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A SUGGESTION FOR THE ENGINEERING PROFESSION

BY WILLIAM MCCLELLAN

The engineer of today traces his ancestry along two distinct lines, one practical, the other theoretical. In times past what we call engineering was done either by a skilled mechanic or by a scientist having a practical bent. As the demand became more and more complex, and as science opened up wider and wider fields of knowledge, the mechanic became more and more skilled in certain ways and some scientists became more and more practical. The merging of these formed a group of workers, having common aims and now known as engineers.

The skilled mechanic, however, from the standpoint of quantity, was by far the larger element. One need go back only to pioneer or colonial days to learn that practically all of the engineering, as we know it, was done by the surveyor, the millwright, the master carpenter, the master mason, the smith, and others. Even now, many a smith claims to be able to forge without plans, a hook equal to any that a mechanical engineer can design, and many a country carpenter will frame quite complex roofs of a variety of types, all "out of his head."

Passing quickly over many interesting details, we find that more or less on account of their industrial lineage, engineers are divided into classes. Once there were two of these, civil and military. Later, starting with the multiplication of engines and machines, the civil class divided up into the almost innumerable varieties of engineers which it is unnecessary to list here—if we could.

As a result, while there are many men of great breadth of mind and experience worthy of the title of "engineer," there

is no one who can claim it in the same way that lawyers and doctors can claim their titles. There are engineering professions, but there is no one profession. There are engineering degrees, but there is no one engineering degree. There is no engineer without an adjective. It must be acknowledged that there is some truth in the charge of "lack of breadth," considering the whole body of engineers. It is also curious that in medicine and law the students leave school all with the same general training and degree, but specialize afterwards, whereas in engineering they are specialists at school.

So far as individual activity is concerned, engineers are of different types in the same way that lawyers and doctors are, but to a greater degree of demarcation. Today all the numerous classes of engineers contain three distinct types of members:

First, the theoretical engineer, who in reality is not an engineer. He is, and it would be proper to call him, an applied scientist. Many of the engineers in our great electrical manufacturing companies are in this class.

Second, the mere manual and mental operative, the hewer of wood and drawer of water in the engineering world.

Third, the real engineer who can design and create, who can adapt the resources of nature efficiently to the service of man.

In passing, it may be remarked that the presence of these three types in each class of engineers is the chief difficulty in arranging proper courses in engineering education.

The intensely practical result of all these causes is that engineering is not securely established as a profession; it is difficult for the engineers of the country to act as a unit where united action would be of benefit to society; the engineer is handicapped in obtaining recognition and authority when working jointly with men of other callings and professions; and finally, on account of its divisions, the development of the profession as a whole is proceeding slowly and inefficiently, resulting in an economic loss to society.

Many will remember how often within the last few years a demonstration or recommendations by a united engineering profession would have been valuable. Society needs such help in connection with conservation discussion, appointments of the many municipal, state and national commissions involving engineering in some form, opposition to ill-advised or vicious laws, methods of conducting public work, and a variety of other similar matters.

When unity is so desirable or even necessary, a great effort is worth while to obtain it, but the question is, how?

We might turn to the colleges and technical schools. I have suggested before, and long to see the time, that some prominent school shall offer the degree of Bachelor of Engineering, and give all such students the same general course with a very small percentage of special electives. The schools are moving in this direction and we should have great faith in them. Of necessity the progress is slow and will not answer immediate needs. If revolutionary changes were possible at once, the effect would not be seriously felt for years. The schoolmen must be given time to work out their plans. Outside engineers may occasionally offer valuable suggestions but they are much less able to attack the problem than those whose business is to study it at close range.

If custom were followed, where it is desirable to get united action in some one direction, a great national society of engineers would be organized to which all properly qualified engineers would be eligible, irrespective of their adjectives. Many men have thought of this, but for a number of reasons it is not practicable. There are a large number of "adjectival" societies now, to which great numbers of engineers have given their allegiance. No one society could be formed without having at least four sections equal in importance and influence to the four great national organizations.

