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*THE ORGANIZATION AND ADMINISTRATION OF NATIONAL ENGINEERING SOCIETIES.**

THE most important factors in promoting the advance of the engineering profession and in disseminating and rendering available to the world the valuable experience and data accumulated by engineers in the practise of their profession, are the professional associations of national engineering societies. The importance of the interchange of data and results of observation and experience was recognized by engineers long before the practise of engineering had been exalted to the dignity of a profession.

While military engineering was recognized from the earliest times and great military engineers such as Vauban, and bridge and highway engineers such as Perronet, had achieved eminence, it was manifestly impracticable for military officers to organize for the purpose of interchange of information, on the very secrecy of which the military establishments of nations were dependent for their offensive and defensive efficiency. The first important step in the association of engineers into a professional body was taken when in 1828 Thomas Telford, in the name of 156 of his colleagues—some of whom had already formed a society as early as 1818—applied for royal charter for the Institution of Civil Engineers (of Great Britain). The original charter recites that the body is formed "for the general advancement of mechanical science, and more particularly for promoting the

* Presidential address, American Institute of Electrical Engineers, twenty-second annual convention, Asheville, N. C., June 19, 1905.

acquisition of that species of knowledge which constitutes the profession of a civil engineer, being the art of directing the great sources of power in nature for the use and convenience of man, as the means of production and of traffic in states both for external and internal trade, as applied in the construction of roads, bridges, aqueducts, canals, river navigation, and docks, for internal intercourse and exchange, and in the construction of ports, harbors, walls, breakwaters and lighthouses, and in the art of navigation by artificial power for the purposes of commerce, and in the construction and adaptation of machinery, and in the drainage of cities and towns."

It will be seen that this famous definition of the field covered by the profession of the civil engineer, as formulated by Telford, covers broadly all of the branches of modern engineering science, excepting military engineering, and includes within its scope directly or by implication mechanical, mining, electrical and sanitary engineering and naval architecture. It was not long before important discoveries in the realm of physical science and epoch-making inventions and improvements in the mechanical arts opened new fields of industrial activity, and we find this broadening of the field covered by the engineer reflected in a differentiation of the profession, in Great Britain resulting in the organization in 1847 of the Institution of Mechanical Engineers, in 1869 of the Iron and Steel Institute, and in 1871 of the Society of Telegraph Engineers and Electricians, which became in 1889 the Institution of Electrical Engineers.

Coming now to our own country, the American Society of Civil Engineers was organized in 1852, the American Institute of Mining Engineers in 1871, the American Society of Mechanical Engineers in 1880 and the American Institute of Electrical Engineers in 1884. While these are the distinctively national engineering societies, there are other technical associations like the Society of Naval Architects and Marine Engineers, the American Society of Heating and Ventilating Engineers, the American Street Railway Association, Association of Engineering Societies, etc., which, although of national importance, do not come within the scope of our subject.

There are still many other professional bodies in the United States identified with the engineering profession, some of a national character, which in addition to professional activities are also associated for commercial relations and whose memberships consist largely of business corporations, such as the National Electric Light Association and the Association of Edison Illuminating Companies, and still others largely local in character, such as the Pacific Coast Transmission Association, the Engineers' Society of Western Pennsylvania, and the league known as the Association of Engineering Societies, representing a total membership of 1,766 in eleven local engineers' clubs or societies.

In this review we shall confine ourselves to the four national engineering societies first referred to, with some reference to the corresponding bodies in Great Britain and on the continent.

NATIONAL ENGINEERING SOCIETIES (U. S.).

Name and Date of Organization.	Date of Report.	Hon. Members.	Full Members.	Asso. Members.	Associates.	Junior Members.	Total.
American Society of Civil Engineers, 1852	Jan. 1, 1905	9	1793	903	127	[1]367	3203
American Institute of Mining Engineers, 1871	Jan. 1, 1905	7	3483	—	190	—	3680
American Society of Mechanical Engineers, 1880	Jan. 1, 1905	19	1915		237	609	2780
American Institute of Electrical Engineers, 1884	Jan. 1, 1905	2	481	2851	—	—	3334

[1] Including 27 fellows.

