

THE WORKER'S POINT OF VIEW

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A Symposium

With a Preface by C. T. Cramp
(General Secretary, National Union of Railwaymen)



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INTRODUCTORY NOTE

THESE articles appeared originally in *The Human Factor*—the journal of the National Institute of Industrial Psychology. They have undergone no revision beyond occasional “cuts” and the minor alterations of paragraphing, etc., to which all manuscripts submitted for publication are liable. They do not, of course, necessarily represent the opinion of the Institute, which is a non-political and entirely non-partisan body; but with their emphasis on the need for treatment of the worker as a human being rather than a machine, and with their demonstration of the importance of an understanding of human motives and reactions on the part of those directing industry, the Institute is in whole-hearted agreement.

C. S. MYERS

Principal, National Institute of Industrial Psychology.

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PREFACE

THE publication of *The Worker's Point of View* is very timely. At this moment when European conceptions of the organization of Society appear to be in the melting-pot, it is opportune that the point of view of those who are the most numerous of the community should be understood. The individual worker, of course, is like every human being. There are variations in temperament and disposition, yet there are certain broad generalizations which can be adopted as a guide to his general attitude towards life and the times in which he lives. The worker's mental background is coloured to a great extent by his material needs. A man who has only one or two pay days between himself and the Public Assistance Committee is certain to pay heed to the material factor when confronted with any of the ordinary problems of life. For instance, I have been tremendously struck by the different way in which an "advanced" trade unionist examines an economic problem, as compared with an academic socialist of the university type. The latter is invariably far more revolutionary in his expressions and far less aware of the immediate consequences of any action which may be urged than is the worker, the difference being accounted for by the fact that the trade unionist probably knows already what it is to be up against the grim facts of

hard living and unemployment, while the former, having only heard and read of these things, looks upon revolution as an adventure and thinks only of the romantic side of the exploit.

It is, of course, true, as suggested in this book, that the worker is usually conservative in respect of changes in method and technique. He always fears that his work and livelihood may be in danger. Security is something he has never had; and always he fears the unknown. I am now speaking of the British worker. A few years ago, when in the Western Hemisphere before the present world-wide depression had changed the outlook of our trans-Atlantic friends, I was very struck by the wide difference in outlook between them and the workers in our own country. They betrayed no anxiety to stick to one job. In their own phraseology, they were always prepared to "take a chance." Usually, of course, they were quite safe in so doing, as there was practically no unemployment and a man with a taste for adventure and change had no difficulty in securing a good job with a higher standard of living than prevailed here. In these islands the time has long gone by when the average workman could gaily sally forth into the world with his bag of tools in his hand, confident of finding work; and this difference between the two sets of workmen strengthens my conviction that it is the insecurity of employment which provides that material background of the mentality of the British worker.

This book, containing contributions by writers who

have made a close study of the subjects upon which they write, should be of the greatest service in enabling all who wish to understand the worker's point of view to have a much better grasp of the subject than has hitherto been possible; and I trust it may be widely read.

C. T. CRAMP

I
A WORKING MECHANIC'S VIEW

BY

W. F. WATSON

W. F. WATSON

MR. WATSON was born in East London—one of eight children—and started work for a local tradesman at the age of ten. He was an office boy in the city at the age of thirteen, and at fifteen a shop-boy in a printing works. He then worked in various engineering shops, and at twenty-one was a journeyman engineer's mechanic and a member of the Amalgamated Engineering Union. He has worked for at least fifty firms, and been engaged in the manufacture, among other things, of sewing-machines, phonographs, electric bulb filament, torpedo destroyers, aeroplanes and cinema machinery. He has contributed articles to various journals and reviews.

A WORKING MECHANIC'S VIEW

I. TOOLS AND TACKLE

Not very long ago I secured employment in the turnery of a big, up-to-date firm of motor-vehicle builders, noted throughout the world for the quality of its products. Its buses, charabancs, and lorries are probably the most reliable on the road.

The internal organization of the factory appeared to be of the best. A progress card was issued with each job, and remained with it throughout the numerous operations, so that it could be "chased" from start to finish, no matter how many departments it had to go through. The bonus system was simple and easily understood; each man knew he would receive as bonus tenpence for each hour he saved.

Normally, no man had need to wait about for a job. If he gave the shop foreman an hour or so's notice of the completion of the one in hand, another would be ready for him to step into without a pause. Shop labourers were always about to keep the machines free from turnings, lift heavy chucks and jobs, and fetch and carry for us generally. The supply of cutting lubricant left nothing to be desired.

If time limits were tight, there was immediate, and usually successful, appeal to the rate-fixing department; and, at specified times, clerks were posted to

receive and examine complaints of errors in wages or bonus. Conferences of managers and departmental foremen were held periodically to inquire into causes of scrap, to discuss progress, improvements, rates and the like. Finally, the machinery was reasonably modern: at any rate, in good condition. The auto, turret, grinding and brass shops, the drifting plant and the tool room, were good. In short, one's first impressions were that it was a smoothly running, well-organized establishment.

While certainly not new, the ten-inch American lathe that was handed over to me was in good condition, had modern attachments, and was adaptable for high-speed production. My first job was to machine some small experimental pistons, four inches in diameter, with an inch chucking boss. I looked for the chuck. Inquiries elicited the information that I would have to share two chucks—one eight-inch and one fourteen-inch—with another lathe of identical size and pattern. Of course, the other man was using the small one, so I had to put up the huge fourteen-inch chuck to grip a job an inch in diameter!

The chuck key was the next problem. There was one, somewhere, for that chuck, I was told—it *must* be about *somewhere*. Perhaps Joe Martin, that chap on the big lathe, right at the other end of the shop, had it. Joe Martin had a chuck key all right, but as he was using it for a short operation job he could not release it. There were a few spares in the stores, either too big or too small. On the advice of the foreman I adapted a large one and proceeded to

mount the job. A quarter of an hour was then spent in raking round the bed of the lathe and the cupboard for the tool-post spanner, all in vain. My next-door neighbour vouchsafed the opinion that Harry Bell had "knocked it off," but as there was no distinctive mark on it, and I was a newcomer, it was useless to try and claim it. Fortunately I had a hardened three-eight spanner in my kit which answered the purpose.

Without any exaggeration, at least two hours were wasted simply because the management, while well organized in the big things, did not appear to pay any attention to what one might term the "important trivialities" of small tools and tackle. This is merely an extreme example of conditions which I have met with almost universally in my thirty years' experience as a working mechanic. One can easily appreciate the financial difficulties of firms who eke out a precarious existence, living from hand to mouth, as it were, by executing repairs, or by doing work for the trade at cut prices; but one fails to understand why big firms should pursue such a penny-wise-pound-foolish policy as to neglect the tools and tackle.

Few shops are equipped with sufficient spanners. Consequently, men have to borrow from each other, which entails much loss of time and friction between the chaps when one fails to return it quickly enough. I pointed this out to a manager on one occasion, and he promised to buy a couple of complete sets. When, a few days later, he brought me a set of flimsy plate spanners (Meccano pattern), I was so disgusted that

I flung them on the bench without thanking him for them! Many a bearing has run hot and seized up, many a centre point has been burned off, through scarcity of oil-cans. There may be one attached to your lathe, but when you want to use it in a hurry you find that Joe Martin, at the other end of the shop, has borrowed it. There will be about three oil-cans between a dozen or twenty men!

Small drill chucks and centre drills are being continually used on the lathe, but it's often a deuce of a job to get hold of a good chuck, and firms are very niggardly with centre drills. Some chucks are frightfully battered about, mainly because turners knock them out of the tail stock with a hammer, because the shank of the chuck is too short to allow it to be ejected by the poppit screw. This battering distorts the chuck, with the result that it is out of alignment with the centre of the job. Imagine the trouble and annoyance experienced in trying to drill a true centre in these circumstances! To say nothing about the time that is wasted, and the number of centre drills broken. Good chucks must mean economy in drills.

I once worked for a famous firm of cinema projector manufacturers. They had their own generating plant and foundry. The engineers' shop was equipped with the latest pattern Brown and Sharpe milling machines, Pratt and Whitney engine lathes, Rheineker relieving lathes, Herbert turrets, Pitlers and automatics. And stuck right in the middle of the shop was an antiquated pillar drilling machine, check by jowl with an equally aged radial

drill, with one decrepit "little Giant" chuck between them, which must have seen at least thirty years' service. The drills were mostly of the parallel-shank variety and worn out. To drill a five-eight hole in a piece of half-inch flat stock—a two minutes' job—took quite half an hour, and was a dangerous job withal.

For the convenience of the mechanics, who had to do all their own drilling, there were two double-spindle sensitive drill presses, excellent machines when kept in proper order. There was always plenty of drilling to do, but as there were only two decent chucks between the three machines, we invariably had to waste time waiting our turn to use the drill press.

And the belting! The belt of one sensitive drill was in eight pieces, I'll swear! I've had to repair the thing three times in one morning. There was plenty of belting in the stores to be sure—balata and leather—but it was very old and perished. The firm refused to buy any new belting until all the old stuff was used up. During the two years I was there, it seemed that everyone was for ever fiddling about with belts, or waiting for the maintenance man to come along.

When in need of a tool, we searched a box containing odds and ends of mild, cast and high-speed steel of all sizes and shapes. If we found a piece which seemed suitable, it had to be tested before forging and grinding to requirements. I am quite certain that the output of that shop could easily have been doubled without asking any man to work harder—indeed, no man would need to work so

hard—simply by properly organizing the small tools and tackle service.

Morse drill collets and drifts are also details which cause unnecessary trouble and waste of time: seldom is there a sufficiency of them. The drift gets lost, there is no file tang handy, so the thoughtless user, in a hurry, loosens the collet by banging it with a hammer, and badly bruises it. Then some silly "blighter" tries to jam a badly ground inch drill through a job without first fastening a carrier on the drill to prevent it spinning round. The drill revolves, scores the collet and the inside of the tail-stock sleeve, and makes a mess of both. And the man wonders why the lathe centre wobbles!

It is usually difficult to get suitable carriers, by the way. The screws are too short, or broken, or so burred up as to be useless. Nobody seems to bother except the man who happens to be wanting to use one: he swears! Boring bars, cans and brushes for cutting lubricant, dusting brushes for keeping the lathe free from muck and turnings, belt dressing, rope, packing for tool posts, are other "important trivialities" neglected by many managements. Such things are as necessary as any other part of the plant.

It must not be thought, however, that such conditions are due entirely to bad management. They are due, as I shall suggest in a minute, to a failure to understand what might be called the psychology of property, and the blame for this failure must, I think, be laid ultimately at the door of management. But one cannot deny that, under

present conditions, the men show a carelessness and wastefulness which are simply appalling. There are some men who appear to be absolutely incapable of taking care of anything. Upon finishing an angle-plate job they sling the bolts, nuts, plates, packing, and washers indiscriminately in the bed of the lathe, in the cupboard, or on the floor. It never occurs to them to return what they have borrowed, or to put each nut back on the bolt, string washers, and neatly place plates and packing where they are easily accessible. "Let them as wants 'em find 'em, same as I had to do!" Flop goes the angle-plate on the floor. What matters if it is burred? The man who needs it next can file 'em off. Never mind about taking it back; give it a kick under the machine.

Such men do not seem to have the sense to hold a bit of packing (a spanner will do) between the body of the chuck and the poppit, so that the screw can easily eject it without damage—they just "biff it off" with a spanner or hammer. They bash the collets about, bend the spout of the oil-can, and if they break anything they never trouble to get it replaced by the management, but just "pinch" another from someone else. When a man leaves, the storekeeper is supposed to collect the kit, small tools, spanners, keys and the like, but when others have been there first, there is little to collect. Consequently, the new man has the same experience as that cited at the beginning of this article. Remonstrances only elicit the reply, "Oh, well! It's not yours, anyway. It belongs to the shop. . . .!" And in

this reply, I believe, lies the key to the whole situation.

People rarely value things that do not belong to them; still less do they value things that *partly* belong to them, unless they are placed exclusively in their charge, and it is in their interest to take care of them. Whilst they may have some respect for a thing that belongs entirely to somebody else, they have none at all for that which is considered public property, except at the particular moment when it serves their purpose.

Tom approaches Fred for the loan of a tool. Knowing Tom's predilection for sticking to borrowed tools, Fred at first demurs. "What's the matter with you?" exclaims Tom. "It's as much mine as yours, isn't it?" Fred takes the tool from the cupboard where he has carefully placed it, and asks Tom to return it as soon as the job is finished. A few days later, Fred wants to use the same tool.

"What tool do you mean?" Tom is quite surprised when Fred asks for it. "I don't remember borrowing a tool from you!"

"You know the tool I mean . . ." explains Fred impatiently.

"Ah! I remember now . . .!" and Tom fishes the thing from the bed of the machine, dirty, bruised, and generally battered.

"You might have taken care of it, and returned it," expostulates Fred, not without cause.

"What the hell are you grumbling at!" Tom is very angry. "It's not yours, is it? It belongs to the blooming shop!"

The promoters of scientific management made a fundamental mistake thirty years ago. They regarded every man as a machine without a personality. Everything was taken out of the shops and put in the stores. All the little gadgets the men had made for their own use, and tucked away in the cupboard against the day they might be needed again, were scooped up; and to make certain that the men should not hoard such useful things, they destroyed the cupboards.

They even tried to prevent us grinding our own tools by removing all emery wheels from the shop. When starting, half a dozen standardized tools, ground to theoretical angles on special machines, by unskilled labour, were issued to us. As they got dull, we were supposed to send the labourer to get them changed for others. Such a system might possibly answer in a shop engaged exclusively on repetition work, but to apply it in a general machine shop was farcical. Before very long we were continually running in and out of the stores to grind tools, and if the storekeeper objected, we swore at him, and shoved him out of the way. The emery wheels soon came back!

What these people failed to understand was that there is individuality in grinding a tool. A man may be quite competent to grind *his* tools to his complete satisfaction, but he cannot always grind *my* tools to suit *me*. Moreover, having adapted a tool to suit his purpose, a man values it, and likes to keep it. Individual ownership in all tools and tackle is,

of course, quite impracticable. A man cannot own his lathe or other machine, chucks, angle-plates, and the like, but it is particularly noticeable that the machine that is anybody's is always in a deplorable condition, because it is nobody's business to keep it in order! Neither is it good, or conducive to efficiency, that every machine should be cluttered up with boxes of bolts and other tackle, but it is possible, I think, to so arrange things that they will be always to hand, and valued by all. Let me endeavour to explain my views.

The care of nuts, bolts, plates and packing should be the work of one man, who would be responsible for the supply of and upkeep of all these things, and should see that all nuts are free on the bolts. Since a man cannot always describe the particular plate or packing he needs, they should all be so laid out in a special store that he could run his eye over the lot without handling them. Shop labourers should be instructed to collect the tackle when it is finished with, and return it to the tackle stores, where there should be bolts, nuts, plates and packing of every conceivable length, size, and description—and shape. The belt man's duties should not be confined to repairing a strap when necessary: he should periodically inspect all belts, and if one appears to be giving out, it should be repaired during the meal hour, or after the men knock off for the day.

Then, every lathe should be fully equipped with chucks and keys, a small and large scroll, and a small and large four jaw, with a set of soft jaws for each of

the scroll chucks. There should also be a full complement of spanners. Each man should have issued to him a small drill chuck, one of each size centre drill, an oil-can, a lubricant can and brush, two sets of centres, a set of carriers and a complete set of collets, according, of course, to the capacity of the lathe, together with proper drifts. Every article should be indelibly stamped with the number of the machine, and the operator should be held responsible for their condition. There should be regular tool inspections, to facilitate which properly constructed cupboards should be provided for each machine, so that the complete kit could be seen at a glance. Should a man be found with a tool belonging to another lathe, he should be required to give a satisfactory explanation; if anything is missing, damaged or broken, the man responsible must furnish adequate reasons.

Then there should be plenty of angle-plates of all sizes in the tackle stores, all kept in good order and condition, and their return when finished with must be strictly enforced.

In addition to the usual wet emery wheels, there should also be dry ones of good quality, say 6 in. by $\frac{1}{2}$ in., for touching up small tools, and all should be kept properly trimmed. No man should be stinted of small turning tools and boring tools, although a check must be kept of what is issued to him, to ensure that he does not waste any.

It should be clearly understood by every man that if he accidentally breaks anything, no matter what;

if the oil-can or cutting lubricant can springs a leak; if anything goes wrong in any way, it should be immediately reported so that the damaged article may be repaired or replaced.

It will be contended that even in such ideal conditions some workmen will continue to maltreat tools and tackle. Maybe. But not many. The knowledge that there was an adequate supply of everything, and that anything could be obtained quickly without "scrounging" round the shop for it; the fact that he would be held individually responsible for its condition while it was in his possession, would cause him to value tackle; and having a complete kit of accessories to his lathe, which he must not lend (neither can he borrow anything), he would take great care of them because, for the time being, they were for his exclusive use. The periodical tool inspection would soon make the habitual maltreater recognize the advisability of mending his ways!

"But look at the expense!" many employers will say, aghast at the very idea of such a bold scheme. Undoubtedly the initial cost would be heavy, but would it not be worth all the expense to remove one of the most fruitful causes of waste of time, irritation and friction between workmen? The increased output and the enormous saving of time would soon pay for the initial cost.

That is the conclusion I have arrived at after upwards of thirty years' experience as a working mechanic.

2. MEASUREMENT AND MANAGEMENT

It is an extraordinary fact that whilst accuracy of measurement has reached a stage approximating perfection, the confusion arising from the absence of uniformity in sizes and systems, particularly in regard to screw threads, and the fact that both the decimal metric system and the duodecimal system of inches are in use in the workshops, is really amazing. No one knows this better than the working mechanic, whose daily life is associated with drawings and dimensions and all kinds of measuring instruments.

The theory of the metric system is that the metre is one ten-millionth of a quadrant of the Earth, through Paris; the litre, or unit of volume, is the cube of one-tenth metre side; the gramme, or unit of weight, is nominally one-thousandth of the weight of a litre of water at 4 degrees Centigrade. The value of the metre, litre and kilogramme were definitely fixed by law on December 10th, 1799, became compulsory in 1801, and in 1837 the French authorities passed an act forbidding, as from January 1st, 1840, under very severe penalties, the use of any other weights and measures than those established by the laws of 1799.

