

High way Transportation.

Foreword and Synopsis

MOTOR transportation is a modern development of world-wide significance. This report seeks to summarize briefly the experience of the United States in this field and to set forth the methods which have been devised to facilitate, extend, safeguard and control this new form of transportation.

Chapter I indicates the extent to which the motor vehicle has become a vital factor in our rural, urban and business life. Chapter II shows the manner in which the problems are being met of providing adequate highways for the motor vehicle, and sets forth principles that have come to be widely accepted in the United States for financing and administering the construction and maintenance of the highways. Chapter III and the appendix related thereto outline progress that has been made, principles developed and future steps contemplated to safeguard and facilitate the orderly movement of traffic on the highways. Chapter IV sets forth what has been and is being done to coordinate motor transport with other transportation agencies, indicating the extent of utilization of the motor vehicle by steam and electric railways, describing typical methods of utilization, and outlining the present attitude toward and status of regulation of motor common carriers. Chapter V lists the public, semi-public and private agencies concerned with the development of highway transportation, and describes briefly the major functions of these agencies. The report also contains what is believed to be the most complete bibliography existing of American publications on highway transport.

In preparing the report liberal use has been made of standard authorities, such as the studies of the United States Bureau of Public Roads, the National Transportation Conference organized by the Chamber of Commerce of the United States, the National Conference on Street and Highway Safety, the National Automobile Chamber of Commerce and other agencies. Acknowledgment is made both of the information given by these organizations and of the assistance rendered by their representatives.

The report was originally presented by the American Section of the International Chamber of Commerce at the Third General Meeting of the International Chamber at Brussels in June, 1925. Extensive revisions have been made in this second edition, to take cognizance of important developments during the past two years, particularly in Chapter III, which has been entirely rewritten, and in Chapter IV, which

has been materially changed and amplified. The changes in Chapters I, II and V are of a minor nature.

HIGHWAY TRANSPORT COMMITTEE
American Section
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Highway Transportation

From an American Viewpoint

CHAPTER I

WHAT MOTOR TRANSPORTATION HAS ACCOMPLISHED

The automobile has been perhaps the greatest single new productive force in the economic and social development of the United States in the past twenty-five years. Practically unknown when the twentieth century began, individual transportation has since added billions of dollars of wealth to the nation's resources.

In 1900 there were but a few hundred automobiles in the United States and their use was regarded as a luxury limited to the few. Today there are 22,000,000 motor cars and trucks, more than one to every six persons, performing for the most part an essential transportation function.

Naturally enormous sums have been invested in the purchase and maintenance of these machines. For ten years the average sum spent in the acquisition of cars has been close to \$2,000,000,000 annually and the amount expended for gasoline, tires, repairs and garage items will now average almost three times that amount.

THE MOTOR NOT A LUXURY

Obviously such an expenditure on a mere luxury would have had an adverse effect upon the other economic factors in production. But during the period of the motor car's advance in America savings bank deposits have nearly doubled, individual bank deposits have more than doubled, assets of building and loan associations have tripled and life insurance in force has increased two and one-half times. The automobile as a basic element of transportation has contributed a vital part of the increased efficiency and productive capacity of all interests, which is reflected in higher wages and power of consumption throughout the population.

A recognition of this relationship by Government authorities and the general adoption of a fiscal policy which allowed development through the imposition of only very moderate taxes were among the factors which have from the outset permitted the expansion of motor car use in the United States. Had this policy not been followed, use would have been limited and the respective units of Government would not have been able to offset a proper share of highway expenditures through the large gross revenue now received from a very low average tax per car.

SAVINGS IN TIME AND COST

The ways in which the automobile has increased the efficiency and productiveness of the individual, the business unit, the community and the nation are manifold.

Its first and most direct effect has been not only to reduce greatly the time in transit over the highways but also to cut in half the actual cost of highway transportation.

It is not necessary to dwell upon the saving in time further than to point out that the average daily haul of a horsedrawn wagon was ten miles, which meant not only that the full day was spent on the road going that distance, but that the cost of labor so occupied quickly ran into such figures as to make the development of territory back from the railways out of the question for ordinary purposes.

From the standpoint of operating costs studies by the United States Department of Agriculture show that in 1918 wagon haulage cost an average of 30c per ton-mile for wheat, 33c for corn and 48c for cotton, while for hauling by motor the average costs were 15c for wheat and corn and 18c for cotton. Studies made since then show that still further economies are effected in the use of the motor vehicle on good roads as against bad roads, the saving in gasoline and tire charges alone frequently being more than sufficient to pay the entire cost of the road improvements. The general public realization of these facts has practically eliminated the horse as a factor in highway travel in the United States.

With improving methods of motor vehicle operation and maintenance, which have not yet been brought to the highest plane of efficiency, still further economies and benefits should be realized.

Of the changes effected in American economic and social life by the automobile, perhaps the most striking have come to the farmer. Government estimates place the number of automobiles on the 6,500,000 farms of the United States at 5,300,000 in 1924, with 460,000 motor trucks also in use. Agricultural students generally agree that the dominant reason for this broad use of the automobile by farmers was at the outset a social one.

FARM LIFE REVOLUTIONIZED

The development of motor transportation has revolutionized the life of the farm. It has brought the town and country into closer touch. It has in a considerable degree destroyed the historic isolation of the farm and the farmer. It has permitted a notable extension in educational facilities available for rural populations. The centrally located school reachable by motor transport from a large surrounding area has largely contributed to the solution of the problem of adequate equipment and adequate instruction for the rural children.

The automobile has proved an effective aid in the field of medical relief for scattered populations. It has enabled the farmer to receive prompt and better medical treatment and has made hospitalization available for large numbers of the population who hitherto had been without any possible recourse to such treatment. The traveling library, the centrally located community church, the development of community life and community spirit are some of the many significant social and cultural changes wrought by the development of motor transport in rural sections.

FARM MARKETS EXTENDED

The economic effect of the development of motor transport on the life of the farm has been important and has wrought great changes in marketing and distributing practices. Before the development of motor transportation the areas within horse trucking range of our large cities had difficulty in meeting the demand for milk, and milk was hauled great distances by rail. Today Government reports show that at Indianapolis,

Indiana, and St. Paul, Minnesota, more than 90% of the milk is hauled direct from the producer to the city distributor by motor truck, and around most of our principal cities new areas of markets for milk producers from fifty to seventy miles distant have been developed through the use of the motor truck as a marketing agency.

Other Government reports indicate that from ten to ninety-five per cent of the total production of butter, eggs, fruit, potatoes and hogs are being delivered by motor. In Connecticut 90% and in California 75% of all farm products are delivered by motor truck. Within a fifty-mile zone of Indianapolis 90% of the hogs are hauled by truck.

Government surveys show that the farmer possessing motor equipment has quadrupled the economic range in his choice of markets. This has enabled him to take advantage of more favorable prices at a greater distance. In some cases it has resulted in direct sales to the consumer, eliminating the middle man. On the other hand cooperative trucking service where it exists has relieved him of the necessity of personally taking his goods to market and has permitted him to devote a greater proportion of his time to the management of his farm. This often results in much being marketed that otherwise might have gone to waste. Frequently the farmer has been brought within reach of a large city and enabled to turn from the production of a low valued crop to perishable and more valuable products.

Through the establishment of road-side markets by small truck farmers it has been possible for people living in cities and owning their own motor cars to drive out into the rural areas close to the cities and in this manner provide themselves with fresh fruit and vegetables at prices often lower than those charged in city stores. In this manner farmers are furnished with a larger market demand and are able to obtain better prices than are ordinarily obtained from city wholesalers and retailers. The use of the passenger car and of improved highways have thus made it possible for both rural producers and city consumers to enjoy mutual advantages.

Attendant upon the great increase of automobiles in the urban and rural districts there has been a notable decrease in the number of horses and mules. According to government estimates, between 1920 and 1925 this decrease on the farms was about 3,000,000 animals, or 12%, while in the cities the decrease was about 460,000, or nearly 33%. These decreases in turn have made available for other use some 9,500,000 acres formerly required for the production of feed for the animals replaced.

DEVELOPMENT OF ALLIED TRADES

The motor vehicle has greatly stimulated production in other fields. Hundreds of thousands obtain lucrative employment in the sale of automobiles, in servicing them and in the sale of commodities essential to their upkeep. The gasoline and rubber tire industries are but two of a number of industries which depend upon the use of the car and in turn provide employment for other thousands. The road building industry of the United States has attained mammoth proportions because of the need for extended highway facilities, and yet it is estimated by officials of the United States Bureau of the Census that all the costs of highway development have been directly compensated in the accretion of wealth

to the property served, which includes urban property as well as that along the right of way.

Touring has become a movement of international economic proportions and millions of persons now take their vacations touring from one point to another. This has an incalculably important educational effect in promoting national understanding and homogeneity of thought. Incidentally it has been very stimulating to the hotel, restaurant and kindred industries.

In the building of the car new markets have been opened in the United States for the raw materials of other lands. Rubber, aluminum, copper and cotton are but a few of the foreign products imported.

AID TO SUBURBAN DEVELOPMENT

The growing urban population has offered a problem which would perhaps be incapable of solution except for the development of motor transportation. The pressure of population has created a vast suburban development, thus serving to check the growing congestion of population in the older portion of urban centers. With the purchase of a motor car it is possible to seek a home outside the urban area where the price of land is lower and where the benefits of country life are available.

The social effect of this suburban development is very important. The ability to live in pleasant and healthful surroundings yet depend on transportation facilities that permit work in the urban centers has been a marked development in the last decade.

AID TO BUSINESS AND TO GOVERNMENT

Aside from the extensive use of the motor truck in hauling goods into the markets and of the passenger car for conveying individuals between their suburban homes and their places of business or employment in the city, both truck and car have become indispensable in the conduct of business and professional work within the city. The motor truck has replaced the horse-drawn truck and much of the heavy trucking between factories, warehouses and railway and water terminals, deliveries by express companies and by large stores are now made by fleets of motor trucks, and even the small merchant who formerly made his deliveries with his two or three horse-drawn wagons is replacing them with small motor trucks.

Bankers, salesmen, contractors, school superintendents and other public officials whose work carries them repeatedly from one part of the city to another use the motor car for this purpose. It is estimated that 144,000 physicians in the United States visit their patients by motor.

The motor vehicle has been a material aid to local government. Motorized fire, police and hospital equipment has both reduced the cost of administering these services and increased their effectiveness by vital saving in time. The utility and in fact the necessity of motor vehicles as a means of national defense was demonstrated in the last war.

THE MOTOR'S PART IN THE NATIONAL TRANSPORTATION SYSTEM

Obviously it is as a unit of transportation that the motor passenger vehicle and the motor truck assume their greatest importance. One of

the lessons that Americans have learned, after some bitter experience, is that the transportation problem is of a dual nature with its major or trunk line functions, and minor or local distribution functions. The tying in of individual transportation to water, steam and electric railway systems presents a major problem, since no one form of transportation can ever reach its greatest state of usefulness to the community unless all other agents are duly weighted. Out of the welter of conflicting interests and active opposition there is developing in the United States a definite understanding of the relation between motor and other transportation, and we are now able to avoid many of the losses and the conflicts in which railways and motors previously competed for service for which they were economically unfitted.

We have realized the fact that the main railway trunk lines can carry a load much greater than they at present handle. It is as a feeder, a supplement to the main lines of railway transportation, that the motor truck and motor passenger vehicle exercise their greatest usefulness. It is probable that, in spite of the fear on the part of the railways that competition with motor transportation would reduce their traffic and earnings, the loss of certain local traffic has been more than offset by the new traffic created through motor feeders reaching into territory hitherto unavailable to the railway territory, in some cases not previously under cultivation because lacking in transportation facilities. And certainly the railroads have derived much new traffic from the direct movement of automobile parts, finished automobiles, petroleum and road materials.

CONCLUSION

In conclusion it should be frankly stated that in the development of motor transportation in the United States mistakes have been made. The function which it could best serve and its relation to other transportation factors were not fully understood at the outset and it has taken much time and money to rectify some of the errors. Inferior highways have been made to serve where the cost of maintenance was uneconomically high and traffic justified their replacement with higher types. Motor vehicles have been sold by over enthusiastic manufacturers or dealers where their use was not economically justified or where a different type was warranted. There has been serious and in some cases destructive competition between the motor vehicle and the older established forms of transportation. But as the development has proceeded it has become evident that motor transportation is a utility which can render invaluable service not alone in the definite additions which it makes in national wealth but in the more far-reaching effect which it has upon the social structure and the standards of living. The motor car has performed a significant function in eliminating sectional differences and the manifold uses of modern highway transportation are welding the nation into a homogenous whole. The development of motor transportation which has taken place in the United States will inevitably come in other countries. Perhaps the best service which the United States can render is to make available a knowledge of its mistakes and errors as well as of its successes and development and place before the other nations in the International Chamber the results of its experience.

CHAPTER II

HIGHWAY ADMINISTRATION AND FINANCE

PART I—ADMINISTRATION

The motor vehicle only reaches its greatest efficiency as an element in transportation where improved highways are provided for its use. The large sums involved and the necessity for adjusting construction and maintenance costs to other budgetary requirements makes the question of financing rational highway development one of immediate moment to the fiscal policies, both of the nation and its subdivisions.

Experience has demonstrated that road improvement more than pays for itself in the form of decreased transportation costs and increment in general valuations so long as the degree of development is not in excess of the economic traffic needs. Because of the large area of the United States, however, and the consequent large mileage of highways, it has been necessary to formulate policies carefully for the administration, selection, character and extent of road improvement.

INTERSTATE, STATE, COUNTY AND LOCAL ROADS

As long as horsedrawn traffic prevailed, the road question was largely one of local administration. With the advent of the motor, however, broader jurisdiction and control became necessary, and today there are four classes of roads in the United States: First, interstate highways, which have a national importance; second, those roads which have a state-wide importance; third, those which serve county needs, and fourth, those which serve only a few families and feed into other roads.

In 1916 the Federal Government recognized the economic need for improvement of main highways by passage of the Federal Aid Road Act, which appropriated a sum of \$75,000,000 for expenditure in five years in conjunction with at least equal amounts appropriated by the States for the improvement of post roads. In 1921 the Federal Highway Act provided for the designation of a limited system not exceeding seven per cent of the total road mileage of all the States and restricted the use of the Federal appropriations to this system. Appropriations made or authorized subsequently to the initial \$75,000,000 have brought the total amount up to \$840,000,000. The current rate of expenditure is approximately \$80,000,000 a year.

HIGHWAY DEPARTMENTS IN EVERY STATE

Under the terms of the Federal Aid Road Act, the States accepting participation in the Federal fund were required to organize highway departments and to provide sums at least equal in amount to those provided by the Federal Government. Actual expenditure was left to the States under rigid requirements of continued maintenance and engineering control.

All of the States accepted these provisions and today the State highway departments have also selected State systems which are generally coincident with the interstate roads.