The membership of these bodies, divided into the several classes according to their last official reports, is given in the following table; as a matter of general interest there is also added a tabulation of the more important European engineering societies.

FOREIGN ENGINEERING SOCIETIES.

Name and Date of Organization.	Date of Report.	Hon. Members.	Full Members.	Asso. Members.	Associates.	Total.
Institution of Civil Engineers (of Great Britain), 1818	Jan. 1, 1905	19	2191	4116	271	[1]6597
Institution of Mechanical Engineers, 1847	Mar. 1, 1905	9	2351	1545	72	[2]3977
Iron and Steel Inst., 1869	Jan. 1, 1905	11	1898	—	—	1909
[3] Institution of Electrical Engineers, 1889	Aug. 31, 1904	6	[4]1101	1435	1761	[5]4303
Verein Deutscher Ingenieure, 1891	Apr. 24, 1903	6	17543	—	—	17549
Société des Ingénieurs Civil de France, 1848	1901	—	—	—	—	3691

A study of the annual reports of these bodies from year to year and of their constitutions and by-laws is of considerable interest, showing their progressive expansion, growing influence, and higher professional standing from year to year, and the lines along which these developments take place. We will not undertake a retrospective analysis, however, but rather confine ourselves to a comparative study of the methods of organization and business administration of the four national engineering societies as revealed in their last annual reports. It should be stated at the outset that this study is not undertaken with a view of criticizing the methods followed or results accomplished by our sister societies, but for the purpose of profiting by their experience and, if possible, avoiding in our own rapidly growing body any abnormal development which may detract from its efficiency as a whole, or result in purely local development at the sacrifice of general usefulness and national standing.

One of the very first questions we encounter is that of the grades of membership, then the requirements of admission to them, and the method of election. These questions are of fundamental importance and they are worthy of the closest attention, as upon them more than upon any other feature of the organization will depend the professional standing of the society and its healthy growth in membership and influence. There is no honor within the gift of the society which requires the exercise of so much judgment, such fidelity to its interests, such conscientiousness, impartiality and impersonality, as membership on the Board of Examiners or Committee on Admissions, and it is deserving of the highest recognition.

The requirements for honorary membership demand no lengthy discussion, as the practise of all of the societies is essentially identical in this respect.

The requirements for full membership vary greatly in the four societies, as we shall see from abstracts from their constitutions.

[1] Not including 1,114 students or graduates.

[2] Not including 450 students or graduates.

[3] Originally organized as the Society of Telegraph Engineers and Electricians in 1871.

[4] Includes 136 foreign members.

[5] Not including 1,107 students or graduates.

AMERICAN SOCIETY OF CIVIL ENGINEERS.

Constitution—Article II.—Membership.

2. A Member shall be a Civil, Military, Naval, Mining, Mechanical, Electrical, or other professional Engineer, an Architect or a Marine Architect. He shall be at the time of admission to membership not less than thirty years of age, and shall have been in the active practise of his profession for ten years; he shall have had responsible charge of work for at least five years, and shall be qualified to design as well as to direct engineering works. Graduation from a school of engineering of recognized reputation shall be considered as equivalent to two years' active practise. The performance of the duties of a Professor of Engineering in a technical school of

high grade shall be taken as an equivalent to an equal number of years of actual practise.

AMERICAN INSTITUTE OF MINING ENGINEERS.

Constitution—Article II.—Members.

Sec. 3. The following classes of persons shall be eligible for membership in the Institute, namely: As Members, all professional mining engineers, geologists, metallurgists or chemists, and all persons practically engaged in mining, metallurgy or metallurgical engineering.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS.

Constitution—Membership.

C 9. A Member shall be thirty years of age or over. He must have been so connected with Engineering as to be competent, as a designer or as a constructor, to take responsible charge of work in his branch of Engineering, or he must have served as a teacher of Engineering for more than five years.

AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS.

Constitution—Article II.—Membership.