One of the four principal societies having an honorable and distinguished history claims to be such a general society, and its constitution provides for the admission of any engineer having sufficient proficiency in his line. The claim to the title can be only nominally upheld, however, because the connotation of "civil" engineer today is so well known to everyone that it is not even necessary to discuss it.

What then can be done? Unity we need badly—unity we ought to have. I have sometimes thought that if a great organizing genius, such as is discovered occasionally in the industrial world, were to undertake the problem, he might build a merger out of or on top of the present organizations, which would leave them organically intact, but provide for united action in general fields. Engineering might have a federal government. It is to be feared, however, that the time is not ripe. Nevertheless there is every reason why we should work toward such an ideal, and the following suggestion is offered. To make it perfectly clear, some details must be given, but there is no insistence on these as essentials, though some of them probably would be. The sugges-

tion is to form a national body, representative in its membership, of all national engineering societies. All trade and business organizations to be excluded. The content of the suggestion can be most easily given by a skeleton constitution as follows:

Name. American Engineering Association.

Object. To assist in the realization of the ideals of the engineering profession and to extend the usefulness of the professional engineer as a servant of the community.

Membership. Any national society of professional engineers, with or without associated grades of membership, to be eligible. No personal membership. Member societies to elect representatives annually on a numerical basis, *e.g.*, one representative for 3000 members or less, and one representative for each additional 1000 members. Representatives to have terms of three years and to be ineligible for re-election. Terms to be arranged in rotation groups. Officers to be elected by representatives annually.

Support. To be by annual assessment of member societies on per capita basis.

Functions. To arrange an annual convention of engineers for discussion of engineering in general, of the engineering profession, and of any related subjects, except scientific and technical subjects such as would naturally and properly come before meetings of member societies.

To hold not less than two other meetings each year at which the objects of the association would be discussed and recommendations forwarded to the member societies, if desirable.

To investigate and report on, with recommendation, any subject which might be referred to it by a member society.

To appear at congressional, legislative or other hearings where it may be desirable, for the purpose of assisting in a proper decision of questions affecting the public good.

To make recommendations at any time to public officers as to policy in relation to matters in which the engineering profession may be interested on its own account or on account of its share in responsibility for public progress.

As the title states, this is merely a suggestion offered, in brief form, to provoke discussion. Everyone will probably agree that the subject is a most serious one and worthy of attention. Should the suggestion be received favorably it could be referred to the Board of Directors. No attempt should be made to carry any such scheme into effect until at least three of the four great national engineering societies could endorse the final plan.

DISCUSSION ON "A SUGGESTION FOR THE ENGINEERING PROFESSION" (McCLELLAN), COOPERSTOWN, NEW YORK, JUNE 24, 1913.

C. O. Mailloux: Mr. Chairman and gentlemen, I regard this paper as one of the most interesting papers that has been presented to the Institute for some time. The President has said that this is *the method* of raising the social status of engineers. I look upon it as *a method*, because I think there are many methods. I have looked forward for many years to greater cooperation among engineers. It has been one of my hobbies. There has been a tendency among engineers to segregation; the different bodies have tended to undergo a process of evolution in different directions, in many respects, in regard to their points of view, and their attitude towards public questions, and also even in regard to their ethics and their methods of professional discipline and conduct. Many engineers in the different branches of engineering realize this, and they also realize the importance of doing something to improve conditions; and various remedies to overcome the conditions that now exist have been proposed.

The American Institute of Consulting Engineers, which has recently come into some prominence, has attempted to bring together the different branches of the engineering profession into a body that will work for the profession of engineering in general. That body is interested more specifically in the welfare of consulting engineers, which is well enough, as far as it goes, but is, perhaps, not as good as it might be if it were sufficiently comprehensive to include engineers of all types, for there are many prominent and eminent engineers who are not consulting engineers, and can not be properly classed as such. I think the suggestion of Dr. McClellan is a very good one indeed. In the way he has formulated it, it is very excellent, but I am not so severe as he is inclined to be as to the means of carrying it out. I think the matter should be carried out by the Institute. It has been the pioneer of progress in the development of many good ideas in this branch of engineering, and in other branches of engineering, generally.