State legislative appropriations have far outstripped Federal road funds, and in many States a system of aid is extended to the counties

which is comparable to that granted the States by the nation. The counties now have organizations working on county and local road improvement, and the extent of the influence of these last two jurisdictions may be attested by the fact that near 50 per cent of all road appropriations are of this character.

Incidentally it is interesting to note that while the Federal Aid system comprises only about 184,000 miles, these roads will connect, when completed, practically every city and town of 5,000 or more inhabitants in the United States. Practically 90 per cent of the nation's population will live within 10 miles of a Federal Aid road and practically all of the remaining 10 per cent will be that close to a State road.

The Federal funds are used exclusively for construction, the States being required to maintain the roads once constructed. Of the funds expended annually on all roads, about 75 per cent is now going into construction and 25 per cent into maintenance. The latter item is increasing somewhat and should continue to increase as the development proceeds. Reconstruction, involving widening and use of heavier types, is not yet segregated in the total amounts, but is a growing factor in States which have highly developed motor transportation.

METHODS OF SELECTION AND TYPES OF IMPROVEMENT

In selecting those roads which should be improved first, the method generally employed now by the Government and the States is to make careful studies of the character, extent and probable future expectations of highway transport movements.

As an example of the effectiveness of this method the study recently made in the State of Maine may be cited.

In that State the survey showed that the previously designated primary system of 1,630 miles carried an average traffic of 1,044 vehicles per day. The secondary system, including 4,049 miles, was found to serve an average traffic of 244 vehicles per day; and the remaining roads of the State, constituting the tertiary system of 17,425 miles, was shown to serve an average of only 29 vehicles per day. Considering each of the three classes as a whole, the survey, as indicated by the above traffic figures, conclusively confirmed the classification which had been made, but the same method applied in detail to the various sections of highway comprised within each system showed that a number of sections classified as primary highways were actually serving lighter traffic than others classified as secondary or even tertiary highways. In this way the question of priority of improvement as between the various routes of the highway system is settled in a manner consistent with their actual traffic importance.

A similar survey in the neighboring State of Connecticut showed that the traffic on the main State roads was so heavy that the aggregate saving in gasoline consumption resulting from the improvement of the entire mileage by surfacing with high-type pavements would be sufficient to pay the entire cost of construction in twenty years. A similar situation is found to exist on the main roads of many of the States.

There still remain, however, hundreds of thousands of miles of roads, primary roads in some States and in others secondary and tertiary, where traffic expectations do not now justify large improvement. In other cases

there is economic justification of immediate surfacing which the funds available will not presently permit.

In these cases the Federal Government and the State now recognize the advantage of what is termed "stage improvement." In other words, the permanent features of the road are carefully provided, including adequate right-of-way, suitable gradients and curves, drainage and similar engineering work. Whatever surfacing material is available locally is then placed on top and the traffic begins to flow over the road.

In one State alone the application of this method has opened to traffic 1,500 miles of secondary road, the surfacing of which will last from five to ten years. The circulation of traffic will continue in the interim and none of the preliminary cost except that of surfacing will have to be met when the time comes to place a hard roof on the road.

Where the present or expected traffic is heavy, however, the higher initial cost of a hard-surface highway has been found to be amply justified by the longer life and lower maintenance cost of the surface.

PART II—HIGHWAY FINANCE

The two controlling principles in modern highway finance in the United States can be briefly stated. The first is contained in the epigram of Thomas H. MacDonald, Chief of the United States Bureau of Public Roads, that "it is cheaper to have good roads than it is to go without them," proper administrative direction being of course understood. The second is that the costs of highway improvement should be equitably distributed.

In order to obtain a full background of the present status of highway finance it is necessary to review the historical development.

Until the latter half of the nineteenth century, main highways or trunk lines were largely privately constructed and operated and were financed by tolls levied upon the user. Local roads were constructed and maintained as now by the local governments and were financed out of general local revenues or by special local road taxes, payable in labor or cash.

The inconvenience and irritation caused by the toll system, the growing recognition of the general utility of highways and the general acceptance of the principle that Government services should be financed by taxation levied on the ability-to-pay principle, were contributing factors in bringing about an almost complete abolition of the toll system and the financing of roads out of the general revenues of local and later of State and National governments.

NEW FACILITIES DEMANDED BY AUTOMOBILE

The automobile brought with it the need for a greatly improved and extended highway system and also the need for new methods of taxation. In the inception of their programs, the States began to draw upon general tax levies. It soon became evident that such a policy would either lead to unduly high tax burdens or would unreasonably retard highway construction, and consequently resort was had to highway bond issues, floated either by the counties or by the counties and State, depending upon the authority of the latter to raise funds in this manner.

The need for adequate maintenance funds not alone to care for roads once constructed but to open unimproved roads to service, prior to their surfacing, resulted in a further search for new sources of revenue. General acceptance of the theory that motor vehicle users obtain a special benefit from road improvement led to a gradual adoption of the practice of assessing special taxes against the vehicle for maintenance purposes, the levies taking the form of weight, registration, gasoline and similar taxes.

EXCESSIVE TAXATION OF CAR AVOIDED

At the outset it was more or less consciously recognized as a fundamental principle in taxation that if these levies were sufficient to create an undue burden upon the user, they would have the immediate effect of limiting and even decreasing the use of the vehicle, which meant, of course, small revenue returns as well as inefficient motor transport, with consequently increased costs. Accordingly this shifting was undertaken slowly and cautiously, and the result of this far-sighted policy has been to encourage the development of motor transport to an extent which would have been impossible had any other plan been pursued.

While the average total of special taxes per car is now something less than \$26, including the Federal war excise taxes as well as State levies, the total sum annually produced by special taxes and property taxes has grown, it is estimated, to an amount equivalent to about 50 per cent of the total highway expenditures made annually. This is far in excess of actual maintenance requirements, the residue being used to defray part of construction, administration and highway bond costs.

At recent sessions of State legislatures license fees on the cars themselves have been reduced in several instances and a tax on the gasoline used has been substituted. In other instances the need for increased revenue has been met by resorting to the gasoline tax rather than by increasing the existing low license fees. This change has the double advantage of relating the amount of the tax to the use of the highway and enabling the user to pay in small amounts instead of a single sum.

Gasoline taxes now constitute an important source of highway revenue in 45 of the 48 States. The rates vary from 1 to 5 cents per gallon and the return during 1926 reached a total of \$187,603,231. The fact that it has been adopted by nearly all the States since the first experiment in two States in 1919 is an indication of its popularity.

USE OF BONDS HAS FURTHER SPREAD COSTS

The general use of bonds to defray original costs has so spread the annual charges of highway construction and maintenance that today the current general tax receipts used for highway development amount to only about 4 per cent of the annual tax bill of the nation and its subdivisions.

Meanwhile the use of the car grows, and as the States reach more advanced stages in road construction two further changes are noted in the fiscal policy. The first is that the resultant increase in motor taxes makes possible a gradual lowering of the general property tax, and particularly of the assessments against abutting farm land, which has frequently been unduly taxed for the development of roads for general use. The second is that the need for further bond issues is less sharply felt, and

gradually several States have entered upon a policy of paying highway charges from current receipts.

Because of the wide variations in degree of highway improvement, number of motor vehicles, land valuations, population, area and other factors, no fixed formula will apply evenly to the several States of the United States any more than it would to different countries.

There are general principles which will apply to varying conditions, however, and which experience here has demonstrated can be used in practice. During the past three years these have been made the subject of an intensive investigation and discussion on the part of the representatives of government, industry, banking, agriculture, road users and others interested in highway improvement.

These are perhaps best summarized in the program of the American Association of State Highway Officials as follows:

PRINCIPLES OF HIGHWAY FINANCE

1. The highway budget is defined as the total annual expenditures in each State for highway purposes.

2. The annual highway budget should be adjusted to the relative needs for other public purposes.

3. No road should be improved by expenditure of public funds in excess of its earning capacity. The return to the public in the form of economic transportation is the sole measure of the justification for the degree of improvement.

4. Broad surveys made by the United States Bureau of Public Roads have determined conclusively that from 40 to 60 per cent of the average costs of highway construction is expended in permanent improvements, such as grading, draining, structures, engineering and rights-of-way. Of the remaining cost, all but a small percentage of the surface can be salvaged in reconstruction and constitutes a definite addition to the capital facilities of the community, which is passed on to the succeeding generations. From all these studies it thus appears that highway bond issues are justified where the "pay-as-you-go" plan does not promptly provide the highways economically necessary, and where adequate engineering and economic control is assured.

5. The wide variance in the present status of highway development in the several States prevents the adoption of uniform policies for securing the funds necessary for the annual budget. Generally speaking, however, these principles may be set forth:

(a) States in the initial stage of highway development should issue bonds to defer that portion of the annual charge for construction which would overburden either property or the road user.

(b) States where original construction programs are well under way can, in the main, finance normal new construction from current funds, utilizing bond issue funds to defer the cost of special projects.

(c) States where original construction is largely completed are concerned chiefly with maintenance and reconstruction, and should depend on current funds to save in cases of emergency.

6. State highway bond issues should be serial in form and should mature over a period not exceeding 30 years.

7. Highway bonds issued by a political subdivision of a State should be serial in form and should mature over a period not exceeding 20 years.

8. Serial maturities should be arranged so that the annual requirements of principal and interest will be as nearly uniform as practicable.

9. Sound public financing requires that where motor vehicle or other special levies are allocated to defray the costs of State highway bond issues, the full taxing powers also of the State shall be authorized to guarantee principal and interest in event of failure of such special levies to provide sufficient revenue.

DISTRIBUTION OF COSTS

1. The cost of building and maintaining adequate systems of highways should be distributed in an equitable relation to the benefits derived. These may be summarized as follows:

(a) Benefits to society in general, such as influence on education, recreation, health, fire prevention, police protection, the national defense, the postal service, living and distribution costs.

(b) Benefits to definite groups, such as agriculture, manufacture, labor, railroads, mining, forestry and waterways.

(c) Benefits to property served.

(d) Benefits to the road user.

2. For the purpose of apportioning costs in relation to benefits received, all highways may be divided into two classes: first, those used by the general motoring public, and second, those which perform a purely local service function.

3. Special motor vehicle taxes should be levied and used only for the improvement and maintenance of highways used by the general public; i. e., for general highway traffic flow lines. They should be expended under the direction of the State highway department.

MAINTENANCE ALWAYS FIRST CHARGE

4. The wide variance in valuation, tax burdens, number of motor vehicles in use and the status of highway development in the several States prevents the adoption of any fixed formula as to the proportion of the total costs of highways of general use which should be paid for from motor vehicle funds. Generally speaking, however, these principles may be set forth:

(a) In States where the income from motor vehicles is insufficient to meet all of the maintenance costs of highways of general motor use without undue burden to the individual motorist, such funds should be applied first to the maintenance of interstate and State highway systems.

(b) In States where the income from motor vehicles is sufficient to meet all of the maintenance costs of highways of general motor use without undue burden to the individual motorist, any surplus should be used for this class of highway reconstruction and administration costs.

(c) In States where the income from motor vehicles will bring in large sums in excess of the maintenance costs without placing an undue burden upon the individual motorist, such surplus should be used

to defray all of the maintenance costs and a substantial share of all of the other costs of highways of general motor use.

(d) In those States where the motor vehicle income is more than sufficient to meet the maintenance costs of highways of general motor use without undue burden on the individual motorist, it may be found advisable to use such surplus for the purpose of defraying all or part of the costs of bond issues to expedite construction of economically desirable motor highways.

5. Roads of a purely local interest, serving only local needs, should be financed out of local revenues obtained from local general tax revenues. Special assessments on adjoining land to defray a portion of the costs of such roads may be justified.

6. Where extraordinary improvements are undertaken in the vicinity of or serving congested areas of population, the increment, if any, in property valuation following the improvement should be drawn upon to defray an equitable portion of the cost.

FORM OF MOTOR TAXES AND COLLECTION METHODS

1. The motor vehicle tax should be simple in form and distributed in equitable and just proportion between the different types of motor vehicles.

2. The State should be the sole agency levying special taxes upon the motor vehicle or the highway user.

In conclusion, rational highway improvement is a continuing process which begins to pay for itself and to return dividends with the first improvement of the dirt road. The same principle can be made to obtain and should obtain in all the successive stages of development up to the highest type of surfaced highway. The chief function of the highway administrator is to insure service to the public, and to that end rigid maintenance requirements should be enforced from the outset. While the aggregate amounts invested in capital highway facilities will be large, the returns to the public in the form of decreased costs, increased valuations, improved communication and other advantages will always yield large profits as long as economic principles and engineering control are adhered to in the development and administration of the highway system.

CHAPTER III

TRAFFIC RULES AND REGULATIONS

Before the days of the motor vehicle the range of highway travel was confined largely to one small jurisdiction, such as the township, and the streets and highways were ample to care for the traffic, so that little regulation was required.

With the coming of motor vehicles conditions have entirely changed. Years ago the public authorities, recognizing a potential element of danger in the automobile, capable as it is of far greater speed than the horse and requiring a measure of skill and judgment to operate, attempted to apply regulatory measures. Unfortunately these measures were far from uniform and in many cases ill-advised, imposing unreason-

able and unenforceable restrictions, and failing to a large degree to reach the fundamental causes of accidents. At the same time the rapidly increasing number of motor vehicles was taxing the capacities of the highways, and the annual toll of lives and property was also rapidly increasing.

To determine ways to stem this tide the National Conference on Street and Highway Safety was organized in 1924 by Hon. Herbert Hoover, Secretary of Commerce, with the support of ten national organizations interested—the American Automobile Association, American Electric Railway Association, American Mutual Alliance, American Railway Association, Chamber of Commerce of the United States, National Association of Taxicab Owners, National Automobile Chamber of Commerce, National Bureau of Casualty & Surety Underwriters, National Research Council, and National Safety Council. Eight committees were created, of police officials, highway and motor vehicle commissioners, insurance, railroad and street railway officials, and representatives of safety councils, chambers of commerce, labor unions, women's clubs, automobile associations, automobile manufacturers and other national groups. The subjects covered by the eight committees were as follows: (1) statistics, (2) traffic control, (3) construction and engineering, (4) city planning and zoning, (5) insurance, (6) education, (7) the motor vehicle and (8) public relations.

The reports of these committees were reviewed by a general meeting in December, 1924, of all of the committees and others interested, and on the recommendation of the Conference four additional committees were created, on (a) uniformity of laws and regulations, (b) enforcement, (c) causes of accidents and (d) metropolitan traffic facilities. The committees on statistics and public relations were continued, and the reports of these six committees, including the Uniform Vehicle Code recommended by the Committee on Uniformity of Laws and Regulations, were reviewed at a second general session of the Conference, in March, 1926. The Conference endorsed the Uniform Vehicle Code with certain changes, and in addition adopted a program of recommendations embracing all of the approved recommendations of the committees of both Conferences. Copies of the two Conference reports, the fourteen committee reports and the Uniform Vehicle Code as modified by the Conference are obtainable upon request from the National Conference on Street and Highway Safety.

The program of recommendations adopted by the Second Conference is given in Appendix A.

