 and 1933-36 the labor requirements of cotton production declined by 16 percent per acre or, on a per-bale basis, by 20 percent. The greatest declines took place in the Western Cotton Area, that is, the area which also experienced the greatest increase in production during the period. The marked shift in the geographic distribution of cotton production to Oklahoma, Texas, and the far West has resulted in some economy in the utilization of labor. This shift is, however, partly offset by the increased proportions produced in the Delta Area, where labor requirements are above the average and where production has been more quickly adjusted to the changed requirements imposed by the boll weevil.

The decline in labor requirements per acre and per bale, in which all areas shared to some extent, reflects the increasing application of more efficient equipment. The development and introduction of large-scale and expensive equipment in cotton production has been seriously impeded by the small size of the farm unit and by the prevailing system of land tenure, particularly in the Old South. However, the accumulation of possibilities for economies through the use of modern equipment may overcome the resistance against extensive mechanization. These factors may in turn tend to change the tenancy and sharecropping system under which cotton is now raised in the Old South.

The tractor is now available for the preharvest operations of seedbed preparation, planting, and cultivation. Its use is feasible wherever the topography of the country presents level or gently rolling land, as in the Mississippi Delta, the Western Cotton Area of Oklahoma and northwest Texas, and the cotton lands of California, Arizona, and New Mexico. Under such conditions the use of the tractor is economical when cotton is grown on large farm units, such as exist in relatively greater numbers in the areas west of the Mississippi where the topography is most favorable. In all these areas tractors have been gradually replacing horsepower. Increasing sales of tractors and displacement of sharecroppers, with attendant increased demand for seasonal laborers, were reported in 1937. In the Mississippi Delta, for instance, sharecroppers and share tenants have already been displaced to some extent by wage labor, whereas in the western Areas a large proportion of the cotton has for some time been harvested by migratory labor.

A primary obstacle to the extended mechanization of preharvest operations is the peak labor requirements for harvesting operations. The development of the mechanical cotton picker raises prospects for overcoming this impediment. It is believed that machines now under development warrant expectations of their adoption during the next decade. They are especially adaptable to use on the relatively level lands favorable to the use of tractors, and they are likely to be used there first. A further shift in cotton production to such lands may then be expected, accompanied by an increase in the size of cotton farms. The successful development of a mechanical cotton chopper, such as was recently reported, would enhance the prospects for adoption of a successful cotton picker by reducing the secondary peak of labor requirements in cotton production.

¹ Based on preface of William C. Holley and Lloyd E. Arnold, *Changes in Technology and Labor Requirements in Crop Production: Cotton* (WPA National Research Project, Report No. A-7, Sept. 1938).

EXHIBIT No. 2771

LABOR REQUIREMENTS IN CORN PRODUCTION ¹

In this report it is estimated that, although production during the period 1932-36 was only slightly less than during the period 1909-13, the number of man-hours needed to produce the corn crop declined by more than 20 percent between the two periods. This reduction in the volume of work amounts to about 600 million man-hours, or the equivalent of 200,000 men working 3,000 hours a year. The decline in the amount of work needed cannot, however, be translated into reductions in actual employment because the volume of agricultural employment depends also on the other agricultural enterprises carried on and upon a great many factors which differ from area to area. Nonetheless, there is no doubt that the reduced volume of labor required to produce corn has contributed toward the general reduction in the volume of agricultural employment during the last two decades.

During the past 25 years the development and adoption of specialized machines in corn production have been extensive. Two-row cultivators have for the most part replaced one-row cultivators, except in the South, and in some areas much larger cultivators are in use. Lister planters which open the furrow and plant in one operation have come into use in western areas where semiarid climatic conditions reduce weed growth to negligible proportions. A variety of mechanical devices suited to the various methods of harvesting has been introduced. Potentially the most important of these is the mechanical corn picker. The adoption of this machine in the Corn Area has been increasing in recent years, and in 1937 some manufacturers reported more orders than they could fill.

The data indicate that changes in methods of harvesting corn, for instance, from husking by hand to mechanical picking in the Corn Area and from husking from the shock to ensiling in the Dairy Areas, have affected the volume of employment for transient seasonal laborers who work from 6 weeks to 2 months during the corn harvest.

