

THE AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS.

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The engineer is defined as "one skilled in the application of the materials and forces of nature to the use of man." Once he dealt almost wholly with materials—some do so still, arranging brick and stone and iron to form bridges or buildings which stand inert. Others combine materials and forces. But the electrical engineer deals with forces, with energy in its moving, kinetic form. His unit is not one of length or mass or volume or strength—it is the kilowatt, a unit of activity. If the flow of energy cease, the electrical system is inert, as useless as the body when life is gone. He energizes and vitalizes the systems constructed by engineers of many kinds. Hence the phenomenal rate of electrical extension—it is not a new thing separate and apart from other things, it enters into them, it operates, it awakens, unites, transforms.

Among the various branches of engineering many are of old standing and have been developed during many years; the greater part of what is standard to-day may be found in the text books and the treatises of a generation ago. On the other hand, the second edition of Kapp's "Electric Transmission of Energy" which is less than fourteen years old contains no reference—other than a sentence in the preface—to the commercial use of alternating current, although it has already become well-nigh universal. If one were about to install a long distance transmission plant he could call hydraulic engineers as advisers, who have had many years of experience. But he would find that

electrical engineers have had scarcely any experience with the high voltages which are now being introduced. In fact the plants which have been operating at 40,000 volts for more than two years may be counted upon the fingers of one hand or even upon the thumb.

The newness of electrical work is shown also in our large cities which depend for their street railways, for their light and for their power upon apparatus in central stations and upon methods of transmission which were unknown a dozen years ago.

The electrical reports in the U. S. Census show that the mean rate of increase in electrical activity as measured by the capital invested is 20 per cent. each year—it doubles in four years.

Technical schools, electrical courses and laboratories have increased wonderfully, but their output of young engineers does not supply the growing demand.

Note how electrical and other interests are interdependent. The underground railway systems in New York City require the work of almost every branch of engineering. The purpose of the whole is the operation of trains. Everything contributes to that end. The operation is by electricity. So also does every department of the system come into relation with the electrical engineer; the design of the power house, of the locomotives or motor cars, of the tunnel, of the track, of the stations, the arrangements for handling passengers—all are related in some way to the electrical system. And naturally so—they all are the passive elements contributing to the one active end, train operation, and electricity is the immediate active element by which trains are operated. Hence, in general, all else is adapted and contributes to the electrical system and must harmonize with it. Hence the electrical engineer is the central engineer, he more than any other comes in contact with all; he more than any other needs to know something of all other departments and professions.

Just as the workmen in a factory depend upon tools and motors and transmission circuits and buildings in order to do their work, so also does modern society depend, for that something which we call commercial and social life, upon mills and factories, upon facilities for travel and communication and upon its bridges and its buildings, its engines and dynamos—all, the results of engineering work. We know all this, we know that the new attitude toward nature beginning with the achievements of Copernicus and Galileo and Newton marked the beginning of new methods of thought and of action. We know that mechanical

power by means of the steamship and the railway train has had the most profound effect upon modern life in every particular—commercial, industrial, social, political. We recognize the new impetus which has been imparted by electricity during the past score of years. We know all these as physical facts and we see their immediate effects. But we are so surrounded by them and they are so close upon us at every hand and we have become so accustomed to them that I question whether any of us appreciate and realize their full significance. The immediate effects are readily seen. It is the indirect but far-reaching influence of the new agencies which is not so easy to discover.

In this new era the AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS represents the profession which is youngest in years yet foremost in activity. To meet the present demands of this new era, to prepare for an expanding future, we may well ask, What should our INSTITUTE be? What should it do? Shall we adopt the methods of the old-time learned society? Shall we imitate the ways of societies or professions whose methods are established and whose rate of change is slow? Shall we reserve preferment for those with hoary locks or well-rounded years of experience?

Not only the activity of our profession but the spirit of the times demands something different. We cannot stand aloof, we cannot be exclusive—we must recognize that we are in a new era with its unprecedented rate of progress. We cannot wait till men develop through many years of experience, for they are needed quickly—how then can we increase the efficiency of their training and accelerate their development? We have no long record of achievement and experience to guide; we must execute and operate in a dozen places what has scarcely had time to demonstrate its success in its first installation—how then can we increase the efficiency of our work by extending the knowledge of that which has been done and by crystallizing from present practice that which should be made standard?