RESULTS BEING ACCOMPLISHED

It was the consensus of opinion of the Conference that the foregoing comprehensive program could best be carried by the participating organizations, and in accordance with the recommendation of the Conference there have been created follow-up committees of representatives of these organizations, and considerable progress has been made along several lines. Bills based on the Uniform Vehicle Code, which has been endorsed by the National Conference of Commissioners on Uniform State Laws, and by the American Bar Association, have been passed in seven States—Pennsylvania, North Carolina, Minnesota, North Dakota, Idaho,

Oregon and Washington—and have been up for consideration in ten or twelve other States.

The Highway Education Board and the Educational Section of the National Safety Council are actively working for the development of safety instruction in the schools. The National Safety Council has also developed a form for reporting accidents that has been adopted in several States and a number of cities. The National Research Council is making a committee study of human factors in highway accidents. A committee of the Society of Automotive Engineers is studying the problems of headlights, brakes, driver vision and other features of the motor vehicle itself.

Among the cities in which traffic surveys have recently been made in harmony with the recommendations of the Conference may be mentioned Providence, R. I., and Chicago, Ill. The Providence report put the emphasis on needed improvements in the major street plan; the Chicago report, on better utilization of the existing facilities.

A committee of the American Engineering Council, working under the auspices of the National Conference on Street and Highway Safety, is making a study to determine best practices relative to street signs, signals and markings.

STATE AND NATIONAL RECIPROcity DESIRABLE

There exists today between all the States of the United States reciprocal recognition of registered motor-vehicle licenses issued by individual States. Some of the States recognize the licenses issued to motor vehicles by other States and allow them to use their roads without further payment of license fees for a complete twelve-month period; other States permit their roads to be used freely for a limited period by vehicles registered in other States without requiring a separate, and additional registration.

Registration plates differ in color and other distinctive symbols, so that motor vehicles from other States are at all times easily discernible as to origin. No difficulty presents itself, however, in passing from one State to another. The large volume of interstate traffic at State borders seems to be compensatory; each State finds its own vehicles traveling in other States to about the same extent as these other foreign vehicles use its highways. Where there is a preponderance of travel of vehicles of foreign registrations, many of the States collect what is considered a fair return for this use in the form of gasoline taxes.

Internationally, by an arrangement with the Canadian Government, American cars are permitted to tour through Canada for a period of thirty days on their American license plates. If a stay of more than thirty days is planned in Canada, Canadian license plates must be obtained, together with a customs bond guaranteeing the re-exportation of the car within six months.

In order that a car may be brought back into the United States duty free, it must be registered at the American custom house at the international border when leaving the United States, or a certificate of registration can be obtained from the custom house at New York City.

UNIFORMITY SECURED BY COOPERATION

Officials of the various States, charged with the duty of highway construction and maintenance, have made great headway in the promotion of uniform practices by joining in conferences for the discussion of mutual problems.

As a recent example of this reference may be made to the designation and continuous numbering of principal transcontinental highways and the development of uniform direction and warning signs for use on such highways. This most important work has been carried out during the last two years by the Joint Board on Interstate Highways, a representative body of State and Federal highway officials, cooperating with the American Association of State Highway Officials.

The United States highways designated by these agencies are main transcontinental routes with an aggregate mileage of approximately 94,000 miles. The several routes have been identified by numbers which distinguish them from other roads in the States through which they pass. The north-and-south routes are designated by odd numbers, with Route No. 1 paralleling the Atlantic Coast from Maine to Florida, Route No. 101 running the length of the Pacific Coast, and others intermediate between these two. The east-and-west routes are identified by even numbers with Route No. 2 crossing the continent near the Canadian border and No. 90 extending from Florida to Southern California.

On the more important routes of this system the tourist may travel from coast to coast or from the Canadian to the Mexican borders, guided in all States by distinctive signs bearing the same number.

The standard route marker adopted consists of a shield bearing the name of the State, the initials U. S., and the number of the route in black characters on a white background. For danger and directional signs distinctive shapes have been adopted which indicate at a glance the purpose and nature of the sign. Thus railroad crossings are indicated by a round sign, other extreme danger by an octagonal sign, the necessity for caution by a diamond shaped sign, attention and occasional caution as at schools, hospitals, etc., by a square sign, and directional information by a rectangular shape. All degrees of danger as indicated by the round, octagonal, diamond-shaped, and square signs are also symbolized by the use of a lemon-chrome yellow background color on which the precise nature of the danger, as curves, hills, etc., is indicated by words and distinctive characters in black. The directional signs are painted white with black lettering.

A similar instance of the cooperative working out of mutual problems is found in the associations of the officials charged with the administration of the motor vehicle law. These groups as a rule are independent of those constructing and maintaining the highways but cooperate with them.

EDUCATION A VITAL FACTOR

In the furtherance of a safer traffic movement in the United States the question of traffic rules and regulations is being made a part of the curricula of the various schools, and campaigns are under way to educate the operators of motor vehicles to safe practice. Safety educa-

tion and accident prevention are being included in the program of various organizations, and every effort is being made to secure uniform legislation, regulation, statistics and practices on the highways of the United States.

CHAPTER IV

COORDINATION OF TRANSPORTATION AGENCIES

PART I—GENERAL

Progress in the development of transportation facilities has always brought forth competition and rivalry between the newer forms and the established agencies. With each step forward there has been a transitory period full of doubt as to the efficiency of the newcomer, and at times there has been outright opposition. In the end, sound economic adjustments have always taken place.

American transportation history records several such instances. Before we had either highways or railroads navigable water was virtually the only means of intercommunication. As turnpikes were built the stagecoach and the conestoga wagon took a prominent place in the transport of persons and merchandise, while the construction of canals widened the range of the boat.

The arrival of the steam railroad brought about a prolonged struggle for supremacy. The stagecoach and conestoga wagon were forced into the background, and the traffic on many of the waterways dwindled to small proportions. The readjustment of railroad and waterways is not yet completed, but there is a growing realization that each has definite fields in which it excels.

The electric railway introduced further competition and necessity for readjustment. A successor to the old horse car, which was essentially an urban facility for persons, the electric line reached into the country and began to compete with the steam railroad in the transport of both passengers and freight. Now the fields of both are fairly well defined, the steam railroads have relinquished certain short-haul traffic to which the more flexible electric line was better adapted.

Most recently of all, motor transportation over the highways has come into existence and grown in a few years to vast proportions. "Inevitably," to quote Committee IV of the National Transportation Conference organized in 1923 by the Chamber of Commerce of the United States, "this rapid growth of a new transportation facility has had its effect on the old facilities. Inevitably there has been, and still is, misunderstanding and conflict in the fields of the old and new facilities, and the old ones are only at the beginning of a readjustment of their activities to meet the new conditions. Meanwhile the new facility, with inadequate organization and often with little knowledge of its own operating costs, has in some cases attempted to handle traffic for which it is not fitted, thus producing an incorrect popular impression as to its proper rôle in our national transportation system."

Recently the Interstate Commerce Commission conducted an investigation into the use of motor trucks and buses in connection or competition with the railroads. Hearings were held in thirteen cities in different parts of the United States. While the report of the Commission

has not yet been made, there is available a summary report on these hearings prepared by Dr. C. S. Duncan, economist for the Association of Railway Executives, who attended the hearings and reports as follows:

"The evidence presented to the Commission tended to show that interstate commerce by motor bus and truck vehicles is absolutely and relatively small. The bulk of traffic, both of passengers and of property, is still intrastate.

"The generally accepted estimate is that there were 75,000 motor buses in operation during 1925, with an average seating capacity of 15, offering about 33,000,000,000 passenger miles. Evidence submitted by representatives of steam carriers showed generally most substantial losses in passenger revenues which were attributed to motor vehicles. In certain localities the sales of local tickets have dropped by 50 per cent or more during the past few years. The evidence indicates, however, that a very large part of these losses, estimated at from 75 to 90 per cent, was due to private passenger automobiles rather than to the motor bus.

"Some evidence was introduced to show losses in freight traffic attributable to motor trucks. Of these losses, however, a very large part, estimated at from 90 to 95 per cent, was due to motor trucks other than so-called common carriers.

"All these losses, both of passenger revenues and freight revenues, have been, for the most part, on short hauls and, therefore, on intrastate business. Certainly the majority of the losses due to motor bus competition is on intrastate business and only from one to two per cent of all motor truck operations by common carrier trucks are interstate.

"This situation is obviously due to the fact that the limit of practical and economical transportation by motor bus and truck is confined to short hauls. It is apparent, however, that State boundaries are wholly artificial so far as currents of trade and travel are concerned and that those situations where the flow over State lines happen to be within economical motor haul show the greatest percentage of interstate business. Likewise, small States have more interstate business than large ones, but the larger States have longer hauls.

"There has been a considerable increase in the number of interstate operations, both by motor bus and truck, since the decision of the Supreme Court in March, 1925. Such operations are beyond the jurisdiction of State regulating bodies and Congress has not yet passed any measure to regulate them. This has been a nation-wide movement.

"It has been claimed by representatives, both of the motor bus and motor truck operations, that there is no real competition between them and the steam carriers. This position has been based upon the claim that the service offered the public by the motor bus and the service offered the shippers by the motor truck are so essentially different from the service offered by steam carriers that competition cannot exist.

"The motor-bus operators claim that their service is characterized by a flexibility which appeals to the traveling public, particularly with respect to the frequency of schedule, the frequency of stops and the speed with which they can adjust themselves to any changes in demand from the public. These factors make their operations, they claim, so totally different from the service offered by the steam carriers that no condition of competition can arise. They nevertheless admit that they carry many passengers who would otherwise have traveled by the steam road.

"The motor-truck operators likewise claim that the peculiarities of the service which they offer shippers remove them from the field of competition with steam railroads. They further hold that they contribute as feeders more than they could possibly take away from the railroads.

"The length of haul by motor bus is considerably greater than by motor truck. Both operations are, however, increasing in the length of haul as the highways are improved and as the equipment is improved.

"It appears to be the general experience that a ride of around three to four hours, or, say, from 100 to 150 miles, marks the limit of continuous and repeated patronage even where the highways have a hard surface.

"There is no average haul by motor truck that has any definite meaning. Some hold that common carrier transportation of general merchandise is

economically limited to about 30 miles, at which distance a truck can return the same day; while others claim that they can profitably carry freight 60 miles, and enthusiasts maintain that their operations up to 150 miles are profitable. It seemed clear from the evidence given that special commodities will stand a much longer haul by motor truck than others and that the character of the commodities, the kind of highway, the location of important markets in relation to the producing territory are the principal determining factors as to length of haul by motor trucks, as is true in the case of steam roads."

PART II—FREIGHT MOVEMENT

Numerous factual studies of the flow of highway transportation have been conducted by the U. S. Bureau of Public Roads. In reporting on these, the field of use of the motor truck is summed up as follows:

The general field of motor-truck transportation can be divided into three major classes of service, which are:

(1) Local distribution of commodities. This service constitutes the bulk of the motor truck tonnage movement, and is primarily the distribution of goods within cities and their suburban areas. In California 58.1 per cent; Ohio 71.6 per cent; Connecticut 67.1 per cent; Cook County, Illinois, 75.8 per cent; and in Pennsylvania 80.6 per cent of the net tonnage transported by motor truck was hauled less than 30 miles.

Seventy per cent of the net tonnage hauled in Cook County by motor truck is a direct distribution of commodities to their final use. Consumption goods constituted 43.5 per cent, materials for construction and repairs were 20.8 per cent, and goods to farms were 5.5 per cent.

The principal food products hauled on the Cook County highways are fruits and vegetables, milk and cream, meat and packing house products, bakery goods, and groceries. Approximately 32 per cent of the daily milk supply of Chicago is trucked into the city.

(2) Organized motor-truck transportation supplementing existing rail and water service, and providing three types of service:

(a) The extension of freight service by motor truck into areas without rail service,

(b) Substitution of motor-truck service for rail operation of unprofitable branch lines, and

(c) Combination rail and truck service for short haul package freight.

(3) Long haul transportation of a limited class of special commodities. The volume of tonnage in the long haul zone is comparatively small and decreasing in importance. In Ohio 10.6 per cent, in Pennsylvania 6.9 per cent, and in Cook County, Illinois, 5.4 per cent of the tonnage is hauled over 60 miles. This movement depends upon speed of delivery or some special characteristic of the commodity shipped, such as household goods.

RAILROAD USE OF MOTOR FREIGHT TRANSPORT

Fifty-two railroads in the United States and Canada now use motor trucks as part of their shipping service. Trucks are being used by 46 railroads for terminal movements, by 11 to replace local freight trains, and by 12 to give limited store-door delivery.

Of the 11 railroads which have substituted motor-truck service for local freight trains, the most outstanding examples are the Pennsylvania, the New York Central, the Lehigh Valley, the Long Island, and the Boston & Maine Railroads.

The Pennsylvania Railroad has substituted motor trucks for the way or "peddler" freight trains for the handling of package freight in some of its most congested districts near large cities. The public delivers its goods to and receives them from the numerous small freight houses as heretofore, but the goods are hauled by motor truck between these points and a few consolidation and distribution stations.

The company is also utilizing trucks in connection with a service it renders between points on opposite sides of Chesapeake Bay, Maryland. Formerly this was a rail-water-rail movement, some of the rail lines being branch lines with too little traffic to be profitable. By the substitution of motor trucks for trains the company has been able to continue this service.

In all the Pennsylvania has substituted motor-truck service for peddler freights on thirty-three sections of line, embracing 1,007 miles of line and 438 stations. In addition, officials of the company are studying the possibilities of motor service to and from local stations in the large cities, a service now in operation at St. Louis, Mo., and of store-door delivery.

The New York Central Railroad has likewise substituted motor-truck for peddler-freight service in some of its congested districts. Three lines of this railroad extend north from New York City, all serving numerous stations in the metropolitan area. Through a motor-truck service the package traffic of all of these stations is concentrated at a single convenient point on the principal line of the railroad.

Besides the lines near the metropolitan area around New York, other truck lines are used for similar purposes on various other parts of the New York Central system. Many are also used for inter-terminal hauling. The New York Central is conceded to be the largest railroad user of trucks, one of its officials having estimated that over 1,000 trucks are in its service.

Considerable progress is being made in the establishment of modified store-door delivery. Most of this work is being done in the New York district by truck service arranged for under contract with such railroads as the Lehigh Valley, Erie, Pennsylvania and Baltimore & Ohio.

The investigation in 1926 by the Interstate Commerce Commission already referred to brought forth the most complete information yet assembled with respect to motor truck and bus operation. The report of the Commission when issued is expected also to carry with it recommendations with reference to the present necessity of interstate regulation of the motor vehicle.

In his report on that investigation, Dr. Duncan said with reference to the relation of rail and motor transport:

"There was no intimation at any time that the steam carriers can now be supplanted by motor vehicles. Motor vehicle operators and shippers alike declared that the steam railroad net was indispensable to the commerce and welfare of the country.

"The attitude seemed to be that the steam roads were big and strong enough to take care of themselves, that motor vehicles contribute more than

they take away, that the motor industry is an infant and needs nurturing and fostering and, hence, should not only be left free to develop but should even be encouraged."

