

PRESIDENT'S ADDRESS

In the absence of the President, his Address was read for him by Mr. H. Beaver.

The Co-ordination of Engineering Institutions and Societies

By SIR ALEXANDER GIBB, G.B.E., C.B.

It is obvious that there is a considerable wastage of effort, and a retardation of progress, caused by the almost haphazard dissemination of scientific effort in general, and engineering effort in particular, over the growing multitude of technical institutions and Societies which now exists.

So far as such societies are devoted to the promotion of the science of engineering, the overlapping and competition must inevitably in many ways hamper the attainment of the object. But there is a need—a very definite and indisputable need—for most if not all of these Societies, and the value of small and specialised technical institutions is not always, I think, fully appreciated by the older and larger institutions. A body of men who have a common tie in their training, in their views, and in their business connections, will certainly, unless they are very apathetic, be more alive to the promotion of their own special interests than would a larger body where so many diverse interests are involved; and I am prepared to claim that the contributions to engineering in general of such a small and energetic body, particularly where it is cutting out a path through new country, might well be of great importance.

The problem, therefore, if I may say so, is not the reduction of the number of existing technical institutions and the prevention of further increase, but to find the best way to satisfy the different individual interests and at the same time secure all the advantages that lie in co-operation. The question must engage the anxious consideration not only of those great institutions who hold an unquestioned position in the scientific life of the world, but just as much of those who are being launched each year into this crowded sea. While hasty action is to be deprecated, the solution does not become any the easier by delay.

At the present moment there are, in this country, so far as I have been able to ascertain, and I am quite ready to believe that my information is incomplete, more than one hundred institutions, institutes, societies and associations devoted more or less directly to the science, subject and practice of engineering. Now there is I suppose general agreement on the advantages to be gained from the greater concentration of these activities. I would say they are; in the first place an economy in actual expenditure on the provision of housing, libraries, records, and other facilities; secondly, the consolidation of professional interests and the improvement generally of the status of properly qualified engineers in the eyes of the world at large; thirdly, the provision of effective means of securing for the engineering profession the influence that it should have when political, departmental or other interests

threaten it; fourthly, the prevention of overlapping in intellectual effort and the co-ordination of scientific study and research; and lastly, and really the most important, being the chief reason and justification for the existence of all engineering institutions, namely, the protection of the public from unqualified persons.

There is no need for me to emphasise the importance of the question for a very great deal of thought has been given to it by many most able minds, and various efforts have been made for many years past to find a complete answer. I suppose there must be a complete answer to every question; but I doubt, myself, whether the complete answer to this one is to be found in our time, if ever. It is in any case a matter for cautious and deliberate treatment, where precipitate action is only likely to make matters worse by emphasising the differences and crystallising criticism. I would not venture, therefore, to offer any finite suggestion, but it will, I hope, be a contribution to the discussion if I summarise, as fully as the occasion will permit, what has been and is being done not only in this country but in other parts of the world, for although Great Britain was the first in the Engineering world, we are by no means the only country where the problem is acute.

Taking our own country first, it will probably be a surprise to many to realise how much has already been done. The problem has been approached in a number of different ways, among them:—

Amalgamation.

Affiliation.

The establishment of joint councils.

The grouping of kindred societies in one building.

General co-ordination by registration or otherwise.

Amalgamation is the obvious remedy proposed by the critic who has not studied the problem very closely. It is not and never will be a solution. There have been occasions, where two or more institutions cover exactly the same ground, when amalgamation has been the proper course, and the course has been taken with conspicuous success. Recently we have seen an example in the Institute of Fuel. I am not sure that the Institution of Mining and Metallurgy is quite on the same footing; but certainly its association with the Institution of Mining Engineers is so close as almost to justify the term.

There is one paramount difficulty in dealing with the question that is particularly to the fore whenever amalgamation is mooted, and that is the fact that engineers are necessarily divided into separate classes with entirely different interests, objects and points of view. To take only the main divisions, there are the professional class, the scho-

lastic and scientific, and the manufacturing and commercial; and amalgamation is only possible where there is complete unity not only in the ultimate object of each Institution but also in the sectional interests of the Members.