The metric system soon became popular, and its adoption spread to other countries. In 1875, the International Bureau of Weights and Measures was formed in Paris, for the purpose of furnishing prototypes of the metre to subscribing countries, and the system is now obligatory in Argentina, Austria, Hungary, Belgium, Brazil, Chile, Germany, Greece, Italy, Mexico, Netherlands, Norway, Peru, Portugal, Roumania, Serbia, Spain, Sweden, Switzerland, whilst its use is legalized in Great Britain, Egypt, Japan, Russia, Turkey and the United States.

The official French metre is represented by the distance between two microscopic lines scribed on an iridio-platinum bar, now reposing in the archives of the bureau, when the bar is at zero Centigrade. The alloy and cross-section of this bar were chosen because they are least susceptible to atmospheric changes. Temperature is a vital factor in measurement. As the temperature of the bar rises above, or falls below, zero Centigrade, the distance between the microscopic lines will, of course, expand or contract in direct proportion to the coefficient of thermal expansion of the alloy. The importance of temperature will be seen in the fact that the American standard inch is measured at 68 degrees Fahrenheit, the English inch at 62 degrees Fahrenheit and the French metre at zero Centigrade. Consequently, to bring the three standards into complete accord, the units must be held at the three different temperatures. For example, if a standard French 100-millimetre gauge at zero

Centigrade is measured at the English standard temperature, it will be 0.23 mm. longer than 100 mm.; and when measured at the American standard it is found to be 0.27 mm. longer. Conversely, an American or an English standard inch gauge becomes correspondingly less when measured at the French official temperature.

During the past fifty years, international exchange of commerce has expanded enormously, due, in the main, to the contraction of time and space by the development of transport, which has brought the nations of the world closer together. With each country manufacturing like commodities for export by large-scale mass production, the interchangeability of parts is becoming imperative, and with it the standardization of measures.

Despite the many attempts made to secure its compulsory adoption in this country, the use of the metric system in Britain was illegal right up to 1864. In that year its use was made permissive by Act of Parliament, and in 1871 a compulsory Bill was rejected by only five votes. The permissive Act of 1864 was repealed by the Weights and Measures Act of 1878, and for another nineteen years the use of the system was a penal offence. Finally, in 1897 (the beginning of the motor boom, be it noted, when foreign cars with metric measurements began to be imported) the system was again legalized, and the penalties for using or having in one's possession metric weights and measures were abolished.

The main argument against its adoption has been

that of the expense that would be entailed by scrapping existing measures and machinery, but the parochial spirit is an important factor. It is a remarkable fact that in some districts of the United Kingdom (and probably in the provinces of other countries) old local denominations of weights and measures are still in use, notwithstanding the fact that they may have been prohibited by law many years ago. What is even more astonishing is that, even in these days of standardization, some manufacturers employ measures so unsystematized that parts which should be interchangeable fail to agree unless they have been made on the same machine in the same shop and at the same time. It may be that manufacturers stick to these rough-and-ready standards in order to monopolize repairs and replacements, but such a policy is surely not conducive to rationalization.

It will be clearly seen that, what with the variation of standards, materials and temperatures, the ways of the mechanic and of machine tool makers are exceedingly hard.

Greater success has attended the efforts to secure accuracy in measuring. An instrument known as the interferometer has been invented, the operation of which is based upon the constant length of the rays of light in the spectrum. It is calculated that in the event of any official gauge being at any time destroyed it could be reproduced by an interferometer to within one ten-millionth part of its theoretical length. This wonderful instrument has shown that

the metre is equal to 1,553,163·5 wave lengths of the red rays of the cadmium spectrum, in air at 15 degrees Centigrade and 760 millimetres barometric pressure. Most physical laboratories are now equipped with interferometers.

The degree of accuracy now obtainable is such that it is possible to take sixty-seven small block gauges at random, from any of several sets made by Messrs. Johanssen, the Swedish firm of gauge makers, and to check them with a single master gauge of the same size as the sixty-seven put together, to within 0·000006 of an inch! When one recalls the primitive gauges in common use not more than twenty years ago—and some are yet in service—such progress in measuring is really stupendous. But we have still to achieve uniformity of systems.

Since 1897, the metric system, with its decimal divisions, has gained steadily in popularity, and for all practical purposes it has many advantages over feet and inches with their unwieldy vulgar fractions. As a matter of fact, mechanics are compelled to resort to tenths when using a precision measuring tool, even if working to inches, and as all such tools are graduated in decimals, the operative engineer must necessarily familiarize himself with decimal equivalents.

It is interesting to note that, although the inch is based upon the duodecimal system, its divisions do not conform to either decimal or duodecimal fractions, and when one gets down to sixty-fourths, the impracticability of such divisions for purposes of

measuring becomes apparent, so one discards vulgar fractions for decimal points. Such fractions as $\frac{1}{28}$, $\frac{1}{56}$, $\frac{1}{14}$ and $\frac{1}{16}$ would look rather absurd.

Although the usual practice is to make all sizes on blue prints in decimals, or all in vulgar fractions, drawings vary according to the firm, or, one sometimes thinks, to the personal whim of the draughtsman, for it is by no means unusual for different styles to be used in the same shop. I have had many drawings where some dimensions were given in inches, and others in decimals. In either case the workman must find the equivalents, because one cannot memorize them all, and the average mechanic is not able to work out conversions mentally.

It is even more confusing when both metric and English systems are in use in the same shop and on the same job. I have done many jobs where the lengths, say, were in millimetres, and the threads and diameters in inches. For example, the sizes of the steering ball joint of a well-known make of motor car are metric, with the exception of the thread, which is British Standard Fine. A possible explanation of this is that it is not always practicable to cut a metric thread on an English lathe (a special gear wheel with 127 teeth is necessary), but there is no such excuse for the absurdity of making brass bushes—for the same car—with external diameters in metric, and internal diameters in inches and fractions thereof! I machined thousands of such bushes.

Engineers' rules and modern verniers are graduated in both millimetres and inches, but no micrometer has yet been devised that can be adapted to both, and it is the micrometer that is most commonly used in British workshops. Consequently, where only one micrometer is available, as is so often the case, it becomes necessary to convert the dimensions to suit the micrometer one is using. Even when suitable micrometers and verniers are to hand, much time is wasted, errors are frequent, and costs are thus increased.

A study of screw threads emphasizes the trials of the turner and the manufacturer, and again reveals the struggle between the decimal and duodecimal systems. The first attempt at securing uniformity in screws was made by Sir Joseph Whitworth in 1841, and in the course of twenty years the Whitworth system was the recognized standard for general engineering purposes. Prior to that, each firm had its own "standard" set of screwing tackle, the existence of which made engineering repairs costly and inconvenient. Owing to the pre-eminent position occupied by British engineering, the establishment of an English system was very favourable, and no difficulty was experienced in securing the adoption of Whitworth screws in Germany and America. It appeared as though they were established for ever in an impregnable position. Two things, however, were lacking to ensure permanency—Whitworth screws were not based on the metric system, and it was not then realized that America and Germany

were destined to come into acute rivalry with Great Britain.

The two great attacks made upon the Whitworth system came from the Franklin Institute in 1864, when the Sellers thread was adopted and recommended to American engineers, and, in 1873, when Delisle of Karlsruhe initiated a metric system. As a result, after several years of effort, the Society of German Engineers took the matter up, and the appointment of a committee gave birth to the International Screw Thread Congress which, in 1918, adopted the International Metric Screw Thread. Broadly speaking, the position now is that the metric system of threads is standardized on the continent of Europe, America has its Sellers standard, whilst England retains the Whitworth system, although the British Engineering Standards Association Thread, which covers all sizes of 6 mm. and under, is based upon the metric system.

But that is not all. It is said that the threads now recognized as standards are included in about eight great systems, but a popular handbook gives details of no fewer than thirty different kinds of screw threads. Imagine the confusion arising out of such a multiplicity of screws. If we place side by side a half-inch American screw, an English half-inch screw and a 12 mm. screw (2 mm. pitch), it is not easy to note the difference. But the American screw has 13 threads to the inch, the English 12, and the metric 13.7, and the angles are 60, 55, and 47½ degrees respectively. Therefore each must have its

own special nut. In these days of international exchange, engineers are constantly handling the products of other countries, and it is frequently found that just as both metric and inch measures are used on plain dimensions on the same job, so are two different systems of screws employed on the one machine.

Only those who have actually experienced it can properly appreciate the trouble that is caused, the time that is wasted, and the extra cost entailed, first in finding out the standard used, then in trying to get a screw conforming to that standard. If none can be found, there is the trouble of trying to get one from dealers, who do not often stock other than Whitworth screws. Either a special screw has to be made, or the thing adapted to suit another standard, which makes confusion worse confounded when the job again comes in for repairs.

As, with plain measurements, the metric screws seem easier to understand and far more simple to work to than other standards, it is a noticeable fact that British car manufacturers are adopting them in increasing numbers. We know that all the screws from continental countries will be metric, but one is never sure which system is followed in the screws of machines built in America or England. Apart from the multiplicity of threads, we come across some curious instances in the workshop. It is difficult to understand, for instance, why, when there is no difference in function to make it necessary, a shaft should be screwed one-inch pipe standard at one

end, and one-inch-and-a-quarter Whitworth standard at the other. The difference in diameters is infinitesimal, but while the pipe thread is eleven to the inch, the Whitworth is seven to the inch. The turner must change his tool and lathe gears for each type, and there appears to be no reason why both ends should not be made alike; it would be far more economical.

There is as much dissimilarity in wire and sheet metal gauges as there is in screw threads. Size two, for example, might mean anything. For Brown and Sharpe's standard it would mean 0.2576 inch; for Stub's Iron Wire standard, 0.284 inch; for Stub's Steel Wire, 0.219 inch; for the Roebing system, 0.2625 inch; for Trenton Iron Co., 0.1650 inch; for British Imperial Wire, 0.2760 inch; for U.S.A. Standard Plate the same number means a size of 0.2656 inch. What a mix-up!

Innumerable instances could be cited of the chaos arising from lack of uniformity of systems of measurement, but space is limited. It is not easy to offer a solution to these complex questions of measurement and management. A layman feels diffident about venturing where experts apparently fear to tread. Perhaps the problems will automatically solve themselves during the process of rationalization. The British Engineering Standards Association has done much to encourage the use of the metric system in this country, but it has no power to enforce its recommendations, and the British mind is proverbially conservative. But it does appear that the

time is over-ripe when such bodies as the Federation of British Industries and the Engineering Employers' Federation should consider the appointment of a commission to examine all sides of this important question, with a view to securing the adoption of an international system of measures for all commercial purposes. Industry, would, I feel sure, be immeasurably benefited, and it should certainly assist the British motor car industry, and British engineering generally, to maintain its supremacy throughout the world.

3. THE HUMAN FACTOR IN FOREMEN

ANYONE familiar with factory life knows that the efficiency and output of a shop depend quite as much upon the psychology or temperament of the one who is in direct charge of the staff—whether he be the foreman, manager or principal—as they do upon organization and equipment; and one is bound to admit that, generally speaking, employers do not exercise sufficient care and judgment in the selection of their foremen.

A man may be appointed to such a post simply because he happens to have friends in high places in the firm. He may be a promoted workman chosen because of his energy and driving power, or because of his length of service with the firm. When advertising for a foreman, candidates are asked to state, in addition to other qualifications, what experience they have had of "handling men"; they are seldom asked *how* they handled men!

Now there can be no objection to anyone using his influence to secure a post for a friend; it seems only right that long service should be taken into consideration when making promotions; energy and driving force may be desirable qualities. But surely

the primary factor is temperamental suitability to take charge of a number of men ?

The position of foreman is by no means an enviable one, particularly in an engineering workshop. In the first place he is up against the fact that there exists something of a complex—varying only in degree—between the man in authority and those under his charge. It is a regrettable fact that most workmen regard all employers as hereditary enemies, and foremen as their agents. When a workman is promoted to foreman, his mates say he has “gone over to the boss.” This feeling of antagonism is engendered by the knowledge that the man’s security of employment often depends upon the whim of the foreman. I care not who the man is: within an hour or two of starting in a new shop, he is making inquiries about the foreman.

“What’s the foreman like, mate ?” inquires Bill.

“Suppose you mean old Jackson,” may be the reply, “Oh, he’s a perfect pig . . . proper bully, he is . . . never satisfied, no matter what we do. . . . Now, old Jerry, the charge-hand, he’s all right!”

Already Bill’s mind is prejudiced, and he gets on with his work with mixed feelings.

“Bit of a pig, is he ?” he muses. “All I hope is that he doesn’t start bullying *me* . . . there’ll be a bust up if he does!” His eyes rove round the shop for a glimpse of the “tyrant,” and he will probably be quite agitated when that gentleman approaches. Bill will remain in that state of mind until he has

discovered for himself the type of man Mr. Jackson is, and if he is not the bully he is reputed to be, Bill's spirits will rise. "Ah!" he will exclaim, "That chap was all wrong about Jackson . . . not a bad sort at all . . . guess I'll like this show. . . ." His work improves in quantity and quality as a result. If, however, Mr. Jackson proves to be a bully, Bill will never be quite comfortable in the job.

Being human, foremen are not alike to all men, and by the same token, all men are not alike.

"What a misery old Chandler is!" says Frank. "Just look at him . . . mooching round the place with a face like a kite . . . he's always grumbling. . . .!"

"Oh, I don't know!" replies Bert. "He's not a bad sort when you know him. What if he does wear a long face. Maybe he's worried about the work . . . guess we'd be if we had his job. He don't interfere with us, anyway. *I've* always found him all right. . . ."

This difference of opinion does not indicate a dual personality on the part of Mr. Chandler. It is possible that Frank is a disgruntled workman of indifferent ability without any desire to give satisfaction to anybody, whilst Bert is a sensible sort of chap who, appreciating the difficulties of his superiors, recognizes that the apparent surliness is only the thin veneer of the disciplinarian, beneath which beats a heart of at least average kindliness. On the other hand, it may indeed be that Mr. Chandler is an irascible chap whom it is all but

impossible to please, that Bert is a sycophant, and Frank a fellow who rebels against tyranny. It just depends!

These are some of the problems confronting the foreman. I have often thought that the conduct of a foreman depends to a great extent on the conduct of the principals of the firm. If the boss makes a practice of bullying his works' manager, that gentleman, feeling humiliated and annoyed, will probably sternly rebuke his assistant without apparent reason. The indignant assistant seeks out the foreman and soundly rates him, and the irritation engendered in the foreman will reflect itself in his attitude towards *his* subordinates.

"The old man's got 'em properly this morning, Fred," says the charge-hand to his shop crony. "Like a blinking bear with a sore head . . . I'm just about fed up . . .!" And away he beetles to bully an inoffensive labourer who is leaning on his broom getting his second wind! Disharmony reigns supreme in that shop throughout the day.

The foreman, then, is something of a buffer between management and men, and as such he is bound to come in for much buffeting, for he has to maintain the efficiency of his department to satisfy his employers, and to get 100 per cent. out of his men he must not antagonize them.

Having worked for about fifty foremen during my workshop travels, I should be a bit of an authority on their natures; at any rate, my experiences and observations have caused me to arrive at very

definite conclusions regarding the qualifications of a good foreman. Let me try and portray the ideal foreman for an engineers' factory.

First and foremost, he should be a good mechanic—one who has been through the shops and knows the ropes. If he is competent to do the job he is asking others to do, he inspires confidence. "There's this much about it," Bill remarks to his mate, "Old Brown is a tradesman. He knows what he is talking about." If he is not a mechanic, or if his experience has been limited to technical schools and books, and he fancies he knows a lot, he will not be liked. The average craftsman loves a mechanic; he can tolerate one who admits he is not a tradesman, but he has a supreme contempt for the "half-inch" mechanic.

Moreover, and this is an important point, the skilled foreman is able to suggest and carry out improvements in production.

There is a danger in promoting a workman to foremanship—he may develop a swollen head and assume "the never-ending audacity of elected persons." Such a man will never gain the confidence of the men, and should never hold a position of authority. Authority should sit ever so lightly on a man's shoulders. The successful foreman must be even-tempered through all the worries and irritations attendant upon his position. A surly man cannot hope to command respect, much less confidence.

The voice should be considered. It is not suggested that a "Chaliapine" voice is imperative, nor a

knowledge of perfect English; indeed a judicious use of robust workshop epithets is recommended (not obscenities, though). But a well-modulated diction is undoubtedly an asset. Nerves are usually strained, particularly when working to fine limits, and nothing is more jarring and annoying than a harsh, discordant voice. What a difference speech makes, to be sure!

When a foreman barks "Here, Watson! I want you to get on with this job next!" forgetting to say "please," one is apt to mutter, "You go to hell and wait for the damned job!" But if he keeps his voice at the conversational level and courteously says, "I'd like you to do this job next, please, Bill," you reply with alacrity, "Certainly, Mr. Smith! Shan't be long finishing this job." And you slip into it with added zest.

The foreman should be on friendly terms with all his men. Those ignorant workmen who try to take liberties with a friendly foreman can be easily checked by timely and dignified rebuke. A man can be chummy with his subordinates without loss of prestige, and it is not really necessary to shed one's manhood and manners when assuming the cloak of foremanship.

Shop discipline is, of course, essential, but true discipline does not necessarily mean insistence upon the rigid observance of irksome restrictions, such as talking, for instance. If my ideal foreman entered the shop suddenly and caught a man away from his job chatting to a chum, he would not roughly

upbraid him and threaten dire penalties. He would know that if he did so the man would be sullenly resentful, and would resume talking as soon as his back was turned. Discipline is not thus maintained.

Realizing that there are moments when the work drags, when one needs that little respite afforded by a moment's chat with a friend, the sensible foreman would know that the man would probably resume work with renewed vigour after such a talk. Unless the man was a persistent slacker (I can't imagine one in such a shop), the foreman would look the other way.

The competent foreman would never dream of *instructing* a man how to do a job. Being himself a craftsman, he would know that a skilled man resents being *told* that which he is supposed to know. The man might try out the instructions, but with a very bad heart.

"What does he think I am? A blinking apprentice, or what?" he will mutter angrily.

On the other hand, if the foreman saw a better method of handling a job, he would tactfully suggest it to the man. "Now, if I was doing that job, Bill, I'd do it in such and such a way . . ."

"Would you?" replies Bill, "I've always done 'em this way!"

"All right, Bill! Please yourself. We all have our own way of tackling a job . . .!" And he will walk away.

"Hmph!" reflects Bill. "Seems to be something in what old Brown says. Hanged if I won't give it a

trial!" A man may resent sharp criticism, but he will always listen to carefully tendered advice!