We have inaugurated the Section movement, which is being taken up by other branches of the engineering profession, and I do not see why this body should not be the fostering spirit of a movement of this kind, looking to cooperation among the different branches of the engineering profession.

I would like to make a motion that this matter be referred to the Board of Directors, as I consider it well worth the closest attention of the Board of Directors; and it should serve as the basis of a thorough study and investigation of the question, the Board of Directors to be given full power in the matter, and to indicate to the membership its conclusions in due course.

Oberlin Smith: As a long-time member of all four of the big engineering societies, I feel that perhaps I can speak on

this subject impartially, although I happen to be more closely related with the mechanical engineering branch than any other.

For many years past progressive engineers have hoped for a united engineering society of some kind. The movement was brought up some time ago, before the Engineering Societies Building in New York City was constructed, and the plan freely discussed, but with some of the societies there was too much of a clannish spirit to permit full and complete coöperation; hence nothing practical was done at that time. When, however, Mr. Carnegie gave us the building on 39th Street, many of us hoped that all four societies would come in. The fact that one of the societies remained out was a great disappointment, but I know that many members of the American Society of Civil Engineers much regret the separation. Last week at a convention of the Society in Ottawa, this feeling was brought out strongly and there was some manifestation of the spirit which has been shown in this splendid paper of Dr. McClellan's. The new president, Prof. Swain, of Harvard, gave us a most effective and interesting address. There were some things in it which seemed to be too conservative, yet he took a broad view of the subject, and regret was expressed that the various societies had not all gotten together before. At the meeting, however, there was in evidence some of the old idea that civil engineers were most important, because they covered all the ground outside of military engineering.

It seems to me that we all might get nearer together by mixing, so to speak, the councils of the different societies. Some members of the Mechanical Engineers who are also members of the Electrical Engineers should be in the Council of the Electricals, and vice versa; and this system of mixing of interests would certainly tend towards greater unity and efficiency.

Thus in the Council of each Society, there would be a few of the best-known and most fit members of each of the other societies.

There have, so far, been but few electrical, mechanical, or mining engineers represented on the Council of the American Society of Civil Engineers. I do not remember whether there are any now. Under such conditions a society can hardly claim to be at the head of all engineering activities.

I think, however, that the feeling is growing all the time, among the members of the various societies, that there should be a greater coming together, but they are not limited to the four old organizations above mentioned.

We have among them an important society, the Naval Architects and Marine Engineers; and we have numerous smaller societies, like the Society for Testing Materials, the Society for Engineering Education, the Illuminating Engineering Society, and similar organizations. We are one family subdivided into smaller branches. Of course, there are all kinds of specialties in engineering, just as there are in other professions. Spec-

ialization is increasing all the time, and must be expected. No one man can acquire thoroughly all engineering knowledge. If he knows his own specialty well, and knows about other things in only a general way, he will be likely to make a successful engineer.

I thoroughly agree with Dr. McClellan's idea that we should make some beginning and start in to organize a United Engineering Society. It would probably be impracticable to make the membership of individuals, but it could be made up of other organizations, as suggested. There is no reason why it should not be a unit by itself and have its complete individual organization, with its own separate meetings. Not only could such a society handle the matter of ethics, which has been so well taken care of by this society, but it could make suggestions for better laws and better government in all sorts of ways; and it would have a broad influence, scientific, economic, moral and social, which engineers do not now possess. We could exert our influence in a powerful way by united strength, rather than individually, as we now do. I look forward to such a movement being a wonderful success.

Chas. L. Clarke: Dr. McClellan seems to be in doubt as to whether the time is ripe for an organization of this sort. Undoubtedly the time is here, and we ought to see such an organization founded before long. The danger that it might interfere with the so-called clannishness of the member societies, is hardly possible, because the plan does not propose interference in any way with the technical business or other individual matters of such societies, but only contemplates fostering national and broad policies affecting the body politic in general, as far as engineers can help to do so, as men of education and of technical judgment.

