WESTERN LOCAL SECTION: CHAIRMAN'S ADDRESS,

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An enormous amount of matter has been spoken and written on the question of scientific and technical research, but in the majority of cases the subject has, very naturally, been treated from the point of view of the individual author, with the usual result that the opinions as to the best method of procedure have been hopelessly conflicting. Even now there appears to be a most extraordinary confusion in the minds of many people between purely scientific and technical research. It is, of course, true that both types require careful training, knowledge, and an unlimited capacity for perseverance, but the objects in view are entirely different. Pure scientific research may be considered to be the following up of a line of thought and experiment, frequently of a most abstract nature, in the hope of establishing some scientific fact, and a man may do far worse than spend his life in the contribution of one small fact to the sum of scientific knowledge, even though it may not appear at the time to be of the smallest commercial or humanitarian value, for who shall say that this small fact may not be the foundation of some such far-reaching discovery as wireless telegraphy or X-rays? Technical research for industrial purposes is usually a very tedious investigation with the definite object of obtaining the most efficient material or process for some particular purpose, and, speaking generally, one of the most important points in such an investigation is to ascertain the cost of such material or process. It is therefore of the first importance that research of this nature should be carried out on a scale comparable with operations in works. This entails very great expense and consequently it is only the very large firm which can afford to equip a suitable laboratory, and the smaller firms have no choice but to co-operate for this purpose if they are to have the benefit of the newest knowledge and methods.

There is, of course, no doubt whatever that the closest possible co-ordination between science and practice is essential to progress, and we have reason for high hopes that this will to a very great extent be brought about through the efforts of the Imperial Trust for the encouragement of such research. Unfortunately the interests of the individual often clash with those of the nation, such a case as the following being by no means uncommon. The scientific man in the employ of some large concern attempts the solution of some particular problem, and, after a great deal of hard work and the expenditure of a considerable sum of money, arrives at a result which, though not a complete solution, yet gives his employers a great advantage over their competitors, and having borne the expense of this investigation they decide to keep their new knowledge to themselves and reap the benefit. Now it may seem rather extraordinary, but it is nevertheless a well-established fact that it is very rarely the case that a

single brain is alone engaged on any particular problem, however abstruse that problem may be.

Probably the discovery of the planet Neptune is the most notable example of this fact.

In the case in question, it is by no means improbable that some other man in some other works is engaged on the same problem and, supposing that he too has some measure of success, the effect is likely to be the same, with the result that a cut-throat competition is started between these two rivals. The consequences are obvious: nobody profits to any extent; other competitors are squeezed out, and it is quite likely that a more complete solution may be found at smaller cost in some other country where knowledge is better co-ordinated and this particular industry gradually dies down and is finally lost to the nation. We can only hope that some satisfactory means may be found which shall overcome this difficulty, for it is undoubtedly a very real one.

I do not think it is the smallest exaggeration to say that the loss or absence of any industry is a very serious matter, and, where the particular industry is of vital importance, in an emergency it might well prove to be a national disaster. It will, I think, be a very long time before any of us forget that in the autumn of 1914 there only existed in this country one factory making search-light carbons at a time when the quick supply of these was of the first importance, or that we had up to that time been almost wholly dependent upon our enemies for magnetos in spite of the fact that the enormous advantages of rapid motor transport had long been recognized. There are of course many other instances and it would be a simple matter to give quite a long list of really indispensable articles and materials for the supply of which we have hitherto been entirely dependent upon foreign countries.

Incidentally this is a magnificent tribute to the British Navy, and it has been abundantly proved that our faith in it was not misplaced. At the same time, that is neither the only nor the main reason for this extraordinary state of affairs. The real reason is that in this country practically everything of an industrial nature has hitherto been left entirely to private enterprise, whereas in foreign countries the Governments have very effectively assisted and financially supported the establishment of new industries on a scale which would have been far beyond the means of private enterprise, and still more beyond its capacity for taking the necessary risks. Fortunately, those in authority now appear to be keenly alive to the importance of this matter, and it is to be hoped that no time will be lost in taking the necessary steps to ensure that so far as is possible we shall in future be in a position of self-contained independence as regards both indispensable materials and the industries dependent upon them. I think we shall

all agree that British industry has not in the past been overburdened with Government assistance or even encouragement. We have only to take as an instance the question of wayleaves in order to realize what this means to our own industry. The linking-up of our numerous generating stations, the resulting economy in the consumption of fuel, and even the very price at which electrical energy can be sold are all inseparably bound up with this question. Surely therefore we have a right to insist that the procedure for obtaining wayleaves should be reduced to the simplest possible form and with the least possible waste of time and money.