Affiliation is in some ways a more nebulous form of amalgamation. It has for many years been pressed with great enthusiasm by some as the only statesmanlike course to be adopted, and probably most of you are aware that one of the oldest and largest engineering institutions laid certain proposals before your own Institution some while ago. At that time nothing eventuated, and it was found impossible to find a *modus vivendi* or formula that would meet the views of all parties. There appeared indeed to me to be a lack of agreement, not so much on what was desirable but rather on what was really involved in the proposal. There was considerable doubt what the term "affiliation" really connoted, and, while there was, I believe, in the mind of the authors some sort of idea analogous to that claimed to operate in our Empire, this Institution at any rate was unable to accept the idea of daughter and mother Institutions, and in fact rejected the term "affiliation" altogether. The possibilities of the suggestion have yet to be fully explored, and it has been suggested that "federation" rather than "affiliation" is the proper line to adopt. I am keeping an open mind, but I must admit that I have not yet been convinced that there is any real gain in this proposal which cannot be obtained in other ways. I have no doubt incidentally that some of the smaller societies approached have felt that they were rather being cast for the part of Red Riding Hood.

The third means to which I have referred is the establishment of joint councils. At the present moment the only such council of whose working I can speak with any authority is the Engineering Joint Council. It has now been in existence nearly seven years, but it cannot be said that it has as yet obtained more than a very partial success. Membership, in the first place, has in practice been limited to the four founder institutions, the Civil, Mechanical and Electrical Engineers and the Naval Architects with only one new addition in this period, and secondly the Council is definitely debarred from executive power or any initiative of discussion. It thus represents just those institutions most able to look after their own interests and can scarcely act except in strict accordance with their directions. It has, so far as I am aware, only secured one or two minor successes, but it is possible that its final position, if it were allowed to develop naturally, might be very different from that which it holds to-day. In saying this I have too in mind what has already been done by the Empire Council of Mining and Metallurgical Institutions.

The grouping of kindred institutions into one building is obviously, apart altogether from other and wider considerations, a very sensible and profitable policy. It has been done in America, notably in the Engineering Building in New York, where all the important engineering institutions are housed together and share the library, information bureau, lecture halls and other facilities. This arrangement owed its existence to the vision and

generosity of a very wealthy man and in the absence in this country of such benefactors, the financing of such a scheme has always been the main difficulty. We have here too other difficulties to overcome that are not so apparent in America. You are aware that negotiations between your Council and a certain kindred society, on the one hand, and another very large and important institution were carried on for some time with a view to our being given rooms for our purposes in their building. The scheme did not materialise but we were agreed generally on principle.

Various comprehensive proposals to this end have indeed been put forward, though so far entirely without success. There is the financial obstacle, but in addition the same difficulty which has always militated against the projected Chemistry House, which no doubt we shall some day see, offers an almost insurmountable barrier to any really comprehensive Engineering Building scheme, namely, the reluctance of the old established societies to leave their homes, or share their position. I understand, however, there is at the present an important project on foot to unite the more important mining, fuel and metallurgical institutions in one large building. The prospects seem distinctly fair, as the principle has been agreed to by all concerned. I sincerely hope it will go through for I can see nothing but good in the proposal. The value of such grouping is I think unquestionable. Whatever else is done, this should certainly be part of any and every scheme of co-ordination; but when we come to consider the actual contribution this offers to the solution of the real problem, I suggest it is really comparatively small though definitely important. It leaves practically untouched the problem of the waste of intellectual effort by overlapping, and of the weakening of the authority of engineering generally due to the confusion of voices representing it.

Let me now consider the position abroad. I have already referred to the Engineering Building in New York. There have been several other efforts in that country to co-ordinate engineering. The first I would mention is the American Engineering Council. This owes its origin, some six years ago, to the suggestion and support of the present President of the United States. It was formed with the object of "furthering the public welfare wherever technical and engineering knowledge and experience are involved, and to consider and act upon matters of common concern to the engineering and allied technical professions." Membership is open to all engineering and allied technical organisations, whether national, State or local, "the constitutional requirements for membership in which are designed to maintain the high standing of the engineering and allied technical professions."

The Council, while to some extent it may have indirectly affected the attitude of the Federal and State Governments or of the various Departments towards engineering, has in practice never been specially directed to that end. It has rather turned its attention almost entirely to general and fundamental research work. Some of its publications, more particularly its first volume dealing with the question of waste in engineering production, have been accepted as definite and valuable contributions

towards the solution of various industrial problems. Engineering opinion, however, was for some time acutely divided on the value of the work done by the Council, though latterly there seems to have been a growth of support, and the American Society of Civil Engineers, which for long stood aloof, has, I understand, now decided to join.