The U. S. Bureau of Public Roads, in its factual studies, reporting in November, 1926, says of rail-motor transportation :

"A summary of conclusions based on a comparison of freight transported by motor truck and by rail between selected points in New England territory during the months of January and August, 1923, are: (The rail movements were all by the N. Y., N. H. & H. R. R. and represent total rail freight. The points compared represent distances from 17 to 140 miles, all points having direct connection by rail and highway.)

"1. A very considerable part of the package freight between origins and destinations in the Connecticut territory less than 50 miles apart is transported by motor truck.

"2. As distance between origin and destination increases transportation by motor truck becomes of less importance.

"3. The ratio of motor-truck freight to rail freight between two points varies with distribution and marketing practices. Cities which are distributing points for surrounding areas receive a larger amount of freight in bulk lots, such as rail carload shipments, than cities which distribute to the local market alone.

"4. For origins and destinations between which the exchange of freight includes bulk commodities, such as coal and oil, the tonnage transported by motor truck compared with total rail tonnage is relatively small. As such commodities are a necessary part of the freight into nearly all cities, motor-truck freight becomes a relatively small part of total freight.

"In the transportation of package freight, particularly of certain classes, such as foodstuffs and perishables, the motor truck is undoubtedly competing with rail L. C. L. service and with express service between the points compared. With regard to this competition the following points must be considered :

"1. The area under consideration (Connecticut) is one of the most highly developed trucking areas in the country. The actual points between which tonnage is compared are located on the most important motor-trucking routes in the area, and the comparison therefore represents the maximum development of motor-truck transportation rather than the average.

"2. Motor-truck transportation between the points compared and other similar points is but a small part of the total motor-truck tonnage in the area. Of the total tonnage transported by motor truck over the Connecticut State highway system, 36.3 per cent moves less than 10 miles and 55.5 per cent less than 20 miles. Motor-truck transportation in Connecticut is, therefore, essentially a local distribution of goods.

"3. The development of motor-truck transportation has been accompanied by distinct changes in methods of distributing goods, especially in the short-haul zones. The fact that a certain amount of tonnage is at the present time transported between two cities by motor truck does not indicate that this same tonnage would, in the absence of the motor truck, be transported by rail. The motor truck has provided a type of transportation service that neither the railroad nor any other carrier limited to fixed lines of movement can render. The smaller towns and villages, even though provided with rail facilities, now obtain a large part of the goods they require for retail distribution by daily motor-truck service from the larger cities. Without the motor truck, a part of these goods would reach the smaller towns by irregular rail shipments in larger quantities, and other types of goods, particularly perishables, would not be regularly provided to the smaller markets.

"4. The greater part of the tonnage transported by motor truck between the cities compared above is moved in trucks owned and operated by the shipper of the commodity. Only a small part is transported by motor-truck common carriers. The ownership of the vehicle of transportation by the shipper results in a type of service which cannot be rendered by other transportation agencies. The service is more flexible, both as to location and time. It is usually a complete transportation service, instead of a terminal-to-terminal movement, and is adaptable to greater variations in degrees of service. These

differences in service tend to reduce the amount of true competition between the two types of transportation.

"5. The conditions of transportation by the two methods (rail L. C. L. and motor truck) are very dissimilar. Packing requirements differ, the amount of handling of goods in transit is very different, and the time required for transportation varies considerably."

TERMINALS

The terminals continue to present the most serious problems in the further expansion of rail operations to meet the growing traffic demand. In discussing this problem Committee IV of the National Transportation Conference said:

"The general demand for more and better rail transportation is insistent, and the railroads are confronted by a serious dilemma. They must either add to their present terminal facilities or find a way to pass more freight through them. Enlargement or multiplication of terminal stations and team tracks in important terminal areas is practically impossible because of prohibitive cost, objection of municipalities to the expansion of railroad holdings in congested areas, and, furthermore, the additional traffic congestion that would result from greater centralization of cartage operations in such areas.

"How the Motor Truck Can Serve

"There are three principal directions in which the motor truck can serve to relieve the terminal situation:

"1. By organized cartage instead of the present go-as-you-please methods of receipt and delivery at the rail terminal; further than this, by store-door delivery, which is the real completed transportation.

"2. By substitution of motor service for a part of the rail service. This would cover trap car l. c. l. freight service to industries and, in large measure, similar movement in interchange and between local stations.

"3. By complete elimination of certain rail service. This would cover intraterminal movement, such as movement between industries or different plants of the same industry within the terminal area, which would then be handled by motor truck.

"Store-Door Service

"A well-organized system of store-door delivery by motor truck would be perhaps the greatest contribution to the solution of the terminal problem.

"In organizing such a system, two objects, not only desirable but fundamental, must constantly be borne in mind:

"First.—Better service to the trader, without increased cost;

"Second.—Economy to the carriers, this object being of vital importance because of its bearing on any future rate reductions."

ORGANIZED TRUCKING RELIEVES STREET CONGESTION

Putting a tremendous additional amount of freight on the streets in motor trucks would, of course, add greatly to the existing congestion unless concentrated through organization. Summarizing the situation the committee said:

"Under the prevailing system of miscellaneous cartage which, with very few exceptions, is in use in all terminal areas in the United States, each trader sends to the terminal station his own or hired vehicle to deliver or receive his particular freight. As a consequence, the streets leading to the terminal station are burdened with innumerable trucks and wagons containing only partial loads. The greater number of these vehicles are drawn by horses and contribute to the congestion far more than would the same number of motor trucks.

"The substitution of an organized trucking system for the miscellaneous haphazard service now employed for station work would greatly increase the load efficiency of vehicles, thus reducing the number on the streets. It would speed up street traffic and reduce the danger to pedestrians.

"Recommends Trucks Handle Short Haul

"There is another class of intraterminal movements, namely, the local movement of freight between different industries or different plants of the same industry within the terminal area and between terminal cities and their suburbs. * * *

"All such short movements of freight should be made by motor truck, which would be quicker and less expensive than by rail and would release for line haul a very large number of box cars.

"The best available information indicates that such short movements of freight by rail are performed at an actual loss to the railroads, as the rates which they are allowed to charge are wholly inadequate to cover the expenses properly chargeable to this service over their most expensive property. Moreover, with the shortage of transportation facilities, it is wasteful in the extreme to use railroad equipment in this legitimate field of the motor truck. On the other hand, if truck service were properly organized, so that the trucker would have high load efficiency in each direction, the complete transportation of freight by truck within city and suburban areas could be furnished at reasonable rates which would be profitable to the trucker.

"It is recommended that all such short movements of freight be handled exclusively by trucks and that the railroads cancel their tariffs covering them and exclude such traffic from their stations. Already the trucks are handling a large volume of this traffic, for which they are furnishing a store-door delivery service, and they are making deliveries within a few hours as compared with several days required by the railroads to perform only part of the transportation. In any event, the trucks must move the freight to the receiving stations and remove it from the delivering stations; they might better carry it all the way."

Since the above report was written in 1923 there has been a material development in the use of store-door delivery, as set forth on page 23, particularly in New York and Boston, by contract truckers working in cooperation with certain railroads.

TRUCK FIELD CLEARLY DEFINED

Conclusions drawn from the U. S. Bureau of Public Roads studies into motor and highway transport are indicated as follows:

1. Motor-truck transportation is primarily a local distribution of goods, principally foodstuffs.
2. The tonnage of goods hauled over 60 miles is small.
3. Truck haulage is largely a direct distribution of goods to their final use.
4. Long-haul transportation, in excess of 60 miles, is usually a movement of special commodities (household goods, etc.), depending upon speed of delivery or some special characteristic of the commodity shipped.
5. The owner-operator hauls the bulk of highway tonnage.

PART III—PASSENGER TRANSPORTATION

It has been recognized that much of the passenger traffic of local and branch railroad lines, both steam and electric, as well as some of the city traffic, has been lost to the private passenger car. Whatever these inroads have been has been accepted as inevitable and the rail carriers are adjusting themselves to the new conditions.

More controversy, however, has attended the introduction of the common-carrier motor bus. As the development originated it consisted simply of private passenger cars operated in competition with estab-

lished trolley lines, but a higher fare. Naturally, this drew the cream of the business, inasmuch as the "jitneys," as they were called, operated mainly in the rush hours.

The next step was to a truck chassis equipped with a body for carrying passengers. This proved impractical, however, partly because of unpleasant riding qualities and partly because of high operating costs.

There has now come an extensive utilization of the de luxe bus. In reality this is but a greatly enlarged private passenger car, in point of riding comfort, flexibility and pleasing external appearance. Recently six-wheeled motor busses have been placed in operation, all creating a growing demand for increased service of the de luxe motor-bus type.

It was early recognized that this new transportation of passengers could not be allowed to develop without respect to its effect upon the trolley lines, or indeed upon its own motor competitors. Municipal as well as State public service commissions have taken cognizance of the situation, and operation in most cities is now permissible only under franchise.

BUS SERVES IN FIVE DISTINCT FIELDS

Committee IV of the National Transportation Conference classified bus service into five groups in its report:

(1) Tourist service, consisting of special operation over selected routes at a higher rate of fare as a rule than obtains for other carriers. A more agreeable form of transit is offered.

(2) De luxe service in urban districts, which is illustrated by the high types of motor equipment operated practically in competition with existing street railway facilities. The Fifth Avenue Coach Company of New York, the Detroit Motorbus Company of Detroit, and the Washington Transit Company of Washington, D. C., illustrate the pleasant motor transportation for which a higher fare is paid than is charged on nearby street cars or subways.

(3) Noncompeting service, furnished by crosstown lines where no rail service exists, or in rural areas with no other facilities for public transportation.

(4) Feeder service to rail carriers furnished by equipment which these carriers either operate themselves or under contract to develop passenger business for their rail lines. Such service may build up traffic in a new section to the point where an extension of rail facilities is justified.

(5) Parallel competitive service.

RAILROAD USE OF BUSES

One hundred and ninety steam and electric railroads in the United States and Canada are using more than 500 gasoline or gas-electric rail motor coaches.

Sixty steam railroads are using 756 buses directly or through subsidiary companies. These buses are replacing steam service formerly given on branch lines, are opening up new territory through feeder routes and are also being used paralleling the railroad tracks to satisfy the demand for transportation on rubber, and to give local service, permitting elimination of stops and quicker service by steam trains.

Two hundred and sixty-six street railway companies are now operating 7,284 motor buses in the United States and Canada. This does not include 36 motor bus lines operated by the same companies which formerly operated street railway service now discontinued. These 36 companies now operate 230 buses. Up to January 1, 1927, street railways had replaced 2,279 miles of electric railway track by bus service, of which 1,061 miles represents abandonment of the entire street railway system and use of buses under entirely new management.

Although railroad use of the motor bus was slower in starting in the United States than truck use, it seems to be developing at a much more rapid rate at the present time. This is due to the fact that while railroad tonnage has been increasing rapidly, passenger traffic has been falling off, particularly on the short-haul trains.

Buses are being used by the railroads under a different type of arrangement than with trucks. Few railroads own truck equipment directly or indirectly, but almost invariably contract for its service. Many railroads, however, own motor buses direct or through subsidiary motor transportation companies.

Buses are being used to eliminate passenger trains on branch lines, light traffic trains on main lines, and, to some extent, for new feeder routes. In a number of instances where buses are used over highways paralleling the main rail lines, it has been possible to eliminate a great many stops and speed up train service appreciably.

The leading railroad users of motor buses are the New York, New Haven & Hartford, which, through a subsidiary, owns 168 buses, providing a network of bus service throughout southern New England, and the Great Northern, which similarly, through a subsidiary, operates buses throughout its territory. The Boston & Maine rents 61 buses to a subsidiary company, mostly to eliminate local passenger service, but also to provide an alternate service for its patrons.

The Union Pacific operates 129 buses, mostly over scenic routes as sight-seeing services. Among other railroads which are giving this latter type of service are the Atchison, Topeka & Santa Fe, the Southern Pacific and the Boston & Maine.

Many local passenger trains throughout the United States, which formerly operated at a small margin of profit, have had their revenues cut down to as low as 30 and 40 cents a mile by the widespread use of the passenger automobile. The motor bus, where highways are available, can give this same service for from 20 to 30 cents a mile. Hence the railroads which have found it possible to substitute buses for local passenger trains have found themselves in a fortunate position financially, the more so because it cost from \$1.00 to \$1.40 a mile to operate a local passenger train and the aggregate mileage of these local passenger trains runs into many millions annually. It is reported that the New York, New Haven & Hartford, for instance, during 1926 eliminated between two and three million miles of local passenger train operation.

One of the most interesting experiments with the motor bus was inaugurated in 1926 when the Baltimore & Ohio Railroad established off-track motor bus terminals at various points in the metropolitan area around New York and began to give motor bus service direct to its rail

terminal in Jersey City. These buses not only tap the business district of New York but stop at a number of hotels where waiting rooms have been established. Buses are run alongside the train tracks and passengers' baggage is checked to the seat occupied by the passenger on the train. This innovation has become very popular and its adoption is being seriously considered by a number of other railroads.

PART IV—COMMON CARRIER REGULATION

The power to regulate intrastate transportation by motor vehicle common carriers, in the last analysis and with few exceptions, rests with the State. These few exceptions occur in States whose constitutions provide for a very broad rule for municipalities.

Until a few years ago our States in no way differentiated between common carrier and other uses of the motor vehicle. In 1914, however, Pennsylvania definitely segregated motor vehicles when used as common carriers and placed them under the regulation of the State's Public Service Commission. Today the laws of forty States regulate passenger carriers to a comparatively complete degree and thirty-two regulate property carriers to a greater or less degree, while in three other States the public service commissions hold that they have the necessary power to regulate motor-vehicle common carriers, but have not yet seen fit to exercise this power except to a very limited degree in the case of passenger carriers.

Although it is an accepted principle in the United States that intrastate commerce shall be regulated by the respective State authorities and interstate commerce by Federal authority, whether direct or by delegation to the State authorities affected, it has not until very recent years deemed necessary or desirable that interstate motor common carriers be placed under Federal regulation. This was partly because of the relatively small amount of interstate commerce by motor vehicle, and partly because it was believed that the State authorities, through their police powers, could exercise the necessary measure of control. Two important decisions of the United States Supreme Court early in 1925, however, denied the States the right to the control they had been exercising over interstate carriers, leaving such carriers subject to no authority except in the matter of size, weight and speed restrictions and similar requirements to which all vehicles using the public highways are subject, and raising the question whether there should not be Federal regulation of such carriers comparable to the State regulation of intrastate carriers.

A bill providing for such regulation introduced in Congress in December, 1925, developed a sharp line of demarcation between the principles affecting motor carriers of passengers and those affecting motor carriers of freight. This distinction was further accentuated in the series of hearings on the subject conducted by the Interstate Commerce Commission in the summer and autumn of 1926.

Quoting from Dr. Duncan's report on those hearings:

"A very clear and definite cleavage was developed between motor-bus operation—that is, the transportation of persons—and motor-truck operation, or the transportation of property. It was unmistakably shown that these two operations must be dealt with separately. Motor-bus operation has an en-

tirely separate operating organization from motor-truck operation. In this respect it differs from railway operation where the two are combined.