2. A Member shall have been an Associate, and at the time of his transfer to membership he shall be not less than twenty-seven years of age, and shall be:

a. A Professional Electrical Engineer; or

b. A Professor of Electrical Engineering; or

c. A person who has done important original work, of recognized value to electrical science.

3. To be eligible to membership, as a professional Electrical Engineer, the applicant shall have been in the active practise of his profession for at least five years; he shall have had responsible charge of work for at least two years, and shall be qualified to design as well as direct electrical engineering works. Graduation from a School of Engineering of recognized standing shall be considered the equivalent of one year's active practise.

4. To be eligible to membership as Professor of Electrical Engineering, the applicant shall have been in responsible charge of a course of Electrical Engineering at a college or technical school of recognized standing for a period of at least two years.

It will be seen that two of the societies fix an age limit of thirty years, one twenty-seven years and one fixes no limit; one requires professional practise of ten years, one five years, two no time specified; three require professional competency in designing as well as constructing or directing engineering works, one requires the applicant to be professionally or practically engaged in the branch.

In the case of the Mechanical Engineers and the Civil Engineers the election is by ballot of the membership at large after approval by the executive board or council; in the case of the Mining Engineers and Electrical Engineers, election is by direct vote of the board of directors, in the latter after submitting the names to the membership at large, in the former without submission. In the Mining Engineers, Mechanical Engineers and Electrical Engineers the application is first passed upon by a board of examiners and then by the executive board or council; in the case of the Civil Engineers by the board of directors directly without action by an examining board. The Electrical Engineers' constitution requires that all members be first elected as associates and then transferred by the board.

It will be seen from the above how different the requirements are for full membership in the several societies, and how varied the procedure for election. It would appear at first thought that the more explicit the constitution in its exact definition of the conditions for membership the easier it would be for the membership committee to act; but this is by no means always the case, as it often prevents the taking of a broad view of the candidate's eligibility and is apt to exclude desirable material on very technical grounds, although on the other hand it is a protection against loose interpretation of the requirements by careless examiners. There would seem to be a better division of responsibility and more direct control of the class of men admitted to membership by giving wide publicity to their candidacy and election

by ballot by the membership at large, after the candidates have passed the scrutiny of the board or an examining committee. A young society covering a branch of engineering that has but recently become specialized can not in the beginning impose rigorous requirements as to age limits or time of professional service and the branch of engineering may be such as to make it difficult to impose severe technical requirements.

In the case of the Civil Engineers the accepted definition is sufficiently broad to cover applicants who are professionally engaged in any of the other branches of engineering; the Mechanical Engineers' definition is somewhat less comprehensive, the Mining Engineers' still less so, and the Electrical Engineers' really restrictive to professional electrical engineers. Under our institute's constitution, however eminent a man may be as a civil, mechanical or mining engineer, he may not fulfil the qualifications of an electrical engineer. It will thus be seen that anything like standardization in the matter of requirements is wholly out of the question, although a greater uniformity in requirements and procedure for election would be advisable. It is very difficult for an applicant in every respect qualified for full membership in our institute to understand why it should be necessary for him to pass through the preliminary, or, as it were, probationary grade of associate, and then be transferred to full membership, but the constitution is clear. Applicants whose superior qualifications would entitle them to immediate election to full membership after their election to the preliminary grade of associate, which takes some time—several months at least—are apt to fail to make application for transfer, with the result that many remain in the associate grade who should certainly be transferred, and when they find the cause of the delay are apt to criticize the administration.

We now come to the consideration of the other grades of membership, associate membership, associates, juniors, etc. It would lead us too far afield to treat each grade in full and we shall confine ourselves to some general observations. It is necessary to provide one or more grades for young men just entering professional life and through which they can rise as they acquire experience to the dignity of full membership; but it is necessary to provide also for another class of men who, while they are not professional engineers, yet cooperate with them and conduct engineering works, acting as the executive heads or business managers. To such men eminent in their particular branch of activity it is humiliating to be placed permanently in an inferior grade of membership with the beginners in professional service, and the situation can be satisfactorily met by the establishment of the grade of associate; junior and associate membership then to represent successive steps in the advancement to full membership, the associates forming a class by themselves.