No foreman worthy of his salt would stand and watch his men at work. When he wants to know how a man is shaping, he will go and ask him, confident of getting a truthful reply. Nor would he meander through the shop a couple of minutes before the hooter goes, just as the chaps are preparing to make a dash for the clock. If he has their confidence, it will be only necessary to walk through the place occasionally to see that they are well supplied with work, and during his peregrinations, he will have a cheery word for each man, possibly passing a little innocuous badinage. If he has not secured their confidence, all the watching and bullying in the world will not make them work conscientiously for him!

So, then, the successful foreman must be a mechanic, cheery and tactful, well mannered, with a good voice. He should never *order* a man to do anything. A man usually obeys an order with sullen submission; he accedes to a *request* with alacrity.

The cynic will probably say that such a foreman would lose control of the shop. If men were allowed to sing, whistle and chat; if they were allowed to stop a few minutes before the hooter goes; if the foreman was too friendly, the men would tend to take things easy, and output would suffer. That is not *my* experience.

After all, it's a question of understanding the

human factor. Workmen are human beings, entitled to be treated as such, not as mere cyphers. To gain the confidence and respect of the men, the foreman must have confidence in them, and treat them with respect, without loss of dignity. Men respond to such treatment. They are the first to remonstrate with one who shows a tendency to abuse latitude.

“Now, don't ‘swing the lead,’ George! Things are not too bad here . . . don't go and blinking well spoil a good shop!”

Most workmen appreciate the human foreman. Friction is reduced to a minimum, distrust is all but banished, and the net result is increased interest in the job, and a happy shop!

II

A MINER'S VIEW

BY

J. H. MITCHELL

J. H. MITCHELL

THE son of a miner, Mr. Mitchell began work underground as a haulage boy at 14. During his seven years as a miner he was employed in most of the various processes connected with the production of coal, e.g. hewing (both under mechanized and hand conditions), timbering, trammig, operating coal-cutting machines, etc. He has had experience in several mines.

He obtained a Miner's Welfare Scholarship at Glasgow University at the age of twenty and took a first-class degree four years later. He is now in training as an investigator at the National Institute of Industrial Psychology.

A MINER'S VIEW

I. THE PERSONAL ELEMENT

THE British coal industry to-day is in a parlous condition. According to the annual returns of the Mines Department, the industry has seldom shown a profit during the past ten years. In 1925 a small profit was realized, when the intervention of the Government with a grant of £23,000,000 pulled up a deficiency of 10½d. per ton of coal produced to a profit of 3½d. per ton. Rates of wages are pitifully low. Real wages are less than they were in 1914. At no time since 1921, on the basis of the Ministry of Labour Index Number, has the increase in wages even approximated to the increased cost of living. The industry is burdened with a huge excess capacity. Some 200,000 miners are permanently unemployed with no hope of employment in their own or other industries. The question of low wages is aggravated by the short time on which many mines are working. In the face of improved economic and social conditions in the general body of the workers, the miner has been compelled to reduce his standard of living from that which he enjoyed prior to the war.

To understand the true state of affairs in the

industry, it is essential to appreciate the viewpoints of both the mine-owner and of the miner.

First let us consider the mental attitude of the former. We must turn our attention to pre-war conditions in the industry. Up till 1914, individualistic ownership of mines and free competition in the disposal of the coal were generally accepted as a proper and wise policy. The owner took no responsibility with regard to the distribution of the products of the industry, and the consumer's interests were protected by free competition. Under these conditions the industry prospered exceedingly. In the words of Mr. Evan Williams, President of the Mining Association (Coal-owners), "it was emphatically a healthy and progressive industry, the supreme example of the success of individualism, free competition and private enterprise, and part of the fundamental framework of our industrial prosperity." Thus we get a clue to the individualistic tradition which dominates the industry to-day, in spite of the move towards amalgamation and rationalization elsewhere.

The average coal-owner undoubtedly pins his faith on free competition and private enterprise. Surrounded, almost overwhelmed, by chaos, he cherishes the belief that, sooner or later, economic forces will put his house in order. He strongly resents legislative interference. He uses to-day the same weapons to combat the attempts of the Government to put the industry on a sound economic basis as he used to fight the legislation of

1886 and 1911 regarding safety, health, wages, working hours, workmen's compensation, etc. When children were prohibited from working underground he announced that the mines would have to close. To-day, how often does he use those very words with regard to the existing or threatened legislation! Individually the mine-owner may exercise the greatest concern for the welfare of his workpeople: but he is apparently quite incapable of acting concertedly in the interests of his workpeople or of the industry in general. In the absence of any co-operative policy among the owners in the past as to the steps necessary to deal with new problems, the Government has invariably had to step in and make certain steps compulsory. When will the average coal-owner see beyond the immediate legislative and economic influences and plan a reasonable and decisive procedure for the future, in accordance with the new economic conditions and methods of control in industry?

The coal-owner is hide-bound by traditional observances. His reluctance to put the past behind him and move with the times is characteristic of his outlook. To give one case, Sir Harry Walker, Chief Inspector of Mines, in his Annual Report (1928) remarks, in connection with the use of steel supports underground:

"It is curious how deep is the conservatism of everyone connected with mines. There are instances where steel props have proved themselves to be safer and more economical than timber, yet no

steps appear to be taken to introduce them into other collieries owned by the same firms."

If the industry is to emerge at all from its unfortunate position, the owner must strike a new note in his conception of labour. He must realize that, in addition to economic, financial and technical considerations, there is a human factor requiring expert attention. In the industry, in the past, the human element received practically no consideration. What was the result? During the past fifty years the industry has continually had trouble with its labour force. Since 1900 over 300,000,000 working days have been lost, due to disputes. During this period there were four national stoppages—in 1912, 1920, 1921 and 1926—while the strike of 1888 is still well remembered by all connected with the industry on account of the extreme privations endured by the strikers and their dependants.

The direct loss due to these stoppages is enormous; but the indirect effect, in the way of loss of markets, etc., is even more serious. Consider, for instance, the seven months' stoppage of 1926. In that year, as a result of the strike, the British output of coal fell by 119,000,000 tons; yet the world's total production was diminished only by slightly over 2,000,000 tons. This illustrates the excess coal-producing capacity of our foreign rivals. It shows clearly how Britain may lose her goodwill through national stoppages; it is important that she should keep a firm grip of her external markets in the face of such strong external competition.

Humanism, then, must take an important place in the rationalization of the industry, if it is to avoid such troubles in the future. There must be a positive move towards more cordial relations between owners and men. I have indicated the tremendous amount of waste in the industry due to strikes and lock-outs. This loss is relatively insignificant compared with that due to lack of co-operation between employer and employee.

The coal-owner's disregard for the human factor is illustrated by his traditional policy for reducing costs—longer hours and reduced wages. Right throughout the history of the industry this tendency can be followed. Whenever economic conditions seem to render a reduction in costs imperative, the wages bill is fixed upon for critical consideration. The owner proceeds to enlarge, in public, on every suitable occasion, on "long hours and low wages on the Continent" and "short hours and high wages at home"—often when such remarks have no foundation in fact. In any case it is extremely difficult to compare real wages in different countries. The average coal-owner really seems to believe that the hope for the future lies in lower wages and worse conditions of employment. This is indeed deplorable. Costs of production can never be reduced by further wage reduction. Wages in the industry are already far too low. The shrewd employer has long recognized that good wages may be—often are—an economy, that good wages and good service go hand in hand. It is an idea totally

foreign to the minds of the controlling interests in coal-mining.

It is easy to see why wages are so readily attacked. They form about 72 per cent. of the total costs of production. But there is a level below which wages cannot be economically reduced; this level has, I am convinced, been reached in the mining industry. Note that I am not referring to the "subsistence level" of economists, but to a higher level, determined mainly by psychological factors, below which the workman fails to give an adequate return for that which he is paid. It is the other costs which must be reduced. This can be done, and done very effectively, but only by drastic reorganization of the industry both on its productive and distributive sides.

Let us consider some typical cases of the mis-handling of the human element in coal-mining which have come within my experience.

A certain large Scottish colliery used to be often on short time—working three, or four, or five days per week. The railway sidings at the colliery were crammed full of wagon-loads of coal awaiting a purchaser. The result was that empty wagons were scarce. There was not the slightest attempt to arrange the idle days on any regular system: so that it was impossible for the workers to plan in advance activities for their idle time. The method of determining the idle time was simplicity itself—it was to carry on as long as wagons were available. Let us see how this worked out. Sometimes the miners

were only an hour or so in the mine when they had to be withdrawn because there were no wagons. Anyone with a knowledge of underground conditions knows what this meant to the miner. It is usually a very arduous process making one's way to the coal face—often considered by the workmen as the most strenuous part of their work. It means travelling long distances along low roadways, with bad underfoot conditions, in very feeble illumination, and often in a hot, moist atmosphere. This particular mine was about one and a half miles from the homes of the majority of the workmen. Often these men arose between 5 and 5.30 in the morning, arriving at the mine before 6.30; by 7 o'clock they reached their working places; by 8 o'clock they probably had the roof securely timbered, rails laid, etc., ready for the work proper of digging and filling coal into tubs; they were all on piece work, paid so much per tub or per ton, and by 9.30 or 10 o'clock they arrived back home, dirty and fatigued, without having earned enough to clear their bus fares. Sometimes a notice was posted the night before that there would be no work in the morning; sometimes the men were at the mine-mouth in the morning before their fate for the day was announced; and on other occasions, all too common, they would make their way to the coal face, only to have an official arrive later to inform them that the mine was idle for the day.

Such a callous method of dealing with labour needs no comment. Both physiologically and

psychologically it is an extremely harmful practice. It was practised at all the collieries owned by the Company I have in mind, and, to my knowledge, by other colliery groups in Scotland as well.

Similar treatment is meted out to workmen whose "place" is unworkable, due to, say, a fall of roof. Such cases are of daily occurrence in mines, and the workmen concerned are usually sent home, although they could be accommodated elsewhere with little inconvenience; except perhaps that this would necessitate a little mental exertion on the part of the management. There is no legal obligation to find these men work, so the line of least resistance is taken, and they are sent back up the mine. And then we find coal-owners complaining of absenteeism amongst miners! What can they expect?

The hard materialistic attitude of the average coal-owner towards the personnel of the industry is further exemplified in his treatment of staff. A large number of small uneconomic mines have been closed down during the past few years. In the majority of cases the officials of these mines, who may be employees of thirty or forty years' standing, are dismissed without their employers giving the matter a second thought. These officials have practically no chance of finding new employment, yet they receive no compensation for their sudden enforced retirement. The industry has received all it wants from these men, so they are discarded. The coal-owner would tell you that he has no time for sentiment: but surely it is not sentiment to make

secure the old age of faithful employees, especially officials. Such treatment has a very bad psychological effect on the more fortunate members of the staff who are not dismissed, and lowers the efficiency of their service.

The attitude to technical education of the controlling interests of the industry is illuminating. We find to-day a shortage of suitable men for executive positions, and an attempt being made in many industries to recruit capable men from the ranks of labour and train them for such positions. But what is the position in the mining industry? The organizer of Mining Education in a Scottish county has provided me with examples of clever, even brilliant, lads, aspiring to positions of responsibility in the industry, whose progress was very seriously handicapped by lack of co-operation on the part of the employers. They refused, for example, to give these lads jobs on the day shift, so that they could attend classes in the evenings, although the mining teachers appealed personally to the mining officials, pointing out the potential value of these young men to the industry. The officials also consistently refuse to give such a "lad o' pairs" work of such a nature as to prepare him for an official position, although there are plenty of such jobs in the mine—usually very badly performed by workmen whose only qualification may be that they are members of the same Bowling Club as the manager. I know a young miner, who, by dint of sheer hard work, won a scholarship and proceeded to a University, where

he took a degree in Mining Engineering. While he was spending his nights struggling with the matriculation examination he spent his days shovelling coal; during his University vacations he went back to the same mine, where he continued to perfect his ability for shovelling coal; after he had graduated B.Sc., and had his First Class Certificate of Competency from the Mines Department authorising him to manage a mine, he still was allowed to shovel coal. It would surely have been to the advantage of this colliery company to employ that man on some of the minor organizing jobs, rather than let him waste his time on routine work of the lowest order. I might add that the ability of this man is undoubted and that it is not an isolated example. This man is now doing very well abroad, and I can vouch for many similar cases. This treatment of mining students is a disgrace to the industry. I have a suspicion that in many cases it is prompted by a fear of the younger men on the part of the existing officials.

We must mention the coal-owner's attitude collectively towards conditions of work. Practically every move that has been made so far towards safer, healthier and pleasanter underground conditions has been made under legal compulsion. He must now make a move in this direction on his own initiative. Let him set out at once to improve the standard of lighting and ventilation in the mine—both deplorably low—to promote a more effective system of accident prevention, to select and train executives

and officials for the future, to thoroughly revise his ideas on the handling of labour, to study the hours and wages question from a new angle. Let him carry out these researches in the light of Industrial Psychology and he will be on the right road towards harmony and co-operation with his employees, and so to prosperity for the industry.

We now turn our attention to an examination of the mental attitude of the miner. In many respects he is like his employer. He views with suspicion and distrust anything that savours of originality. He resists fiercely, with miners' meetings and lightning strikes, all attempts to alter existing conditions and customs, whether or not the alteration will be to his ultimate benefit.

The progressive colliery certainly has a problem here when it tries to displace the old methods of mining with the latest American and Continental methods. The workers oppose such moves with fierce and unreasonable obstinacy. They cannot be persuaded that it is to their benefit, as well as to the owner's benefit, that there should be improvements in the technical side of the industry. Tactful handling of the men is essential for the successful introduction of such innovations. Unfortunately, tactful handling of its employees is not a strong point of the conduct of this industry: so in the conservative spirit of the miner we have a very potent source of labour troubles, unless an attempt is made to understand the miner's outlook and modify the line of action accordingly.

The question of the installation of pit-head baths lately provided a striking example of the reluctance of the miner to move with the times. Pit-head baths are undoubtedly the greatest boon of recent years to the miner. He n@ longer comes home from work smeared with the grime of the mine—a miner for all to see—an object of compassion to sentimental old ladies, and an object of contempt to patriotic old gentlemen, who blame him for the high price of coal, the slump in world trade and the financial crisis. Quite seriously, however, pit-head baths are going to raise the social standing of the miner tremendously. But in the majority of cases where they were proposed, the miners turned the proposal down almost to a man. They could give no convincing reason for their action, although they did give reasons of a kind—such as that of the gentleman who had not washed his back for forty years and was not going to run the risk of beginning now (even to-day a surprising number of miners believe that excessive washing is inducive of weakness). Finally, in conjunction with the Trustees of the Miners' Welfare Scheme, some of the colliery companies carried on with the provision of pit-head baths on their own responsibility. In every case, so far, the bath "caught on" immensely, after the first few days' stagnation, and are now used by practically every workman in the mines concerned.

The miner, as a class, is clannish, undoubtedly owing to his conditions of employment. His occupation detaches him, both mentally and physically,

from his fellows. The violent contrast of his life, compared with that of other workers, has the effect of making him a man apart from the general body of workers. His occupation does not offer that diversity of outlook that exists in other industries. He lives in isolated mining villages, or in a self-centred group in towns. He has his own peculiar habits and interests; a capacity for good living, easy spending of money, keen appreciation of all branches of sport—such are characteristic of the miner and result from his industrial environment. The common dangers which he faces tend to draw him closer to his mates, and to isolate him still further from other grades of workers. It is interesting to note, for example, that it is the custom in most districts known to me for all work in the mine to cease for the day in the event of a fatal accident at work.

The social forces at work during the past few years are reflected in the mental attitude of the miner. His improved social outlook is a most potent factor for good in the industry to-day: yet if the mine-owner chooses to disregard this tendency, it will be a powerful source of discontent and friction. The miner is beginning to respond less and less to the crude individual appeal of the incentives of the past and more and more to improved conditions and humane treatment.

His loyalty to his Union is amazing. Sheep-like he follows the injunctions of his leaders, regardless of where they may lead him. He is never heard, but through his leaders. He is quite different from his

employers in one respect—he is capable of united decisive action when he deems it necessary for the benefit of the group. The stoppage of 1926 illustrates the case in point. The Union had the support of practically every man in the industry. The miners' case was mishandled in a particularly distressing fashion; but for seven whole months they energetically supported the policy of their leaders, whose sole contribution towards solving the problem and bringing the deplorable situation to an end was to utter, at wildly enthusiastic miners' meetings, the parrot cry, "Not a penny off the pay, not a minute on the day."

Such an unreasonable attitude—this refusal to look facts in the face and give constructive criticism—on the part of the Union is largely responsible for alienating public support for the miner during times of stress in the industry. The "mental isolation" of the miner has already been emphasized. This attitude of other workers towards the miner places the latter in a weak position in his legitimate strivings for betterment. If he is to receive the moral support of the community in his struggles for social advancement—so essential for success—he must be guided by men having qualities of leadership such as have been conspicuously absent in the Union officials of the past. The miner relies on his leaders to such an extent as to be in grave danger of being, as a group, the victim of autocratic democracy. The educative initiative of the miner is high. He must make full use of his faculties and take a critical part

in the activities of his Union. He must realize that the industry is facing an economic storm at the moment and weathering it very badly. He has heard the cry of "Wolf" so often that he continues blandly to reiterate demands, obviously impossible to fulfil, regardless of the owners' incessant cries that "the industry is on the verge of disaster," "the mines will have to close," etc. If things are so bad as they are painted, he says, if the owner is losing 2d. on every ton of coal taken from his mine,¹ why does he hang on so tenaciously to the uneconomic venture, why does he oppose so strenuously proposals of nationalization? It is surprising, but undoubtedly true, so far as I can judge from personal inquiries, that not one miner in fifty believes the audited returns of the industry, officially issued for each quarter.

The Miners' Union must radically change its attitude, it must evolve a new conception of its function, of the relationship between labour and capital, if it is to take its place in modern industrial life. Its history is a story of unremitting opposition to every proposal of the Mining Association. It cannot be brought to realize that what benefits the industry benefits the miner. It first began to function as an organized unit in 1912. Since then it has succeeded in raising the status of the miner considerably. But it has made some horrible blunders, for which the miner has had to bear the brunt. The

¹ According to the official returns of the Mines Department, there was a debit of 2d. per ton for the quarter ending September 1931.

mishandling of the 1926 strike has already been referred to. "The Miners' Next Step," issued by the more revolutionary spirits in the movement, is another example. This infamous document advocated a policy of deliberate restriction of output in the mines, the idea being that by this move the mines would cease to function as economic units, so paving the way to nationalization. To-day there seems to be a tendency in Union circles for rationalization to take the place of nationalization in the plan for the reorganization of the industry, but, especially among miners, both nationalization and rationalization are alike in one respect—they are "blessed words" on the lips of everyone, and no two persons are alike in their conception of their meanings. The Union must make itself clear as to what rationalization means, how it is going to affect the industry, and then apply itself wholeheartedly in co-operation with the employers in the attainment of the ideal. It must be able to discuss constructively with the employers the problems of industry, such as the question of hours and rates of wages, and, by the employment of industrial psychologists if necessary, give scientific justification for its demands. The Union has always stood for humanism in the industry. Lack of consideration of the human factor is largely responsible for crippling the industry. The Union must demonstrate that by more humane treatment the human machinery will run more smoothly and efficiently, and that only by taking such action is there any hope of the industry returning to prosperity.