The continued adoption of the mechanical corn picker in the Corn Area, which produces about 40 percent of the crop, will in all likelihood result in further displacement of seasonal laborers during the harvesting season. Furthermore, the adoption of tractors is still progressing in most corn-producing areas. Improved practices and wider adoption of hybrid seed corn promise higher yields per acre with little or no increase in the amount of labor needed. In the light of these findings and of the fact that corn production has not increased during the past quarter century, further declines in employment in the corn fields are predicted.

EXHIBIT No. 2772

LABOR REQUIREMENTS IN WHEAT PRODUCTION ²

For the country as a whole, the labor used per acre in wheat production declined during the period studied by more than 50 percent, or from 12.7 hours in the 1909-13 period to 6.1 hours in the 1934-36 period. The period of greatest reduction was the decade following the war, during which the average labor requirement decreased from 10.3 hours per acre to 6.7 hours. In this decade tractors and combines came into use in large numbers.

The greatest reductions have occurred in the more specialized wheat-producing areas. For instance, the amount of labor used per acre has declined in the Western Cotton Area by 68 percent, in the Range Area by 60 percent, in the Small Grain Area by 57 percent, and in the Northwestern Area by 53 percent. On the other hand, in the Eastern and Delta Cotton Areas labor requirements remained nearly the same throughout the period. In the Middle Eastern Area they were reduced only 7 percent and in the Eastern Dairy Area 24 percent.

According to our estimate the production of wheat in this country normally ³ required 367 million hours of farm labor annually in the 1934-36 period. This is over 240 million hours, or 40 percent, less than was used annually just prior to the

¹ Based on letter of transmittal of Loring K. Macy, Lloyd E. Arnold, and Eugene G. McKibben, *Changes in Technology and Labor Requirements in Crop Production: Corn* (WPA National Research Project, Report No. A-5, June 1938).

² Based on Robert B. Elwood, Lloyd E. Arnold, D. Clarence Schmutz, and Eugene G. McKibben, *Changes in Technology and Labor Requirements in Crop Production: Wheat and Oats* (WPA National Research Project, Report No. A-10, Apr. 1939), pp. 90-2, 94-96.

³ In order to eliminate the effect of the AAA program and the drought in recent years, the average acreage in the 1927-31 period was used in computing the normal labor needs in the 1934-36 period.

war. The reduction in the Small Grain Area alone amounts to 80 million man-hours, but in the Corn Area and the Western Dairy Area the labor used in wheat production has decreased 64 million and 41 million hours respectively.

One factor which has tended to reduce the labor needs of wheat production has been the trend toward expansion of acreage in areas of low per-acre labor requirements and contraction of acreage in areas where labor requirements are high. Thus in the Western Cotton Area the acreage in wheat increased by 232 percent from the 1909-13 to the 1927-31 period. A slight increase in total labor requirements has occurred there, whereas in the Dairy Areas, largely due to a reduction in acreage, there has been a substantial decrease in labor needs. The net effect of this shift in acreage has been to reduce the labor needed in wheat production in the country as a whole.

This reduction in the labor requirements of wheat production, besides reducing the need for regular farm labor prior to harvest, has virtually destroyed the demand for nonresident wheat-harvest laborers in those regions where the combine has come into general use. It has been estimated that in 1920 from 100,000 to 200,000 of these migratory laborers found employment in Texas, Oklahoma, Kansas, Nebraska, and the Dakotas. In the winter wheat belt, where the majority of these men were employed, combines now make it possible for the regular farm labor to complete the harvest with very little extra help.

EXHIBIT No. 2773

LABOR REQUIREMENTS IN OAT PRODUCTION ¹

The fact that oats are usually profitable only when grown in a diversified cropping system has resulted in the production of this crop remaining less mechanized than has that of wheat. Yet, with the exception of the labor used in the production of wheat and possibly barley, that used in the production of oats has declined more since 1909 than that of any other major crop.

Since the 1909-13 period the average amount of labor used in producing an acre of oats has declined from 12.5 to 7.9 hours, a reduction of 37 percent. In contrast with the production of wheat, where large reductions in labor requirements have occurred only in the specialized wheat-producing areas, reductions in the labor used in oat production have been comparatively uniform over a wide region. Reductions since 1909 in labor requirements per acre ranging from 34 to 44 percent have occurred in the Corn, Eastern Dairy, Western Dairy, Small Grain, Range, and Northwestern Areas. In California, an area of very small production, it is estimated that labor requirements per acre have decreased 72 percent since 1909. On the other hand, in the Eastern Cotton, Delta Cotton, and Middle Eastern Areas reductions in the labor used per acre range from 8 to 10 percent.