A year ago when your votes imposed the responsibilities of the presidency upon me, it seemed that while the preceding year had fixed a high standard for our monthly meetings in New York, we should develop next some method by which distant members might take much more active part in our work. I took up the conditions confronting me as a definite problem. I studied it and discussed it with others; it grew, and new phases appeared. The problem as it presented itself to my mind together with

certain specific ways for advancing our interests were set forth in an address upon " Proposed Developments of the INSTITUTE " which I read at the beginning of the year. I may add now that the more deeply I have become involved in the affairs of the INSTITUTE the more interested have I become and the greater have its possibilities appeared.

In that address of last September several specific ways were proposed by which the work of the INSTITUTE might be advanced during the year. Let us review them briefly, noting their bearing upon the future.

(1) " The membership should be increased."

My own convictions were expressed during the year in the following words: " We have failed to catch the spirit of the times and the keynote of electrical progress if we do not realize that we must expand and broaden and progress as well as maintain high standards of excellence. Full membership should be exclusive, associate membership should be inclusive."

Our membership list on September 15, 1902, included 1630 names. Since that time nearly 1000 applicants have been elected as Associates. Who are the men who have come among us? What is their age, what has been their training, what is their present position?

The new men range in age from 19 to 65. The ages of those who have been elected are given in the following table:

Over 50 years.....	2%
45 to 50 years	2%
40 to 45 years	6%
35 to 40 years	10%
30 to 35 years	24%
25 to 30 years	34%
20 to 25 years	21%
Under 20 years	1%

Approximately 60 percent are between 25 and 35 years of age and are presumably young men who are getting under substantial headway in life and are in their accelerating period.

Forty-four percent of these men are graduates of schools of recognized standing. Of the graduates 45 percent graduated within the past 5 years (not including 1903), and 77 percent within the past 10 years. Cornell University leads the list with 12 percent of the graduates; the Massachusetts Institute of Technology is second with 8 percent; Columbia, Purdue, Ohio State, Princeton, Worcester Polytechnic Institute, Lehigh,

University of Michigan and the University of Wisconsin follow next and there are substantial numbers from McGill, Stevens Institute, University of Pennsylvania, University of Illinois, University of Minnesota, Pennsylvania State College, University of Nebraska, University of California, Harvard, Yale, and Rose Polytechnic Institute. In addition there are graduates from numerous additional institutions, as well as many others who have not taken degrees.

The position and occupation of the new members is difficult to classify definitely, but a general summary shows the following:

Electrical engineers with manufacturing companies . . .	30%
Electrical engineers with operating companies	25%
Managers and superintendents, duties presumably executive rather than technical	16%
Consulting engineers	10%
Electrical engineers with mills, mining plants and the like	6%
Students	6%
Professors and instructors	4%
Mechanical and electrical draftsmen	3%

I think we may congratulate ourselves that our additions are truly representative of the electrical engineers of America, including not only those advanced in the profession, but young men of promise—the engineers of the future. An addition of 60 per cent. to our numbers in a single year principally of men who are entering active engineering work and who have been attracted to the INSTITUTE because they believed that it was well worth while to join, means much to the INSTITUTE, it means much to the men and it means much to the electrical engineering profession.

Other plans proposed at the beginning of the year were that:

(2) "Papers and discussions should be contributed from a larger proportion of the membership."

(3) "Local meetings of the INSTITUTE in various cities will broaden the interest of its work and generally extend its benefits."

(4) "Universities and technical schools with electrical engineering departments may organize local meetings of the INSTITUTE."

These three lines of activity have developed most satisfactorily and are closely related to each other. General plans were presented for the formation of local branches and such branches have been formed among members in a number of leading cities;

also in many of the principal technical schools and universities. In some cases local members and students unite. The methods have been simple: there is a minimum of organization and formality; the primary purpose is to bring electrical men together, to awaken interest, to consider and discuss important engineering topics. At the beginning of the year definite subjects were assigned for each month for the meetings in New York. Usually several papers were secured from experts upon each subject. Printed copies of the papers, together with the stenographer's report of the New York discussion have been sent promptly to the secretaries of the local branches. As the branches have usually held their meetings subsequent to the meeting in New York, they have had the advantage over the first meeting in having the discussion as well as the papers. This material is presented in suitable form by the members of the local branches and the discussion is continued. Such material as is new and valuable is reported to the Secretary for publication in the *TRANSACTIONS*. By this means the latest phases of electrical engineering work are presented and discussed not in one meeting only but in more than a score.