But the Union cannot co-operate with the employers in the quest for industrial efficiency unless there is a similar change in outlook on the part of the Mining Association. This body must cease to insist on its sacred right to manage its own affairs, free from "interference" of any kind. It must be prepared to take constructive criticism from the Union, and co-operate with the Government in its endeavours to reorganize the industry on rational lines. It must recognize that adequate consideration of the human factor is compatible with, indeed essential to, the well-being of the industry. Instead of the Union concentrating its activities in futile (in the present state of the industry) pleas for shorter hours and higher wages, instead of the Mining Association expending its energies in opposing the efforts of the State to remedy the muddle, let them unite—they have a common cause—and in an atmosphere of good will and mutual tolerance restore the industry to its pre-war prosperity.

2. WAGES IN THE MINING INDUSTRY

THE problem of wages in the mining industry presents difficulties rarely met with elsewhere. These difficulties all arise from the very variable natural facilities for coal-getting.

Underground conditions vary enormously: they vary from day to day, from pit to pit, and from section to section within the same pit. A man may be able to produce ten tons of coal from his "place" one day, while a few days later, working at the same rate in the same "place," ten cwt. may be nearer his output. The seam may become thin owing to geological disturbances; the coal may become hard and difficult to "win" for no apparent reason at all; the strata may become wet so that the hewer is soaked and chilled; a fall of roof in the air-course may interfere with the ventilation and render the air at the coal face hot and noxious; the roof may become insupportable, so that the miner, instead of producing coal, expends his time and energy in timbering and clearing away falls of stone. In short, as colliery managers are wont to reiterate, the only thing one can be sure of in a coal mine is—trouble.

Under such conditions it would appear that the piece-rate system of payment is unsuitable. Yet, in

point of fact, very few of the actual coal-getters are paid otherwise. The whole point is, of course, that the actual quantity of coal produced by each worker is usually easily measured, and, provided conditions remain constant (as they often do for months or years) there is a decided advantage in paying by piece.

But the piece rate must not be rigid and inflexible if it is to operate successfully. It must vary from day to day and from place to place in accordance with variations in working conditions. Nevertheless, the rigid piece rate is generally applied throughout the industry, and it is with the psychological consequences of this fact that I propose to deal.

Payment by piece under these circumstances produces results precisely the same as, or possibly worse than, those it was introduced to remedy. Consider the common case of two workmen, A and B, working in neighbouring "places" in the same coal seam. Suppose that A has the best "place" in the section, while B has the worst. Owing to the superior natural conditions, A can produce twice as much as B, with less expenditure of energy. The ton-rate throughout the section is the same, so that A earns twice as much as B.

The management admit that A has a much better "place" than B, but state that it is quite impossible to have different ton-rates operating in the same section. They point out that it all comes to the same in the end. B's "place" may improve while A's deteriorates, so that the circumstances may be reversed. They suggest that it is all a matter of

luck: each workman must take the good with the bad, and taking it all over, each man gets approximately the same amount of good and bad.

Even though we admit this, the fact remains that this system of payment, particularly from the psychologist's point of view, has serious defects. It gives rise to jealousy and bad feeling between the workmen. B feels that he is unpopular with the management. He may be a Communist, say, and the idea persists, whether justified or not, that the management are penalizing him for his political opinions by assigning to him the difficult "place." It is obvious that, rankling under this supposed grievance, B will not work his best.

On the other hand his mates tend to look on A as the manager's toady. They decide, quite unreasonably, that he gets the best "place" from favouritism. The man soon becomes aware of his mates' attitude towards his good fortune. Finding himself out of sympathy with his fellow-workers he is no longer attracted by work which, to begin with, had been particularly attractive because he was in the easy "place": and his output suffers accordingly.

A may find himself in disfavour with his mates for quite another reason. As we have seen, he can with ease produce twice as much as B, while all the other men in the section can produce something between A and B. Now, if A is earning too much, there is a grave danger that his ton-rate will be broken, which means that the piece rate of the whole gang (including B) will be broken, so pressure is brought

to bear on A to ensure that his output conforms more nearly to that of his fellows. A generally does "ca' canny"; but he does so with a bad grace, for he sees slipping through his fingers the chance he has long sought of earning an extra shilling.

Incidentally, the mining industry is particularly addicted to rate-cutting. This is a direct result of the varying working conditions, of course, but it is an unfortunate practice. If the coal becomes very much easier to win than usual, the miner soon learns not to increase his tonnage too much or the result will be a reduced ton-rate, and he will be unable to earn a satisfactory wage when conditions revert to normal. He knows only too well the difficulties of getting a rate increased, even when bad conditions justify an increase, so he prefers to have a little in hand. In many mines the employers look upon abnormally high wages as positively immoral. In a certain large Scottish colliery, the time books are returned to the management each week with the names of those workmen who are earning too much, in the eyes of the general manager, ticked off in red ink. The lesser officials have then no choice but to cut the ton-rate, or, if the probable consequences render this inadvisable, they must adopt some means of curtailing the output of the individuals concerned. I believe this pernicious practice is common in the coal industry.

Let us go back to the case of the worker B in the unsatisfactory "place." If conditions become so bad that he cannot earn the minimum wage, his wages

are "made up" to this amount. This system of payment is very common in coal mines, though its defects are generally recognized. The piece worker who finds himself on the "make up" invariably takes advantage of the opportunity to have a rest, so that he may apply himself to his work with renewed vigour when he returns to the piece rate. Moreover, he is not going to work very hard to earn just slightly over the minimum wage when he is assured of at least the minimum when he takes it easy. In fact, it is often bad policy for the workman to do his utmost in a deficient "place," for he may just fail to earn "the wage" by a few pence. In such a case the management will often refuse to augment his earnings. Yet if he slacks judiciously, so that his daily wage is several shillings short, he is sure to be "made up," probably, if he is a good workman, to several shillings above the minimum.

The solution of this rate-fixing difficulty seems to be for each colliery to employ a rate-fixing expert, who, as conditions change, establishes by time-study methods rates which are scientifically justifiable. One experienced rate fixer should be quite able to serve a large colliery, for, as I have already pointed out, conditions often do remain constant for months, even years, although ever liable to change. It appears certain that the provision of such a department would pay for itself many times over.

While most of the men actually engaged in winning the coal are paid by piece, the tram runners, haulage

men, pony drivers, etc., are almost invariably paid by time. Why this should be so it is difficult to see. There is no difficulty in ascertaining the number of trams handled by each runner, pony or haulage, so that payment by piece would be simple and decidedly advantageous. As matters stand at present, piece-rate workers are dependent on time-rate men for their supplies of trams, and the result is very unsatisfactory. The time-rate men tend to regard each tram they handle in terms of its cash value to the piece workers. They object to the piece workers earning much more than they themselves earn, mainly because the more the piece worker earns, the harder is the time-rate man working without increase of wage. Thus a barrier grows up between the two distinct groups, the haulage workers and runners (paid by time), and the coal-face workers (paid by piece). There is complete lack of harmony between the groups and no co-operation in the common task of sending coal to the pit bottom. Rather the haulage workers try to hinder the coal-face workers, so far as they can without their tactics becoming apparent to the management. They are able to do so very effectively. Complaints of "hanging the hammer" are often lodged by the hewers against the haulage men, but the officials are rarely able to tell whether the complaint is justified or not. The time wasted waiting for supplies of trams in certain mines is positively disgraceful. I, myself, have worked where anything from 20 to 40 per cent. of the hewers' time was spent waiting for supplies of

tubs, and no steps were taken to remedy matters. Under such circumstances the incentive to the hewer to give of his best is distinctly remote. Once his performance is spoiled by a long wait for trams, he loses interest, gives up the attempt to fill his usual quantity of trams, and dallies through the rest of the shift.

It is often suggested by Trades Unions and others that payment by results should not be allowed underground in the interests of safety. Undoubtedly many accidents do occur because the miner, so long as trams are available, tends to keep on extracting the coal without stopping to secure the roof over his head. He may feel that the supply of tubs must soon run out, and that then he will get plenty of time to bring his timbering up to requirements. If he stops filling the coal to secure the roof, his mates are going to fill trams which ought to come to him (provided he is able to use them), and he will have difficulty later in getting back his turn. So there is a big temptation for the hewer to take unnecessary risks. The solution of this problem, however, is not to abolish piece-rates, but to instil in the worker a safety-first attitude, under the influence of which he will be unwilling to take unnecessary risks.

The wages agreement operating in the mining industry at present calls for some comment. It was abolished in 1926 as a national agreement, but still holds as a local agreement in many districts. Without going into the details of the rather complicated agreement, it may be described as a com-

mination of the sliding scale (i.e. wages varying with the selling price of coal) and profit-sharing methods of wage determination. It stands condemned at once by its complicated nature. Not one miner in a thousand understands the means by which his wage is determined. All the psychological advantages of profit-sharing are lost in the mining industry, simply because the miner does not know that there is an element of profit-sharing in his wage.

The agreement stipulates that the miner should receive a certain minimum wage before the shareholders get their standard profits, a clause stating that if, in any one year, the standard profits are not realized, the claim of the shareholders is carried forward to the following year. Contrary to expectations, when the agreement was first drawn up in 1921, the standard profits have rarely been realized, so that the shareholders' claim has been piling up year after year. Now, although the miner does not know the details of the agreement, he does know that he is in debt to the shareholders. His union officials are always telling him so, impressing on him that, though conditions in the industry improve, his economic position cannot improve for a very long time—in fact, till he has paid back to the coal-owners this huge debt. The unfortunate effect of this state of affairs need not be stressed. Because of these conditions, and in spite of the profit-sharing element in the wages agreement, the objection to working for the absentee shareholder is perhaps more rife in the mining industry than anywhere else.

3. THE MECHANIZATION OF THE MINES

THE British mining industry, through economic pressure, is turning to the machine for salvation—the last of our more important industries to do so. To-day, in Scotland (which in this respect is ahead of England and Wales) over 70 per cent. of the coal is won by machines. In 1921 there were 800 coal-face conveyors in use in the United Kingdom; in 1930 there were 2,100; to-day there are vastly more. Machinery is, to some extent, doing what is expected of it. Output per man-shift has increased from 21 cwts. in 1928 to fully 24 cwts. in 1931, an increase of nearly 14½ per cent. It required 82 man-shifts to produce 100 tons by hand methods of production. Now the same production can be obtained from 39 man-shifts, aided by machinery. In another instance 1,390 men are found to be able to do with the aid of machinery what 2,400 men used to do—this, in spite of thinning and more inaccessible seams, in spite of the general tendency towards “diminishing returns,” which is particularly effective to-day after the blind irresponsible scramble for coal during the boom period of the early post-war years.

The mechanization of the mine may be considered

to be entirely successful if this increased production balances the cost of applying machinery to colliery operations. That is the question we propose to discuss in this article. Put it to a coal-owner, and he will say that most certainly machinery pays; put it to a miner, and he will have quite the opposite tale to tell. Both, within their own lights, are correct. The coal-master finds his answer in his balance-sheet; the costs measurable in terms of money are less. The miner finds his answer in his personal experience; the costs which fall on the human agent, he finds, have increased.

The latter costs, in general, cannot be measured in terms of money, but they are none the less real. They include, for example, discomfort and exasperation arising from uncongenial working conditions; illness arising from unhealthy working conditions; pain and suffering as a result of industrial accident; worry over economic insecurity; feelings of fatigue or boredom attributable to the nature of the work; and feelings of unrest and ill-will arising from unsatisfactory relationships with employer and fellow-employees.

Such costs contribute to the real cost of coal, and ought to be considered in determining the benefit derived from machinery. We must not fall into the error of the coal-master of considering only the business costs without regard to the costs that are borne by the human element.

Are the latter costs greater or less in a modern mine than in a colliery where the coal is won mainly

by hand? To answer this question we must look for a moment at the miner at work in pre-war days. He toiled with his assistant, usually a young lad, in a "place" of his own, where he was practically his own master. So long as he obeyed the regulations laid down in the various Coal Mines Acts, he was not interfered with. He was a skilled craftsman on a piece rate, so there was no need of an overseer directing his activities. No one knew better than he did how to blast the coal to best advantage or how to secure the roof so that it would not cave in upon him. The work was unhurried, so that the workman had plenty of time to instruct his assistant. He taught him how to wield the pick, how to gauge the quantity of explosive necessary, how to detect inflammable and poisonous gases, how to recognize a dangerous roof and support it, etc. So by this method of training, the miner's assistant of pre-war days became a skilled craftsman, well able to look after his own safety. He was more than a skilled craftsman—in his isolated working place he was a master craftsman, in the same position, in many respects, as the small tradesman owning his own business. He could organize the work to suit himself—work as hard as he liked, and, to a great extent, as long as he liked.

Now compare the lot of this worker with that of a miner in a modern colliery. All is hurry and bustle. The coal is cut by machinery. The workers and machines are concentrated in small sections in the mine, so that the workers must pool their resources

and each work to the other's hand. Most of them are "on the chain." Prompt on the hour for beginning work, the conveyor starts. Prompt on this hour the miner must start to load coal on to the conveyor. He must continue to load coal till the conveyor stops for lunch—for a period of fifteen minutes exactly since the $7\frac{1}{2}$ hours' day came into force—then on again to the end of the shift. There must be no quitting the job so long as the conveyor can gobble up more coal. If the conveyor breaks down, his work falls behind. He cannot utilize his spare time drilling shot holes or setting props—such are not part of his work any longer. The work is sub-divided. A special staff drills the holes and blasts down the coal before the coal-filling shift begins. Another gang of specialists puts up the timber. Each group of workmen must keep up to schedule (and circumstances are continually arising underground tending to prevent its doing so) or the succeeding group is held up and the whole section disorganized, perhaps for several days.

This is the position as it appears to the casual observer—the leisurely isolated worker of some years ago has been displaced by the hurrying squads of to-day. But to obtain a critical estimate of the cost to the miner to-day of his day's work compared with the cost to the miner of pre-war days, we must look well below the surface, and examine in detail certain aspects of this comprehensive change.

First of all in importance, perhaps, is the question of supervision. As we have seen, the miner of pre-

machinery days was to a large extent his own master. Hence he takes very ill to the supervision to which he now finds himself subjected. For he has lost his old independence. He finds himself a link in a chain of producers and must conform to the routine of the mine, and consider the requirements of his mates rather than his own immediate interests.

This co-operative attitude at work is quite contrary to all precedent in the mine, and it requires real tact and skill on the part of the management of a colliery going over to machine-mining to make the transition without arousing a great deal of unrest among the workers. The miner must be taught to sink his own individualistic traditions and co-operate with his fellow-workers in the common task of producing coal. He must carry this co-operation to the extent of pooling wages, for on a conveyor face it is impossible to ascertain individual outputs.

In very few mines, I believe, are there officials capable of carrying the workers over this critical period without more or less serious trouble. The mining industry, in general, draws its officials from the ranks—men who have obtained the necessary qualifications by evening class work while working as miners, an arduous task taking six or seven years and leaving little leisure time for the development of other interests. The result is a narrow specialist, proficient enough, perhaps, when it comes to a fall of roof or a broken haulage rope, but little able to deal with trouble with his labour force. It may hardly be fair to blame him for being unable to per-

suade the strongly individualistic miner to become a practical co-operator in a day, to persuade the extremely conservative worker to conform cheerfully to the new working conditions, and accept without demur a new piece rate which is only a fraction of the old one—such, indeed, is an impossible task. But I *do* blame him for failing to recognize that here is a problem beyond his powers, a problem for the labour manager or industrial psychologist. I do blame him for concentrating all his attention on the technical difficulties arising from the introduction of machinery into the mine, and failing to notice that there are human difficulties also to be overcome, till the growing discontent of the workers at last forces itself upon him—too late.

The miner is a hard, conscientious worker if tactfully handled. For working without supervision he is second to none; faced with a job and left to it, he will give of his very best. But put him under a domineering foreman, and soon there is trouble. One can see this regularly at these surface undertakings where miners are employed as navvies. Although this is usually a better-paid and less arduous job than work in the mine, very few miners make a success of it. Their navvying career generally ends abruptly with a dispute with the foreman, whose interfering habits, they find, limit the scope of their own initiative to a most exasperating extent. This is partly the reason why few unemployed miners, whose industrial experience has all been gained in the old "hand places" where the manage-

ment left them severely alone, take at all kindly to new work, in spite of the fact that their industry has now nothing to offer them.

To summarize, then, on the question of supervision to which we have so far confined our attention, machines have resulted in taking the onus of management from the shoulders of the worker and have placed it where it ought to be—on the executive staff and lesser officials. The old *laissez-faire* attitude of the management, which was virtually an admission that the worker knew how to do the job better than themselves, no longer persists. Machines have forced the management into a constructive policy of labour guidance and control. Again, machines are winning the miner from his old independent attitude, often developed to an anti-social extent, and inducing in him the new co-operative spirit more in accordance with the needs of modern society. Both of these results are bound to benefit the miner, although he cannot as yet see it to be so, and vigorously denies that he reaps any benefit whatever from the presence of machinery in the mine.

On the other hand, though the end is good, the means to the end are bad. The faulty supervision to which the worker is subjected induces psychological strains, which all contribute to the general spirit of unrest which has characterized the industry during the past few years. Happily, this difficulty can be overcome, for the most part, by the employment in the mines of officials trained in labour management. So on both counts, machines stand vindicated.

Their employment need not adversely affect the status of the miner and may indeed, as we have seen, improve his social outlook. As someone has put it, "it is men, not machines" that have attempted to make of the resourceful, independent craftsman an automatic coal-heaver, without initiative, without imagination, without feelings, "*sans* everything."