According to our estimates the normal annual labor needs of oat production in the 1934-36 period were roughly 316 million hours as compared with 458 million hours in the 1909-13 period. In the Corn and Eastern Dairy Areas the reduction amounted to over 30 million hours, and in the Western Dairy and Small Grain Areas the decline in labor needs has been nearly as great. Decreases ranging from 3 to 7 million hours have occurred in the Eastern Cotton, Delta Cotton, Range, Middle Eastern, and Northwestern Areas. The labor used in the Western Cotton Area increased more than 4 million hours during the period studied.

EXHIBIT No. 2774

LABOR REQUIREMENTS IN ALL SMALL-GRAIN PRODUCTION ²

The estimated reduction in the amount of labor used annually in producing and marketing small grains (wheat, oats, barley, and rye), totaling about 450 million man-hours, is the equivalent of 150,000 man-years of 3,000 hours of labor each. However, it is difficult to estimate the extent to which the decline in the labor requirements of these crops has actually affected employment in agriculture. The intricate and ever-changing relationships among the various farm enter-

¹ Based on Robert B. Elwood, Lloyd E. Arnold, D. Clarence Schmutz, and Eugene G. McKibben, *Changes in Technology and Labor Requirements in Crop Production: Wheat and Oats* (WPA National Research Project, Report No. A-10, Apr. 1939), pp. 96, 99.

² Based on Robert B. Elwood, Lloyd E. Arnold, D. Clarence Schmutz, and Eugene G. McKibben, *Changes in Technology and Labor Requirements in Crop Production: Wheat and Oats* (WPA National Research Project, Report No. A-10, Apr. 1939), pp. 102-3.

prises is such that all or part of the labor saved in one enterprise may merely be shifted to another. Or again, a reduction in the labor used in an enterprise may result in greater leisure for the farmer and his family without any actual reduction in employment.

In the regions where small grains are the most important crops, as in the Small Grain Area and in parts of the Western Cotton, Range, and Northwestern Areas, there has no doubt been a definite relationship between the hours of labor used in small-grain production and the number of persons employed in agriculture. Statistics of agricultural employment in the Small Grain Area appear to support this conclusion. Employment remained about constant from 1909 to 1930 while the indexes of crop acreage and livestock numbers were increasing about one-third and one-fourth respectively. From 1930 to 1936 employment in the Small Grain Area dropped 7 percent. Both hired labor and family labor have felt the impact of mechanization. Transient labor formerly used in harvesting has been displaced on many farms by the combine. The use of this machine and the tractor has increased the area which one family can operate so that vast areas of new land have been brought under cultivation with no increase in employment of farm operators and members of their families. In Montana, for example, the number of wheat farmers declined from 35,000 in 1915-17 to 14,000 in 1929, though wheat acreage rose about two-thirds. Much of this consolidation of farms was due to causes other than mechanization; yet the example indicates the trend throughout the Wheat Belt. Thus, the decreasing volume of work needed in the wheat fields of the middle western and eastern States due to the westward movement of wheat production has not been compensated for by increased employment in the newer areas.

It must be remembered, however, that from 70 to 80 percent of the small-grain acreage is located in diversified farming areas. On individual farms in these regions less employment does not necessarily follow a decline in small-grain acreage or in labor requirements of these crops. Nevertheless, these factors have undoubtedly been partial causes of declining agricultural employment in the Middle West and East.

EXHIBIT No. 2775

LABOR REQUIREMENTS IN POTATO PRODUCTION ¹

Potato production in recent years has not been much above the pre-war level. In the heavy potato-producing regions of the North and Northeast the labor required to produce a bushel of potatoes declined nearly 20 percent during the past 25 years. During that time the total labor required to produce the country's potato crop is estimated to have declined by about 45 million man-hours.

It is to be expected that further concentration of the country's potato crop lies ahead, as well as further mechanization of production, especially of the processes which consume most labor—picking up and grading. Machines for both of these processes are available, and an increase in their use is likely. It is also likely that the further development of disease- and pest-resistant varieties will make possible the elimination of part of the labor now needed to fight these blights.

EXHIBIT No. 2776

LABOR REQUIREMENTS IN VEGETABLE PRODUCTION ²

In contrast with other major crops, vegetable production and acreage have grown substantially and at a fairly steady rate during the past 30 years. Improvements in transportation and storage techniques and the opening up of new irrigated lands have been important factors in bringing about increased consumption in this field. Vegetables are produced commercially in all areas of the country. The increase in production has affected all areas in some degree but it has been especially marked in the Southwest and in California.