"It was maintained by the various witnesses that the transportation of persons by motor buses, since it is based upon a common unit, namely, the carrying of an individual from one point to another, can be more readily standardized and is susceptible to general regulation on this account.

"With regard to motor-truck operation, it was maintained, on the contrary, that the service offered is predominately a highly specialized service, which service, being unique and essentially different from any other service, is, therefore, not capable of standardization and not susceptible to general standardized regulation."

CHAPTER V

PUBLIC RELATIONS

Part I—METHODS OF PROMOTION

In the days immediately preceding the general introduction of the motor vehicle, bicycling had a large vogue in the United States, and it is to the bicycle rider that credit must be given for the first public interest in improved highways. All-day tours, endurance contests and pedaling from one town to another were neither pleasant nor in some cases possible without improved roads, and it was a persistent demand from the riders that led to public appropriations for improvements, amounting in some cases to as much as \$3,000 a mile.

With the advent of the motor car, much the same type of contests were undertaken to popularize the vehicle. Races of all descriptions were held everywhere. Sometimes they were the highly specialized speed contests between expert drivers which are still a feature of motor life in America. Again, long-distance tours were taken. Cars were driven up long flights of steps, over mountains and through streams to demonstrate their fitness, and then, as more persons acquired cars, friendship tours were taken by business men to advertise their own commodities, their cities and their states, and to enable themselves to become acquainted with people elsewhere.

A demand for road development followed naturally. Gradually associations of motor-club owners sprang into being, and these have continued at all times staunch supporters of highway improvement. Good roads associations were formed by business men.

Among the earliest of the national organizations was the Lincoln Highway Association, which was organized by a group of public-spirited men in Detroit with the idea of visualizing to the people of the country what a transcontinental road would mean to the United States. Others were quick to accept the idea, and there followed a period of highway organization which resulted in the naming of highways and campaigns for their improvement.

As public interest grew, the demand for expenditures increased and with it the demand for more mileage. It became necessary to select the roads to be improved with great care, and also to demonstrate clearly the savings to be effected. Consequently, economic surveys were inaugurated, and today it may be stated that the highway policies of the states and nation rest upon a rational basis of economic fact.

ORGANIZED STUDY OF HIGHWAY AND MOTOR TRANSPORT NEEDS

As road improvement has gone on apace, the needs have changed and with them the type of work of many of the highway organizations. Emphasis today is placed on the need for providing adequate facilities for future urban as well as suburban and rural development. Questions of uniformity of regulation, of law enforcement and similar subjects are occupying more time than ever, and the result has been that a large number of national organizations have gradually found themselves studying those phases of the highway problems which peculiarly affect their interest whether they represent agriculture, industry, government, science, the women, labor or any one of countless groups concerned.

A list is given of the most important of these organizations, with a brief outline of the fields they cover.

Naturally, large amounts of informational material have been prepared for newspaper and magazine release. Thousands of highway lantern slides have been made by the U. S. Bureau of Public Roads, and from that source and others, films, pictures, exhibits and similar matter bearing upon questions of highway development and use can be obtained at any time.

Large national conferences have been held on questions of construction, maintenance, education, safety, economics and other phases of motor transport, participated in by scores of organizations. Regional and community discussions without number have been held.

The First World Motor Transport Congress met at Detroit, Mich., in May, 1924, for the first time bring together representatives of the motor industry from all parts of the world for a discussion of highways, financing, and various related topics. The Second Congress was held in New York, in January, 1926, and the third in New York, in January, 1927.

Other interesting international meetings include the visit to the United States of the Pan-American Highway Commission. Forty of the leading highway engineers of Latin America were brought to the United States as guests of the Highway Education Board and taken on a month's tour of the highways and industries of the United States. The event was fostered by the Departments of Agriculture, Commerce, State and Interior, with the cooperation of the Pan-American Union and the Inter-American Highway Commission.

In 1925 the United States accepted the invitation of the Argentine Government to attend the First Pan-American Road Congress, and a delegation from the United States visited nearly all of the Latin American countries, either en route to the Congress or returning from the sessions. Extensive reports were submitted to the Congress and a report was made on the return of the delegation.

A similar delegation from the United States attended the Fifth International Road Congress at Milan, Italy, in 1926, later visiting all the countries of eastern and northern Europe.

The discussion of the motor transport section of the International Chamber of Commerce and the reports rendered are important contributions to the subject of better international understanding of mutual transportation problems.

PART II—ORGANIZATIONS IN THE UNITED STATES STUDYING HIGHWAY AND MOTOR-TRANSPORT DEVELOPMENT

The general public interest in motor transport in the United States, as already indicated, has brought a large number of organizations into the field. Some of these have the study of motor transport as major functions, others are interested because motor transport affects their groups. A complete résumé would occupy more space than can be allotted, but it is possible to summarize those from which data can be obtained by the nationals of other countries if desired. Their names, addresses and the phases in which they are interested follow :

AGENCIES OF PUBLIC OFFICIALS

The United States Bureau of Public Roads, Department of Agriculture, Washington, D. C., has made a large number of physical and economic studies independently and in cooperation with various State highway departments. Among these may be listed investigations of the magnitude of impact blows delivered to road surfaces by motor trucks and their effect upon the surfaces, studies of the rate of wear of various kinds of surface under traffic, tests of the characteristics of soils as highway subgrades, comparative tests of various designs of types of surfacing under accelerated traffic, studies of the flow of traffic over State highway systems and the effect of population density, industry, motor vehicle registration, the season of the year and other factors on the distribution and amount of traffic. Surveys of this character have been made in Connecticut, Pennsylvania, Maine, Ohio, California, New Hampshire and Vermont, and in Cook County, Illinois, adjacent to the City of Chicago.

The Bureau of Agricultural Economics, Department of Agriculture, Washington, D. C., has made studies designed to bring out the influences of motor transport upon marketing and distributing practices. Other surveys are directed toward the social effects upon farm life.

The Automotive Division, Department of Commerce, Washington, D. C., is the governmental agency in the Bureau of Foreign and Domestic Commerce of the Department of Commerce which deals officially with automotive trade problems and relations between the United States and other nations. It compiles statistics, furnishes information and cooperates generally with the automotive industry in foreign trade. *The Transportation Division* conducts studies into the transportation systems and services of other nations. Surveys of rail and highway facilities in South America are among its most recent activities.

The Bureau of Standards, Department of Commerce, Washington, D. C., is studying questions of automobile design and practice, including brake testing and engine efficiency.

The Bureau of Mines, Department of the Interior, Washington, D. C., has made exhaustive studies into gasoline costs, consumption and production, as well as studies to determine the effects of gases resulting from gasoline use.

The Bureau of Education, Department of the Interior, Washington, D. C., has made studies into the use of the motor bus in its relation to consolidated schools.

The Pan-American Union, Washington, D. C., comprising in its membership the twenty-one American republics, fosters the interchange of viewpoints on social, economic and educational problems. It publishes a monthly bulletin which devotes much space to highway and other transportation questions.

The official bodies charged with questions of highway administration are the U. S. Bureau of Public Roads and the state highway departments. Representatives of these bodies are carrying on cooperative study through the American Association of State Highway Officials, Washington, D. C.

All questions of construction, maintenance and administration as they relate to national and state highway development are settled by the men belonging to these organizations, although formal action by the national government rests upon the signature of the Secretary of Agriculture in whose department the Bureau is lodged.

In most of the states, enforcement of rules and regulations relating to the use of motor vehicles on the rural highways is now lodged in the hands of a motor-vehicle administrator, who may or may not be related to the state highway department. These officials in the Eastern states are organized as the Eastern Conference of Motor Vehicle Administrators, which meets regularly to discuss mutual problems. There is a similar conference in the Mid-West.

JOINT PUBLIC AND PRIVATE AGENCIES

Many phases of highway development have required joint study and discussion on the part of representatives of both government and industry. The more active of these agencies today are:

Highway Education Board, Washington, D. C., made up of representatives from the Departments of Agriculture, Commerce and State, Society for the Promotion of Engineering Education, Pan-American Union, American Association of State Highway Officials, Investment Bankers Association, National Automobile Chamber of Commerce and the rubber industry. The function of this board is to distribute the results of highway research to the universities, colleges and other educational institutions, review highway engineering and transport curricula, hold safety and road essay contests, arrange for technical exhibits for classroom use and otherwise deal with the educational relations.

Highway Research Board, National Research Council, Washington, D. C., has eight committees engaged in studying the relation of improved roads to transport costs, highway finance, subgrades, different types of road construction and similar subjects, including causes of highway accidents. This work is being done, as is a great deal of all of the highway development work of the country in all fields, in cooperation with the U. S. Bureau of Public Roads.

National Research Council, in cooperation with other bodies, is also now undertaking studies into questions of driving, traffic direction and similar matters, including a committee investigation of human factors in highway accidents, undertaken at the request of the National Conference on Street and Highway Safety.

The Inter-American Highway Commission, Washington, D. C., is made up of representative commissions in each of the twenty-one Ameri-

can republics and devotes itself to the promotion of improved economic and commercial relationships between these nations, including the interchange of highway information.

Joint Highway Transport Committee. % Bureau of Public Roads, made up of representatives of the Bureau of Public Roads, American Association of State Highway Officials, National Automobile Chamber of Commerce and Investment Bankers' Association of America. This body has been making a detailed study into questions of highway finance and regulation, and over a period of years has held numerous hearings attended by agricultural and industrial economists, representatives of the using public and others.

National Conference on Street and Highway Safety, organized by Hon. Herbert Hoover, Secretary of Commerce, and participated in by the American Automobile Association, American Electric Railway Association, American Mutual Alliance, American Railway Association, Chamber of Commerce of the United States, National Association of Taxicab Owners, National Automobile Chamber of Commerce, National Bureau of Casualty & Surety Underwriters, National Research Council and National Safety Council.

This conference was called in 1924, and through committees working during 1924, 1925 and 1926 assembled and made public the best practices relating to all questions of motor and other highway transport having to do with safety on the streets and highways. These practices are embodied in the program of recommendations set forth in Appendix A of this report, and the present and contemplated activities in connection with the conference are briefly set forth on page 17.

Pan-American Confederation for Highway Education, % Pan-American Union, Washington, D. C., has as its members representatives from each of the nineteen Latin republics of the Pan-American Union and the United States. Its executive committee is made up of the Director of the Pan-American Union, the Assistant Secretaries of State and Commerce, the Chief of the Bureau of Public Roads and representatives of the National Automobile Chamber of Commerce, the Rubber Association of America, and banking.

Its purpose is to act as a clearing house for highway information and to stimulate the development of systems of highway communication within and between the countries comprising the Pan-American Union.

PRIVATE ORGANIZATIONS

The private organizations active in the field of highway development are so numerous that they can be summarized only briefly.

The American Academy of Political and Social Science, Philadelphia, Pa., composed of leading men interested in political and social science, recently devoted an entire edition of its publication, "The Annals," to a comprehensive survey of motor transport.

The American Automobile Association, Washington, D. C., is the national organization representing the automobile users of the country and their local and state clubs. Its function is to deal with all questions pertaining to highway development and use from the standpoint of the user.

Its *Bus Division* brings together the operators of motor buses for the purposes of studying questions of mutual interest, promoting sound legislation and working for the good of the industry.

The American Economic Institute, Chicago, Ill., composed of economists generally, held a round-table discussion of motor transport last January and is now cooperating with the Highway Education Board in preparation for a national economic conference on motor transport.

The American Electric Railway Association, New York City, made up of electric railway officials, has made several studies of the use of motor bus in relation to the electric rail car, and maintains a joint committee with the National Automobile Chamber of Commerce on these subjects.

The American Farm Bureau Federation, Washington, D. C., is one of the largest of the farm organizations of the country. Its committee on resolutions formulates reports on highway policies from time to time, and recently its president was authorized to name a committee to deal with highway policies from the farm viewpoint.

The American Railway Association, Washington, D. C., representing the railroad officials of the country, has studied the question of grade crossings and other matters dealing with relations between rail and motor transport.

The American Road Builders' Association, New York City, made up of the machinery and material manufacturers, road contractors and those interested in construction and maintenance phases of highways, holds annual road shows and otherwise stimulates interest in highway developments.

The Chamber of Commerce of the United States, Washington, D. C., is made up of business men of the United States who have membership as individuals or corporations or through local Chambers of Commerce. The Chamber maintains a Transportation and Communication Department which takes an active part in questions of motor transport as they relate to industry and in public questions arising therefrom. The National Transportation Conference of 1923 was held under the direction of this body. The Chamber also maintains Insurance and Civic Development Departments which deal with related problems.

The General Federation of Women's Clubs, Washington, D. C., the national headquarters of women's clubs, has committees at work on the beautifying of highways. They have also participated in highway safety work and in studies of principles of highway administration and finance.

The Motor & Accessory Manufacturers' Association, New York City, is the organization of manufacturers of accessory equipment and has made especial studies of credit.

The Motor Vehicle Conference Committee, 366 Madison Ave., New York City, is made up of representatives from the American Automobile Association, Motor & Accessory Manufacturers' Association, National Automobile Chamber of Commerce, National Automobile Dealers' Association, and Rubber Association of America. This body deals with the legislative phase of motor use and has issued many excellent detailed statements of fact relating to existing methods of taxation and regulation of the motor.

The National Automobile Chamber of Commerce, with its highway offices in Washington, D. C., is made up of the motor manufacturers of the country. The Chamber maintains a standard highway committee and a motor truck committee as well as other committees, conducts research investigations into all phases of motor transport as related to the use of the car and takes an active part in public questions growing out of their use.

The National Automobile Dealers' Association, St. Louis, Mo., made up of motor car dealers and distributors, specializes on subjects of interest to the dealer and has made several studies in "used car" practice, salesmanship, taxation and related topics.

The National Grange, Washington, D. C., is the oldest national farm organization in the country. It maintains a standing committee which formulates reports and policies on highways from the farm viewpoint.

The National Safety Council, Chicago, Ill., deals with all phases of safety, whether industrial, community or on the highways. Its chief function for highway purposes is to stimulate sound methods of conservation of life, limb and property on the highway.

The National Tax Association, New York City, made up of the leading tax economists of the United States, through a special committee on problems of highway finance, has made a report on that subject.

The Rubber Association of America, New York City, deals with questions affecting the rubber industry and is the center point for information concerning consumption and production of tires and their use.

The Society of Automotive Engineers, New York City, is made up of the motor engineers of the country and has made numerous studies into the technique of car manufacture, standardization and allied subjects.