The American outlook, however, with regard to such institutions is very different from our own. The whole executive power is generally concentrated in the hands of one official, whether he is president, or director, or executive secretary. The success that can be secured by an exceptionally energetic and efficient dictator is undoubted. On the other hand, when the business of the institution is in the hands of an inefficient or unsuitable person it is very likely to lose prestige very rapidly. Moreover, such American institutions generally owe their existence to the support of some wealthy industrialist and, when they require funds for research work, they obtain them from the industries and businesses that may be expected to benefit. When this system is applied to professional institutions or councils formed of professional institutions, it certainly does not satisfy our views on what is fitting.

Another direction in which engineering efforts have been co-ordinated in America is the Engineering Foundation, which was formed for the furtherance of research in science and engineering by the American Society of Civil Engineers, the Institution of Mining and Metallurgical Engineers, the Society of Mechanical Engineers, the Institution of Electrical Engineers, and the United Engineering Society. It has carried out some valuable research and experimental work, the most notable being the detailed and exhaustive investigation into factors of safety in arch dam construction—a purely civil engineering problem. The method of obtaining the necessary funds is similar to that already described, and while the results will be very useful the Foundation makes no attempt really to do anything more than promote research. It therefore only effects one of the objects of co-ordination of engineering, although admittedly a very important object.

It would be impossible for me to enumerate the many other Joint Councils and Joint Research Institutions and Departments connected with engineering and science in America. I cannot claim to have studied them all myself, but so far as I have, they appear to me to be in principle little different from those I have mentioned, and they offer little assistance to us in considering our problems here—for, in fact, in America I do not think there is any desire to limit the number of societies. It is I suppose felt there is room for all in that spacious country.

One of the principal objects of co-ordination, however, namely the improvement of the status of engineering, is in America secured, or at least attempted, very largely by the registration of engineers. Statutes directing either compulsory or voluntary registration of engineers exist in 25 out of the 48 States, practically the whole of this legislature having been enacted during the last twelve years. Action on similar lines has been taken in most of the Provinces of Canada, and in Quebec, for instance, the result has been that engineering is now practically a

close corporation. The qualifications necessary for registration appear on paper at least to be high, but I think it is easy to see the many grave disadvantages which would or might be found to exist in any scheme of general registration at least in this less bureaucratic country.

The compulsory registration of engineers exists also in Austria and is the principle of the foundation of the "Austrian Engineering Chamber," which is the body whereby the centralisation of engineering in Austria is effected. This is certainly the most determined and complete effort to co-ordinate engineering and it is interesting to note that its origin dates back to an Imperial law of the old Empire in 1913, revived by a Decree of 1918. At the outset the Chamber consisted of civil engineers, civil surveyors and mining engineers, but I understand that it now includes mechanical, chemical and electrical engineers and architects. Members are only admitted after completing regular technical courses and after a number of years successful practice. Assistants or pupils in the employ of members are registered and in due course may become eligible for election. The rules appear to be very strict, allowing little latitude to the members of the Chamber in any professional question. Questions in dispute between members, or any complaint or claim against members in regard to their professional activities, other than actions for civil damages by outsiders, are compulsorily dealt with by the Chamber, and there is no appeal except to the Minister of Public Works. The whole administration and operations of the Chamber are subject to the supervision of the political head of the district, known as the Lieutenant Governor, and from him there is no appeal except to the Minister of Public Works. It is compulsory on members to serve on the directorate if they are elected, and default in the payment of subscriptions renders the defaulter subject, according to the translation I have, to "political execution," a method that some of the harassed secretaries of our own institutions will envy. It is difficult to criticise an arrangement so entirely foreign to our views, without knowing all the reasons which led to the establishment of the Chamber, and with but scant information of the results which have been obtained. It is, however, quite certain that nothing of that nature would be tolerated in this country.

Time prevents me from giving details of the efforts which have been made in many other foreign countries to tackle this grave problem, but in view of the forthcoming Engineering World Conference at Tokyo, I think it would not be out of place to give some details of that unique body, the Kogakkai, which is to act as host on that occasion. The Kogakkai is the original engineering institution of Japan. Intended like our own Institution of Civil Engineers to cover all engineering activities, it was threatened in course of time by the increase of specialising in engineering. In the first instance it endeavoured, I believe, to meet the demand by the establishment of branches or departments to cover the various interests. In spite of this, institutions began to be formed to meet the requirements of mechanical, electrical, chemical, marine engineers, and so on; and members of the Kogakkai found themselves forced, if they were to keep abreast with the latest developments, to join

whichever new societies dealt more particularly with their own special interests.