Growth of production, combined with a decline in average productivity that is unusual among agricultural products, has resulted since 1909 in doubling the

¹ Based on letter of transmittal of Harry E. Knowlton, Robert B. Elwood, and Eugene G. McKibben, *Changes in Technology and Labor Requirements in Crop Production: Potatoes* (WPA National Research Project, Report No. A-4, Mar. 1938).

² Based on letter of transmittal of J. C. Schillester, Robert B. Elwood, and Harry E. Knowlton, *Changes in Technology and Labor Requirements in Crop Production: Vegetables* (WPA National Research Project, Report No. A-12, Sept. 1939).

volume of labor required. The continuing growth of population, a persistence of the dietary trend toward greater use of vegetables (particularly green and leafy vegetables), and further improvements in quality and in transportation and storage methods are all likely to bring about further increases in vegetable consumption. The production of vegetables is thus one branch of agricultural enterprise which, in contrast with other branches, promises to afford an increase in employment opportunities.

Total man-hours of employment in this field, however, have recently amounted to only 2 or 3 percent of all direct labor used in agriculture. Furthermore, much of the employment afforded is highly seasonal in character, most of the jobs are casual, and a large part of the labor force (especially during the harvest periods) is composed of migratory men, women, and children.

EXHIBIT No. 2777

EMPLOYMENT AND RELIEF PROBLEMS AND MIGRATION OF THE LUMBER INDUSTRY¹

The economic dislocation which attended the decline of lumber production has been intensified in particular regions by the depletion of the timber resources. The traditional clear-cutting policy resulted in the migration of the industry to fresh sources of supply, leaving abandoned cut-over areas in its wake. In the period of agricultural expansion the population of these areas frequently made a successful transition to agriculture; studies of the Division of Research of the Work Projects Administration have shown that in recent years such areas have become, for want of alternative employment opportunity, centers of particularly aggravated relief problems.

Timber depletion has taken its toll of lumber and related forest industries, particularly in the Northeastern, Lake, and Central States. Although the southern lumber regions as a whole are not now similarly threatened, particular localities have been struck by the passing of the lumber industry. The United States Forest Service found that in 1934 there were over 18 thousand workers employed in southern logging and sawmilling operations of large mills whose owners expected to exhaust their local timber supplies by 1944. The expected increase in the number of small and medium-size mills is not likely to enhance the employment security of workers attached to such mills because of the prospective depletion of the timber supply within the working area of the mills. Although in the Pacific Coast States fewer localities are subject to the same imminent dangers, the potential economic dislocation due to timber depletion is much greater because of the strategic position occupied by the forest industries in the economy of the Northwest.

EXHIBIT No. 2778

EFFECTS OF MECHANIZATION OF BITUMINOUS-COAL MINING ON LABOR REQUIREMENTS²

Technical advances underground and on the surface reduced the number of men required to mine a given volume of coal, though doubtless aiding coal to meet the competition of other sources of power. At underground mines the average output per mine worker per hour increased by 24 percent between 1920 and 1935. The continued spread of the mechanical devices that were available before the war, such as the undercutting machine; the electrification of underground transportation; and improvements in mine lay-out and management methods contributed toward the rising output per worker. Shortly after the war a new machine, the mechanical coal loader, was introduced.

In a mine in which coal is loaded by hand, from one-half to two-thirds of the entire working force consists of miners who, in addition to undercutting the seam and preparing shot holes for blasting down coal, shovel the coal into mine cars. Most of their time is spent in loading coal and the mechanization of this process can obviously have an important effect on the amount of labor required by the mines.

¹ Based on letter of transmittal of Alfred J. Van Tassel with the assistance of David W. Bluestone, *Mechanization in the Lumber Industry* (WPA National Research Project, Report No. M-5, Mar. 1940).

² Based on letter of transmittal of Willard E. Hotchkiss, F. G. Tryon, and Others, *Mechanization, Employment, and Output per Man in Bituminous-Coal Mining* (WPA National Research Project in cooperation with Department of the Interior, Bureau of Mines, Report No. E-9, Aug. 1939).