To turn now to quite a different aspect of the question, it appears that machinery is increasing the liability of the miner to accident. There are several contributory factors to this increase in the accident rate. In the first place, the presence of machinery in itself adds a new hazard to the mine, especially since it is working under adverse conditions in a confined space and is poorly illuminated. In addition, there is always the possibility of igniting fire-damp by short-circuiting of the electrical apparatus. Of even greater moment, however, is the question of noise. It will be readily understood that the narrow confines of the mine greatly magnify the noise of the mechanical appliances in operation and the difficulties of keeping the plant in that condition for smooth and "silent" running, in face of the very rough usage to which it is subjected, mean that the miner labours under noisier conditions than most factory workers. Now the Industrial Health Research Board has lately shown, in one of its Reports, that noise may have a slight detrimental effect on the worker. This "general" effect, however, is of little importance compared with the effect

of noise on a worker who is continually on the alert, ears strained to catch the slightest sound that will indicate that the roof is "working" and in need of support. In the old days, the miner was able to command instant and complete silence while he listened for ominous crackings of the timber and rumblings of the strata. On the machine-cut face, it is difficult to obtain such silence. The conveyor can be stopped and a message passed along the workmen calling for silence. This indeed is often done—but not as often as is advisable in the best interests of safety. The scorn of his mates for being so timid and the grumblings of the management for holding up the work of the section makes the nervous worker hesitate to take this rather drastic step every time he imagines he detects a warning sound above the noise of the machinery. So noise of machinery in operation imposes a far greater strain on the underground worker than on the individual working under normal factory conditions.

There is still another factor contributing to the increase of accident rate where modern intensive mining methods are adopted, namely, the method of training boys entering the mine. In pre-war days the new recruit to the industry invariably commenced work underground under the wing of a father, elder brother, or friend of the family. Father and son worked together in their own "place," somewhat isolated from the rest of the mine, where the older miner had ample opportunity for training the lad, pointing out the dangers of the mine, and

the safeguards to be adopted against them. During the first few days in particular this system was invaluable to the new starter in the mine. In his very strange environment, the boy has to be carefully looked after if he is to be prevented from running into danger. For example, he must get into the habit of walking and working with a stoop, and keeping a look-out for low parts of the roof and irregularities of the floor, or he will give himself some nasty knocks. He has to accustom himself to the poor illumination and to the lamp fixed on his cap. He must learn to keep his lamp alight in an air current (if it is a naked light). He must also "pick up" the geography of the mine if he is not to wander into danger in a disused roadway, and is to be able to make his way out of the mine by the escape road in the event of being shut in by a fall. These are only a few of the problems which face the new boy in the mine in addition to the difficulties of learning the actual job.

No doubt this system of training boys had its limitations, but it was vastly superior to that in vogue since machinery made it no longer possible. The conditions on a machine-operated coal face make it quite out of the question for a father nowadays to keep his son with him till the latter has acquired "pit sense." It would be ridiculous to put a new boy to work on a machine face—he would be certain to meet with disaster. The miner to-day has plenty to cope with under such circumstances attending to his own work, and could never under-

take the task of keeping a "green" lad out of danger. So the new boy is left in the care of the management, who generally put him on to haulage work and hand him over to another boy to be initiated. The older lad only too often takes advantage of the opportunity to show off and succeeds in making things very difficult—and dangerous—for the new boy.

H.M. Inspector of Mines (Northern Division) comments on the matter rather strongly in his Annual Report. He says¹:

Most boys going fresh to the pits have to pick up their jobs as they go along and get their training from the example, advice and help of older boys and brief instructions from the workmen and officials with whom they work or come in contact. This may train them in bad habits as well as good, and all the time their training is being done in places where very often a slight deviation from the straight path results in death or serious personal injury. While boys cannot be trained in mines without taking some risks, there is no point in subjecting them to unnecessary and avoidable risks during their training period. In my view such a system—if this word can be used to describe it—is unfair to the boys.

A systematic training of boys on the surface, with short spells underground under a capable instructor, would quickly wipe off this blot from the organization of the industry. The coal-masters have their opportunity now to make the move collectively before they are again forced to it by legislative

¹ Report of H.M. Inspector of Mines, Northern Division, 1930.

“interference.” So again we reach the conclusion that it is not machinery, but its application without sufficient thought to its effects on the human element, that is at the bottom of the antagonism of the miner to his new conditions of employment.

Indeed, under certain conditions, modern mining methods may definitely tend to reduce accidents. In a conveyor district, for example, only two main roadways are necessary where previously there may have been, say, a dozen. We may therefore expect to find, and happily on occasion do find, that these two roadways are larger and supported very much more securely than were any of the dozen. Besides, in a thin seam there is not the same hazard in blasting out two as in blasting out a dozen roadways from the rock adjoining the coal seam. But, on the other hand, where conveyors are employed bringing the coal from the face conveyor along the roadway to some convenient loading point, probably a few hundred yards from the coal face, the tubs no longer fix the lower limit of the size of the roadways, and we may find conveyors to have quite the opposite effect on their condition.

The writer recently visited a mine for the special purpose of seeing conveyors on roadways and there found that the main road, for a distance of one hundred yards or so, had an average height of eighteen inches to two feet. A man lying flat on his back on the moving conveyor belt (which may be six or eight inches above ground level) would have jammed in many places against the roof; and, in the

event of an accident, it would have been quite impossible to remove the injured man on a stretcher. But perhaps the most serious aspect of such roadways serving a district of a mine is that of ventilation, and in this particular case the state of the atmosphere was far from satisfactory.

This again illustrates what has been emphasized throughout this article—that the mechanization of the mine without adequate consideration of the human factor may lead to hardships, but that, with careful attention to the needs of the workers, mechanization has great possibilities for good.

Still another way in which the mechanization of the mine has resulted in a heavier load on the worker's shoulders arises from the fact that machines will break down occasionally. This is especially true in the mine for two reasons:

(i) The adverse conditions—dust, dampness and the difficulty of overhaul arising from inaccessible machinery—mean a severe wear and tear of the mechanical plant.

(ii) Instead of capable engineers and electricians being in charge of the plant, the work, with a few honourable exceptions, is in the hands of poorly-paid mechanics and blacksmiths. Sir William Ellis, in a paper read before the Institution of Mining Engineers,¹ refers to this point. I quote him as an indication that my personal experience is not an isolated instance.

¹ *Proceedings of the Institution of Mining Engineers*, vol. lxvi, p. 85.

The mechanical engineering side of colliery work has up to now been largely in the hands of a capable millwright. I speak with the greatest respect for this type of man, as he has in many instances efficiently tackled the maintenance and upkeep of the boilers and driving engines, etc., but the point I wish to urge upon your Institution is that the time has come when the mechanical engineer of a more technical and wider training should be included amongst the staff of a colliery, and that he should have given him a status higher than has previously been the custom.

For these reasons, then, breakdowns of underground mechanical plant are frequent. When a breakdown does occur, the worker can either stop work and go home, or sit down and await the restart. The former course means a loss of wages and is not usually followed unless it is going to take a considerable time (say three hours or more) to put matters right. Where the breakdown is less serious the worker usually waits till it is repaired—receiving no pay for the time thus spent.

When the restart is made, the spurt is often so intense as to cause the worker to suffer from over-exertion in a very short time, besides rendering him more liable to accident during the rush period. Or, on the other hand, the reaction of the men to the stoppage may be quite different. They sometimes appear to lose heart, and drag through the remainder of the shift absolutely without interest, manifesting not the slightest desire to put out a satisfactory day's work and earn a decent wage. The latter result is

more common where there have been a number of stoppages during the previous days, this last of the series rendering previous "rushes" to keep up the week's output all in vain; but it is impossible to forecast whether the workmen will speed up or slack after a stoppage. The external conditions may appear to be exactly the same on two occasions, yet in one case the men may do their utmost to make up the lost ground, while in the other they throw up the sponge. There seems to be scope here for the student of mass or crowd psychology in investigating the various factors inducing workmen to adopt in a body one or other of these conflicting attitudes after their work has been hindered by some cause outside their control.

In the mechanized mine, then, the human agent is continually being called upon to shoulder the failures of the mechanical agent—and shouldering failures is at best an exasperating business. These sudden periodic loads on the human machinery have a very wearing effect—more than is generally recognized. Every effort must be made to eliminate them, for example by the employment of well-trained mechanical and electrical engineers for underground work, or we shall again be compelled to record that the mechanization of the mine is throwing a heavier strain on the miner.

We must mention another point in connection with the application of machinery to coal mining. The coming of machinery has made it an economic proposition to extract very much thinner seams of

coal than could previously be worked by hand. A Glasgow firm has lately placed on the market a coal-cutting machine requiring only fourteen inches of headroom. The result is that seams of sixteen and eighteen inches in thickness are being worked. The trials of the miner, carrying out his work cramped up in such limited space, need not be stressed. Here there seems no doubt that machinery has brought about an increased cost to the human agent.

So far we have confined our attention to the effects of machinery on the worker at the coal face, but the increasing application of machinery to haulage operations is also bringing about developments from the labour point of view. At the very start we can lay down an axiom. It is this—*the less hand haulage the better*. It is the most brutal and limb-racking work in the mines to-day.

At first sight, then, it might appear that the introduction of mechanical haulage is an undisguised blessing to the worker. But this is not so. Mechanical haulage in the main is displacing ponies rather than men. Being less flexible than hand or horse haulage, there is much underground work to which it cannot be economically applied. But in a highly mechanized mine, more for conformity than anything else (though perhaps for reasons of safety) ponies are usually completely eliminated. The result is that in such a mine there is rather more haulage by hand than in an old-fashioned mine where ponies are available. Mr. J. Masterton, H.M. Inspector of

Mines, has some pointed remarks to make on this subject. He says¹:

The number of horses in the mines has again decreased. This is satisfactory when it is possible to replace horses by mechanical haulage. But it should be remembered that there are circumstances in which it is not practicable to have mechanical haulage near the working faces. In such cases young and growing lads have to push the tubs, and it is, in my opinion, better to see sturdy ponies at work than to see lads straining themselves to the point of injury.

So here again machines have worsened the lot of the worker.

In conclusion, we will refer briefly to unemployment. According to the Board of Trade Journal (September 1932) the number of colliery workers in Britain at the end of June was the lowest recorded during the past thirty years. There are several hundred thousand miners who will never again secure employment in their industry. If machines are to blame for this, then they have added to the cost falling on the human element to an alarming degree. The miner blames machines. He knows that to-day he handles maybe five times as much coal as formerly. So he takes it that he and the machine are doing five men's work. This, of course, is not so. The subdivision of labour has, unnoticed by the miner, resulted in a far bigger proportion of on-cost workers. No, it is only by the progressive application of up-to-date, intensive mining methods,

¹ Report of H.M. Inspector of Mines, Scotland Division, 1930.

employing machinery at every opportunity, that the unemployment figures will be kept at a minimum. Under the present system of cut-throat competition in the external market, Britain can only retain and regain her markets abroad by producing at the lowest possible figure.

The unemployment which would surely result from the failure of the British coal industry to keep pace with her foreign rivals in the adoption of modern methods of production would throw a much heavier burden on its labour force than the workers are called upon to shoulder through certain harmful effects of the mechanization of the industry. The miner must recognize that costs must be reduced and that it is better from his point of view to have them reduced by improved organization and methods of production rather than by a reduction of wages. The mine-owner in his turn must recognize that the new conditions in the mine impose a strain on the worker which must be relieved if there is not to be another rupture in the industry. Certainly we must mechanize our mines to the fullest possible degree—it will be to the ultimate benefit of everyone connected with the industry—but that is not to say that we should attempt to mechanize the miners. In the mines, the mechanical era is just commencing. Whether or not it will be a successful and prosperous time for the industry, and for its associated industries, depends largely on one thing—whether the mechanical era and the psychological era coincide.

4. PIT-HEAD BATHS: THEIR EFFECT ON THE WORKER

To the Rt. Hon. Lord Sankey is due the principle, which is embodied in the Mining Industry Acts of 1920 and 1925, of levying the whole mining industry at the simple rate of one penny per ton of coal raised in order to create a fund "to be applied for such purposes connected with the social well-being, recreation, and conditions of living of workers in or about coal mines, and with mining education and research." Under the Act of 1926 a tax on coal royalties and wayleaves augments the income of the Miners' Welfare Fund to fully £1,000,000 per annum. No better application of the money could be conceived than in providing pit-head baths, and it is extremely gratifying to note that during the past few years about one hundred collieries have been fitted with baths under the Scheme. The building programme for this year allows for approximately three new baths to be put in hand each month.

I was employed in a Scottish mine at the time a proposal to erect pit-head baths was first placed before the workmen, during the period of their installation, and for six months after they were in use, and was thus able, throughout this period, to

obtain and follow up the opinions of a number of my fellow-workers on the subject. (I should remark that my work was such as to give me the opportunity of forming contacts with some 200 of the 1,000 men employed). These notes set out to record the reactions of the men to what was to them a distinctly novel experience, and the effects of the baths, so far as yet ascertainable, upon their industrial efficiency and social welfare; and may be of interest as exploring the attitude of one section of the British working public to welfare work from the employers' side.

The scheme was resisted by the men from the very start. A majority had to signify their approval before the installation could be proceeded with, and a ballot of the workmen was accordingly taken. The result was amazing, though, on reflection, typical of the miners' extreme conservatism. Almost to a man they rejected the proposal.

I set out to canvass the workmen systematically and catalogue the reasons put forward for not accepting the offer. I pointed out to them that they were being offered, as a body, roughly £15,000, a sum which would be diverted elsewhere if they persisted in refusing it.

The majority objected to the proposed deduction of probably 6d. per week (depending on the number using the baths) from the wages of each bather. They seemed to feel that they must resist at all costs further deductions from their wages—that any scheme lowering the total amount of money which

they carried home at the end of the week must be rigidly eschewed.

I could well appreciate the origin of this attitude. The list of off-taxes on a miner's pay-slip is larger than in most industries, and represents a heavy burden when wages are low. Besides the contributions for National Health and Unemployment Insurance, there are weekly deductions for medical benefit for the wives and children of the workmen, for explosives, tools, pick-sharpening, check-weighman and occasional levies for various purposes, such as infirmaries, the local nursing association or football team.

It was useless to point out that this was a sixpence well spent—how well spent only those having a knowledge of the home life of a miner can appreciate. Consider a miner's home where there are three or four of the family all on one shift, and all coming in practically at the same time, probably some of them with wet clothing. For two hours or thereabouts a big basin sits in the middle of the living-room floor, where each in turn does his best to remove the grime of the mine. If he wants a thorough bath, he retires to the scullery and washes himself as best he can in a wooden tub of absurdly small dimensions. Hot water must be provided with only one fire available, which must also cook the supper and dry the pit clothes. These clothes dominate the picture for the rest of the evening. They are scraped clean of mud, and draped round the fire to the exclusion of everyone else, the women-

folk devoting their evening to supervising the drying. Again, consider the dangers and discomforts of travelling to and from work in damp and dirty clothing. Men just out of the warm atmosphere of the mine required to walk or cycle several miles home in clothes wet with sweat or water are in grave danger of catching a chill, or worse.

That an offer to remove these very real discomforts of mining life should be rejected by the miners themselves is indeed deplorable, and typical of perhaps the most conservative body of workmen in industry to-day. Incidentally, it is this rooted objection to change on the part of the miner which is mainly responsible for those "black spots" in certain mining areas—places where maybe 90 per cent. of the population is unemployed. The miner refuses to jolt himself out of the rut, so that relatively few miners have switched over to new occupations, either through the activities of the Industrial Transference Board or otherwise, since their industry ceased to hold out for them reasonable hope of employment.

So in this innate tendency of the miner to steer clear of anything which savours of originality, I found the prime motive for his opposition to the proposed baths. He, and his father before him, perhaps, had always removed the dirt of the mine in the middle of the kitchen floor, and he refused to be convinced that a change in the procedure was necessary or desirable.

A surprising number of the older men informed me

that they had never made a habit of washing the whole body, and did not think it was wise to begin experimenting at their time of life—safety first! The majority believed that excessive washing is inducive of weakness.

Some objected to pit-head baths on the ground that they were insanitary, or that there was not sufficient privacy. When one compares the conditions in a modern installation of pit-head baths, where each man has a cubicle and spray to himself, with those under which he must wash in the home, it is at once apparent where the insanitary conditions and lack of privacy are really serious. Incidentally, there should really be no problem of privacy in colliery baths, where the bathers are all of one sex. In most sports pavilions in this country the bathing accommodation is of the open variety. I will refer again to this question when discussing the various types of cubicles.

It is to be regretted that the Colliery Company thought fit to advise the workers to accept the offer, and in various ways made it clear that they thought their advice would be acted upon; for there is no doubt that that mutual suspicion and distrust which characterizes so many of the dealings between the Miners' Federation and the Mining Association—that unfortunate spirit immediately chose to see in the coal-owners' regard for their employees' welfare some ulterior motive, and various absurd reasons were raked out to account for it. For example, a surprising number really seemed to

believe that the Company was out to make money from the scheme. If the Miners' Welfare Fund was supplying the funds to erect the baths, why the sixpence per week deduction from their wages? Others saw the reason for the Company's enthusiasm in the fact that they would be able to sell the bricks for the construction of the building at their own figure to the Welfare Committee, on which they were well represented. Others, nearer the mark, said it was only another dodge to get them to produce more coal for the same wages, although they were not very clear in their own minds as to how this was to be done.

Several men put forward as their reason for not favouring baths at the mine that it would lead to increased voluntary absenteeism on their part. They explained that when they left home in their pit clothes, there was definitely no alternative but work; but under a system of pit-head baths, where they left home in their ordinary everyday wear, they might set out for the mine in perfectly good faith yet never reach there, having yielded to the superior attractions of the bar, the football field, or the billiards saloon. I admit they seemed to me at first to be exaggerating their little weaknesses, but experience of six months' operation of the baths shows that there is increased voluntary absenteeism, whatever the cause.

So the miners would at first have nothing to do with pit-head baths. The Miners' Union called a meeting of the men and advised them strongly to

accept the offer. A publicity officer of the Welfare Scheme came up from London and explained the baths to the men, with films. The ballot was repeated. Again there was not a majority in favour of the baths. The Colliery Company was in a dilemma; the Miners' Union was in a dilemma. Here was democracy in need of a dictator! Then some bright statistician discovered that by eliminating the votes of the surface workers, who were solidly against acceptance of the offer (probably because (i) they were not so dirty as the underground workers, and (ii) they were poorly paid and felt the levy of 6d. per week excessive), there was an apparent small majority in favour of the project. So the baths were erected, at long last.