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**	City Pavements	F. S. Benson	1923	McGraw-Hill Book Co., Inc., N. Y. C.
**	Construction of Roads and Pavements (3rd Edition)	T. R. Agg.	1924	(Same as above)
**	Design of Highway Bridges and the Calculation of Stresses in Bridge Trusses	M. S. Ketchum	1920	(Same as above)
*	Determination of Consistency of Soils by Means of Penetration Tests	Public Roads, Vol. 7, No. 12.	Feb., 1927	B. P. R.
*	Direct Production Costs of Broken Stone	Public Roads, Vol. 7, No. 8.	Oct., 1926	B. P. R.
**	Dust Preventatives and Road Hinders	Prevost Hubbard	1910	John Wiley & Sons, Inc., N. Y. C.
*	Earth, Sand-Clay and Gravel Roads	U. S. Dept. Agric., Bul. 463.	Feb., 1917	B. P. R.
*	Economies of Bridge Work	J. A. L. Waddell	1921	John Wiley & Sons, Inc., N. Y. C.
*	Efficiency in Concrete Road Construction	Public Roads, Vol. 6, Nos. 9, 10, 11, 12, Vol. 7, No. 1.	Nov., Dec., 1925	B. P. R.
			Jan., Feb., Mar., 1926	

Legend	Title	Author	Date	Where publication can be obtained
***	Federal and State Policies in Construction of the Federal Aid System.	T. H. MacDonald	Dec., 1923	B. P. R.
***	Federal Government's Part in the Country's Highway Program.	R. D. Chapin	1920	N. A. C. C.
*	Field Methods Used in Subgrade Surveys.	Public Roads, Vol. 6, No. 5	July, 1925	B. P. R.
*	Fill Settlement in Peat Marshes.	Public Roads, Vol. 7, No. 12	Feb., 1927	B. P. R.
*	Friction Tests of Concrete on Various Subbases.	Public Roads, Vol. 5, No. 5	July, 1924	B. P. R.
*	Grading to Help Nature Clear Roads of Snow.	Public Roads, Vol. 4, No. 4	Aug., 1921	B. P. R.
*	Gravel Roads.	Amer. Highways	Apr., 1924	A. A. S. H. O.
**	Highway Engineering; Rural Roads and Pavements	G. R. Chatburn	1921	John Wiley & Sons, Inc., N. Y. C.
*	Highway Engineers Handbook (3rd Edition)	Harger & Bonney	1919	McGraw-Hill Book Co., Inc., N. Y. C.
*	Highways and Highway Transportation	Y. B. Sep. No. 914	1925	B. P. R.
**	History and Development of Road Building in the United States.	Thomas H. MacDonald	Oct., 1926	B. P. R.
*	Location, Grading and Drainage of Highways.	W. G. Harger	1921	McGraw-Hill Book Co., Inc., N. Y. C.
*	Macadam Roads.	Dept. Agric. Farmer's Bul. 338	Oct., 1908	B. P. R.
*	Mistake of Changing Highway Personnel.	American Highways	Jan., 1924	A. A. S. H. O.
**	Modern Asphalt Pavement.	C. Richardson	1908	John Wiley & Sons, Inc., N. Y. C.
**	Modern Highway Traffic and the Planning of State Highway Systems.	Public Roads, Vol. 7, No. 9	Nov., 1926	B. P. R.
*	Modern Road Bldg. and Maintenance Principles and Practice.	A. P. Anderson, Pub. by Hercules Powder Co.	1921	Hercules Powder Co., Wilmington, Del.
*	Motor Truck Impact Tests, Bureau of Public Roads.	Public Roads, Vol. 3, No. 35	Mar., 1921	B. P. R.
*	Motor Truck Impact as Affected by Tires, Other Truck Factors and Road Roughness.	Public Roads, Vol. 7, No. 4	June, 1926	B. P. R.
*	On Bituminous Macadam and Bituminous Concrete Roads.	Public Roads, Vol. 4, No. 2	June, 1921	B. P. R.
*	Pan American Bulletin on Highways.		Apr., 1924	Pan American Union, Washington, D. C.
*	Percentage of Water Freezable in Soil.	Public Roads, Vol. 5, No. 12	Feb., 1925	B. P. R.
**	Portland Cement Concrete Roads.	Dept. Agric., Bul. 1077	Oct., 1922	B. P. R.
*	Practical Field Tests for Subgrade Soils.	Public Roads, Vol. 5, No. 6	Aug., 1924	B. P. R.
*	Present Status of Subgrade Studies.	Public Roads, Vol. 6, No. 7	Sept., 1925	B. P. R.
*	Report of Highway Research at Pittsburg, Calif.	California Highway Com.	Jan., 1923	B. P. R.
*	Report of Highway Research on Bates Road, Ill. (8 Bulletins).	Illinois Dept. of Highways	1923	Ill. Dept. of Pub. Works and Bldgs., Div. of Highways, Springfield, Ill.
*	Researches Affecting Design of Roads for Heavy Motor Traffic.	Public Roads, Vol. 3, No. 34	Feb., 1921	B. P. R.
*	Researches on Bituminous Paving Mixtures.	Public Roads, Vol. 7, No. 10	Dec., 1926	B. P. R.
*	Resistance to the Transportation of Motor Vehicles.	Iowa State Col. Off. Pub. Bul. 64	May, 1922	Eng. Exper. Sta., Ames, Ia.
*	Rural Highways Pavements.	W. G. Harger	1924	McGraw-Hill Book Co., N. Y. C.
*	Simplified Soil Tests for Subgrades and their Physical Significance.	Public Roads, Vol. 7, No. 8	Oct., 1926	B. P. R.
*	Soil Pressure Cell Measures Accurately to Tenth of Pound.	Public Roads, Vol. 3, No. 28	Aug., 1920	B. P. R.
*	Subgrade Studies of the Bureau of Public Roads.	Public Roads, Vol. 8, No. 1	Mar., 1927	B. P. R.
*	Superelevation and Easement as Applied to Highway Curves.	Public Roads, Vol. 3, No. 31	Nov., 1920	B. P. R.
*	Tar Surface Treatment of Gravel Roads.	Public Roads, Vol. 6, No. 2	Apr., 1925	B. P. R.
*	Tentative and Standard Methods of Sampling and Testing Highway Materials.	Dept. Agric. Bul. 1216	May, 1924	B. P. R.
*	Tests of Impact on Pavements by the Bureau of Public Roads.	Public Roads, Vol. 4, No. 6	Oct., 1921	B. P. R.
*	Textbook of Highway Engineering.	Blanchard and Drown	1913	John Wiley & Sons, Inc., N. Y. C.
*	The Bulking of Moist Sands.	Public Roads, Vol. 5, No. 5	July, 1924	B. P. R.
*	The Economics of Highway Grades.	Iowa State College Off. Pub. Bul. 65	Feb., 1923	Eng. Exp. Sta. Ames, Ia.
*	The Effect of Haul on the Cost of Earthwork.	Public Roads, Vol. 5, No. 7	Sept., 1924	B. P. R.
*	The Effect of Moisture on Concrete.	Public Roads, Vol. 6, Nos. 2, 3, 4	Mar., April, 1925	B. P. R.
*	The How and Why of Motor Truck Impact.	Public Roads, Vol. 3, No. 31	Nov., 1920	B. P. R.

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*	The Interrelation of Longitudinal Steel and Transverse Cracks in Concrete Roads	Public Roads, Vol. 6, No. 6	Aug., 1925	B. P. R.
*	The Organization and Equipment of a Concrete Paving Operation	Public Roads, Vol. 6, No. 12	Feb., 1926	B. P. R.
*	The Relative Value of Different Types of Rural Pavements	Public Roads, Vol. 3, No. 33	Jan., 1921	B. P. R.
*	The Six-wheel Truck and the Pavement	Public Roads, Vol. 6, No. 8	Oct., 1925	B. P. R.
*	The Traffic Census and Its Use in Deciding Road Width	Public Roads, Vol. 4, No. 3	July, 1921	B. P. R.
*	The Trend of Highway Design	Public Roads, Vol. 8, No. 1	Mar., 1927	B. P. R.
*	The Value of the Foreman on Fresno and Wheel Scraper Work	Public Roads, Vol. 7, No. 3	May, 1926	B. P. R.
*	The Wagon and the Elevating Grader	Public Roads, Vol. 6, No. 2	Apr., 1925	B. P. R.
*	Thin Brick Pavements Studied	Public Roads, Vol. 7, No. 7	Sept., 1926	B. P. R.
*	Time Losses in Concrete Road Construction	Public Roads, Vol. 7, No. 10	Dec., 1926	B. P. R.
*	Tractive Resistance and Related Characteristics of Roadway Surfaces	Iowa State Col. Off. Publication Bul. 67	Feb., 1924	Eng. Exp. Sta., Ames, Ia.
*	Transverse Distribution of Motor Vehicle Traffic on Paved Highways	Public Roads, Vol. 6, No. 1	Mar., 1925	B. P. R.
*	Treatise on Roads and Pavements (3rd Edition)	L. A. Baker	1918	John Wiley & Sons, Inc., N. Y. C.
*	Valuable Study of Movement of Capillary Water in Soil	Public Roads, Vol. 3, No. 28	Aug., 1920	B. P. R.
*	Wear of Concrete Pavements Tested	Public Roads, Vol. 5, No. 3	May, 1924	B. P. R.
<i>Finance</i>				
*	Basic Principles of Highway Management and Finance	T. H. MacDonald	1923	B. P. R.
*	Collection and Disposition of Motor Vehicle Revenues	Public Roads, Vol. 7, No. 11	Jan., 1927	B. P. R.
*	Commercial Vehicles on Free Highways	Thomas H. MacDonald	Oct., 1925	B. P. R.
*	Common Carrier Truck Fees and Taxes	Public Roads, Vol. 6, No. 11	Jan., 1926	B. P. R.
**	Financing Highways and Highway Transportation Lines	G. R. Chatburn	1923	Highways and Highways Transport
*	Highway Finance	A. J. Brosseau		
*	Highway Financing and Taxation	Highway Green Book, 3 A's	1922	American Auto. Asso., Washington, D. C.
*	Highway Management and Financing in the Various States	Highways Green Book, A. A. A	1922	American Auto. Asso., Washington, D. C.
*	Highways and the Taxpayer	A. J. Brosseau	1922	N. A. C. C.
*	Motor Vehicle Fees and Gasoline Taxes	Public Roads, Vol. 5, No. 7	Sept., 1924	B. P. R.
*	Principles of Highway Finance	American Highways	Jan., 1925	A. A. S. II. O.
*	Problems of Highway Finance	Nat. Tax. Asso.	1924	N. A. C. C.
*	Pub. Rd. Mileage and Revenue in the U. S., 1914	Dept. Agric. Bul. 390	Jan., 1917	B. P. R.
*	Rural Highway Mileage, Income and Expenditure	Dept. Agric. Bul. 1279	Mar., 1925	B. P. R.
*	Taxation of Transportation Agencies	U. S. Chamber of Commerce	1923	Chamber of Commerce of the U. S.
*	Transportation and Taxes	John E. Walker	1923	N. A. C. C.
*	Urban Aspects of Highway Finance	Public Roads, Vol. 6, Nos. 11, 12	Jan., Feb., 1926	B. P. R.
*	Wealth, Debt and Taxation	Bureau of the Census	1922	Bureau of the Census, Washington D. C.
<i>Highway Transport Policies</i>				
***	Highways as a Dividend Paying Public Investment		1925	N. A. C. C.
*	Interstate Regulation of Motor Vehicles	C. C. McChord	1926	N. A. C. C.
***	Motor Carrier Regulation	Irwin S. Rosenbaum	1926	N. A. C. C.
***	Motor Carrier Regulation by Certificates of Necessity and Convenience	David E. Libenthol and Irwin S. Rosenbaum	1926	N. A. C. C.
*	The Financing of Highways	T. H. MacDonald	1924	N. A. C. C.

APPENDIX A—PROGRAM OF RECOMMENDATIONS OF SECOND NATIONAL CONFERENCE ON STREET AND HIGHWAY SAFETY

NOTE: The Uniform Vehicle Code, the four Acts separately printed, the two Conference reports and the fourteen committee reports referred to below can be obtained from the National Conference on Street and Highway Safety, Department of Commerce, Washington, D. C.

Traffic Laws and Regulations:

1. A Uniform Vehicle Code, including (1) A Uniform Motor Vehicle Registration Act, (2) A Uniform Motor Vehicle Anti-Theft Act, (3) A Uniform Motor Vehicle Operators' and Chauffeurs' License Act, and (4) A Uniform Act Regulating the Operation of Vehicles on Highways should be enacted by each of the States and the District of Columbia. A suggested model for such a code is endorsed by the Conference and is recommended to the several State legislatures as the basis for uniform legislation on the subject.¹

2. The Uniform Vehicle Code should be supplemented by State administrative regulations which should, as far as practicable, be developed on a uniform basis through cooperative action of the associations of officials concerned, particularly the State highway officials and motor vehicle commissioners, together with joint committees including other public officials and representatives of automobile clubs, scientific organizations and commercial and other bodies concerned.²

3. The Uniform Vehicle Code should further be supplemented by local traffic ordinances with regard to which progress toward uniformity should be sought through State or regional conferences of officials and other persons or organizations interested.³

4. Local traffic ordinances should also be supplemented by the necessary detailed rules and regulations to be established by local authorities, and uniformity in such regulations should be secured through the associations of officials concerned, with the cooperation of other persons and organizations interested.⁴

5. In view of the fact that fatal collisions of motor vehicles with pedestrians, already amounting to 60 per cent of the total number of fatal traffic accidents, are increasing at a rate out of all proportion to the rate of increase in other traffic fatalities, the education and regulation of pedestrians as well as of drivers should be given greater attention than at present. Pedestrians and motorists should bear a considerate attitude each to the other. Along rural highways, wherever there are suitable sidewalks or paths pedestrians should use them. Where there are none, they can generally walk most safely on the left-hand side facing the traffic, having due regard to danger at curves, but should not force motor traffic out of line or otherwise impede it. In cities pedestrians should be instructed, urged and required to keep within the boundaries of designated safety zones and crossing places and, when there is congestion, to cross only with the traffic. Motorists should be required to accord pedestrians safe and dignified use of such safety zones and crossing places. Pedestrians as well as motor vehicle operators should be required to obey the traffic rules and regulations and should be punished by adequate fines for failure to do so.⁵

¹ Report of Committee on Uniformity of Laws and Regulations, 1926, pp. 9-14, 105-125, 205-218, and 305-337. See also report of Committee on Public Relations, 1924, p. 8, on need for a State department or bureau to administer the motor vehicle law; report of Committee on Insurance, 1924, p. 9, conclusion 2, and pp. 14-16, on need for certification of automobile title; report of Committee on Traffic Control, 1924, p. 11, conclusions 14-16, and pp. 22-24, and report of Committee on Causes of Accidents, 1926, p. 8, conclusion 2, and pp. 20-23, on need for examination and licensing of drivers; report of Committee on Traffic Control, 1924, pp. 8-10, conclusions 1-8 and 11-13, and pp. 12-18 and 20-22, on uniform rules of the road; report of Committee on Statistics, 1924, pp. 7 and 8, conclusions 2-5, and pp. 9-27, and report of same committee, 1926, p. 8, conclusion 9, on need for uniform reporting of accidents; report of Committee on the Motor Vehicle, pp. 8-11, 14-16 and 18-19, on regulation of equipment; report of Committee on Enforcement, 1926, pp. 8 and 9, conclusions 9-11 and 15, pp. 17-19, and Appendix A on need for definite and adequate penalties.