It is quite impossible to over-estimate the importance of questions of this nature as, unless a really cheap supply of power is made available, our industries will be quite unable to hold their own in the period of commercial stress which will undoubtedly commence immediately after the war. The task awaiting all engineering companies, and particularly electrical companies, will be enormous. For the last three years all plant and machinery has been run to death while only the most important has been replaced. The huge deficiency in output for that period will have to be met; the demand for new plant will be enormously increased, and it is of course essential that no part of this demand shall be supplied, as in pre-war time, by importation. That there will be a tremendous increase in the demand for electrical plant and power is beyond question, and I believe that this will be largely due to the part played by electricity in the really wonderful acceleration in the output of munitions of war, for all power users have appreciated the fact that this would have been impossible without electricity. In many cases it has been a manufacturer's first real experience of the many advantages of electric driving, and we may be certain that in all such cases there will be no thought of reverting to former methods. Then again there are many purposes for which the use of electricity is growing very rapidly. The increase in the use of the electric steel furnace is most striking when we consider the former prejudice against it, and it has been amply proved that high quality steel castings made by this method are distinctly superior to those made by any other process. The electric furnace is also being largely employed in the production of the highest grade tool steels and the special alloy steels used in aircraft manufacture. Its many advantages, including a very considerable reduction in melting losses and the ability to use second-grade materials in the manufacture of high class steel are at last fully recognized, and there is no doubt that its use for such purposes is now firmly established on merit. There are of course many other applications of the electric furnace, such as the fixation of nitrogen, which seems likely to develop into a considerable industry. Steps are being taken in many directions to establish electrochemical works for various purposes of the utmost importance, and these should be most welcome to the central station engineer not only on account of the magnitude of their demand for power, but also by reason of the fact that in most cases there should be no insuperable difficulty in working on a restricted-hour basis. From the United States we hear of experiments in the production of synthetic petrol

by an electrochemical process and the pickling of steel by an electrolytic method, both of which may become valuable industries. Then we have electro-culture, which is receiving a large amount of attention at the present time. Experiments with a variety of crops are being carried out in several districts in this country, but unfortunately a long time must necessarily elapse before results are known, so that progress is somewhat slow. Enough, however, has already been done to afford good grounds for believing that great benefits will result from this treatment. Instances are recorded in the case of wheat of an increase of 50 per cent in grain and 90 per cent in straw; oats an increase of 49 per cent in grain and 88 per cent in straw; potatoes, carrots, beet, and other roots 20 to 50 per cent; while young strawberry plants have shown an increase up to 80 per cent. It is a most interesting subject, and we hope to hear a great deal more about it before the end of this session.

The war has taught us that farmers are quite as valuable as bankers or manufacturers, and they should receive every encouragement and assistance and if, as seems probable, electro-culture should be found to render the farmer more independent of the weather, in addition to increasing his crops, it will be an enormous gain to the community, not only from the food point of view, but also from the fact that it will help to keep money in the country and free more shipping for those essential raw materials which are not obtainable in this country. This particular application of electricity will not in itself mean a large demand for power, but it should nevertheless be of value to the station engineer as a means of introduction to a class of consumer who has many uses for power which hitherto he has only been able to obtain by costly and wasteful means. Incidentally also it should be a useful assistance in the obtaining of wayleaves in country districts, as even what I can only term the natural cussedness of the landowner is likely to be considerably modified where prospective benefits are to be obtained by the granting of a wayleave.

Many more instances might be given of the demand for plant and power which will have to be met, but these few are sufficient to give some idea of the sort of conditions which are certain to obtain immediately the war is brought to a close, and these conditions will not be confined to our own and other engineering industries, but will undoubtedly apply to industries of all kinds. It is of course thoroughly well understood and appreciated that such conditions cannot be met without very careful organization; in fact such terms as re-organization, reconstruction, co-operation, co-ordination, etc., have been household words for some time past. They are, however, a very great deal more than mere words, for it is not too much to say that the ideas which such terms express are of really vital importance to the continuance of the British Empire. For if we are to succeed in maintaining our position in the world it is absolutely essential that we should make the fullest possible use not only of all material, but also of all mental and physical effort. We are well aware that our enemies have for a long time been giving the very closest attention to these matters, and we may be

