

required the manufacture on the spot of 50,000 tons of steel girders and other work. As a rule, the compression members consist of tubes, and the tension members of lattice girders; this arrangement from an architectural point of view proved most effective. The central connecting girder was erected in two halves temporarily connected with the projecting ends of the cantilevers. The bottom members of the two halves at the centre of the 4,700 feet span had large holes bored in them for the insertion of pins to connect the two projecting halves of the bridge, each of course 320 feet long. These holes had to be watched so as to seize the right moment when the varying temperature and consequent expansion of the steel brought them opposite each other, so that the pin could be dropped in. The next thing was to release the temporary ties holding the top members of the central girder to the cantilever. These were steel bars, three feet wide and two inches thick; to cut through such section of steel would have taken a long time. At the ends of the bars, each of course 320 feet long, where the ties could be made white hot in a short time, and so the strain on the ties was relieved as effectually as by cutting them. Mr. Baker admits that the cost of the bridge exceeded the estimates. He claims that this was not an exceptional thing, and says that if such a bridge had to be built again, time and money might both be saved. It is expected that trains will begin to run over the bridge in March next.

Before concluding a reference to this great bridge, I may add that last year a charter was granted for a 2,800 feet span bridge at New York. This year, Messrs. Schneider & Company, of Cressent, in conference with Sir John Fowler and Mr. Baker as consulting engineers, have designed the steel work of a bridge over the English channel, and Messrs. Hersent & Co., of Suez and Panama canal fame, have designed the piers. The total length of the projected bridge is 24 miles, the number of piers is 17, and the greatest span is 1,200 feet. The bridge will be 120 feet high, the opening of the water 180 feet, and the height from the foundations to the top of the steel work 300 feet. It is calculated that a trifle less than a million tons of steel would be required for this stupendous structure. The estimated cost of the bridge is £34,000,000 sterling. The Forth bridge is not only a lasting monument to the designers and constructors, but verifies most forcibly illustrates the fitness of the motto adopted for the profession of architects, "We hereby give the great services of power in nature are converted, adopted and applied for the use and convenience of man."

ELECTRICAL ENGINEERING.

Electricity as a science and electrical engineering are making very rapid progress to control that wonderful power in nature for the use and convenience of man, which was so graphically described by Mr. Thomas Keefe in his address to the members of the Society at the last meeting. It is chiefly known by its effects; its range is universal, in the heavens above and the earth beneath, and apparently in all things living, in all animal and vegetable life. As chairman of the commissioners of the Victoria Niagara Park, I am in negotiation for the use of Niagara Falls to generate electricity in sufficient quantity and power to be transmitted to Buffalo, Lockport, Rochester, Hamilton and Toronto, there to be used as contemplated distances working stationary engines at the rate of one kilowatt cost per horse power. The project is to drive a tunnel under the falls at a point about 165 feet below the upper level of the river, and at its termination excavate a large chamber for placing water wheels and dynamos, the supply of water to be from pipes leading into the tunnel, with a fall of about 160 feet. That an almost unlimited electric power can be generated by the use of Niagara Falls is not doubted. The transmission of that power to contemplated distances by electric force is maintaining by some electrical experts as quite practicable; there are others, again, who place a much shorter limit to the power of transmission. However that may result, there can be no doubt that the science of electricity and its uses are still in a very early stage of development.

RAILWAY DEVELOPMENT.

Canada has now in operation within her borders no less than 13,410 miles of railways representing a capital of \$727,180,448. In this vital necessity of rapid locomotion the Dominion, with its five millions of people, is as full and favorably equipped as the most favored of the sister nations. But vast as has been the development of Canada's capacities for meeting the needs of agricultural, mineral and industrial enterprises, and for providing the conveniences of ever enlarging commerce, and of domestic life, the future will see even greater strides made in the material progress of our country. The works that have signalized the past only foreshadow those enlarged opportunities for usefulness and distinction which the future will open up to the civil engineer.