Machine loading was adopted slowly in the early years of its introduction. Only 0.3 percent of all underground bituminous-coal tonnage was loaded by machine in 1923. By 1929 the percentage was 7.3 and in 1935 it was 13.5. Between 1935 and 1937 the machine-loaded tonnage increased from 47 to 83 million tons, or to 20.3 percent of all underground production, and it is estimated that in 1938 one-quarter of the output was loaded mechanically.

The installation of mechanical loaders has not taken place at an even rate in all producing areas. During the twenties and the years between 1930 and 1935 it had its principal acceptance in the great Illinois-Indiana producing district and in some of the less important producing States of the far West. In West Virginia, the country's leading coal producer, 21 percent of the output was mechanically loaded in 1938 as compared with 2 percent in 1935. While it was being adopted to an increased extent in other areas the coal loader also continued to be more extensively used in Illinois and Indiana.

It is estimated that within another decade as much as half of the total underground output may be mechanically loaded. How this will affect employment in the industry depends upon a multitude of factors. Between 1929 and 1935 output per man-hour in underground mines increased by 5 percent and production declined by 32 percent, but the average number of men employed declined by only 9 percent. The men have worked fewer hours per day and fewer days per year.

Some mines and mining communities which by virtue of natural conditions or other factors have been unable to adopt mechanical loaders are being placed in unfavorable competitive positions and are finding their employment opportunities restricted. Some of the older miners, accustomed to the tempo of hand-loading mines, are finding themselves displaced and unable to gain a foothold in the mechanized mines. To many of these communities and for many of these older miners emergency relief measures of one type or another are the only alternative to destitution as long, at least, as mass unemployment remains a problem in the United States.

EXHIBIT No. 2779

Employment status of textile workers during year following mill shut-down in 1935¹

Employment status	Men and women		Men		Women	
	Number of months	Percent of total	Number of months	Percent of total	Number of months	Percent of total
Total elapsed time between lay-off and date of interview.....	16, 445	100. 0	8, 488	100. 0	7, 957	100. 0
Employed.....	2, 430	14. 8	1, 825	21. 5	605	7. 6
Unemployed seeking work.....	12, 406	75. 4	6, 510	76. 7	5, 896	74. 1
Unemployed not seeking work.....	1, 609	9. 8	153	1. 8	1, 456	18. 3

¹ Based on data from interviews with 1,068 workers laid off during 1935 when the Amoskeag Manufacturing Co. closed its cotton and worsted mills in Manchester, N. H. The period covered, which is the time elapsed between lay-off and October 15, 1936, ranged from 13 to 22 months. Data are from Daniel Creamer and Charles W. Coulter, *Labor and the Shut-Down of the Amoskeag Textile Mills* (WPA National Research Project, Report No. L-5, Nov. 1939), p. 89.

CONCENTRATION OF ECONOMIC POWER

17595

EXHIBIT No. 2780

Duration of unemployment since last job ¹ of weavers and loom fixers who were unemployed in May 1936 ²

Duration in months	Total		Weavers						Loom Fixers (Men)	
			Total		Men		Women			
	Number	Per cent	Number	Per cent	Number	Per cent	Number	Per cent	Number	Per cent
Total.....	96	100.0	93	100.0	78	100.0	15	100.0	3	100.0
1-4.....	21	21.9	21	22.6	16	20.5	5	33.3	0	-----
5-16.....	27	28.1	26	28.0	20	25.6	6	40.0	1	33.3
17-28.....	12	12.5	12	12.9	11	14.1	1	6.7	0	-----
29-40.....	11	11.4	11	11.8	10	12.8	1	6.7	0	-----
41-52.....	7	7.3	5	5.4	5	6.4	0	-----	2	66.7
53-64.....	9	9.4	9	9.7	8	10.3	1	6.7	0	-----
65-76.....	5	5.2	5	5.4	5	6.4	0	-----	0	-----
77-88.....	2	2.1	2	2.1	2	2.6	0	-----	0	-----
89-100.....	2	2.1	2	2.1	1	1.3	1	6.6	0	-----
Median duration (in months).....	17.5		16.9		20.8		11.0		(3)	

¹ Or since a period of not seeking work.

² Based on data from interviews with a sample of 357 workers in Philadelphia, Pa., whose usual occupation in May 1936 was weaving or loom fixing in one of the following industries: woolen and worsted, carpet and rug, and upholstery fabric. All were able to work and were either employed or looking for work on May 1, 1936. Data are from Gladys L. Palmer and Others, *Ten Years of Work Experience of Philadelphia Weavers and Loom Fixers* (WPA National Research Project in cooperation with Industrial Research Department, University of Pennsylvania, Report No. P-4, July 1938), table 16, p. 72. Six persons who became unemployed in May 1936 are excluded from this table, together with the 255 workers who were employed at their usual or some other occupation.