The first day they were open for use a few venture-some souls (including the writer) carried with them to their work a parcel containing their clean clothing which they donned after washing at the end of the shift. Everything went well, except for one unfortunate fellow who omitted to bring his trousers! Our pioneering efforts were witnessed by a large number of the workers, and rewarded next day by a big increase in applications for lockers. Every day more men came in, till, a fortnight after the baths were opened, 88 per cent. of those employed, including pit-head workers, were using the baths.

This evidence is in accordance with the general experience. According to the 1931 Report of the Miners' Welfare Committee, the preliminary ballot gave an average of 58 per cent. for acceptance,

while actually, on the average, 82·7 per cent. of the workmen employed at collieries equipped with baths make use of the bathing facilities. This bears out the contention of the Welfare Committee that once a bath has been provided, it is only a matter of time before the great majority of the workers use it, whatever may have been their views before they had practical experience of its advantages.

A short description of the bather's procedure in a modern installation may be of interest. He arrives at the baths and passes to his clean-clothes locker, where he undresses and hangs up his clothing. Taking his soap and towel from the locker and wrapping the towel around him, he proceeds through the building, via the bath-cubicle section, to the pit-clothes locker room, where he dons his working apparel. Warm air is kept continually circulating through the pit-clothes lockers, so that the clothes are always warm and dry at the beginning of the shift, no matter how wet they may have been at the end of the previous day.

Making his way through the building to the doorway leading to the pit, the worker fills his water bottle, and greases his boots in the outer room between the pit-clothes locker room and the main doorway on the pit side. Returning from work, he re-enters this room, and, by means of revolving brushes driven by a small electric motor, has his boots thoroughly cleaned of grease and dirt before passing on to the pit-clothes locker room. Here he undresses, arms himself with soap and towel (which

he has placed in readiness in his pit-clothes locker at the beginning of the shift), then seeks out the nearest vacant cubicle.

This is generally, in this country, of the screened type. The baths are spray baths, with facilities for varying the temperature of the water as required. It is interesting to compare this type with those in common use in Germany. In such installations there are no separate cubicles, which involves a big saving in initial and cleaning costs. Certainly nothing could be simpler or more hygienic than this bathing arrangement. Its advantages are clearly recognized by the Welfare Committee, who are trying to persuade the men to adopt it in the latest schemes. So far, however, the British miner insists on special screening, though the trend of the design is definitely towards the Continental ideal. In all the baths erected prior to 1926 the cubicles were fully screened—the double T type; in the case of the National Colliery baths and the others completed last year, the cubicles are partly screened by an L-shaped projection; while in the baths completed this year the cubicles are quite open in front. This suggests that the future development of the bathing arrangements will be on the lines of the German installation.

Whatever the type of cubicle, the worker must wash as quickly as possible to make room for others. He then goes to his clean-clothes locker, dresses, and makes his way out of the building or into the canteen, if there is one attached.

The first apparent effect of the baths was a big

increase in absenteeism due to sickness. This was because of the men catching cold by bathing in hot water, then going out into the open. Experience soon taught them that they had to have a splash in tepid water before leaving their cubicle; and now, after six months, there appears to be a definite decrease in time lost due to sickness and accidents; but there is an increase in voluntary absenteeism.

To deal with the latter point first, the probable reason has already been stated—there is more opportunity for a worker to succumb to a sudden impulse to have an idle day. This trouble is particularly real with regard to men on the afternoon shift (starting work at 3 p.m.). One can hardly blame a man who, on his way to work, hears that he has cleared several pounds from a betting transaction, if he suddenly decides to stay at home and have an evening's celebration: yet that same man would never have dreamt of absenting himself from work had he been wearing his working clothes. It may be that the amount of voluntary absenteeism will decrease after the novelty of going to work in clothes fit for other activities has worn off. On the other hand, wages are low at the moment, and it is fairly certain that as wages increase, so also will there be an increase in such lost time.

Time lost by men stopping work early has decreased very considerably. Rarely a day passes in a large mine but someone asks to be allowed to stop an hour or two early as he is going to a funeral, or wants to catch a train for some special purpose,

etc. When the man can go straight from the baths to the station or to the funeral (there is a canteen attached to most modern installations) he is able to remain longer at work. As it is not usual to deduct such time from the wages, this represents a very important saving to the Company.

Besides those workmen who ask to be allowed to stop early for a specific purpose, there used to be a large number who regularly stole ten or fifteen minutes at the end of the shift, knowing that they had before them the long walk home and the slow and laborious process of washing in a confined space with few facilities. Now that the baths are in use there is not the same necessity for rushing away at the end of the shift, because the men are speedily washed, and speedily home by bus. (Note that the workmen were not able to travel by bus before the baths were installed. This will be dealt with later).

With regard to the time lost due to sickness, it was to be expected that the baths would have the effect of reducing this loss. Apart from the beneficial effects of cleanliness to health in general, there are several other aspects of the question.

The mine is situated about two miles from the village. Before the baths were installed, the men often reached the mine on a wet morning with soaked clothes, in which they had to work all day. Now they change into warm, dry working clothing, and their clean clothes are dried for donning again at the end of the shift. Similarly, when men are working in wet "places," they do not require to

tramp or cycle the two miles home in wet clothing—in cold weather an experience to test the hardiest of frames. It was a common experience for a miner to arrive home from work with his clothing stiffly frozen.

Again, the men can now travel to and from work by bus. True, the bus company did not specifically prohibit miners from using their service, but after experiencing the hostile attitude or tearful lamentations of passengers to fellow-travellers who might well be the paid embassies of the local laundry, they would have been brave fellows indeed who persisted in travelling by bus in their dirty clothing.

The beneficial effect of this new privilege of travelling by bus need not be stressed. There is a great advantage in arriving at work unfatigued. Certainly the two miles' journey across a piece of open country on a stormy morning resulted in men arriving at work in no condition to perform it effectively. This is very probably one of the chief factors affecting the fall in the accident rate since the installation of the baths.

There is another way in which the baths might bring about a reduction in the accident rate. Emergencies are continually arising in the mine where men must work overtime without warning. In such cases, before the baths were installed, the workmen, after two or three hours' extra hard work at the emergency job, were in a half-dazed condition from hunger and fatigue, and particularly susceptible to accident. Since the baths have been installed, the

situation has greatly improved. The men go up the mine at the end of their normal working shift, bathe, and have sandwiches and tea and a smoke in the comfort of the bath's canteen. They return to work greatly refreshed and fit for several hours' strenuous exertion without ill effects.

So far I have examined only the physical effects of pit-head baths on the worker, but their psychological influence is even more important. It may sound trite to remark "*Mens sana in corpore sano*," yet there is sound truth in the tag.

However, the influence of pit-head baths on the mental outlook of the miner springs from a deeper-seated source—a change in the environmental factor. The miner is a victim of environment. His whole outlook is dominated by coal and the drabness of the mine. Night after night he drags himself home from work in his ragged old clothes, stiff and uncomfortable from the oil and dust with which they are saturated. The darkness of the mine clouds his home life. His wife, living in an atmosphere of dirty steamy clothes, and bath tubs, and muddle, is long since overwhelmed by her environment, and is herself an integral part of the depressing atmosphere. She has given up any attempt she might have made to make a cheery home to contrast with and counteract to some extent the gloom of the mine. On the contrary, in the miner's home there is much the same dull cheerlessness, the same steamy dampness, the same queer mixture of discontent and dispiritedness, the same grim atmosphere of fear

or foreboding arising from the close and realistic contact with the overwhelming forces of Nature, as characterizes the existence of the miner underground. Under such conditions, there can be no dignity and little joy in work.

Pit-head baths are going to play a tremendous part towards brightening the miner's life, and are going to exert a far-reaching influence on his attitudes and opinions. It is only in a relatively small degree that the underground conditions can be bettered, though something can be done by improved ventilation, lighting, etc.; but the miner's home life can and will be changed out of all recognition—and the provision of pit-head baths is the first big step in that direction. The miner is going to leave the gloom of his work behind him at the mine with the dirt. His wife is going to find a burden of distressful work taken from her shoulders and will react accordingly. She will become healthier and cheerier: her apathy will be driven away. No longer depressed by the dull cheerlessness of her home, and by the knowledge that any efforts she may make to clean and brighten it will be spoiled by the dirt of the mine, she will strive to make a home where her husband can escape from his gloomy working associations. Pit-head baths have undoubtedly opened the way to better things for the miner and his family.

It is to be hoped that the time is not far distant when they will be erected at every colliery. The Miners' Welfare Trustees in this and other connec-

tions are doing work which will be far-reaching in its consequences, and I cannot emphasize enough how strongly I deplore the suggestion made in Mining Association circles that, in view of the unprecedented depression in the industry, the scheme should be suspended in the meantime. It must go on. It is one of the few gleams of hope in the industry—an industry crippled partly by lack of concern for the human element.

III

A PLASTERER'S VIEW

BY

JOHN GIBSON

JOHN GIBSON

MR. JOHN GIBSON, son of a cobbler, was born in July 1901. At the age of ten he began work, before and after school hours, selling newspapers and periodicals in the streets. He left school for good at thirteen years of age, and within a year he had worked in a corn-chandler's shop, at bottling mineral waters, at labelling beer bottles, in a bakehouse, and as a grocer's boy. In 1915 his parents moved to London and young Gibson was apprenticed to a plumber. After a year, his employer joined the Army and he entered the machine shop of a munition factory. After the war he became a packer in a gramophone warehouse, then went into the optical lens manufacturing trade. Within two years he became a lens-grinder, but the optical industry fell on bad times and he was faced with unemployment. For a short time he became a traveller in fancy goods and then worked for a year on a railway electrification scheme. This job ended, he turned to the building industry, and working for various employers was in turn a navvy, a painter, a pointer, a general jobbing hand and then a plasterer. While working on the railway and later as a navvy he attended evening classes and studied, among other things, Electrical Technology, Economics and English. The building industry provided only casual employment and, forced to consider some way of bridging the gaps between the end of one job and the beginning of another, he tried his hand at free-lance journalism. By dint of much effort he gained a measure of success, and as a result is the author of several short stories, a good many articles and book reviews on a variety of subjects, and two short plays which have been successfully produced by amateur companies.

A PLASTERER'S VIEW

I. LET THE SCIENTIST TRY

A SIGNIFICANT fact about recent political happenings is that *all* people in Great Britain have expressed an urgent desire that determined steps should be taken to end the depression which for so long has clouded the industrial life of the country. The fact remains, however, that not one of the organizations through which the opinion of the people is expressed is really suited to utilize the prevailing tendencies effectively. The present position of industry calls for drastic measures of reorganization, and for a more rigid and logical application of science to our productive methods. But if science is to be applied, the scientist must apply it. Within certain broad bounds he must be allowed a free hand. He must be allowed to take all the facts of the case and, by following the normal course of scientific investigation, to arrive at unbiased decisions. To ask this is to ask no more than the observance of the essential conditions in which all scientific research and investigation has been brought to a successful issue in the past.

It is not easy to indicate in other than general terms the way in which we must strive to avail ourselves of the fullest benefit of this opportunity. No detailed examination of the whole problem has

as yet been undertaken, but certain points are apparent from ordinary observation. Notwithstanding many amalgamations and adjustments, there is still a lack of cohesion and unity about our industrial machine. It works, but its cogs are an odd assortment thrown together by chance rather than placed by design; it does not respond quickly or accurately to control, and certainly cannot be guided as a whole, consciously, in a given direction. But the faults which strike home from the wider and more general view of industry, grave as they are, are appreciably less than those which appear when we come to consider individual trades and industries. Here indeed is a queer mixture, the impact of new ideas, half assimilated, applied timidly and erratically, upon the old. The modern lorry, made to "tip up" and "shoot" its contents mechanically, receives its load by the weary method of the hand shovel. Or a new crane (as the writer saw recently in a London foundry) is fixed in a definite position, its operations limited to a restricted range (within which everything of weight and importance had perforce to be cast else the crane was useless), instead of being mounted on runners of some sort to render it movable and operative along the whole length of the foundry. Exits and entrances are often inconvenient and congested; skilled planning is often absent. It is not generally realized that the management and organization of factories and workshops is a job requiring a special aptitude of mind, and perhaps a special training. Incidentally,

a thing that occurs to me is the number of instances where the factory manager was originally a draughtsman. A good craftsman, too, is very often put into a position of trust. Why is it, I wonder? I have nothing against draughtsmen or any other section, but neither a good draughtsman nor a good craftsman is necessarily a good organizer. The ability to organize, in fact, is not attached to any definite craft or profession; such ability may as readily be found among non-professional and non-craft workers. If this is the case, then it seems to me that industry in many instances is quite unnecessarily limiting the range of its choice in a vital matter, and such a limitation cannot be without disadvantageous consequences.

The foregoing raises a matter which is by no means trivial or unimportant, for efficiency implies something more than the mere mechanization of industry; it implies, indeed, not merely use, but the most effective use of the best possible means of production. There seems no reason why we should not take a big step forward in the matter of both method and labour. The researches of the psychologist make it abundantly clear that we need no longer rely on chance to supply us with workers adapted to certain classes of occupations. There was never a better time to make use of these researches. I am sure that, at the present moment, the inquiries of the specialist and the application of the knowledge of the industrial psychologist can go forward with the minimum of opposition and the maximum support of the

workers. Economic pressure makes speedy and radical changes in the outlook of the individual. Eighteen months ago, when I mentioned the industrial psychologist to some workers, the following comments were offered: "They sort o' fits you into your little niche!" And: "It's all very well . . . most people in industry know better and quicker ways of doing things . . . but why throw people out of work by harping on them?" Less than a week back, one of the same men, discussing the effects of intense competition, said: "We ought to try out any likely idea." I reminded him of his former statement. "Well . . ." he said, "it seems to me we've got to do something, so we may as well get on with it." Neither is this change of attitude any solitary or isolated instance; one meets with it quite frequently nowadays.

So far as the selection of labour is concerned, the new, potential workers leaving the schools could be examined and graded, and supplied with a document indicating the kind of employment for which they are best fitted. It would be a more difficult business with those workers now unemployed, but it ought not to be impossible. There are large numbers of men, such as harness-makers, horse-carmen, farriers and so on, who can never hope to work at their old trades again. Surely it would be to the advantage of such men to have behind them, when seeking other employment, the considered opinion of an expert that they are likely to be successful at that employment.

All this may seem very prosaic, but sentiment does not aid clear thinking, and if I have merely tabulated bare propositions, let me hasten to testify that I have the welfare of the workers not less at heart on that account. Adversity is teaching us how dependent men are on one another. Each is essential—the scientist no less than any other. We are learning, too, that what may be called a “bit and dab” application of science is not good enough. We have to be thorough. The fittest and most adaptable survive, the others. . . . That is why we must let the scientist try!

2. RATIONALIZATION IN THE BUILDING TRADE

To the greater number of British industries rationalization is still but a word; indeed it is doubtful whether it has passed the initial stage of the linking-up of big concerns in more than a few instances. Evidence points to the conclusion that the more spectacular efforts of enterprise only receive the consideration of the captains of industry when economic pressure is active; if amalgamation will stave off depression and bring things somewhere near normal, then more detailed reorganization of method and production is allowed to wait. In short, *the rate of progress in industry does not run parallel with scientific knowledge, but is limited to the speed forced by the circumstances of competition.* An example of this may be seen in the case of the railways, which firstly contented themselves with a mere amalgamation, and now, by reason of more intense economic pressure, are driven to far deeper and more painstaking changes. The case of the mining industry will also occur to one, although here an innate conservatism has rendered attempts at alteration very feeble. British industrialists suffer from a serious lack of vision.

The general idea is that so long as an industry pays it is being run on efficient lines. This is neither true

nor ultimately profitable; but the layman hears little of the methods of any concern whilst it is prosperous. It is only when depression sets in that the general public gets any notion of how production is carried out. There are industries which still remain sheltered economically, and which as a consequence show scanty signs of progress in method. Of these the building industry is an outstanding example. Here amalgamation has not taken place on any large scale, and with a building in any degree larger than a moderate-sized living-house, directly the bare structure is up the rest of the work is handed over to a horde of sub-contractors; indeed, one notable firm until two years ago employed only a general foreman to watch its interest, and was in the habit of sub-letting the whole of its work on any building, from the ground work at the very beginning to the last coat of paint. This firm erected some of the most notable buildings in London.

It is true, of course, that a building can be erected and completed quicker to-day than in the past, but even so we are a long way behind the speed that might be attained. The layman, seeing the huge cranes and great iron structures about any big city, will not at first understand this point, but it must be remembered that the cranes one may observe working are often the plant of the particular sub-contractor who is doing the ironwork. Not all builders possess a crane. As soon as the main structure of a building is up, the crane, whether it belongs to the builder or not, invariably comes

down, and thereafter all materials have to be manhandled. All sand and materials for plastering, for woodwork, for brickwork, or for concreting are moved and transported to their various destinations within the building by exactly the same methods as were employed by Chephren and Mycerinus, who built the pyramids five thousand years ago—by an unwarranted and wasteful expenditure of human energy. To give a clear idea, let me discuss a theatre on which I worked recently.

Directly the bare structure of this building was complete the cranes were taken down. It was impossible, owing to traffic, to receive goods at the main entrance, and the only other available opening was a small door about fourteen feet wide and not more than eight high in a by-road. One would have thought this entrance would have been kept strictly clear, but such was not the case. The people using it being only sub-contractors who had given their price, and the only person with any real authority being the builder who, since a price had been given, really cared little how other people got their goods in, it is not to be wondered at that this entrance became congested with a variety of articles and materials that had been dumped for quickness. In addition to this there was a wellnigh constant stream of men coming and going through this entrance, carrying sand to different parts of the building. It seems unbelievable, but it is nevertheless true, that no better method was employed to get the materials for the plasterwork on the ceilings to

their destination than to carry them bit by bit at an enormous expense of labour. Each day several tons of sand would arrive and would be put into sacks, about a bushel in each, and thence carried up eleven flights of steps—about a hundred in all. Portland cement, plaster and Keene's cement, which are still for some obscure reason put up in sacks holding two cwts., were also carried up these steps, after having been divided into single cwts. at a great cost of time. Even then, when the materials had reached their destination and it came to mixing them, the nearest supply of water was down four flights of steps, and such an elementary requirement as a piece of hose-pipe was not to be obtained, so that one man had to be constantly carrying water. To remove the mixed material from its place of gauging to the actual ceiling was another point that was never given thought; the stuff was merely carried one pailful at a time a distance of forty feet and thence up a twenty-rung ladder.