Those who have taken up the local work usually report that the interest, the activity and the attendance surpass expectations. In nine cities in which local branches have been formed the total membership has practically doubled. The attendance is not limited to members, as others are welcome. A number of professors have spoken of the interest taken by students and the avidity with which they enter into the work. One professor recently remarked to me that the *INSTITUTE* papers were giving him a new insight into present electrical engineering and such papers as those upon *Central Station Practice* made him realize how far practical engineers were in advance of the lecture room and the laboratory.

The element of greatest importance in this extension of our work is to my mind not so much the mere technical knowledge which it may diffuse but the broader aspects of up-to-date problems which it presents and the sentiment of unity and coöperation among electrical men. Electrical engineers have not the advantage of long-time acquaintance, but in this plan we have an effective means of bringing them together, of uniting them in a common interest and of directing the studies and the work of young men along definite and effective lines.

At the beginning of the year it was indicated further that:

(5) "The collection of engineering data and the establishment of standard practice in electrical engineering is one of the important functions of the INSTITUTE."

The present years are formative years. Electrical engineering is crystallizing. In addition to our Committee on Standardization two new committees have been formed, one on High-Tension Transmission, the other on Engineering Data. The Transmission Committee is composed of engineers of recognized standing. A consulting engineer is the chairman, and representatives from several large manufacturing companies and a western university complete the committee. This committee is collecting specific data with respect to present practice in high-tension transmission and will formulate these data for the use of electrical engineers. It has further prepared a number of short papers as introductions to discussions upon a number of important branches of transmission which is calling forth the opinions and experience of engineers at large.

The Committee on Engineering Data is composed of men of high standing, under the direction of the Electrical Engineer of the Niagara Falls Power Company. It has been appointed for collecting and publishing electrical engineering data upon new and special subjects which are evolving daily throughout the country in the practice of the engineering profession. There is much important data which have not found their way into text books and hand books and about which little is generally known. Such data, if allowed to follow existing channels, either never reach the public, or only after a long period. The first subject to be taken up for investigation is insulated electrical conductors. Under this general subject is included the heating of cables of various character under different conditions, the life of cable insulations, the methods of ventilation in conduits, the effects of short-circuit, and general data bearing upon the operation of cable systems.

I count such work as has been undertaken by these committees as of the highest importance to the INSTITUTE and its members, for it deals with matters vital to substantial electrical progress. They are the means of carrying out one of the highest functions of the INSTITUTE in bringing together the diversified achievements of many workers which in the aggregate constitute a single total of accomplishment which we designate as progress. They bring definite and systematic results out of what is otherwise indefinite and chaotic. Thus they lay the foundation for advancement.

As a further department of our work it was stated at the beginning of the year that:

(6) "Our library merits a cordial support." The generous contributions of members have been continued during the year by substantial additions to our valuable collection, not only in contributions of present volumes but in endowment provision for the continuation of sets which have been presented. Plans are now under consideration for giving our own TRANSACTIONS—a panoramic history of American Electrical Engineering—greater value by preparing a general index to be issued both in pamphlet form and also on cards, which may be distributed alphabetically through the card catalogues of public and private libraries.

The crowning event of the year was in a measure anticipated by these sentences of last September:

(7) "Permanent quarters for the INSTITUTE should be an object of plans and anticipations. * * * Personal acquaintance and social intercourse are influential factors in unity of sentiment and of action."

The story of our Library Dinner with its distinguished guest who spoke in happy mood of American engineers and of coöperation among them and of "institutions like this of the Electrical Engineers which do so much" is already familiar to you, as well as the events of the following day when he called to his house two of our members to talk further of what an engineering building should be and of plans for its realization. I count as the most memorable privilege of the present year the opportunity given me of sitting next to Mr. Carnegie on the evening of our Library Dinner and the hour in his own library on the following afternoon. At the dinner he was in the best of spirits, alert, and ever interesting as conversation shifted easily from one topic to another. The talk was pleasant and appropriate to the hour but never trivial. One topic after another came up, but it was the more serious, the more definite, the substantial idea which he brought out before turning to something else. The happy response to his toast was almost throughout a repetition of the ideas and the sentiments which he had expressed in the conversation of the preceding hour.