² Report of Committee on Uniformity of Laws and Regulations, 1926, p. 14.

³ Report of Committee on Uniformity of Laws and Regulations, 1926, p. 14.

⁴ Report of Committee on Uniformity of Laws and Regulations, 1926, p. 15.

⁵ Report of Committee on Traffic Control, 1924, p. 10, conclusion 12, and pp. 20 and 21; First Conference on Street and Highway Safety, p. 28; Committee on Enforcement, 1926, p. 9, conclusion 16, and p. 20; Committee on Causes of Accidents, 1926, p. 8, conclusion 1, and pp. 12 and 13.

6. Additional legislative and administrative measures should be adopted as hereinafter recommended for enforcement of the traffic laws and regulations, public education in traffic safety, street and highway planning, construction and maintenance, railroad grade crossing protection and elimination, and other measures for improvement of the traffic situation.⁶

Enforcement of Traffic Laws and Regulations:

7. State laws should prescribe a uniform system of enforcement to be applied in part by the State courts and administrative machinery and in part by the local authorities. The necessary special traffic control and traffic patrol police should be provided and the regular police should participate in traffic enforcement. Provision should be made for prompt and thorough collection of evidence and investigation of accidents; for special traffic courts or special traffic sessions of general courts, and traffic violations bureaus with a schedule of penalties for disposing of minor infractions, so as to give the courts more time to deal adequately with more serious cases; uniform permanent records of all convictions of traffic violations and traffic accidents, suspensions and revocations of operators' licenses and refusals to grant licenses; and exchange of detailed information between jurisdictions as to suspensions and revocations of licenses and convictions for serious traffic offenses. Neither the traffic officers nor the court judges should receive any fees from the money collected from traffic convictions.⁷

8. The courts and the police through vigorous enforcement and even-handed treatment of offenders should instill in the public respect for the traffic laws and regulations.⁸

9. Public opinion in support of enforcement should be organized through a representative citizens committee in each locality, forming part of an organized effort of all elements in the community interested in street and highway accident reduction.⁹

Education:

10. Education in safety and accident prevention should be incorporated in the curricula of elementary schools, both public and private, parochial schools, night schools, vocational schools, citizenship schools and schools for non-English speaking adults, and should also be carried on through educational contests, organized playground training, school boy patrols, boy and girl scouts, and juror safety organizations. More advanced training in safety and traffic matters should be developed in secondary schools, normal schools, schools for playground supervisors, engineering schools and universities, including training of traffic engineers.¹⁰

11. A uniform manual should be compiled and distributed for the education of operators of motor vehicles in safe driving practices, divided into two sections, one comprising special instructions to drivers of commercial vehicles and the other special instructions to drivers of private passenger automobiles; and standardized plans should be further developed and put into operation for the education in safe driving and accident prevention of the employees of steam and electric railways, employees of taxicab and motor bus companies, and the drivers employed by operators of commercial vehicles.¹¹

12. Plans should be developed and put into operation for the education in safety of the general public through:

- (a) Newspaper and magazine publicity, including the foreign language press.
- (b) Posters in public places.
- (c) Motion pictures and lantern slides.

⁶ Report of Committee on Uniformity of Laws and Regulations, 1926, p. 15.

⁷ Report of Committee on Enforcement, 1926, pp. 7-9, conclusions 1, 3, 6-7 and 12-14, and pp. 11-16 and 18-20.

⁸ Report of Committee on Enforcement, 1926, p. 8, conclusion 8, and pp. 16-17.

⁹ Report of Committee on Enforcement, 1926, p. 9, conclusion 17, and pp. 21-24.

¹⁰ Report of Committee on Education, 1924, pp. 7 and 8, conclusions 1-5, and pp. 9-15; First Conference on Street and Highway Safety, pp. 30 and 33.

¹¹ Report of Committee on Insurance, 1924, p. 8, conclusion 1b, and p. 12; Committee on Education, 1924, p. 8, conclusion 7, and pp. 16-18; First Conference on Street and Highway Safety, pp. 32 and 33.

- (d) Radio talks.
- (c) Schools for motorists, including both men and women.
- (f) Safe drivers clubs.
- (g) Safety programs or addresses at meetings of various organizations.
- (h) The churches.
- (i) Mass meetings.
- (j) Plans for reaching parents through school children.
- (k) Special campaign.¹²

13. Standardized plans should be developed for the selection and training of traffic officers, and such plans should be put into operation by all communities either alone or in cooperation with other communities, or on a State-wide basis, so that the benefits of such training may be available to the smaller communities.¹³

Statistics:

14. To promote a better understanding of the traffic accident problem and the measures which should be taken for the elimination of accidents, accurate, complete and up to date statistical information should be secured by the duly authorized State officials, or, in large municipalities, by municipal officials, regarding all traffic accidents, with standard definitions of terms and reasonable uniformity in reporting and tabulating schedules, under the following headings:

- | | |
|--|---|
| (a) Location (place and position) | (m) Condition of car or cars at time of accident |
| (b) Time (hour) | (n) Speed of car or cars |
| (c) Type of accident | (o) Primary cause of accident |
| (d) Weather | (p) Contributing causes or circumstances of accident |
| (e) Road conditions | (q) Violation of traffic ordinances or motor vehicle laws |
| (f) Lighting conditions (street) | (r) Age and sex of injured |
| (g) Physical condition of persons involved | (s) Extent and character of injuries |
| (h) Experience of driver | (t) Character and amount of property damages |
| (i) Age and sex of driver | (u) Preventive safeguards recommended |
| (j) Relation of driver to car ownership | |
| (k) Mental condition of driver | |
| (l) What was the driver doing | |

The information secured should be analyzed and the summarized results published promptly and frequently. Accident spot maps should be maintained to detect those points at which accidents occur most frequently and to form the basis for plans to eliminate the conditions which cause accidents.¹⁴

15. To promote popular understanding and attention to the accident problem and stimulate competition between various communities in accident reduction, a comparative index rating of all the States and communities should be set up through the Bureau of the Census with the cooperation of the organizations concerned.¹⁵

16. A contest in accident reduction, based on (a) the performance of each State or community for each year as compared with its previous record, (b) the adoption of measures recommended by this Conference for improvement of traffic control and enforcement, and (c) the provision of improved traffic facilities, is recommended to such organization or organizations as may be able to undertake such a contest.

Causes of Accidents:

17. A comprehensive program of research into the causes of street and highway accidents should be undertaken by a national body qualified for the purpose with the cooperation of other organizations interested, with a view to determining the direct and contributing causes of accidents and the frequency of the various hazards, and with a view to pointing the way to im-

¹² Report of Committee on Education, 1924, p. 8, conclusion 8, and pp. 18-21; First Conference on Street and Highway Safety, p. 34.

¹³ Report of Committee on Education, 1924, p. 8, conclusion 6, and pp. 15 and 16; First Conference on Street and Highway Safety, p. 30.

¹⁴ Report of Committee on Statistics, 1924, pp. 7 and 8, conclusions 2 and 5-9, and pp. 9-17 and 20-27; First Conference on Street and Highway Safety, pp. 10-21; Committee on Statistics, 1926, pp. 8 and 9, conclusions 9 and 10.

¹⁵ Report of Committee on Public Relations, 1926, p. 10.

improvements from the standpoint of safety in design, construction and adjustment of motor vehicles; design, construction and maintenance of streets and highways; traffic laws, regulations, systems, signs and signals; and methods of examining applicants for operators' licenses, including special examinations for professional drivers, persons suffering from physical or mental handicap, and persons who may be brought before the courts or motor vehicle commissioners for repeated traffic violations.¹⁶

Design and Maintenance of Motor Vehicles:

18. Continued effort on the part of manufacturers is urged with a view to improving further the design and construction of motor vehicles and accessories from the safety standpoint, with particular reference to proper road illumination without dangerous glare; construction and location of controls, accelerator and brake pedals to minimize possibility of confusion or uncertainty of application by the driver; greater certainty, durability and readiness of adjustment of brakes; improvement of driver vision, and other safety features.¹⁷

19. A simple and practical inspection chart and code applicable to all makes of motor vehicles, giving particular attention to items affecting safety, should be prepared and issued through the Department of Commerce; and public authorities having supervision of motor vehicles carrying passengers and freight for hire should require adequate inspection and upkeep of such vehicles.¹⁸

Street and Highway Traffic Facilities:

20. A comprehensive traffic improvement program, including urgent immediate items and long-time items, should be undertaken in every community or metropolitan area confronted with a traffic problem. In the preparation of such a program due consideration should be given to the relation of costs to benefits in safety and acceleration of traffic, and the program should be properly worked out and budgeted.¹⁹

21. The traffic improvement program should be based on a thorough traffic survey giving the necessary physical and traffic data and kept up to date, and due attention should be given to city and regional planning and zoning in their effect on traffic. The program should include:

(a) A transit plan, covering facilities for the mass movement of population by vehicles of all classes, including rapid transit, steam railroad commuter service, street car lines, bus lines, private automobiles and other means.

(b) A street and highway plan, providing for main thoroughfares, bypass and interconnecting thoroughfares, secondary streets, business and industrial streets, and local residence streets, with any necessary enlargements and improvements required to carry the traffic with expedition and safety.

(c) A traffic control plan, to provide for the orderly improvement of facilities and measures for the safe, efficient and complete utilization of street and highway capacity.

A sound financial program should be established which will insure properly balanced progress in such improvements and will properly distribute the burden of providing the necessary funds.²⁰

22. To insure proper planning of traffic facilities and traffic control, to assure cooperation of the different departments of city or local governments concerned and to enlist public support, a traffic planning organization should be created in each city or metropolitan area as follows:

¹⁶ Report of Committee on Causes of Accidents, 1926, pp. 9-11, conclusions 7-14, and pp. 16-23.

¹⁷ Report of Committee on the Motor Vehicle, 1924, pp. 7-18; First Conference on Street and Highway Safety, pp. 27 and 28.

¹⁸ Report of Committee on the Motor Vehicle, 1924, pp. 10-11, and p. 18; First Conference on Street and Highway Safety, p. 28.

¹⁹ Report on Committee on City Planning and Zoning, 1924, pp. 8 and 9, conclusion 8, and p. 19; Committee on Public Relations, 1924, p. 9; First Conference on Street and Highway Safety, pp. 16, 19 and 23; Committee on Metropolitan Traffic Facilities, 1926, p. 10, conclusions 2-4, and p. 19.

²⁰ Report of Committee on Traffic Control, 1924, p. 10, conclusion 9, and p. 18; Committee on City Planning and Zoning, 1924, pp. 7 and 8, conclusions 1, 3, 5 and 7, and pp. 10-18; First Conference on Street and Highway Safety, pp. 21-23; Committee on Metropolitan Traffic Facilities, 1926, pp. 10 and 11, conclusions 5-7, and pp. 19-23.

(a) In each city there should be an official traffic commission, including such officials as the chief of police, city engineer, engineer of the city plan commission, chief of the fire department, a representative of the public authority supervising city transit and transportation, a member of the city council, and a representative of the city's legal department. This commission should be a permanent body having the services of an engineering staff, preferably in charge of a trained traffic engineer, and should prepare a comprehensive traffic plan, make and keep up to date a traffic survey, and recommend a traffic ordinance and regulations or recommend from time to time any necessary modifications in the existing ordinance and regulations.

(b) It will also be of value to have a traffic committee not made up of officials but including representatives of street railway companies, motor bus companies, taxicab companies, trucking organizations, chambers of commerce, automobile clubs and associations, safety councils, merchants' associations and other interested groups. The traffic committee should serve in an advisory capacity to the traffic commission and assist in securing the interest and support of various representative organizations and the public generally. If there is no traffic commission the traffic committee may temporarily carry out the functions of both bodies.

(c) In the improvement of main highways leading to and from large centers of population it is frequently found that administrative jurisdiction over various sections of the road is divided among municipal, county, State and even national authorities. In such cases practical results in relieving traffic congestion will usually be obtained most quickly by voluntary cooperation between the authorities concerned through the creation of joint boards to consider and determine policies of location, construction, maintenance and use of the highways.

(d) To provide unified consideration and treatment of traffic problems in metropolitan areas which include more than one city or a city and politically independent suburbs, it will generally be necessary to depend upon an enlargement of the unofficial traffic committee of the central city by adding proper representatives of important suburban communities, or, in the case of two large cities in a single metropolitan area, to form a joint traffic committee with representatives of suburban communities added. When developments warrant, an official metropolitan authority should be created to control physical growth and provide for proper traffic facilities within large population centers.²¹

23. In street and highway construction attention should be given to adequate roadway width with provisions for pedestrians, adequate rights of way to provide for parking space, for clear view at curves and intersections and for future roadway widening; space for parking off the traveled portion of rural highways, either continuously or at intervals not exceeding 300 feet; reasonable grades of not more than six per cent where feasible on thoroughfares of primary importance; curves of not less than 300-foot radius on highways of primary importance; widening and banking of curves; avoidance of combinations of heavy grades and sharp curves; adequate curb radii and smooth grades at street intersections; cross-sections of the pavement or roadway as flat as drainage conditions will permit; guard railings of substantial type on the shoulder of embankments; clear view of approaching vehicles for at least 300 feet on highways of primary importance, provided by necessary control of private advertising signs on the right-of-way or upon private property near the highway and by the removing of trees, shrubs and sloping banks on or off the right of way at curves and intersections, and the cutting down of sharp hillcrests; bridges at least 22 feet wide, to enable two lines of traffic to pass without difficulty, and suitable provision for the safety of pedestrians on such bridges; careful selection and clear marking of detours and maintenance thereof in safe condition; maintenance in good condition of pavements and roadway shoulders; prompt snow removal from streets and highways of heavy traffic; proper signs, signals and highway surface markings on a uniform basis; and proper illumination of city streets, and of State highways wherever financially practicable.²²

²¹ Report of First Conference on Street and Highway Safety, p. 16; Committee on Metropolitan Traffic Facilities, 1926, pp. 11 and 12, conclusions 8-10, and pp. 24-28.

²² Report of Committee on Construction and Engineering, 1924, pp. 5-8, conclusions 1-2, 4-10, 14-17, 21 and 23, and pp. 9-14 and 18-24; First Conference on Street and Highway Safety, pp. 23-27.