We now come to the question of the dues and at the same time we may, with advantage, consider the general question of the income and expenditures or the cost of conducting the business of the societies.

The expense of membership in the several societies is as follows:

	Entrance Fees.			Annual Dues.			Foreign.	
	Juniors.	Associates.	Members.	Juniors.	Associates.	Members.	Associates.	Members.
Amer. Society Civil Engineers	$10	$20–25	$30	$10–15	$10–15	$15–25		
Amer Institute Mining Engineers	—	10	10	—	10	10		
Amer. Society Mechanical Engineers	15	25	25	10	15	15		
Amer. Institute Electrical Engineers	—	5	15	—	10	15	5	10

In view of the new relations entered into between the three national engineering societies, which are to occupy jointly the Union Engineering Building, and as the societies have now roughly about the same membership, it would appear to be desirable to have membership dues as nearly on a uniform basis as practicable.

It would appear that the entrance fees of our institute might be revised without disadvantage, increasing the entrance fees for associate to at least $10 and a payment of an additional $15 on transfer, a total of $25 for full membership. An increase in annual dues also is not at all improbable in the near future, and they might with advantage be increased to $15 for resident associates (within fifty miles of New York) and to $25 for resident members; this increase for resident membership would seem to be warranted by the greater advantages enjoyed by the membership residing in or near New York, more especially after the occupancy of the Union Engineering Building.

RECEIPTS AND DISBURSEMENTS PER YEAR PER MEMBER.

Receipts.	Civil.	Mining.	Mechanical.	Electrical.
Entrance Fees	$2.59	$0.28	$2.45	$0.83
Dues	16.99	10.64	14.04	9.30
Transactions, Sales and Adv	1.86	2.09	1.64	1.70
Badges and Certificates	.65	—	—	.28
Interest	.36	.34	—	.21
	$22.45	$13.35	$18.13	$12.32
Disbursements:				
Transactions	$4.63	$5.28	$7.50	$3.77
Salaries, etc.	6.13	4.22	3.99	2.20
Meeting Expenses	.29	.30	.94	.82
Library, including Rent and Salaries	.30	.80	.39	.81
Rent	2.84	.74	2.79	.75
Stationery and Miscellaneous Printing	.62	.34	1.19	.70
Postage	1.10	1.02	.26	.66
General Expenses	.34	.47	.11	.54
Badges and Certificates	.50	—	.33	.25
Express	—	.83	—	.22
Totals	$16.75	$14.00	$17.50	$10.72
Credit Balance per Member	$5.70	$0.65 (Deficit.)	$0.63	$1.60

Let us now consider the annual receipts and disbursements per paying member per year in the four societies. These figures are presented purely as a matter of general interest and not at all of invidious comparison; the table of receipts and disbursements per member is subdivided under appropriate heads as accurately as they can be compiled.

It should be borne in mind that no deductions of value can be drawn from a mere comparison of these figures alone; take the cost of the transactions, for instance, in order to make a comparison of the relative economy with which this item is handled in the several cases, it would be necessary to know in each instance the number of pages, number of cuts, number of advance copies distributed at meetings or in monthly advance publications in addition to the regular annual volumes. The figures, therefore, represent the amounts which are being spent on the several items, rather than a comparison of their economic handling; it would be fallacious to assume that the figures necessarily represent the comparative economy with which the societies conduct the items in the table.

AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS.
RECEIPTS AND DISBURSEMENTS PER YEAR PER MEMBER.

During each fiscal year for the past five years.