Dr. McClellan has invited suggestions on two points. The speaker has one suggestion to make with reference to the name of the society. According to the suggestion in the paper of Dr. McClellan, it is to be called the American Engineering Association. The speaker proposes that it be called the American Association of National Engineering Societies, which title seems to explain as briefly as possible what the Association is in fact, and is calculated favorably to attract attention of Congressmen when receiving a communication relative to pending legislation sent to them by this proposed Association, for they will see just what it stands for and comprehend the situation from its name, especially if coupled with a list of its members.

D. B. Rushmore: We received a great deal of inspiration from the Address of the President this morning, and we have also been greatly impressed by the suggestions made by Dr. McClellan in his paper, and these things together lead me to believe that there is very great necessity now for some one to take these ideas and reduce them to general principles, so that the best results from coöperative effort may be secured therefrom. However, I am afraid that we are getting into a

condition of over-organization all over the country. If we take our political life, our industrial life, our social life, and our professional life, we will find that we belong to a great many more organizations than we can take an active part in.

Here we have a very interesting proposition brought forth, and the question arises: What is its practical value? Can we express in general terms this particular hope we wish to accomplish? To a person who has had to work in a large organization, and possibly not especially fitted to adapt himself to others, it has been necessary many times to think— Why an individual? Why a department? Why an organization? And what is it trying to do? All over the country you see rising up industrial organizations, political organizations, and agricultural organizations. In the agricultural organizations an interesting development is taking place. In these organizations a differentiation is being made between those things most efficiently done by individuals and those best accomplished by coöperative effort. They are being organized from beneath upward, the individual action extending as far as efficient results justify it, and further on coöperative effort is substituted, with the most beneficial results for all concerned.

In our field of engineering activities we have a large number of small societies, all actively engaged in fields of special effort. A similar result could be accomplished by joining all of these in one large holding company, and instead of separate entities, having them as members of one large whole. It is, however, a question, and a serious one, as to which method of organization will produce the better results.

It is absolutely essential for the future welfare of the engineer that he should not allow himself to be pushed into the field of an exclusively pure scientist, but that he demand that his work include the consideration of money expenditures, which factor is one of the basic principles of engineering practise.

The standing of the engineering organizations and their value to their membership will depend upon the part which these organizations play in the field of industrial, social and political activity. It is most important that an unrelenting fight be waged against the licensing of engineers by the State. We should insist that the membership rank of the engineering societies be accepted as the means by which the standing of an engineer in his own profession shall be judged. This means that considerable revision must be made of the grades of membership and the requirements for admission to such society.

Dr. McClellan's suggestion has much of value and is of interest to all engineering societies. It is worthy of much consideration, but it is suggested that it receive the benefit of all possible criticism before we organize another society.

C. L. deMuralt: I am very much pleased with Dr. McClellan's paper, and heartily endorse what Mr. Mailloux has hinted at, namely, that it is just about the right time to have this sug-

gestion made. Dr. McClellan has put it in very good form, even down to the details.

If I say anything at all, it is because I desire to make an additional suggestion: Why is it necessary to add to the many existing societies a new one? Why can we not use one which is already in existence?

The American Society of Civil Engineers is unfortunate in that its name, according to present usage, seems to cover one branch of the engineering profession only. That is not so. Many of us are members of the American Society of Civil Engineers, and the American Society of Civil Engineers has always taken the view that it is the old mother society which represents all engineers in this country. Why should we not approach the American Society of Civil Engineers through our Directors, perhaps in cooperation with the American Society of Mechanical Engineers, the Society of Naval Architects and Marine Engineers, the American Institute of Mining Engineers, and similar bodies, and discuss with them this proposition which Dr. McClellan has made.

I am not authorized to speak for the American Society of Civil Engineers, but many of the members of that Society have told me they would like to have the support of the individual engineering societies. I have no doubt they would listen to any reasonable suggestion of having the individual societies come in with them on some broad basis. This could either be done as Dr. McClellan's paper suggests, through a lump sum payment from each society or else by allowing the individual members, if they want to join the American Society of Civil Engineers, to obtain membership by paying some agreed-upon additional fee. I think that along these lines something of real practical value could be accomplished in the direction of Dr. McClellan's suggestion.