24. Adequate playgrounds throughout the community should be provided, and particularly there should be available a playground for every school as a safety measure to keep the children off the streets. Schools and playgrounds should, as far as practicable, be so located that children will not have to cross busy traffic streets in going to and from them. Adequate provision for skating and coasting, where practicable, should be made in parks and playgrounds, properly lighted and supervised, or on streets set apart, safely marked, and traffic controlled during the hours used for these purposes.²³

Elimination and Protection of Grade Crossings:

25. Elimination of grade crossings, either by relocation of highways or rail lines or by grade separation, which constitutes the only perfect solution of the problem, should be carried on under a proper program, first eliminating the most dangerous crossings on thoroughfares carrying heavy traffic, and with due recognition of the enormous costs involved, which, if elimination were attempted on a wholesale scale, would impose an excessive financial burden resting in the last analysis upon the public. The program should have due regard to the relative costs and advantages of grade crossing elimination and other methods of protection, and should be given the most thorough joint consideration by proper authority. In laying out new highways or railroads, or relocating existing highways or railroads, grade crossings should be avoided or eliminated whenever feasible. In eliminating grade crossings, narrow or obstructed underpasses and sharp turns in the approaches thereto should be avoided. Authority to order grade separations or proper protection at grade crossings should be vested in the commission having jurisdiction over the railroads, and this commission should also determine the proper division of costs between the railroads and the public. The State highway department or other highway authorities should plan the improvement and initiate the proceedings for all highways under their jurisdiction. Time is an essential element and a prompt decision should be provided for in the law.²⁴

26. Railroad crossings remaining at grade should be safeguarded in every reasonable way. Standard warning signs and pavement markings should be used to mark clearly the approaches to all public railroad crossings. Where the volume of traffic requires it, additional protection should be afforded by the use of flagmen, gates or approved electric or mechanical devices standardized as far as practicable. So far as possible a clear view along the track in both directions from both sides thereof should be maintained. The placing of railroad cars near unprotected grade crossings so that the view is thereby obstructed should be discouraged. Sharp curves, abrupt changes of grade, roughness in the pavement or other conditions at or near the tracks which tend to divert the attention of the motorist should be avoided. Properly designated State commissions should be empowered to designate dangerous grade crossings at which motorists must stop.²⁵

²³ Report of Committee on City Planning and Zoning, 1924, p. 8, conclusion 6, and pp. 17 and 18; First Conference on Street and Highway Safety, p. 19.

²⁴ Report of Committee on Construction and Engineering, 1924, p. 6, conclusions 11 and 12, and pp. 15-17; Committee on City Planning and Zoning, 1924, p. 7, conclusion 1a, and pp. 10-11; Committee on Public Relations, 1924, pp. 9 and 10; First Conference on Street and Highway Safety, pp. 16 and 17.

²⁵ Report of Committee on Construction and Engineering, 1924, pp. 6 and 7, conclusion 13, and pp. 17 and 18; First Conference on Street and Highway Safety, 1924 pp. 17 and 26.

APPENDIX B—CHIEF PROVISIONS OF UNIFORM MOTOR VEHICLE
REGISTRATION ACT RECOMMENDED BY NATIONAL CONFERENCE
ON STREET AND HIGHWAY SAFETY

Motor Vehicle Department or Division—The State is to have a vehicle department or division of an existing department, with a motor vehicle commissioner in charge, whose duties are to enforce the provisions of the vehicle act or acts, keep all license and registration records, maintain and publish or post records of suspension and revocation of operators' licenses, and collect, analyze and publish accident statistics.

Registration of Vehicles—All motor vehicles, with the exception of farm tractors, road rollers and road machinery temporarily operated or moved on the highways, must be registered, and number plates must be displayed on the vehicles. Registrations must be renewed annually, and new registrations must be obtained when the ownership of a vehicle is transferred. The act also contains provisions to enable manufacturers and dealers to move vehicles under certain conditions without separately registering each vehicle, to make it possible to obtain duplicates for lost number plates or registration cards, and to enable the department to suspend registrations upon notice of theft or embezzlement of vehicles.

Reciprocity—Complete reciprocal rights and privileges in all States with reference to vehicles registered are provided for non-residents.

For Rent Cars—Owners of motor vehicles for rent without drivers are made liable for the negligence of the drivers of such vehicles, are required to carry public liability insurance, and are required to maintain public records of the identity of persons renting their vehicles and the time such vehicles are in the possession of such persons.

Refusal or Cancellation of Registrations—Registrations are to be refused when the applicant has not complied with the requirements, and registrations are to be rescinded for causes specified. Violations of the registration provisions are made unlawful.

Registration Fees—The act assumes that it is the function of each State to determine the amount and disposition of the registration fees.

Unlawful Taking, Transfer of or Injury to Vehicles—Driving a vehicle without the owner's consent, injuring a vehicle and tampering with it except in an emergency or under the direction of a public officer are made misdemeanors, and knowingly receiving or transferring a stolen vehicle is made a felony.

APPENDIX C—CHIEF PROVISIONS OF UNIFORM MOTOR VEHICLE
ANTI-THEFT ACT RECOMMENDED BY NATIONAL CONFERENCE
ON STREET AND HIGHWAY SAFETY

Certificate of Title Required for Registered Vehicles—No motor vehicle shall be registered unless and until the owner thereof shall apply for and be granted an official certificate of title for the vehicle, or present satisfactory evidence that the department has previously issued a certificate for the vehicle. The department shall issue a certificate when satisfied that the applicant is the owner of the vehicle, such certificate to carry thereon a statement of all liens and encumbrances on the vehicle. Such certificate shall be good for the life of the vehicle so long as the vehicle is owned by the original holder of the vehicle. Duplicate certificates may be issued if the originals are lost.

Endorsement and Delivery of Certificate Upon Transfer of Title or Interest—The owner of a motor vehicle must not sell it unless he has obtained a certificate of title therefor, and when selling a vehicle for which he has such certificate, must endorse on the certificate an assignment and warranty of title with a statement thereon of all liens and encumbrances on the vehicle. The transferee shall present this certificate thus endorsed to the department, and shall apply for and obtain a new certificate.

Refusal to Issue Certificate or Rescission of Certificate—Certificates of title are to be refused when the applicant has not complied with the requirements, and certificates granted are to be revoked for proper reasons.

False Statements and Altering or Forging Certificates—Making a false statement in any application or other document required by the act is made unlawful. Altering or forging a certificate of title is declared a felony.

Anti-Theft Provisions—Police officers must report and the department must maintain a list of stolen motor vehicles. Destroying or altering an engine or serial number is made a felony, except that an owner may restore a number on a vehicle for which a certificate has been granted. Receiving or transferring a stolen vehicle is made a felony.

Dealers in Used Cars—Dealers in used cars must be licensed by the department, and must maintain records of every motor vehicle bought, sold or exchanged.

Auto-Theft Fund—All fees and revenues received under the act are to go into the "Auto-Theft Fund," which is to be used by the department in carrying out the provisions of the act.

APPENDIX D—CHIEF PROVISIONS OF UNIFORM MOTOR VEHICLE OPERATORS' AND CHAUFFEURS' LICENSE ACT RECOMMENDED BY NATIONAL CONFERENCE ON STREET AND HIGHWAY SAFETY

Operators and Chauffeurs Must Be Licensed—No person may drive a motor vehicle upon the highways, either as an operator or as a chauffeur, without first having been issued a license, unless expressly exempt.

Reciprocity—Complete reciprocal rights and privileges in all States, with reference to drivers' licenses, are provided.

Age Limits—Minimum age limits of sixteen years for operators and eighteen years for chauffeurs are established. No person under eighteen is permitted to drive a vehicle in use as a school bus, and no person under twenty-one is permitted to drive a public passenger-carrying vehicle. The application of a minor for a license must be signed by the applicant's parent, guardian or employer, and such parent, guardian or employer is held jointly responsible with the minor for any damages caused by negligence of a minor when driving a motor vehicle, as is the owner of a vehicle a minor is knowingly permitted to operate.

License Restrictions and Examination of Drivers—Besides persons under the legal ages, licenses are not to be issued to any habitual drunkard or narcotic drug addict, or to any person found by the vehicle department to be incompetent to operate a motor vehicle with safety. The department is required to examine every applicant for a license before issuing same, except that it may waive the examination of any person applying for a renewal, or of any person who has operated a vehicle satisfactorily in the State for not less than one year at the time the law goes into effect.

Duration of Licenses—Chauffeurs' licenses are to be renewed annually, but operators' licenses are made valid until suspended or revoked, except that the department may order the renewal of all outstanding operators' licenses not more often than once in three years.

Suspension and Revocation of Licenses—The courts are authorized to recommend suspensions of licenses, but power to suspend or revoke is vested in the department, which may suspend or revoke for reasons which the department deems sufficient, subject to right of appeal to the court. Suspension or revocation is mandatory for certain major offenses. No person whose license has been revoked may receive a new license within one year after such revocation.

Liability for Public Employees—Counties, cities and municipalities are held jointly liable for damages caused by the negligence of their employees while driving in the course of their employment.

APPENDIX E—CHIEF PROVISIONS OF UNIFORM ACT REGULATING
THE OPERATION OF VEHICLES ON HIGHWAYS RECOMMENDED
BY NATIONAL CONFERENCES ON STREET AND HIGHWAY
SAFETY

Driving While Intoxicated—Driving while under the influence of intoxicating liquor or narcotic drugs is declared unlawful and punishable as provided elsewhere in the act.

Reckless Driving—Reckless driving is defined and declared punishable as provided elsewhere in the act.

Speed Restrictions—Subject to the provisions that a vehicle shall not at any time be driven at a speed greater than is reasonable and proper, having due regard to all of the existing conditions, it is declared *prima facie* lawful to drive a motor vehicle at a speed not exceeding fifteen miles an hour in congested districts, twenty miles in residential districts, and thirty-five miles in the open country. Exceeding these speeds is declared *prima facie* unlawful. Local authorities are authorized to increase the speed limits on through traffic highways properly safeguarded, and the speed limits are declared not applicable to certain emergency vehicles. Provisions are made for special speed limitations according to weight and tire equipment, and for special limitations on bridges.

Railroad Grade Crossings—Failure to obey railroad warning signals is declared unlawful, and the proper State authorities are empowered to designate certain grade crossings at which all vehicles must come to a complete stop.

Driving on Right Side—Vehicles are required to drive on the right side where possible, and particularly at intersections and railroad crossings. Slow moving vehicles must keep as close as possible to the right hand edge or curb of the highway.

Meeting of Vehicles—Vehicles meeting must pass each other to the right, each driver giving the other at least half of the traveled way where possible.

Overtaking a Vehicle—Vehicles overtaken must be passed on the left. A vehicle in overtaking must not be driven to the left of the center of the highway unless the left side is clearly visible and free from oncoming traffic for a sufficient distance ahead to permit such overtaking in safety. Overtaking is prohibited at highway intersections or railroad crossings, and on curves and on the crests of hills where the driver's view along the highway is obstructed within 500 feet. Vehicles being overtaken must give way to the right when signaled.

Following Too Closely—One motor vehicle must not follow another more closely than is reasonable and prudent. Outside of business and residence districts one motor truck must not follow another motor truck within 100 feet.

Turning at Intersections—Drivers of vehicles intending to turn to the right at intersections are required to approach such intersections in the lane of traffic nearest the right hand side of the roadway. Those intending to turn to the left are required to approach in the lane to the right of and nearest the center line, and to pass to the right of the center of the intersection. Local authorities may modify these rules by placing suitable markers or direction signs.

Signal on Starting, Stopping or Turning—Drivers intending to start, stop or turn must first see that they can do this in safety and must give a signal either with an approved mechanical or electrical device or by extending the arm horizontally beyond the left side of the vehicle.

Right of Way—Except at through traffic highways, and except in the case of fire, police or other emergency equipment, vehicles approaching an intersection are required to yield the right of way to vehicles approaching the intersection at approximately the same time from the right. Except as controlled by traffic officers or traffic signals, vehicles are required to yield the right of way to pedestrians on marked crosswalks or regular pedestrian crossings included in the prolongation of sidewalk lines at the ends of blocks; elsewhere in the roadway pedestrians are required to yield the right of way to vehicles.

Through Highways—The public authorities are empowered to designate certain through highways and erect "stop" signs at the entrances thereto from all intersecting highways, and all vehicles must come to a full stop before entering or crossing such through highways from an intersecting highway.

Passing Street Cars—Street cars must not be overtaken on the left when a travelable portion of the highway exists on the right. The driver of a vehicle overtaking a street car stopped or about to be stopped to receive or discharge passengers must stop not less than ten feet in the rear of the street car and not proceed until any passengers have boarded the car or reached the adjacent sidewalk, except that where a safety zone has been established, or where the traffic is controlled by an officer or traffic signal, they may proceed with caution, at a speed not greater than ten miles per hour.

Driving Through Safety Zone—Driving through a safety zone is prohibited whether or not the zone is occupied.

Stopping on Highway—Except in case of an emergency, stopping or parking on the traveled portion of a rural highway is prohibited when it is practicable to stop or park off the traveled portion.

Stopping and Reporting in Event of Accidents—Drivers are required to stop immediately in the event of accident, give their names, addresses and license and registration numbers and render reasonable assistance to injured persons, and to report serious accidents to the Department or other designated authorities within twenty-four hours. Garage keepers are required to report damaged vehicles within twenty-four hours.

Size, Weight, Construction and Equipment—General provisions controlling the size, weight, construction and equipment of vehicles are provided, and the Department is authorized to supplement these provisions with regulations as the conditions require. The subjects covered include size and weight of vehicles and loads, tire equipment, trailers and towed vehicles, brakes, horns and warning devices, mirrors, windshields, muffler cut-outs and lighting equipment. Required and additional permissible lighting equipment is indicated, and the requirements as to head lamps and auxiliary driving lamps, test and approval of lamps and the enforcement of the provisions are set forth. Requirements for lights on parked vehicles are indicated, and red and green lights visible from the front are prohibited.

Penalties—Penalties are provided for misdemeanors under the act and special penalties, including specified minimum penalties and higher minima for second or subsequent convictions, are provided for driving while intoxicated, reckless driving, failure to stop in event of accident involving personal injury or death, and felony. These penalties for major offenses are in addition to the mandatory revocations of licenses provided in the proposed Uniform Motor Vehicle Operators' and Chauffeurs' License Act.



AND WEIGHT RESTRICTIONS RECOMMENDED
 MOTOR VEHICLE CONFERENCE COMMITTEE

Size Restrictions

1. Width, including load, 96 inches. (Traction engines 108 inches.)
2. Height, including load, 14 feet 6 inches.
3. Length, including load:
 - a. Single vehicle, 33 feet.
 - b. Combination of vehicles, 85 feet.

NOTE.—From the foregoing it is apparent that in order to admit of the safe passage of two vehicles each of which with its load is 96 inches wide, a highway at least 20 feet in width is desirable.

Weight Restrictions

1. Single vehicular unit of four wheels or less. (Tractors and semi-trailers to be regarded as separate units)..... 28,000 pounds
2. Any one axle of the vehicle or any additional axles or semi-trailers or trailers 22,400 pounds
3. Per inch width of tire measured between flanges of the rim in case of solid rubber tires.

Size of tire	Load per inch (Maximum)
3".....	400 pounds
3½".....	400 "
4".....	500 "
5".....	600 "
6".....	700 "
7".....	750 "
8".....	800 "
10".....	800 "
12".....	800 "
14".....	800 "

4. Minimum thickness of rubber for solid rubber tires:

3"; 3½"; 4"; 5" Tires.....	¾"
10"; 12"; 14" Tires.....	1½"
6"; 7"; 8" Tires	1"