³ Base too small for calculation.

EXHIBIT No. 2781

Volume of unemployment experienced during 1926-35 by weavers and loom fixers ¹

Number of months	Total		Weavers						Loom fixers (Men)	
			Total		Men		Women			
	Number	Per cent	Number	Per cent	Number	Per cent	Number	Per cent	Number	Per cent
Total.....	357	100.0	328	100.0	284	100.0	44	100.0	29	100.0
None.....	127	35.6	111	33.8	96	33.8	15	34.1	16	55.2
1-12.....	73	20.5	69	21.0	57	20.1	12	27.3	4	13.8
13-24.....	43	12.0	40	12.2	31	10.9	9	20.5	3	10.4
25-36.....	37	10.4	36	11.0	33	11.6	3	6.8	1	3.4
37-48.....	34	9.5	31	9.5	30	10.6	1	2.3	3	10.4
49-60.....	18	5.0	18	5.5	16	5.6	2	4.5	0	-----
61-72.....	12	3.4	11	3.4	11	3.9	0	-----	1	3.4
73-84.....	8	2.2	7	2.1	7	2.5	0	-----	1	3.4
85 and over.....	5	1.4	5	1.5	3	1.0	2	4.5	0	-----
Median number of months:	Total.....		10.3		10.8		8.5		0.9	
Those reporting 1 or more months.....	24.9		24.9		27.4		17.0		(2)	

¹ Based on data from interviews with a sample of 357 workers in Philadelphia, Pa., whose usual occupation in May 1936 was weaving or loom fixing in one of the following industries: woolen and worsted, carpet and rug, and upholstery fabrics. All were able to work and were either employed or looking for work on May 1, 1936. Data are from Gladys L. Palmer and Others, *Ten Years of Work Experience of Philadelphia Weavers and Loom Fixers* (WPS National Research Project in cooperation with Industrial Research Department, University of Pennsylvania, Report No. P-4, July 1938), table 28, p. 80.

² Base too small for calculation.

EXHIBIT No. 2782

*Age distribution of cigar-machine operators and of hand cigar makers whom they replaced*¹

Ages on July 1, 1931	Machine operators		Hand cigar makers	
	Number	Percent	Number	Percent
Total.....	184	100.0	321	100.0
16-19 years.....	34	18.5	0	0
20-24 years.....	49	26.6	7	2.2
25-34 years.....	59	32.1	53	16.5
35-44 years.....	31	16.8	77	24.0
45-54 years.....	9	4.9	100	31.2
55-64 years.....	2	1.1	63	19.6
65 and over.....	0	0	21	6.5
Median (age in years).....	26.2		47.0	

¹ All of the machine operators were women; all of the hand makers were men. The company, located in Manchester, N. H., changed over from hand to machine manufacture of cigars in 1931. During that year the men were laid off and the women were hired. Data are from Daniel Creamer and Gladys V. Swackhamer, *Cigar Makers—After the Lay-off* (WPA National Research Project, Report No. L-1, Dec. 1937), table 8.

EXHIBIT No. 2783

*Employment status of hand cigar makers during five years following displacement in 1931*¹

Employment status	Number of months	Percent of total
Total elapsed time between lay-off and date of interview.....	8,287	100.0
Unemployed not seeking work.....	959	11.6
Unemployed seeking work.....	4,300	52.6
Employed in cigar industry for others.....	842	10.2
Employed in cigar industry for self ²	729	8.8
Employed in other than cigar industry.....	1,397	16.8

¹ Based on data for 129 men interviewed in February 1937. All were laid off during 1931 when the Manchester, N. H., company which had employed them introduced cigar-making machines. Data are from Daniel Creamer and Gladys V. Swackhamer, *Cigar Makers—After the Lay-off* (WPA National Research Project, Report No. L-1, Dec. 1937), table 22.

² This constituted chiefly a form of disguised unemployment (*Ibid.*, pp. 51-7).

“EXHIBIT No. 2784” appears in text on p. 17254

“EXHIBIT No. 2785” appears in text on p. 17254

“EXHIBIT No. 2786” appears in text on p. 17255

“EXHIBIT No. 2787” appears in text on p. 17255

“EXHIBIT No. 2788” appears in text on p. 17256

SUPPLEMENTAL DATA

The following letter appears at this point in connection with the testimony of William S. Elliott, supra, p. 17079.

