BIRMINGHAM LOCAL SECTION: CHAIRMAN'S ADDRESS,

By SYDNEY T. ALLEN, Member.

(Address delivered 14 November, 1917.)

It is not my intention to read a technical paper but to make a few remarks bearing upon matters in which many of us are specially interested at the present extraordinary time in the history of the Institution, occasioned by what was called the "European War," but which can now be described as the "World War."

We shall probably be experiencing during the coming winter the most strenuous time, as far as those engaged on the industrial side of the applications of electricity are concerned, that has been experienced during any period of the war. I therefore feel it is advisable that we should make these meetings as far as possible a real relaxation from our other duties.

We might perhaps treat our meetings during the war in a less formal and serious manner, at the same time conforming entirely with the rules of the Institution, with which we are all proud to be associated.

I think the strict formality of some meetings in the past has prevented a large number of the younger members from joining in the discussions, and it seems to me to be a pity if this formality, or shall I say want of sympathetic understanding between members, defeats in any way the objects of these meetings.

One cannot help noticing what a different atmosphere exists at the informal meetings which are held after the formal meetings, and how animated is the discussion which often arises on the subject of the papers, by members who seldom if ever take any part in the discussions at the formal meetings. I think this prevails to a great extent at the meetings at other centres, and it is a great loss to the Institution if many of the younger and other members who do not take part in the discussions cannot be persuaded to do so. Such members form by far the great majority and are often by their knowledge and practical experience well fitted to further the principal objects of the Institution.

I mention this in my Address at the commencement of the session, and I appeal to all members to contribute something, however small, either in writing or personally at the meetings, to the discussions on those papers with the subject of which they are acquainted in their everyday life. Often most valuable and instructive remarks come from members who, although they may not be gifted as public speakers, for which they are wholeheartedly excused, are able to add items of great interest from their own practical experience, not only to their friends in this particular local section, but also to the electrical community throughout the world. These meetings are practically the only opportunities which we, as members, have for interchanging ideas and knowledge.

There is no branch of science in which developments are taking place more rapidly than that in which we are all interested, and many of those developments are far-reaching and of great importance to the future industrial position of this country. This is why I have laid special stress on the importance of a very free intercourse between us at the present time.

Whilst dealing with this matter it is very gratifying to be able to note how much closer is the intercourse and relationship between this Institution, which in its earlier life restricted its operations and considerations more to electrical science from a theoretical point of view, and other Institutions and Associations which deal with the applications of that science more from their industrial and commercial aspects.

The fact is being realized more and more at the present time that there should be no barrier between the theorist and the practical man. The former should be encouraged always to have before him the necessities and difficulties in connection with practical applications: the practical man on the other hand should always realize that the days of success by "hit and miss" methods are gone, and that in the great competition of nations it is of vital importance to the future welfare of all sections of the electrical industry that the scientific and theoretical side of all matters connected with them should have a prominent place and a more prominent place than it has in the past.

The war has awaked this country as to its industrial position as perhaps nothing else could. We so easily recognize things now to which we were blind before.

In the past we have, as a nation, been slow to recognize the possibilities of some of the applications of electricity as far as manufacture in this country was concerned. Absolute necessity, with perhaps Government assistance, has forced manufacturers to produce things which were previously mainly made outside this country; and this same compulsion has opened the eyes of manufacturers to the enormous possibilities in the use of electricity and of scientifically designed apparatus and machinery.

Several instances might be cited of manufacturers who have, by means of modern labour-saving plant, surprised themselves in the enormous and successful increase they have been able to make in their output with the same works and staff, and, what is of greater importance, in the improvements they have been able to effect in the cost of production, calculating the cost of raw material and labour on a pre-war basis.

A large manufacturer told me soon after the war began that he was requested to make an article which had previously been imported mainly from Germany and which he had considered for years he could not produce to compete with the imported article. After commencing to manufacture this article he found that he could well produce it at a price, after calculating on a basis of pre-war costs, cheaper than the same article could be imported previous to the war, and this with his original plant, etc.

This brings out another point which I wish to touch upon, and that is the evidence which the war has produced of the want of confidence of a great number of British manufacturers in the past in their own abilities. This want of confidence was not confined to the manufacturers themselves, but unfortunately to a large extent to others who were able by their influence and financial assistance to further the great progress in the electrical industry which was bound to continue. The benefits derived from this progress if not taken advantage of by us in Great Britain, would surely be worked to benefit other countries.