The position of the Kogakkai was thus much weakened, because in that frugal country engineers were reluctant to pay subscriptions to two societies. The difficulty was eventually solved by the Kogakkai some ten years ago closing its membership entirely so far as individual members were concerned, and becoming an institution of twelve members composed of the twelve presidents for the time being of the twelve major societies. These Institutions are, I believe:

- (1) Civil Engineering, covering hydraulic, sewage and river engineering;
- (2) Mechanical, covering locomotive, automobile and aeronautical engineering;
- (3) Electrical;
- (4) Marine;
- (5) Chemical;
- (6) Mining;
- (7) Heating and Lighting;
- (8) Metallurgical;
- (9) Architects;
- (10) Ordnance and Armaments;

and two others whose names I have been unable to discover.

The Kogakkai now acts as the nominal head and representative of engineering in Japan, whether in relations with the Government, or in regard to any proposed legislation affecting the interests of engineering generally or individual societies, or, as in the present instance, in a social way. The personal opinions of such Japanese engineers as I have discussed the matter with seem to indicate that the influence of the Kogakkai is definitely waning, but it is probably too early to say what the ultimate development is likely to be. It is, however, of great interest to me to see the entirely different lines on which an institution similar in origin to our own Institution of Civil Engineers has eventually developed.

If now we are to sum up the results of these brief and scattered details for our own benefit, I would suggest that our first conclusion must be that there is no single solution of the problem. The lines on which action might most profitably be taken would seem to be:

- (1) The grouping of kindred societies, *pari passu* with the elimination by amalgamation of some of the weaker societies for whose separate existence there seems to be no justification. This grouping would not necessarily imply a physical grouping. The conjoint publication of Proceedings of kindred societies, which is an excellent suggestion which has been put forward, might be one line of approach; and the extension of joint meetings another.
- (2) The evolution by slow degrees of councils representing the major engineering societies and the several groups of societies—with eventually perhaps a General Engineering Council.

It is possible that some form of general co-ordination for research work alone could also be worked out without great difficulty. The good work done by the Conjoint Board of Scientific Societies which was

established during the war under the aegis of the Royal Society, justifies one in hoping that eventually, without having to wait for such an emergency, something on the same lines might be done by engineering institutions. In fact to some extent it is already being done in, for instance, the Marine Oil Engine Trials Committee, set up jointly by the Institution of Mechanical Engineers, the Institution of Naval Architects and the Institute of Marine Engineers. Perhaps the most notable example of co-ordination is offered by the British Engineering Standards Association, which, owing its existence to the foresight of one of the greatest presidents of the Institution of Civil Engineers, is now supported and controlled by all the leading institutions.

If there is to be a co-ordination of engineering research work, someone must take the lead. It could I think scarcely be expected that the Royal Society should act as sponsor, but it appears to me that the doyen engineering institution of the world could adequately fill the roll. For the Royal Society and the Institution of Civil Engineers have this in common; that they are the oldest bodies in their respective spheres of science and engineering—and they alone include in their membership respectively every kind of scientist and engineer.

If the result of these necessarily disjointed remarks is to make the members of this Institution turn again to the problem, the object of the Address will have been secured. It is a problem which must be faced by all engineers, whether they belong to the oldest or to one of the youngest institutions, in both of which categories I am proud to be able to count myself.

MR. W. MACNAB, in thanking the President for his address, said he had dealt with the subject which was most prominently before the members of the different scientific societies, namely, co-ordination. The wise and cautious words of the President on the difficulties and care with which such schemes must be operated were very valuable indeed. They were not discouraging but they certainly showed the necessity for caution. A great deal could be, and was being done, in one direction, namely, the housing together of similar or associated societies. That seemed to be very desirable, and when accomplished would prepare the way for the closer working of these different societies, since they could then go across the passage to discuss things with one another instead of having to go from one end of London to the other. In proposing a hearty vote of thanks to the President he wished to add another to Mr. Beaver for the admirable manner in which he had read the address.

PROFESSOR W. E. GIBBS, in seconding, said that although it might not be possible to hope for complete uniformity in action among such diverse societies as indicated by the President we could hope for harmony of working, and it was only by means of harmony that we could get progress. One of the main desires was co-ordination in the development of research work, because at the present time research work was very haphazard and scattered, particularly in chemical engineering.

The vote of thanks was carried with acclamation and the meeting adjourned until the afternoon.