INTERNATIONAL HARVESTER COMPANY, INCORPORATED
180 North Michigan Avenue, Chicago, U. S. A.

JULY 9, 1490.

Dr. H. DEWEY ANDERSON,
Temporary National Economic Committee,
Apex Building, Washington, D. C.

DEAR SIR: On April 24, 1940, I made the following request of the Temporary National Economic Committee:

"I would like to ask, if I may, that we might have permission to put into the record some statements of our own as to our estimates of the relative cost of horse-farming and power-farming. We find the industry in a curious position—Dr. Johnson of the Department of Agriculture put figures in here yesterday to show that the farmer made no more money out of tractor farming than he did out of horse-farming, and today Dr. Taylor shows that it is so much more economical that it is sweeping the country and will go further."

The Department of Agriculture statements above referred to appear in the TNEC record as exhibits No. 2663 and No. 2664. From these statements and the working papers which Dr. Sherman E. Johnson has kindly made available to us, it appears that the comparisons of income and expense of farms using animal power and tractor power are based on only one wheat farm and one corn farm. The excess of income over expense, the dollar difference and the percentage difference resulting from the use of horse or tractor power as shown in said exhibits are summarized in the following tabulation:

	Excess of Income Over Expense by the Use of		Dollar Difference	Percentage Difference
	Horses	Tractors		
320 Acre Wheat Farm.....	\$844	\$633	-\$11	-1.7%
200 Acre Corn Farm.....	2847	2922	+75	+2.6

Individual cases such as the two selected above can be found, where the advantage of tractor power over animal power is very slight or entirely absent, but we believe such cases are the exception, rather than the rule.

It is our understanding that the above tables had to be selected by the USDA for presentation to the TNEC on very short notice. Had there been more time for preparation, data based on a larger number of wheat and corn farms could have been selected from the numerous publications of State Colleges which cooperate with USDA. This would have enabled the USDA to base its conclusions on a representative sample of wheat and corn farms, rather on such a thin sample as one wheat and one corn farm.

In the case of the study presented by the USDA to the TNEC on cotton production which was based on a larger number of farms, the excess of income over expense on tractor-operated farms under normal conditions was substantially larger than on mule-operated farms. Basing a judgment on our studies of all published data available, we believe that similar difference would be found on any representative number of wheat and corn farms.

In further support of our claim that it is dangerous to base a judgment on the comparative cost of operating a single farm with tractors and horses, we submit the following criticisms of the wheat cost data submitted to the USDA by its field forces and resubmitted by USDA to TNEC:

Cost of "Machinery (repairs, fuel, oil)"—Under this cost classification, \$96 appears for the horse-powered farm and \$543 for the tractor-powered farm. The breakdown of this cost for the tractor farm is as follows:

Tractor fuel—1800 gal. @ 12¢	-----	\$216. 00
Tractor oil—75 gal. @ 60¢	-----	45. 00
Total for 600 hours	-----	\$261. 00
Tractor and combine repairs	-----	61. 00
Truck operation (fuel, oil & repairs)—5000 mi. @ 2½¢	-----	125. 00
Repairs on tillage and other equipment	-----	96. 00
Total	-----	\$543. 00

CRITICISM

(a) The tractor farm costs are loaded with \$125.00 of expense for operating a motor truck. The changeover to tractor power would not necessarily require the acquisition of a motor truck and does not ordinarily result in the purchase of a motor truck, particularly in cases such as on this farm, where it is apparent that a number of horses were retained on the farm after it became a tractor farm. Iowa State College in its Research Bulletin No. 258 showed that out of 1711 farms studied, only 24% had motor trucks. These were found on 10% of the horse farms and 29% of the tractor farms. Furthermore, 72% of the farms had tractors but there were only 11 on which no horses were kept.

The University of Illinois study of costs on Illinois farms in 1938 showed that only three out of 27, or 11.1% of the farms had motor trucks.

(b) The repairs for tillage and other equipment are given as \$96, precisely the same as the entire repairs, fuel, and oil cost on the horse-powered farm. There are several machines, such as the grain binder, bundle racks, wagons and also harness that are used on horse-powered farms but not on tractor farms. Operating cost for this extra machinery was not charged on horse powered farms.