Of course restrictive legislation and other causes greatly discouraged advancement of electrical development in the past; but as the co-operation and combined action of such Institutions as ours, representing as it does the greater number of scientifically and technically trained and experienced electrical men in the country, has already done an enormous amount to influence the ruling powers to decide on reconstructing the legislation on electrical matters, so we in the future, with the great lessons of the past before us and with a much greater confidence in ourselves, should by united efforts and mutual support accomplish those things which will make and keep Great Britain first in the world in the great advancements that we cannot help but see ahead of us.

I am sure that this Local Section will fully awaken to the realization of the necessity of greater activities. Such activities do more than express opinions or pious hopes such as I may refer to in this Address, and will help forward the work that must be undertaken to bring about those results which are so necessary.

There are many ways in which we might act to help to bring about these results.

First of all we must realize that our work is of national importance. We must endeavour to encourage all members to have sufficient self-confidence to express their views without hesitation and to hold broad-minded views on all things as long as possible. We must not hesitate to express those views and describe our experiences when occasion arises.

I think, further, that we should consider it wrong to withhold information when its publication might benefit the nation. It is almost as wrong for a person to withhold such information which he does not intend to make certain use of, as for a person to hold patent rights in connection with useful practical applications which he does not intend to put into practical operation.

I think that real efforts should be made by encouragement and live inducements to attract a much

larger Student membership. It is to the student of the present day that the country must look for the great and important work of the future, and I think this Institution has a definite responsibility to see that it assists forward that part of their Students' education which can only be accomplished through its efforts.

To this end I suggest the formation of a special Students' Section in this area after an interesting and useful programme has been drawn up for them. They might have their own Sub-Committee, and of course special representation on the main Committee. Special meetings for the junior members alone would tend to encourage that practice in discussion which I have previously spoken of as being so badly needed.

There is little doubt as to the desirability of the formation of a central bureau or headquarters for this district, from which information on matters relating to the proceedings and work of the Institution, the Standard Rules and Conditions which it has drawn up, and the work of its various Committees, etc., could be distributed. Some central place is required where members can meet to discuss matters affecting local electrical work and conditions.

I do not suggest a club in connection with the Institution in Birmingham, but I cannot help thinking of the enormous local benefits which are often derived from such institutions as the Engineers' Club in Manchester.

It may be that we shall be able to take a much more active part in the work of the local chambers of commerce in the future and be strongly represented on those and similar bodies, and perhaps form separate sections in them. If this be the case it will be more necessary to have some central headquarters.

There may be financial difficulties, but these should be overcome.

It may be said that any radical changes in our operations should be postponed until after the war, but I think it is because of the war that changes and greatly increased activities are necessary.

I am very glad that I have received suggestions from members on this matter, as it tends to prove that the Birmingham Local Section is not behind the other local sections in that progressive spirit which is being displayed in electrical matters throughout the country.

I think that one of the most important matters which should have the consideration of the Institution is the means by which the large new industries lately introduced into this country may be retained after the war. Large developments have taken place in the industrial applications of electricity which had not, on account of extensive and effective foreign competition, been carried out in this country but which in the light of our experiences since the war began and on account of the great necessities occasioned by the war, have received active encouragement.

This development must be further encouraged and systems and methods perfected, so that when the great demands due to the war cease, we may continue in such a condition of economical production that these new industries which have sprung up may

serve as a basis for stronger industrial supremacy afterwards.

I think no better example can be cited than the electro-metallurgical and chemical furnace industries which are being started in this country and in this immediate district. Of course we have had steel and other furnaces in use previous to the war, but the developments in this direction have since increased to an extent far beyond anything expected. Large plants have been and are being put down for the making of high-class steel for the smelting and refining of metals, the making of calcium carbide, phosphorous, arcorundum, aluminium and many other substances requiring electrical energy, in some plants at rates of over 10,000 units per hour.

If we look back afterwards upon the war as having performed some useful service to the industrial position of the country, I hope that we shall be able to instance the forced introduction of these industries together with many others. The mere introduction of certain industries at these abnormal times, when costs do not determine or limit their operation, does not necessarily mean their successful continuation afterwards when the war requirements cease and when the world's demand for the materials produced can again be met from other and competitive sources. It should, however, be our duty to make every effort to retain those industries in a flourishing condition, and this can only be accomplished after great co-operative effort, realizing, as we should do, the enormous benefits we should derive from their continuation.

Vast sums of money are being expended in this country in this one branch of industry which I instance, and let us briefly consider the position in some of its aspects.

The electric furnace work may be split up into two main sections:—

First, the use of those furnaces that are required for work for which the electric furnace is almost alone suitable and without which the industry could hardly exist; and as examples I would mention the production of aluminium and calcium carbide.

Secondly, those industries in which the electric furnace is still a competitor with fuel furnaces, such as for steel production, zinc smelting, etc.