The method of manhandling things seems to die very hard in the building trade; woodwork, timber and great plaster casts were among the things that were pulled and dragged by human brawn about this theatre until they reached their destination. It is not sufficiently realized that, in addition to the enormous and costly waste that this method is responsible for, it involves a great physical strain on the worker. A number of the men with whom I worked on the theatre in question suffered from rupture,

which is quite a common condition among non-craftsmen in the building industry.

Like most big buildings, the theatre was also cursed with its crowd of sub-contractors, and there arose the inevitable overlapping and warfare between these people—quarrels about sizes, about what should be done first, and so on. The plaster-work was undertaken by two separate firms, another firm had much of the concreting; the electrical work was “let out,” as was the plumbing; the painting was the concern of a separate firm, and someone else tackled the fittings; window fittings and glazing again came under another firm, and the furnishings were the business of yet some other body. In England the architect will not take responsibility for finished sizes, and this is the cause of much delay. One firm cannot even commence the manufacture of its commodities until another has finished the work to which it must fit its material. The amount of time wasted in a sort of internecine warfare that perpetually wages between these sub-contractors is enormous, and the cost of a type of skilled negotiators that each deems necessary to keep under the title of “representatives” must also be considerable. I have neglected to mention that even the scaffolding is “let out” to sub-contractors; steps are another item, the asphaltting on the roofs is let, and the metallic lathing on which the solid plasterwork is rendered is also the speciality of quite a separate firm.

When one reflects that all these concerns need a

profit, and that they all have to employ separate clerks, foremen, measurers, representatives, and so on, it is inevitable that there are some items of work which are duplicated again and again and which add tremendously to the cost of a building.

Apart from these considerations, which in all conscience are great enough, as I have mentioned much time is wasted in the out-of-date methods employed to do the work. Let me explain this a little more fully. Readers will no doubt be familiar with the type of machine used on roadmaking—a bulky arrangement which mixes concrete, driven by a small petrol engine. This type of machine could, with ease, manufacture all the “compo.” (sand and cement) which would be required by all the sub-contractors, but such an arrangement seldom appears on a building after the foundations are finished. Instead one finds little groups of men dotted here and there about the place, each group working for a separate employer, laboriously mixing materials with shovels. Then a stream of other men emanates from each group carrying pailfuls of “compo.” away—up stairs and up ladders—to sides and backs and ante-rooms. In the theatre I am discussing, some of the materials for the ceilings were pulled up from the bottom by means of a rope and jenny-wheel; but this method, although easier for the men, was found to be less efficient and profitable than to carry the materials up the stairs, so after a while it was done away with.

That there are better methods than these which I

have attempted to outline is certain; to commence with, almost the minimum amount of foresight could have prevented in this case the entrance for goods getting blocked and would also have made provision for a spacing of some size to be left at suitable places in the scaffolding where goods could be drawn up to any height or portion of the building. This, of course, would only be done by builders more interested than the usual run who just give over the building to sub-contractors. I know it is easy to criticize, and I am aware how difficult is the task of providing a remedy; the many conflicting interests do not make this task easy, but it would perhaps be possible to arrange in most cases for the builders to supply and distribute material, in others to receive and distribute. It would be possible then to have a small crane on the roof of a building and to lift many items right up, and to lower them into their place through skylights, or even to have a special portion of roof left with only a temporary slide-back covering it. The task would be very simple in the case of theatres, large halls, and similar buildings. A machine could be kept to mix all the "compo." on the job; a special entrance could be kept for receiving sand, cement, plaster and so on. This could be served with a set of narrow gauge lines and some "tip-ups" which would run to and from the machine. A hoist (lift), or perhaps two, could be erected in the centre of the building with a platform at the top. From here a series of ropeways could serve goods around the building to walls, ceilings, balconies and stage. It

would possibly be quicker to take materials to the top of this hoist and drop to the bottom again for the lower portion of the walls, as there is always great difficulty in getting a clear route for carrying goods about—this in spite of the fact that so much has to be carried nowadays.

Not only would an efficient ropeway system cheapen production by saving time, but woodwork and pieces of enriched fibrous plasterwork would be less likely to get damaged than when they are picked up by numerous hands, carried a few yards and dropped, then picked up again, carried, dropped, and so on, until they reach their destination, requiring hours of workmanship to repair them before they can be fixed. Without doubt many of these suggestions could be greatly improved on investigation by specialists with the necessary training and mechanical knowledge—as they stand they are merely the obvious alterations that would occur to anyone.

One other point which perhaps would stand in the way should be mentioned. It is obvious that such ideas, if carried out, would displace labour. New ideas usually do—that is why they meet with opposition from the workers. Building trade workers are certainly not exceptions in this respect. They hate new ideas—they have seen, for example, what automatic paint sprays have done for the painter. They have suffered greatly through these innovations—new methods, progress, has too often been at their expense. But it need not be so if the result of these

innovations does not go entirely to swell profits and dividends. A cheapening of building costs may lead ultimately to a greater number of building works being undertaken. In this way displaced workers may be absorbed. Some guarantee along these lines would perhaps be necessary to gain the whole-hearted support of the workers—and after all, why should the employer alone take toll from progress? There is a point where such profit becomes anti-social!

3. MECHANICAL APPLIANCES

THE present outlook for the building industry is not bright. It is an industry that seems to have become a special target for economy measures. May not this be due in part to high costs? Building is certainly an expensive business. Whilst the industry has been prepared to accept any improvement coming to it by the agency of chance, such as the steam navvy and the pneumatic drill (the latter, incidentally, was in use for road work a long while before it was adopted by the building industry), it has made little conscious effort to grapple with its problems of production. It is doubtful, even at present, whether the true nature of many difficulties that stand in the way of cheaper production are realized. This lethargy has been rendered possible until the present by reason of the "sheltered" position of the industry, but even that has failed to serve now against the demands for economy facing the country. Yet large portions of every town and city in Great Britain need re-building, indeed, it is said that in some instances such re-building is a necessary prelude to the return of prosperity.

The building industry is almost the only important industry in which the tools (machinery of produc-

tion) are still the property of the individual worker. There are, of course, certain mechanisms that are owned by the employers, but these form a very small proportion. Every grade of building worker owns some at least of his tools. Many grades (joiners, plasterers, plumbers, tilers, bricklayers) own all of them.¹ It may be for this reason that the employers have never given much attention to the question of tools. In any case, there has been relatively little progress in the development of building implements. The building industry in an enlightened and mechanical age remains an industry carried on largely by means of hand craft.

It seems quite certain that some research, centred in this matter of tools, would yield a fruitful return. One or two directors of large concerns have evinced interest in the writer's proposals for improved transport and distribution of materials, and some, I believe, have benefited by adopting them.² But important though these matters are, these are only

¹ The reference here to joiners concerns those employed "outside" mainly on assembling. In the "shop" or factory, of course, the machine tool is already in use with great effect. However, the advance in this single section is not enough on its own without a corresponding advance of other sections, to allow such cheapening of production as will result in expanding demand for building.

² I have recently seen at least one large building in process of erection in London where some effort has been made to organize the distribution of materials. Two entrances were reserved for the reception of incoming materials and two more for the exit of debris and anything else going away. For the first time (I believe) an endless conveyor was used to take bricks from the point of unloading in the street to the centre of the building, where one main stack was made, near a hoist, for general distribution.

the beginnings of reorganization. Set a building job out as neatly as possible, organize the distribution of materials accurately and smoothly—then still the speed of production is limited by the tools. In practice this means, once the structure of your building is up, a shovel and a wheelbarrow for the transportation of sand, a hand-larry for mixing coarse-stuff, a hand-trowel for rendering and finishing a wall, and so on. Let any interested person take the time sheets of half a dozen plasterers' labourers and see how much time is allocated, notwithstanding any special attention previously given to distribution of materials, to an item variously termed "moving sand," "shifting sand" or "carting sand." The value of some mechanism that could reduce this recurring item will be obvious. The same method could be followed with other grades and in this way the most vital points of expense might be attacked first.

The devising of suitable mechanical appliances will not be easy, but it is not impossible. Mechanical experts working in collaboration with people who thoroughly understand the nature of the building industry's requirements, could, I believe, allowed a reasonable time for experiment, effect an immense improvement.

It must not be thought, however, that such a plan can go forward and be successfully operated without due consideration of the human factor. A great defect of the building industry is that for its workers it is never anything but casual employment. A man is employed on an hourly basis and he works on a

certain job because it happened to be the first he came upon where there were vacancies. When that job is complete, or his particular part of it is complete, he will go to the next irrespective of employer. He wanders from job to job, knowing no loyalty to any one employer. The fortune of the individual employer—whether he loses or gains on a contract—is not a matter of consideration to him. He may be a good, bad or indifferent workman—what matter? The industry is divided into rigid grades—he is in one of those grades, and can never step from one to the other. There is no future for him, only a monotonous sameness; he is a bricklayer, a carpenter, a plasterer or a labourer for life. Why should he bother? Even if he becomes a foreman in his grade it is only for the moment; his present job will soon end, and on the next the foreman is already appointed, and he will work under a man who formerly worked under him. I am not attempting to place any blame in this matter, for it is traditional. It is a system that has grown with the industry, but, like the tools, it must give way in the interests of reorganization. If the best is to be obtained or even expected from the workers then it is necessary to provide more incentive. It should be possible for the very lowest grade of worker to rise by effort and diligence to the top. Such a possibility would have a twofold value, for where (as at present) directive and organizational positions are achievable only by a select few, then the chance of discovering talent is correspondingly limited.

In conclusion, let me say this with reference to the human factor, lest there be any who think I may have over-stressed this aspect of the case. Think of those industries that have been an outstanding success. Consider the motor industry—think of Ford. Ford won the loyalty and enthusiasm of his workers for his scheme, and they became part and parcel of the plan, deriving benefit from its success. I believe that the loyalty and enthusiasm of the building workers won for any firm that cares to make the attempt, will enable it to go forward swiftly and easily with improvements that will lead it to an era of unprecedented prosperity.

IV
A COMPOSITOR'S VIEW
BY
LOUIS KATIN

LOUIS KATIN

MR. LOUIS KATIN entered the printing trade at the age of fourteen, "in the same way that most working-class boys enter any trade—merely because this was the only post vacant in the town at the time." He was not apprenticed, and for two or three years he merely ran errands and "put away leads." He eventually became a craftsman; but, being convinced that the printing craft, as a craft, was bound to be swamped by the rising tide of mechanization, he decided on journalism as the way out. To earn the money for his education he delivered papers in the early hours before going to work, and after work was a copy-holder in the reading office of the local newspaper. Eventually he went to London and was admitted to "that most exclusive and efficient of Trade Unions, the London Society of Compositors." As a fully-fledged journeyman he worked in many offices, while engaging in free-lance journalism in his spare time. He published a number of articles, and on the strength of these applied for, and was given, the post of editor of a suburban weekly, for whose printer he had formerly worked as a compositor. That post he still holds.

A COMPOSITOR'S VIEW

I. IMAGINATION AND RATIONALIZATION

It is my own experience, as a compositor, that imagination is a quality suppressed as much in the workshop as it used to be in the classroom. In the eager concentration on efficiency the struggle of personality to show itself is regarded with disfavour. Production on big lines demands conformity to type of workmanship, and, in the effort to secure this, industry endeavours also to secure conformity in its type of workmen: a dead level of sameness in manpower.

It might be thought that the craft of composition would be, of all vocations, the least likely to suffer from the onslaught of rationalization. Type-setting demands a fairly high standard of general education, a retentive memory, a knowledge of grammar and spelling, a sense of proportion, even if not of artistic effect, and a fund of common sense, even if not of ideas: in short, it demands imagination.

Yet it is an indication of the hold which rationalization has gained upon every large industry that this most intimate and personal of crafts has now been converted into a purely mechanical routine. Formerly the compositor had the pleasing task of designing the layout of his own jobs. He used his

imagination there. Now the layout is designed by another department or by another firm, and his work lies in setting the type to conform to it. He is no longer a craftsman, but a copyist.

Recently a new method of rationalizing hand-composition has arisen. In some printing offices girls are employed to draw out a proof with pen and ink almost identical with the compositor's ultimate proof printed from type. The customer having approved the pen-proof, the type assembler sets the type-face. He has no thinking to do, but just obeys instructions.

It may be pointed out with truth that though the compositor has suffered this loss, his misfortune has led to the creation of a new vocation for women, which is entirely imaginative. But the design of layouts for typography cannot be classed as an industry: it is only a form of commercial art.

Imagination in industry is that which applies to handicraft or machine craft the qualities of artistic taste, a sense of proportion or a wise personality. When imagination is placed in a separate department, and when the worker has only to follow a set of rules for putting imagination into visual effect, then trouble along certain psychological lines is bound to accrue.

The suppression of imagination and personality for eight or nine hours a day is really an impossible process. If personality is excluded from a man's labour, then it will find its outlet in illicit, and perhaps dangerous, ways. Observers tend to think

that imagination is dependent on a high degree of education or ethical introspection. There is no basis for their theory in the least. I have worked with all sorts of men, most of them with only the limited education that an elementary school has conferred on them, some of them drunkards, wife-beaters, braggarts and egotists. But I do not remember ever having worked with a man who had no imagination at all.

There is an amusing tendency to regard the millions of workmen as all living the same life, on the same plane, and in the same narrow groove. If there is one feature more prominent than any other about the lives of working people it is the variety of their interests. One of my former workmates could give the name of every Grand Opera performed in London since the end of the war, another is an authority on ornithology, another is a lay preacher to the Wesleyan Church, and another a student of political economy. The private lives of working people teem with variety.

It will be much better, therefore, for the relations of employer and employed, the sooner it is realized that individuality is a "luxury" possessed by the factory worker as well as by the factory owner. When allowances are made for the bare facts of personality and imagination, workmen will be more willing to co-operate with their management even in difficult or distasteful jobs.

Shirking is accepted as a condition of industry. When I was a compositor I shirked as much of my

work as I dared without laying myself open to the charge of laziness or incompetence. All my work-mates did the same. We were not blamed. Neither the employer nor his overseers demanded any different standard of conduct, but they took care to see that we shirked no more than trade union rules would permit us.

I had not then, nor have now, any qualms about this shirking business. The standard of efficiency maintained was so high that it left us no room whatever for personal interest in our work. In the largest factories especially, there was at no time the slightest sense of co-operation between workers or between workers and employers. We rarely, in fact, saw our employer. We saw only his intermediaries, the manager and the overseers, who, between them, devised an able and intricate system of espionage which would be quite unnecessary were industry run in a less "efficient" way.

The struggle of personality to find an outlet had strange and disturbing consequences. When the overseer, who sat in a glass cage from which he could see every compositor, left the room for a moment, we behaved like schoolboys. Our absorption in the hands of the clock was proverbial. For trivial reasons, the atmosphere of the factory often became charged with gunpowder. We were ready at any moment to down tools. Rationalization, carried to its limits, produced irrational tempers.

From my experience in the workroom, I am convinced that most factory troubles spring from two

causes: too much subdivision of labour, and too little outlet for personality and imagination. Under modern methods of production, subdivision of labour seems essential; but the worker would not mind so much being a mere link in a chain if he were permitted to see the rest of the chain. It is this brutalizing process of degrading the worker to the place of a mere non-thinking machine which makes it necessary to employ spies to see that he does a fair day's work for his wages. How to make him see that he plays an important role in production, how to enlist his interests and sympathy in his work, how to make him feel a co-operating unit in the scheme of his particular industry, are no doubt puzzling matters to undertake.

But the necessity for their being undertaken must be realized if we are to have a happier atmosphere in our factories. Lectures on the craft, conducted tours round the factory, so that each department understands its relation to the rest, the co-option of workers' representatives on the Board, a works committee, frequent meetings between employer and employed, are some of the ways in which the difficulties might be overcome.

As to the provision of an outlet for imagination, here again modern methods of production make the task one of inherent difficulty. One can plead for the worker to be given a free hand, as far as possible, for personal contact and ready access between the office and the factory, for variety in work, the relaxation of strict discipline, the introduction of colour and

music where conditions allow it, and the encouragement of the worker to use his own methods and ideas in production. Perhaps the safest and easiest outlet for personality is singing or whistling. Efficiency frowns, in most factories, on the vocal expression of the workers, but if efficiency only knew the psychological effects of a tune or two during the day, then singing or whistling would be recognized as part of healthy working conditions just as fresh air and sunlight are.

In the old days, the pleasure in creating a piece of work together was sufficient to ensure co-operation and harmony between master and man. Regretfully enough, I think we must realize that the creative impulse as a main stimulating factor in production has passed out of industry. At the moment, nothing tangible has been found to replace it, and the worker has been left stranded high and dry on the barren shore of rationalization. If that creative impulse which has vanished from our workaday life can find a successor in the co-operative impulse, then it seems to me that rationalization will be justified. The craftsman's imagination, once chained to his work, will now find its full purpose in a real understanding of industry, and in a sense of fellowship with all those who take their part with him in our vast machine of production.

2. SNOBBERY IN THE FACTORY

IN the factory, workmen are segregated into classes just as, in the social sphere, people are grouped according to breeding or income. But the standard by which the workman judges his fellows is quite different from that which obtains in the world outside his factory doors.

The standard, applied severely, sometimes cruelly, may be summed up in the question, "Have you been apprenticed to the trade?" Whatever the snobbery which may exist in social circles, it cannot be more rigorously applied than by the apprenticed to the non-apprenticed workman. And whatever the humiliation which less well-off or less well-bred persons may have to undergo from those more exclusively placed, it cannot be deeper than the humiliation of the workman who has no indentures to show his foreman.

Not that, fortunately for him, he is often called on to show his indentures. When a workman has long passed the apprenticeship period, when he has his Trade Union card in his pocket, and can show that he has given satisfaction to other employers, these proofs are considered adequate for his admittance. But his workmates are not so easily satisfied. Sooner

or later the dreaded question, casually uttered, arises: "Where were you apprenticed?"

The hapless non-apprentice may save himself from perdition by a downright lie (his secret always liable to be revealed), or he may confess and be forever scorned of his fellowmen. Now that I am no longer liable to suffer for my sin, I can reveal that I never was apprenticed. In those earlier days, when the Trade Unions were not so emphatic about the conditions of apprenticeship, and when one scaled the giddy heights from six shillings per week in the first year to fifteen shillings in the seventh, apprenticeships under indentures meant stable economic conditions in the household and a degree of sacrifice by parents.

Many of us, therefore, had to scramble along the path of artisanship, picking up a little of the trade here and there, relying upon some kindly workman or foreman to help us from the sum of his experience—though it was nobody's business to teach us—and then, after gathering the threads of a more or less rough and ready knowledge, to offer our services to other employers as improvers.