In discussing at his house the next day the project of an engineering building he impressed me as seeking the way by which he could realize an ideal. He was not very familiar with the organization of the several engineering societies, he knew

little of their methods and of their financial means and their facilities. But he saw a need, not merely the physical need of accommodations, but the higher need of elevating and developing engineering and engineers. He used about these words: "Yes; engineers need to get together, they need to get acquainted and to meet socially. You can provide for that, can you not?" In his address as President of the Iron and Steel Institute since that time he has discussed methods of industrial organization, particularly the relations between men, and he has emphasized the advantages of a general partnership and common coöperation. When, a few days after our first conversation, estimates and a general scheme of procedure were presented, Mr. Carnegie did not care to go into the details of method. He seemed to have confidence that engineering organizations could develop their plans in the ways which would be most efficient. He set no restrictions. The great Gift to Engineering is presented in a single sentence shorter even than the superscription of the letter which proffers a million dollars. Four of the organizations (the fifth has not yet taken final action) which were designated in his letter have without hesitation formally accepted the administering of this generous gift to engineering and their representatives are now actively developing plans. These plans look forward to the realization of an ideal long cherished by some of the foremost and far-seeing engineers of the country, an ideal in harmony with the new era in engineering and with the trend of American development, an ideal which brings within its scope the advancement of the engineer and of his profession both within itself and in its outward relations. In short, an ideal the realization of which will strengthen modern engineering—the very basis of national prosperity and progress—and will exert influences which are beyond our power to discern.

The remaining specific way mentioned at the beginning of the year for advancing the interests of the INSTITUTE was:

(8) "Coöperation with similar institutions in other countries."

Our relations with the Institution of Electrical Engineers of Great Britain in particular are most cordial and beneficial, and we are planning to have its members with us at the time of the Engineering Congresses to be held at the St. Louis Exposition next year. But the idea of coöperation has had its development along domestic rather than foreign lines. It is not worth while here to recount the advantages of coöperation. We recognize it as the modern method. The possibilities which may come

through coöperation among engineers and in engineering work are hardly less than those which are recognized in industrial, commercial, financial and social affairs. The founding of the John Fritz medal, and the gift of a Union Building are magnificent examples.

In the interrelations between societies, care must be taken that individuality and freedom for individual development are unrestricted, and that the points of contact and common endeavor are only those in which the most efficient results can be obtained through coöperation. I think all will agree that just as electricity has been pre-eminently a unifying element in modern affairs, so also the electrical engineer should be a unifying element in the engineering profession and that there should be in particular a coöperation among electrical organizations. Let us develop the ideal and then realize it as best we may, step by step, in the future.

To present definitely a general scheme I will give the substance of a suggestion which I presented to our Committee on Affiliated Societies which now has the general subject under its consideration.

First.—A plan should be outlined providing for special departments or sections of the INSTITUTE for such lines of electrical work as may demand greater attention than can be given by the INSTITUTE as a whole and which can be more efficiently conducted in this manner than by the formation of new specialized societies.

Secondly.—Affiliation or coöperation is desirable with other electrical associations by which the INSTITUTE may work in harmony along certain lines, such as Standardization, adoption of the National Electric Code, the Collection of Engineering Data and other matters of a general nature. Many associations dealing with specific industries have both commercial and engineering interests. I would make the INSTITUTE the electrical head or center, bringing into a unity the electrical engineering of all these associations, not restricting, but broadening their work and making them constituent parts of a great whole.

Thirdly.—There is opportunity for close relations between our local branches and local engineering societies or clubs. In two or three cities the local societies are considering plans of uniting sections of their societies with local branches of the National Societies. Think for a moment of the possibilities in elevating the work and increasing the efficiency of engineering organizations by establishing close ties between local and national

societies—keeping them in close sympathy and coöperation, and bringing them into one great system! The success which has attended our branch organizations augurs well for further extension by similar methods for awakening and stimulating a general interest in engineering subjects.

Fourthly.—There should be coöperation—without affecting their present individuality—between national engineering societies in the nature of a National Engineering Congress for promoting closer relations between the various branches of engineering work and for representing the engineering profession as a whole.