quite certain that their preparations to meet the strenuous times ahead of us will be made with the most painstaking care and most minute detail. It is probably owing to their undoubted thoroughness that so many people in this country appear to think that Germany has a sort of monopoly in the power of organization, but we have only to consider how quickly and efficiently our workshops and factories were adapted without any warning to the production of munitions of war in order to negate that theory once and for all. A very great deal has already been done towards the attainment of these ends, but an enormous amount still remains, and it cannot be done too carefully or too quickly. We have had one very severe lesson in the dangers of unpreparedness, and though it is even now very difficult to realize how nearly fatal was our condition in that respect in 1914, yet I believe that we have taken that lesson to heart so deeply that we shall not again run a risk which would certainly prove fatal in an industrial conflict. Before leaving this subject there is one point with regard to organization in industry which is, I think, of some importance. Any thorough organization implies a more or less high degree of specialization if it is to be really efficient, but there is always the danger that specialization may be carried too far. For while a very complete and intimate knowledge of one's own particular branch of a subject is of infinitely more value than a smattering of many subjects, this should not be attained to the exclusion of all else. As a nation we undoubtedly possess a very marked individuality, and in my opinion it would be a very serious misfortune if this characteristic should become atrophied by condemning our youth to enter a narrow groove at an early age.

Now in all this remodelling of the industrial edifice with its main objects of increased production and maintenance of quality in the product, there are of course many problems to be solved, but the majority of these almost pale into insignificance compared with the question of the existing relations between employers and employed. The prime necessity in dealing with this problem is to find some means of removing the feeling of mutual suspicion and distrust which at present characterize their negotiations, and are in reality the foundations of all the trouble. Members have doubtless read what is known as the "Whitley Report," with its suggestion for the formation of a series of trades and industrial councils composed of members of trade unions and employers' federations. In principle such a system, though somewhat cumbrous, is of course perfectly sound, but I think it is obvious that it cannot be a practical success unless these two requirements are fulfilled. First, it must be thoroughly understood and fully appreciated by all parties concerned that the object of this machinery is not to settle disputes but rather to remove at its source any cause which might lead to a dispute if allowed to continue, and to enable all parties to work amicably together for the advancement of their particular industry to a high degree of prosperity, with the necessary provisions to ensure that all parties shall receive an equitable share in the benefits resulting from such prosperity. The other essential requirement is that every member of each council shall

be a real and accredited representative of his particular body, and I firmly believe that if this question of representation can be satisfactorily solved we shall be well on the way to a lasting industrial peace. It is, however, very far from being a simple matter. If every worker in any particular industry were a member of his trade union, and every employer in that industry were a member of his federation, the difficulty, though greatly simplified, would not be wholly overcome, for there would still remain the chance that, though the trades council might be in perfect agreement, the body of employed, or perhaps even of employers, behind the councillors might refuse to abide by the terms of such agreement. We all know that this sort of thing has happened more than once, and it seems to me that if we will go back far enough we shall find that this discreditable state of affairs is primarily due—on the part of the worker at all events—to a desire, of somewhat modern growth, for an improvement in social position, and this desire is naturally greater when the position connotes better pay and probably less arduous work. Whether this view be correct or not there is no doubt that membership of these suggested councils will be eagerly sought after, and it is most unfortunately a fact that the man who shouts loudest and most often has the power to sway his audience, however crude and undeveloped his arguments may be, and this is especially the case when the audience is in a discontented humour. The result is that in many instances the elected representative is a man whose study of his subject is very superficial and who probably knows nothing of the complicated nature or cost of distribution and sale. Such a man is invariably suspicious. Now it is fairly certain that the arguments put forward by a man of this type for election purposes will never have been really convincing, and he will not have succeeded in imbuing his supporters with a very deep faith in his knowledge and judgment, and moreover he has become an object of some envy owing to his now having comparatively light and congenial work, greater freedom, better pay and, I believe most desirable of all, an improved social position. Under such conditions, he will soon begin to lose touch, and it only needs the arrival of an agitator with perhaps a more glib tongue or more fiery eloquence and the so-called representative is finally discredited. I hope it will not be thought that I have laboured this point unduly or that the cause I have suggested is too small to deserve notice, for it undoubtedly exists and has its influence, even if it has not the weight which I have attributed to it.

These and many other matters of the highest importance are on all sides receiving the closest attention at the present time, but I think we shall all agree that it is always well to ventilate ideas as to the causes of trouble, as it is only by thorough investigation that the remedies can be discovered.

The need for these remedies is very urgent, for we must not for a moment lose sight of these two points:—First, there never has been and in all probability there never again will be a chance like the present. And secondly, whatever men's sentiments may now be, trade will inevitably go to those who are in a position to meet it adequately.