C. O. Mailloux: I want to say a word on this question of the role or function which the American Society of Civil Engineers might have played. The American Society of Civil Engineers had the opportunity to lead all the engineering societies of this country, but lost that opportunity thirty or forty years ago, and it is too late to go back to it. The suggestion which Mr. de Muralt made would meet with enormous opposition in the minds of a few fossilized civil engineers who believe in the lion and the lamb lying down together, provided the lamb is inside of the lion. When the lion has become a small thing, dwarfed, in comparison with the lamb, the suggestion is preposterous. I am second to none in my respect for ideals in engineering, and I think I have done my share in the work of raising the ideals of engineering. I know we cannot accomplish the objects which Dr. McClellan seeks to accomplish by proceeding along that line, for the reason that the very things he seeks to have done, namely, the pursuit of ideals, the participation of the engineering profession in the consideration and determination of public

questions, are notoriously the very things which the American Society of Civil Engineers has always dodged and kept away from, and on which it has been afraid to hold distinct and pronounced opinions.

C. L. de Muralt: That, of course, is an individual opinion. It may be shared by many here, but I do not quite see why my proposition is necessarily ridiculous and preposterous. The American Society of Civil Engineers might have had some fossilized members thirty or forty years ago—I was not an engineer at that time—but it does not seem to me fair to cast reflections upon the present membership of that Society on the basis of what happened thirty or forty years ago. I know, as a positive fact, that those who are now managing that Society are not fossilized and I have reason to believe that they are very much in favor of such a movement. They should be approached to find out if it is not possible to carry out Dr. McClellan's idea, without starting a new and unnecessary society.

Oberlin Smith: The American Society of Civil Engineers was, I think, the first engineering society of consequence established in this country. I have great respect for it as a body, but it constitutes only one branch of the profession. Applied to their branch only, the term "Civil Engineers" is a misnomer, and does not mean anything, because most of the rest of us are also "civil". The term was of course used in contradistinction to the term "military engineers," and was applied to all engineers other than those engaged in military work. Although not logical as at present used, it probably will remain with us, but it cannot be a comprehensive name for a united society. If we have a new society, we should not call it "The American League of National Engineering Societies." We rarely could spend the time to pronounce the whole name, but would call it by its initials. Witness the sad case of the American Society for the Prevention of Cruelty to Animals; we always call that the A. S. P. C. A. and then have to think it out. There is a great advantage in having a short name for a society or other organization so that people will be able quickly to remember what the initials stand for. We should have "American Engineering League," or some such name, the shortest that we can get. If a Congressman or such should not know what A. E. L. stood for, we could have the full name presented for his notice, far better than we could a very lengthy one.

D. C. Jackson: This paper has much of suggestiveness in it, and it proposes one of those things which ought to be put into execution. It is one of those things which has been discussed year after year for a long period of time. I hope that Dr. McClellan's entry into the lists will result in the accomplishment of the purpose. I am with him thoroughly, but I want to criticize his paper in a small way.

We generally recognize, I think, that the old definition that comes down from Tredgold, that "Engineering is the directing of

the forces of nature to the use and convenience of man," is a correct definition and sufficiently ample and comprehensive of all modern engineering practises of today. If it is a correct definition of engineering, then what are engineers? I have put the definition of engineers as "Those who are competent to conceive, devise and organize the directing of the forces of nature to the use and convenience of man." If that definition is correct, then it is not quite fair to our profession to eliminate therefrom (as Dr. McClellan's classification purports to do) some of the men who are working distinctly on the scientific aspects of engineering and doing little towards direction and execution. We must include within the profession those men who are scientists primarily, and engineers secondarily, or vice versa. We must also to some degree go over to the other side and include some men who are executives and administrators of engineering enterprises, and also men of engineering ideals and views although their active work may be done in the laboratory or school; in other words, we must make our definitions and our ideals of the profession as comprehensive as may be necessary to take in all these men. This is scarcely a criticism of Dr. McClellan's admirable paper, but a suggestion of the way in which his proposed classification should be modified.

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