Year.	1901.	1902.	1903.	1904.	1905.
Membership	1260	1549	2230	3027	3460
Receipts:					
Entrance Fees	$0.61	$1.16	$1.59	$1.65	$0.83
Dues	8.61	10.06	9.01	9.33	9.30
Transactions, Sales and Adv	1.03	1.54	1.79	2.11	1.70
Badges	.18	.26	.35	.39	.28
Interest	.12	.24	.21	.18	.21
	$10.55	$13.26	$12.95	$13.66	$12.32
Disbursements:					
Transactions	$2 83	$3.50	$4.67	$3.43	$3.77
Salaries	2.49	2.78	2.49	2.50	2.20
Meeting Expenses	1.05	1.13	.87	1.16	.82
Rent	.94	.94	.65	.79	.75
Library, including Rent and Salaries	.55	1.85	1.38	1.39	.81
Postage	.46	.51	.69	.66	.66
Stationery, Miscellaneous Printing	.39	.53	.96	1.01	.70
General Expenses	.33	.59	.52	.45	.54
Badges	.16	.19	.27	.35	.25
Express	.15	.15	.15	.28	.22
Total	$9.35	$12.17	$12.95	$12.02	$10.72
Credit Balance per Member	$1.20	$1.09	$0.00	$1.64	$1.60

It may also be interesting to compare the receipts and disbursements per institute member during the past five years, in which the membership has increased from 1,260 to 3,460.

Our next concern is with the officers of the societies and the method of nomination and election. A truly national society should draw its membership from all parts of the country and should afford representation in its officers and on its administrative committees to the membership at large; in other words, should select its officers as far as possible with a view also to geographical distribution. It is admitted that this is difficult, owing to the opportunities afforded to practising engineers by large enterprises whose administration, technical as well as financial, is located in the important commercial centers, hence the important groups of members in the large cities. From these are drawn the majority of the officers, such selection being emphasized by the necessities of the central administration of the society. Such tendencies, however, are apt to operate to the disadvantage of available candidates for the important posts of honor within the gift of the societies who may happen to be stationed some distance away from headquarters, and to keep the institution on the plane of national standing it should also have a care to broad geographical distribution. This end can best be accomplished by providing for a nominating committee selected according to a geographical distribution into approximately equal groups of members, each geographical district consisting of, say, 300 or 400 members, and upon these, in consultation with a number of past officers, would rest the selection of the official nominees, with provision also for the filing of such nominations as may be made directly by the general membership. This procedure was introduced by the American Society of Civil Engineers several years ago. Such a plan would provide geographical representation and at the same time discourage unseemly electioneering and circularizing for the coveted posts of honor. It is thought by some that our own institute could with advantage modify its own procedure in this direction.

We would add further that the election once accomplished, the officers-elect could again, with advantage to the interests of the institute, take office at once at the close of the annual meeting, or at latest as the last act of the annual convention. The supercession of the retiring president and officers and the installation of the new should be an official function before a general institute meeting, a deficiency of our present method of procedure, which now allows four months to elapse after the election of the new officers before they actually take office, and within three months or at most four months after taking office the active canvass for their successors already begins. It will be admitted by all with experience in the administration of professional societies that it is most desirable to eliminate all tendencies to political agitation in connection with the election to the honors within the gift of the membership, concentrating all efforts on the advancement of the professional standing of the society and the interests of its members. It would also seem to be of advantage to have the fiscal year coincident with the calendar year; this would bring the annual meeting less close to the annual convention and, spreading it over several days, would secure a larger attendance of the out-of-town membership for the annual business meeting and the annual banquet or other functions could be held at this time. The annual meeting as held at present is not markedly distinguished from the other monthly meetings, and there is usually only

a month between it and the annual convention. With the growing importance of the financial interests confided to the care of the successive administrations the yearly business meeting should have larger attention and participation from the membership at large than is the case at present.

The administration of the societies should be in the hands of their board of directors or councils, and similarly the important standing committees in whose hands rests the conduct of the routine in the several branches of administration should be committees of the board or council. Such being the case, it is desirable that their appointment should in the beginning rest with the board itself, one member of each standing committee retiring each year and the new president filling the vacancies, a much more satisfactory arrangement than the plan followed by our institute at present, under which the responsibility of the appointment of all the committees, standing as well as special or temporary, rests alone with the president. The suggested plan of appointment of the administration committees primarily by the board or council, the president filling the vacancies that occur each year, is not the one usually followed by our national societies, but even where all the appointments devolve on the president alone, membership on the standing committees is, as a rule, limited to members of the board. The advantage of selecting the standing committees from the members on the board is evident, as the committees are then not apt to follow a policy at variance with the wishes of the executive body, disturbing harmonious relations and continually raising questions of jurisdiction.