It does not follow that because, for instance, the electric calcium-carbide furnace has little to fear from competition from any fuel furnace, that it is the furnace which can make headway in this country however many large plants may have been put down owing to the war demands. These plants have been put into operation mainly because of the great difficulty of transport from those countries where such plants existed which had supplied these commodities before, and not because of the comparative costs of production.

These particular furnace plants, which previously supplied the world's markets, obtained their electrical energy from water-power supplies, whereas we are obtaining our energy from coal-burning plant, the costs for electrical energy being generally much higher in consequence. We shall therefore in the future be in the position that we shall have large fur-

nace plants in working order with the employees available for running them with a great deal of experience gained during the war on the working of such plants, but it is unlikely, unless great changes are made in the costs of production and in our internal transit charges and facilities, that we shall be able to compete against the supplies from foreign water-power plant and the low freight charges from those countries who previously had the monopoly of this furnace industry production.

In the case of the other type of electric furnace industries to which I refer, we shall still have also the competition of the fuel furnaces.

The necessary low power price, coupled with easy and cheap internal transport facilities, will be the key to the continuation of not only the particular industry to which I have referred, but also to an enormous bulk of the other industries which have been commenced in this country.

The supply of electricity on a much larger scale and at much cheaper prices must have one of the very first places in the consideration of the country in the near future, and nothing can be of greater importance to the electrical engineers collectively than the devising of means to bring about that important result. The Government has already had such strong representation made to it that it is taking important action; but there are matters of great issue to be settled which will require the united efforts of all seriously thinking institutions such as ours.

The question of cheap electricity supply has become a national one, and we must look upon it as such. These cheap supplies which are so necessary are mainly dependent upon cheap fuel and a much better use of it, the reduction in the handling and transport of unnecessary material, the production of electricity by means of large units, and its transmission from those large units by extra-high-pressure currents.

These points and many others have already been decided and are obvious, but the best means of bringing them about is what the electrical world is still discussing. There are so many points which will have to be considered from so many important aspects that a considerable time will elapse before any decision upon any definite schemes affecting all the electricity generating centres in the country can be acted upon; and it is quite uncertain whether any scheme which will be satisfactory for one section of the country will be satisfactory for all the others.

The number of the generating stations in the country must of necessity be reduced, but it does not follow that the positions of the large stations which now exist will be the positions in the future for the fewer generating stations which should supply the country's needs.

Whilst it is a fact that most of our principal centres of industry owe their position to existing collieries in the immediate neighbourhood, it must be remembered that owing to the gradual working out of coal seams in certain districts, and to the exploiting of others in districts farther away, the centres of maximum coal output are altering, so that the main generating stations of to-day which are placed in a satisfactory

position with regard to existing collieries may not be so conveniently placed in the future.

Again the question of internal transport will affect the issue very much indeed. If great changes for the better are effected in this direction no existing costs of transmitting coal will avail in considering the matter.

Coal transmitted under existing conditions might cost twice as much to transmit as it would after the whole system of rail and canal traffic facilities had been re-organized to suit the best needs of the nation as a whole, instead of those of individuals who own them for their own interests.

The question as to whether the coal should be carried to the generating stations or whether the stations should be erected at the collieries depends upon local conditions to a great extent.

The large quantities of water which will be required for condensing purposes will also be an important determining factor.

The valuable by-products which can be obtained from certain coals should be put to their greatest and most important uses, and although it is a somewhat debatable point as to whether the recovery of these by-products on extensive lines would help in any way in directly cheapening electricity supply, the matter will have to be considered on other grounds.

A problem for investigation is whether it would be more economical to produce gas from the coal at the collieries and transmit under pressure to generating stations at places more suitable on account of water and other facilities.

It is to be hoped that no great decisions affecting these matters of national importance will be arrived at without the most thorough and open investigations have been made by all parties interested.

The economies to be obtained from the linking up of different generating stations throughout the country have already received a large amount of consideration. Here again local circumstances must determine the matter. It seems certain, however, that schemes of electrically linking up existing generating stations will precede any great changes in the matter of centralization of electric power supply.

The question of linking up the principal power stations in the Midland area is already being dealt with by a committee appointed for the purpose, and their decisions may soon be made known.

The connecting electrically of, say, two power stations may be arranged to serve three purposes:

First, to improve the efficiency of both stations, arranging the division of the total load between them so that the daily load factor of the running plant may be improved. This would be accomplished by completely shutting down as far as possible all plant which would otherwise be only partly loaded, and by keeping the most economical units at both stations running at their most economical loads.