In this summary review of the year's work no mention has been made of less conspicuous though scarcely less important matters—the Committee on Finance, the Committee on Papers, the Editing Committee, the Board of Examiners, the Committee on National Electric Code, the Reception Committee, the Committee on Membership, the coöperation of the INSTITUTE in the establishment of the John Fritz Medal, the plans of the INSTITUTE for the Louisiana Purchase Exposition, the extension of certain privileges to students in electrical engineering upon the payment of a small fee, the plans for receiving graduating theses and according recognition to those of superior excellence. On the Board of Directors and the Committees are earnest active men who have freely contributed time and labor to the advancement of your interests. After all, the element which promises most for our future is the spirit of the men who are leaders in our work and the ready response to their efforts which has come both from our members in carrying out our work and from those who have come in such generous numbers to join with us.

It is difficult to see wherein our work can be materially reduced without serious loss. It is easy to see how it may be expanded. I emphasize particularly the establishing of permanent committees to be continued from year to year to carry on lines of work such as the committees on standardization, on transmission, and on engineering data. The value of the results is unquestioned, but the amount of work necessary is not so readily appreciated. We must depend for our best work upon the men who are busiest and who are in a way least able to give it. We must efficiently utilize small contributions of endeavor and assistance from many men. This requires organization and direction, these men should have the fullest assistance from others who are paid to carry out their directions and to care for details.

Our expenses are within our income simply because we have been watchful, restricting expenditure at every turn. In order to expand and to carry out the lines of work which are most valuable to ourselves as individuals and for the substantial promotion of electrical engineering and of electrical industries, we need money.

In the Union Building for the Engineering Societies, it devolves upon the societies to provide the land upon which the Carnegie gift is to be placed. To provide for the INSTITUTE in this matter, a committee has undertaken the raising by subscription of a fund for this purpose. This magnificent supplement to what Mr. Carnegie is doing will give the INSTITUTE rent-free its building for general meetings, for library, for offices, reading and reception rooms and the like. This will enable us to devote to technical purposes the funds which would otherwise be required for rent, which are considerable now, and would be greater in the future.

We anticipate substantial contributions from those who have reaped a rich reward from the applications of electricity. Their wealth has come in no small degree from the work of electrical engineers. Whatever the INSTITUTE may do in raising the standards and increasing the effectiveness of electrical engineering brings rich returns to those men and particularly to those companies commercially interested in electrical pursuits. The farmer saves from his surplus the best seeds for the coming season—should not some of the wealth which engineering effort has produced be returned to train men and to develop methods for the future? Is not the wholesome recognition of the engineering profession by Mr. Carnegie coupled with his generous gift but the beginning of a new attitude toward engineering and of better things to come? Engineering researches and investigations and tests requiring large sums of money should be undertaken. It is not too much to hope that if we use well the talent which has been given us, more may be entrusted to our keeping.

But building and library, professional papers and technical data are only the facilities, the means, the tools, for the men who are to use them. We must develop men, more effective men. Let us maintain high standards of excellence, of professional attainment and of integrity. This does not require that we be too exclusive, holding ourselves aloof and apart. In religion the ideal is no longer the monk in the cloistered cell, it is activity in daily life. Electrical engineering is in contact with many interests, let electrical engineers be in touch with many men. In

one sense engineering and commercialism are widely apart. Yet there is a commercial side to engineering, not mere selling, but the adaptation of engineering work to definite industrial and commercial conditions in such manner as to bring the best results. In our papers we do not discard subjects which are of engineering interest and value, simply because they may be of financial importance to some one. It is not our function to treat simply of the things which are of no value to anybody. Yet our criterion is not commercial, but engineering; practical common sense, not sentiment, must prevail in our relations to things and to man. The engineer is not merely the man in the closet surrounded by slide-rules and tables. Electrical enterprises depend upon manufacturers, industrial captains and financial managers—upon those who construct and apply and use and direct the results of engineering work. Engineers should know these men and work in harmony with them. The plan for the new Union Building—the Capitol of American Engineering—not only brings engineers of different professions together but it recognizes broader relations, as the engineering societies will be adjacent to a social club “composed of engineers and others who may be interested in or connected with the engineering profession.”

We are in an engineering age, an electrical age, with its physical commercial, industrial and social changes, with its new conditions, new opportunities and new responsibilities. And these are the beginnings of yet greater things to come. Let us be awake to the times and in touch with modern methods. Let us make the work, the methods and the ideals of our INSTITUTE in full harmony with that profession which deals with kinetic energy and whose units of measure are the units of activity and whose mission it is to awaken, to energize, to unite, to transform to operate, to make effective.