It is also desirable to avoid constant changes in the personnel of such important committees as the finance, library and membership committees; provision should be made for standing committees of three or five, with one member retiring each year, the new members to be appointed by the incoming president. Such a plan secures continuity of policy, gives the committees the benefit of accumulated experience and relieves the president of the responsibility of making such a large number of new appointments on entering his term of office. Such standing committees as finance, membership, library, publication and meetings, or the last two consolidated into one, are necessary for all societies, together with such other committees as the particular field covered by the work of the society may require. Outside of the standing committees required by the regular routine, it is desirable to avoid as far as practicable the appointment of special or temporary committees, and these, when the special work assigned to them has been performed, should be discharged. There is nothing more subversive of effective and energetic administration than board meetings at which an interminable series of committees make 'no report' or the chronic 'report of progress.'

In case it is considered advisable to appoint a separate 'committee on meetings' or 'papers and meetings' and a 'committee on publications' or 'editing committee'—a division of work which becomes necessary when monthly meetings are held with reading of papers and discussions, as well as one or more annual meetings—it becomes necessary to define their respective responsibilities very clearly, placing upon the committee on meetings or papers the responsibility of the acceptance of the paper or communication for presentation at the meeting, and upon the publication or editing committee alone the responsibility for the publication of the paper or discussion, as a whole or in part, in the official transactions of the society.

It might be observed here that great care

should be exercised in the conduct of a society occupied with a specific branch of engineering, that as far as practicable all of its divisions receive due consideration. In an institute of electrical engineering, telegraph and telephone, electric traction and electric lighting, central station and isolated plant, transmission and distribution, design and construction, theory and practise, in fact all branches of electrical engineering, should receive consideration, and in the solicitation of papers for the series of meetings held during the year a wide range of subjects should be covered so as to interest and attract the largest circle of members.

We have already referred to the importance of conducting a national society on broad lines so that the members at large should have a share in the benefits as well as the obligations of membership, whether they be located near the headquarters of the society or at a distance. It is manifest that when the monthly meetings, as well as the more important annual functions, are held at the headquarters of the society, the members at a distance feel that they are at a disadvantage, and there is a tendency to form local clubs or organizations and secede from the parent society or at least lose interest in it. Our institute has met this situation courageously, and through the initiative of Past-president Scott a series of local organizations was established and they have been added to under succeeding administrations; these organizations have done much to keep up the interest at distant points and they have undoubtedly induced desirable accessions to our membership and have been an important stimulant of professional activity.

Our sister societies are facing the same problem and are watching the result of our undertaking—it can no longer be called an experiment—with great interest. But this scheme of local organizations, while undoubtedly successful, is developing new problems and new conditions and requires the constant care and supervision of the central administration.

As the close of another administrative year draws near I have felt it incumbent upon myself, and the fulfilment of a duty, to direct your attention to some of the questions which are before us and to give expression to a few thoughts that have occurred to me as a result of some years' experience in connection with the administrative work of our own society and a study of the methods followed by our sister engineering societies.

The comparisons which have been presented and the suggestions offered are not made in a spirit of criticism, nor am I unmindful of the splendid work accomplished by the framers of our present constitution, to whom the highest credit is due for an altogether excellent compilation, but our institute is growing rapidly and with its expansion new problems are arising, its field of activity is constantly broadening, and it should be expected, therefore, that modifications in its organic law may from time to time become necessary.

It is in meeting and solving such new problems of society administration as I have referred to, that the youth and enthusiasm of our members are of the utmost advantage; we are less handicapped by precedent and tradition than some of our older sister societies, and we may, therefore, expect for the Institute of Electrical Engineers a glorious future full of activity, initiative and prosperity, and successful in the attainment of the highest professional standing, dignity and usefulness.

JOHN W. LIEB, JR.