And it is as an "improver" that the non-apprenticed workman must go through his working life, since he can never start from the bottom again and make good the omission of the indentures. "Improver" is the factory's stigma, just as "outsider" is society's stigma upon one of its ostracized members. "Amateur," applied occasionally to an artisan by his workmates, is perhaps an even greater insult.

There is, of course, a very strong principle behind all this factory class-distinction. In a rough sort of way there is a vigorous element of justice about the treatment of the non-apprentice, impersonal though it may be, with the impersonality of all law. Though conditions have militated strongly against it in the past two or three decades, through the wholesale introduction of machinery and the focussing of industrial attention upon the questions of hours and wages, yet pride of craft still holds a strong place in the etiquette of the factory.

From personal experience in many factories, I am certain that a workman is judged primarily by his mates, not upon his personal qualities or his standing in the union, but upon his standard of workmanship. In the same way as professional men take a pride in carrying through a difficult task to the end, so factory workers take a pride in producing, by their collective effort, a better piece of work than another factory. This is always contingent, however, upon interior conditions being favourable to such a spirit: I have worked in factories where the slightest spark of enthusiasm would be extinguished in a day by sheer managerial unimaginativeness.

Given such favourable conditions, however, it is obvious that workmen will look with resentment upon anyone who, by his inability and lack of experience, is likely to weaken the efficiency—the “tone”—of the collective force.

More fundamental still, perhaps, is that attitude of intolerance with which, according to Oliver

Wendell Holmes, the healthy member of society regards the unhealthy, and which reveals itself in the factory as the distrust felt by the efficient towards the inefficient. To a workman who has graduated through his trade, non-apprenticeship spells inefficiency. It may happen, and often does, that the boot is on the other foot: the unindentured workman may be a more skilful artisan than his "superior." Such exceptions, however, do not alter the morality of a fixed principle, and there is little doubt that, unless industry is completely mechanized and there is no place whatever for pride of craft, the standard in this matter will remain.

Such a standard will, then, frequently continue to be a source of disharmony within the factory among employees. It tends to render ineffective attempts to instil *esprit de corps* and to produce "class" feeling, strange as it may sound, between workman and workman.

It is essential, therefore, for the right management of industry that this problem of distinction between apprenticed and non-apprenticed workers should be appreciated and solved. There can be, ultimately, only one solution to the problem, and that is apprenticeship for everybody, from managers downwards; for a manager will only command the full respect of his workmen if he knows as much about the trade as they do.

Every lad entering a firm from school should be apprenticed, if the apprenticeship system obtains in that trade or branch of trade. It is the duty of the

employer, not only for his own and for the lad's benefit, but for the benefit of industry as a whole, to insist that apprenticeship shall be one of the conditions of employment. With improvers, too, provided they are not too advanced in age, a limited term of apprenticeship might be insisted upon.

But once having insisted on this condition, it is for the employer to carry out his part of the agreement and to see that every apprentice has a fair opportunity to learn the trade under a skilled foreman. I have seen many apprentices who, left entirely to themselves to "pick up" the principles of the trade, might well have torn their indentures into pieces, and scattered them to the winds, for all the value they proved.

In consequence of the laxity of some employers, apprenticeships are regarded with disfavour by many parents. Another reason for non-apprenticeship is the length of time which a young man must serve. With the large number of admirably equipped technical schools existing for the instruction of apprentices in almost every variety of calling, seven-years' and five-years' apprenticeships hardly seem necessary. The tendency in this country is for "speeding-up" in industry, and if the tendency can be combined with complete efficiency, there seems no reason why it should not be applied at least to apprenticeship. It is possible that schools may do much to solve the problem which is discussed in this article, though, with conditions in the classroom so different from those of the workshop, factory

apprenticeship must always be necessary. A school has the enormous advantage that in it a pupil may reveal early whether or not he is fitted for a particular trade, without being tied to that trade for life. Schools, too, are playing an increasingly important role in solving that other, more tragic problem of the square peg in a round hole.

A very serious handicap to apprenticeship is the agreement made between some Trade Unions and associations of employers to limit unduly the number of apprentices who may be admitted to the trade. In one branch of the printing trade, for example, the number of apprentices allowed is regulated in the proportion of one apprentice to eight journeymen. This rule has made it so difficult for school-leaving lads to gain an entry into that branch of the printing trade, that several headmasters have petitioned for its mitigation. Denied legitimate access to a desired vocation, a lad has the alternative of taking a cul-de-sac post, or of entering the trade in a small non-union house, where conditions may not be of the best. He may, also, of course, go to the technical school, but without a scholarship his maintenance there will be difficult, and in any case he has still to get his Trade Union card on reaching the age of 21.

A round-table conference between employers and Trade Unions is a necessary step before the varied aspects of this question are at all likely to be settled to the satisfaction of those interested in the vocational welfare of young people.

V

WORKING CONDITIONS AND MORALE

BY

T. H. HARGRAVE

T. H. HARGRAVE

AFTER five years' apprenticeship to a firm of engineers, Mr. T. H. Hargrave worked for two years as a fitter, for four years as an assistant rate-fixer, for four years as a technical cost engineer investigating costs of production under H.M. Government, and for ten years as estimator at an engineering works.

WORKING CONDITIONS AND MORALE

To the industrial worker any suggestions for the improvement of factory conditions must necessarily make a strong appeal. Progress there undoubtedly has been, in the relationship, for instance, between employer and employee, but there still remains room for further improvement. Foremost among such changes the writer would put an amelioration of avoidable dirty and unpleasant surroundings. If a particular trade involves contact with dirt there is all the more reason for providing any possible remedies. One large machinery works where I was once engaged painted the whole of their machines a cream colour, and these, being located in a ferro-concrete building having clear glass windows from floor to ceiling, provided a distinctly bright and cheerful atmosphere. There was, of course, as an offset to the expense involved, an appreciable saving in the expenditure on artificial light.

I would like, too, to see a wider recognition of the worker as a thinking individual—in other words, less talk of factory hands and more of the “fellow-worker” feeling. And since apparently industry seems to demand—at any rate in most trades—some method of remuneration akin to payment by results, I would require agreement with a man, or his elected

representative, before a price was fixed on any task he had to perform.

We hear a lot about "time study" or "analysis of the motions involved in any particular operation," but let us approach it from another angle. What would be the attitude of each and every one on the other side of the business—from the manager down to the most junior clerk—if some individual were to come along and say "I am going to pay you from now on strictly in accordance with the number of jobs you turn out. I shall fix the standard output, and your earnings will depend absolutely on your attaining such."

Of course it will be said that such a thing is impossible, that much office work cannot be graded, etc., but really precisely the same thing was said when piecework and similar systems were introduced on production work. In any event, if everyone conscientiously analyzed his own attitude to the installing of such methods in his own sphere of work, there could not fail to be a wider conception of the need for fair play in the fixing of wage rates and prices. I remember one works where, if a man failed to earn his standard wage and went into debt, he was automatically discharged when the debt reached a certain figure. There may have been factors quite outside his control contributing to this, but no appeal was permitted. It is to combat that sort of thing that the suggestion mentioned is advanced. Really, one is not so certain that these systems, with their fostering of the too-competitive spirit and possibili-

ties of friction, are as efficient as they are generally deemed to be. It is probable that a simple bonus system in which everybody shared, based, say, on the sales, would be both cheaper in administration and fairer all round.

On all hands we hear that the importance of labour is steadily diminishing owing to the further introduction of labour-saving machinery. If that is the case there is surely all the more need for inquiry into the other forms of expenditure. One establishment used to circularize their works with a statement each month showing what it had cost for lighting, power, keeping the machines in order, and supplying them with tools, etc. They had about 1,500 employees, and their costs under those headings were approximately thus: lighting £85, power £950, maintaining machines £1,500 per month. Such information seemed to give everybody a much more intimate acquaintance with the problems of the business, and to act as a far better incentive to economy, than any number of blunt instructions to "cut down."

I would urge a much wider dissemination of facts similar to these, and so get away from the idea that such facts are sacrosanct to the office side only. Actually there are too many water-tight compartments in most firms, and a leakage from some of them might lead to better understanding and a revealing of talent previously hidden.

Allied to this is a thought for the wider adoption of the suggestion box idea, with an adequate

encouragement of originality. I have seen quite a number of such schemes in operation, but most of them have become dormant after a time, not necessarily because ideas were stagnant, but because of the impression that by far the major portion of any saving effected went, not to the suggestor, but to the firm. It ought not to be beyond the scope of any concern to devise means for keeping such schemes alive, to the mutual advantage of worker and employer. A statement showing the savings effected as the result of a suggestion, with a percentage payment to the author over an agreed number of years, would probably solve the problem.

Most of us will agree that one of the most potent factors in breeding discontent is the monotony associated with repetition work, where the same movements are performed day after day and week after week. Competitive conditions doubtless make this necessary to a very large extent, but, where possible, there is good cause for granting facilities for a change of work. No lengthy study of psychology is needed to realize the advantage of reducing boredom, with its consequent indifference and apathy.

If it be argued that, in all the foregoing, only one view-point—that of the worker—has been considered, let it be remembered that a contented staff is one of the best assets that any employer can possess. It may be difficult to value such "goodwill" in terms of money, although attempts have been made to appraise the costs involved in the loss

of an employee and the training of a new man. But even on the narrow grounds of financial return, the reduced labour turnover consequent on good conditions is worth while to any employer, quite apart from the wider humanitarian principles for the adoption of which so many are striving.

VI
THE INDIVIDUAL EMPLOYER
versus
THE JOINT STOCK CORPORATION
BY
ROGER DATALLER

ROGER DATALLER

MR. DATALLER is a Yorkshireman. On leaving school he entered a mineral water factory, where he was engaged in bottle-washing, filling, carting (which comprised selling over a wide area), and the manipulation of essences called "mixing."

Later, he was employed for about ten years in a steel works, first in the traffic and weighing department, and then as an assistant stocktaker (being in control on the night shift) at a plate mill. He afterwards became an underground time-keeper in a South Yorkshire colliery for many years.

In 1928 he secured a Miners' Welfare Scholarship to Oxford. He is the author of *From a Pitman's Notebook* and *A Pitman Looks at Oxford*.

THE INDIVIDUAL EMPLOYER *VERSUS* THE JOINT STOCK CORPORATION

WHOLE libraries have been written about the leisurely (but none the less inevitable) elimination of the great individual employer in favour of the Joint Stock Corporation with its Board of Directors control. But there is one aspect of this economic development that is worthy of further exploration, namely, the problem of allegiance as it strikes the worker still occupied beneath this shifting (and shifted) authority. For, when all is said and done, the future of industry hangs, not only upon mechanical interplay and certain official regulation, but also upon indubitable good-will between the governors and the governed—between authority and consent.

I am old enough to remember working to the directorship of a member of the Victorian era, whom we will name Sir Henry. It was not enough for this man to be familiar with every aspect of the great ironworks that he controlled, and through which he had risen from a very humble status to the position he later occupied. At the same time he was familiar—often to the point of friendship—with great numbers of the workmen. As an up-to-date gesture, a “Company” lingered somewhere in the background; but everybody knew that Sir Henry

dominated the Board, and in terms of direct allegiance personified the firm. In his office, or in his frequent perambulation of the mills, he represented indubitable sovereignty. He was the final, accessible court. He could (like any other pedestrian—and indeed much more than any other pedestrian because of his settled habit of approaching the works) be waylaid in the street for a conversation; and when, as colonel of the volunteers, he marched the men who had enlisted in his detachment for “sham-fighting” on the green slope beyond the chimneys, it was with a certain patriarchal air that he sat upon his chestnut mare surveying the red-coats. When he called for a final cheer, you felt it was given much more to please Sir Henry than King Edward.

When Sir Henry died, “the Company” became “the Company” indeed. We discovered that where Sir Henry would “assent to this,” or “not in the least consider that,” it was now the Company that approved and disapproved. Very well. But who were “the Company”? In the works nobody quite knew. Odd workmen reading their newspapers noticed that there were “big men” in it, and one figure with a wide local reputation; but since he was associated with so many complementary establishments his personality remained as ghostly as the photographs that sometimes set out his features. As far as we were concerned, he was a cipher. I do not remember that he ever became anything else.

It was interesting to mark the slow disintegration of morale that followed. Where was now the

arbitrary figure—that final court of appeal? Everybody soon recognized that the manager was just as much an employee as the smallest errand boy on the establishment. When the appeal had passed through the foreman into his hands, there were moments when he did not fail to admit—“I am sorry, men, but the Board——” Again, who were the Board? Where did they live and have their being? One day two workmen passed before him charged with some delinquency. “Look at them—look at them!” he cried, “they are not even ashamed!”

Nor were they. If he had made deeper investigation into the springs of their conduct he would have recognized that they felt the Company to be too impersonal a body upon which to rivet allegiance. Such delinquency—the whole problem of pilfering (time included)—is bound up in that position. I have known workmen who in any other social relationship would have been thoroughly alarmed at the mere suggestion, pilfer cheerfully on the plea that it was “only Company property,” or that “the Company owed it” to them. Property was appropriated with no more compunction than that displayed by a wayfarer plucking a wind-flower.

In mining areas particularly, this element of divorce between directorate and worker is definitely marked. There are miners of twenty years' experience in one colliery who have not only never beheld a director underground, but have never “clapped eyes” upon a director at all. At times (they will tell you) they encounter a string of motors parked

alongside the colliery offices, and from this are able to conclude that some mysterious function—a Board Meeting—is taking place beyond the walls. Beyond that there is no intimate contact. Certain controlling personalities have haunted the scene. That is all. The governing body, to whom the miner's allegiance is due, remains in his recollection as faery as a creation by Yeats—and in selective instances as malign.

Here are two widely divergent examples.

A short time ago a mining community with which I am acquainted suffered the loss of a young collier struck down at his work. It is quite beside the point that this young man was very popular in the village, for the calamity was as usual a community matter. It was the main theme of conversation in the days approaching the funeral. For the funeral everyone turned out in sympathy. Of local organizations, the colliery management alone was represented in no form whatever.

I need not add that the effect of this negligence was (and still is) of very great significance. "They"—meaning the directors—"didn't care!" The vague—the nebulous body again! Under the old regime, the manager would have been called to account; but who would consider writing to the Board with a "grievance" of this kind?

The second example is a rather more diverting incident, but no less significant in its repercussion upon the temper with which a workman approaches his employer. In this case a visit of directors and

friends had been planned to a certain colliery, and accordingly the management had ordered to be *built upon the surface* a replica of an underground road. This piece of work they darkened and illumined with lamps, and through the structure the visitors were allowed to pass in order that they might savour the atmosphere of the coal-mine without any actual danger!

It would be quite possible to dismiss this frolic as one of the lighter vagaries of management, and worthy of little consideration, were it not for the psychological influence upon those miners who were engaged in arduous labour close at hand. The frolic in question has been the subject of a perfervid flow of comment that still continues; the general burden of which being the utter fatuity, first of the construction itself, and second, of unwillingness to encounter even for a short visit the grim environment that the collier is called upon to meet for a lifetime.

In contrast with the foregoing, there is still a remnant of industry where the older type of mine owner remains. I spent some years in the service of such an employer, and discovered only a tithe of the resentment against working conditions that I have since found in different quarters of the coalfield. The figure in question is a member of an old landed family—*noblesse oblige* indeed in his industrial as in his agrarian relationships! In his younger days he knew his mines thoroughly—and through his elder years he has been accustomed to call at the lamp-

room for a light, take an available stick, and push forward into the workings. To sit upon a shovel, to converse freely with his workmen at *the point of their labour* has effected an enviable ease of relationship more marked than anything I have encountered in recent years.

It may well be argued that such a figure represents an outworn society—a society that has gone for good; and that the modern industrial establishment strives to combat the general dissipation of morale by means of recreative endeavour, seeking to weld the component members into a social whole.

This recreative experiment does meet with a certain amount of success, though it is at times somewhat painful to encounter the enthusiasm of the professional directors of recreation. The system, however (while scoring its successes), is open to grave abuse. There is, throughout industry, a tendency to secure jobs for clever sportsmen—the real criterion being, not “are you a competent hewer?” or an “expert furnaceman?” but “are you a good cricketer or footballer?” It is a position producing constant resentment among the other workers, who feel that it is not good workmanship that matters most—the standard that is always being urged upon them. It is doubtful whether “Company” clubs and recreation can ever effect the unity desired. The most fruitful social and recreative movements are not those imposed from without, and closely associated with the industrial scene. They are of a more spontaneous nature, and derive

not from the inside of the gates but from the outside, where the worker likes to forget about the works and the bleak shadow of modern regulation—even the regulation of pastime.

The further attempt at unity in the scientific staffing and ordering of all departments has its negative as well as positive values. Within the neat dovetailing, the skilful interweaving and interrelation of vast establishments, the worker tends to move apprehensively, girding sometimes with a passive resentment. Flat rates of wages, unvarying conditions, neat and smooth and well-ordered, so that the machine appears to run without a hitch, may produce many things. There can be no doubt about the fact that they tend to produce a flat and unresponsive recognition of industrial duties. "What are you doing?" is too often answered with the terse, but how expressive: "Waiting for pay day!"

Organization of itself cannot produce allegiance. What then?

The foregoing observations display the prevailing tendencies of our industrial age, the highly mechanized forces, and the standardization to which that mechanization gives rise. And nothing is more certain than that the past can never return.

At the same time I do affirm the vital necessity of intercourse between the high command of industry, and the rank and file engaged within its ramifications. Military leaders who inspire the utmost devotion in their men are not those who tend to

shirk the arduous of the campaign. The worker does not greatly desire a director, a great industrialist, to work beside him; but he does like to feel, in the course of his labour as an industrial unit in a vast establishment, that there are human beings at the top.

Nothing is more notable than the affection with which a miner grows to regard his Trade Union leader—an affection by no means to be ascribed to demagogy, or habitual “smoothing down.” It is possible for such a leader not to have handled a pick blade for thirty years and still retain that loyalty unimpaired. The main reason is that the Trade Union leader concerned maintains close contact with his men, moves underground in the conditions of their employment, and in time of disaster is always to be found in the forefront of the rescue operations.

Implicit in the problem, there are further aspects of allegiance which it would be inconvenient to discuss here; but whatever the structure of our industrial society, now or hereafter, if that society is to function with well-being and to produce harmony between the directors and the directed, a personal contact at once free, friendly and comprehensive, is altogether necessary.