Secondly, so that the amount of spare plant at both stations may be reduced, thus reducing capital expenditure.

Thirdly, to allow of plant in each station to be shut down during certain week-ends to allow the very

necessary cleaning of boilers, flues, etc., and general overhauling to be carried out.

There are many complicated considerations which must be thoroughly thrashed out before any useful decisions can be arrived at.

When such stations are linked up electrically, if this is to be made use of to the best advantage, it will be necessary for such a complete understanding between the managements of the different undertakings that they can be controlled as one undertaking as far as the division of loads between them is concerned. A control board must of necessity be set up representing all the undertakings to decide principally on the extensions and amount of spare plant at the different stations, on the division of the load between them, and on the charges which should be made for the interchange supplies.

It is unfortunate that the conditions due to the war demands have prevented the attainment at present of the principal objects of linking up, owing to the fact that practically all electric power stations are fully loaded with little or no spare plant and are obliged to run their older and less economical plant for long hours daily, tending to reduce considerably economical production. This continual running of nearly all the plant available has also prevented that regular cleaning of boilers, flues, condensers, etc., which is so necessary for economy; and also what is important, the shortness of staff has tended to prevent to some extent that continuous check and control which is so necessary. The temporary labour often employed is much more inexperienced and really calls for extra and not reduced control.

It is generally recognized, however, that schemes of linking up on a smaller scale to allow of individual stations which are fully loaded throughout the week to be either partly or wholly shut down during certain week-ends for the necessary repairs before referred to, should be considered and put into operation, if feasible, as soon as possible.

The electrical linking-up itself must involve a considerable amount of capital expenditure and is complicated owing to the fact that the class of supply from the different generating stations varies considerably; some generate continuous current, and others alternating current differing as to phase, periodicity, and pressure.

There is an important matter bearing upon the present costs of electrical energy and railway and canal traffic to which I should like briefly to refer, and that is the large and increasing amount of incombustible matter being distributed throughout the country with the fuel we are burning. If it ended with the waste of transport it would not be so bad, but unfortunately hundreds of thousands of tons of this useless material under present conditions has to be heated up and mostly fused in the boiler furnaces, entailing large heat losses, dirtier flues, reduced boiler output and inefficient steam production, and then to be transported again away to tips often many miles distant.

The hundreds of thousands of extra tons of this useless material mixed with the fuel is being sold and transported about the country, employing after it

leaves the collieries an enormous amount of extra labour, locking up trucks and canal boats which could be put to some useful purpose, and adding to the already congested condition of things. In the Midlands the overall cost to the user of this incombustible matter must average over £1 per ton, and if the percentage increase of it since before the war be taken as 10 per cent, a modest figure, it will readily be realized what an enormous waste is going on and how this increases the cost of production of electrical energy.

This points to the uselessness, in comparing overall efficiencies, of taking quoted figures of pounds of coal per unit generated at the present time without special care being taken to ascertain the heat values of the coals used.

This extra cost of coal after it has left the collieries must outweigh many times any cost which would be involved by the colliery authorities in improved washing, picking, cleaning, and grading the coal; and if it could be assured that cleaner coal could be guaranteed, a much higher price could be paid for it.

Unfortunately large buyers of coal are unable to determine the source or quality of the coal they purchase at the present time, and it is unlikely that this condition will alter for some time. I think that a great deal of the loss and waste in connection with fuel at the present time could be prevented if a standard coal specification could be agreed and acted upon.

The time at my disposal will not permit me to refer to other matters which might engage our attention during the coming session. Before concluding, however, I should like to refer to a bulletin which I

received from New York a few days ago. This particular bulletin was issued by one of the United States new Consulting Boards which have been formed on account of the war, and it deals with the submarine and kindred problems. It is written with the intention of setting out in a concise manner a large amount of information relating to the modern submarine and torpedo as now used. This information is to form a basis for the consideration of the people in the United States on this matter and at the same time an invitation and an encouragement to those people to assist in the devising of means effectually to combat and nullify the power of the German submarine.

It is interesting to note that the Board who issued this bulletin mainly consists of electrical engineers. After reading it carefully through I was struck with one or two important points.

The governing bodies in the United States realize not only the great importance of encouraging the serious thoughts and assistance of the largest number of people on these vital questions, but also that the man who may be at present of little importance to his country may, if encouraged in the right line of thought, be of the greatest service to it. As it is in the United States of importance to co-opt everyone possible in the consideration of these problems, so it is of greater importance for us to encourage and assist as far as possible everyone interested in the electrical industry by the dissemination of information and by co-operative effort, thereby helping forward to a proper conclusion those great problems and changes which are inevitable in this country.