(c) In the USDA calculation, it was assumed that tractors were used 60 days for an average of ten hours per day. On that basis, the fuel and oil cost of \$261 for the tractor would average 43.5 cents per hour. This cost is excessive when compared with the results of other studies. The following table shows a comparison of tractor fuel and oil costs.

Study or Source	Type of Tractor	Number of Tractors on Which Average Is Based	Cost per hour Fuel and Oil
USDA Statement to TNEC	?	?	43. 5¢
University of Minnesota: Report No. 108:			
1935	Two plow	4	23. 6
1936	"	9	30. 9
1937	"	10	26. 7
1938	"	13	25. 8
4 year average:	"		26. 7
1935	Three plow	9	19. 2
1936	"	9	30. 7
1937	"	11	31. 3
1938	"	7	34. 9
4-year average	"		29. 0
Iowa State College: Research Bulletin 1936-37 No. 258	General Purpose		
"	Two Plow:		
"	Steel Wheel	73	27. 6
"	Rubber tire	61	22. 7
"	Three Plow:		
"	Stl. & Rubr.	20	32. 8
"	Standard Type:		
"	Two Plow	66	31. 3
"	Three Plow	39	36. 9
University of Illinois: 1938 Farm Business Analysis:			
1936	Two Plow	18	24. 5¢
1937	"	23	20. 3
1938	"	22	20. 8
1930	Three Plow	8	31. 7
1937	"	9	30. 0
1938	"	9	28. 3

This table shows that in none of these representative studies did the cost per hour for fuel and oil, even for three-plow tractors, approach the calculated amount shown in the United States Department of Agriculture's table.

(d) The item of \$61 for tractor and combine repairs is also high. How much of this applies to combine and how much to tractor is not stated, but considerably more than half would naturally apply to tractors. This can be compared with the actual average repairs cost as found by studies at Iowa State College and the University of Illinois. The Iowa State College studies found that in 1936-37 the average repairs cost for 73 steel wheel two-plow general purpose tractors was \$13.16; for 61 rubber tired, two-plow general purpose tractors it was \$19.38; for 20 three-plow general purpose tractors it was \$19.15; for 66 standard type, two plow steel wheel tractors it was \$15.00 and for 39 three-plow standard type steel wheel tractors it was \$30.54.

The University of Illinois study showed that in 1936 the average cost of repairs for 18 two-plow tractors was \$22.94; in 1937 for 23 two-plow tractors it was \$13.51 and in 1938 for 22 two-plow tractors it was \$15.65. The same study shows the following average per-tractor repairs for three-plow tractors in 1936-8 tractors average repair cost \$20.70; in 1937 9 tractors average repair cost of \$11.59 and in 1938-9 tractors average repair cost of \$14.18.

"Purchased Feed".—This figure is the same for both types of farms because it is said most of the horse feed was produced on the farm and the purchased feed is used primarily for other types of livestock than horses. The horse feed necessary has been taken care of by adjustment of the feed crop acreages.

CRITICISM

If a comparison of costs between horse and tractor use is desired, the cost of horse feed should be included with the other costs of horse maintenance, regardless of whether horse feed was purchased or produced on the farm. Another objection to the method of acreage adjustment used by the Department of Agriculture is that a specific acreage cannot be accurately allocated to the production of horse feed. The acreage used might produce too much or not enough feed, depending upon crop conditions in which case, either the sale or purchase of feed would be in order. Clear and accurate cost accounting demands that the horse feed used be included under its proper caption rather than allowed for through an acreage adjustment.

Depreciation.—Depreciation of horses is not included in the costs of the horse-power farm. This is an omission which would raise the cost of the horse-power farm considerably.

The same amount of pasture and woodland was assumed for each type of farm. No charge or acreage adjustment is made for the extra pasturage required by horses on the horse-power farm. This cost, like the depreciation on horses, is ignored by the comparison.

General.—The corn cost submitted by the United States Department of Agriculture are also based on the operation of a single farm and are not, in our judgment, representative costs. We shall not, however, write detailed criticisms as in the case of the wheat farm.

In conclusion, we wish to submit that our studies and observations indicate that in general it is cheaper to farm with tractors than with animal power and the fact that more than a million United States farmers have purchased tractors indicates that they are convinced that tractor power is cheaper power.

Yours very truly,

(Signed) Wm S ELLIOTT,
Wm. S. Elliott,
Vice-President.

WSE/RC

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