Permit me, in conclusion, to say a few words about our society. The report of the council shows a considerable increase in our numbers. This no doubt is highly satisfactory from my own point of view, not only because of this increase, but as a proof that the society is doing work that is appreciated by engineers, and that the work is good, for were it otherwise they would not have joined us. During the year of my office as your president, I have to regret that owing to my residing at so great a distance from the headquarters of the society, and for other reasons beyond my control, I have done but little towards promoting the interests of the society. This failure to do more has been from inability and not from earnest good will towards or interest in the society. Allow me, however, to say that any effort of your president alone will not suffice to ensure success. He is powerless unless aided by members. I do not mean if I say that it is the duty of each one of us to help each other, but I mean that it is the duty of every subject of interest connected with our profession which he has experience in the course of his practice. He ought to attend the meetings for reading and discussion of papers as frequently as possible. You will forgive me for these words of personal advice to every member. Although they come from one who was your nominal head but for the short term of twelve months, he is not unworthy of your confidence and let me assure you that they are inspired solely by a desire that the transactions and papers selected by the council for discussion should be worthy of the society. They are the proper medium by which the society's usefulness is to be maintained. By the printing and distribution of those papers our work becomes known, and by their merits new members are attracted. Accept of the assurance that I will do all in my power to further the interests of the society, and I shall watch its progress with anxious desire to see it prosper. I cannot sit down without making an allusion to the death of my predecessor in the presidency of the society, Mr. Samuel Keefe, who was my warm personal friend, and the earliest professional colleague I had in Canada. During the period of my service in the Department of Public Works from 1841 to 1846, Mr. Keefe was my superior officer. I have learned from his advice sound and most valuable. He was devotedly fond of his profession, to which he did honor. He left important engineering works with which his name will always remain associated. His irreproachable life reached almost four score years, the limit allotted to man, leaving a good example to be followed by all members of our profession."

THE ANNUAL REPORT.

shows that during the past year the membership of the Society has been increased by seventy. The honorary members elected were His Excellency the Governor-General, Sir John William Dawson, Sir Charles Augustus Hartley, Sir Frederick Joseph Bramwell, Bart., Sir William Thomson, Sir John Fowler and Sir John Hawkshaw.

Council again feels it an imperative duty to direct the attention of members to the qualifications required for admission into the several classes. As regards the student class, it is considered that a candidate should be capable of undergoing an examination equivalent to that required for the matriculation into the arts or science department of a university. The qualifications for admission into the classes of members and associate members should be rigidly exacted. Corporate members should make it a rule to verify the accuracy of the statement of the candidate's professional career, and should satisfy themselves that he would prove a fit and proper member of the society. This is especially necessary, as, in many cases, the applicant is personally unknown to the members of the council.

During the year 1889, sixteen ordinary meetings were held, and four students' meetings, at all of which appropriate papers were read.

During the past year, the meetings of the society have been held in rooms at McGill College. The council, however, has long considered that the growing requirements of the society, and the need of a library, rendered it desirable that the society should possess rooms of its own. This has now been made possible through the liberality of the president, Colonel Gzowski, and the council has, therefore, secured the lease of the first floor of the new bank of Montreal building, at the corner of St. Catherine and Mansfield streets, for a term of five years. It is expected that the rooms will be ready by the 1st of May.

The building committee reports the receipt of subscriptions to the amount of \$5,323. It is very satisfactory to find that so high an average as \$4.20 per subscribing member has been reached. Had all the members contributed in like proportion, the building fund would now amount to \$25,000. The president, Colonel Gzowski, has generously given \$300 a year, for five years, towards the rental of rooms for the society. (Hear, hear.) But the building committee feels that no time should be lost and no efforts spared in raising the sum required for the purchase of a site and the erection of a building, so as to give a more permanent basis to the society. Messrs. James Ross and R. G. Reed have also given \$500 each towards the building fund.

The income for the year, ended on 31st December, 1889, amounted to \$3,640.91, and the general expenditure reached \$3,075.95, leaving a balance of \$564.97, which, together with the balance of \$1,948.92 brought forward from the year 1888, gives a total balance of \$2,503.89 to be carried forward.

The report was adopted.

A resolution of condolence with the widow of the late Mr. Samuel Keefe was adopted on motion of the President.

OFFICERS ELECTED.

The following are the officers and council for the ensuing term: President, Colonel Gzowski; Vice-presidents, Messrs. Kennedy, Perley and Hannaford; Treasurer, Mr. Herbert Wallis; Secretary, Professor Bovey; Librarian, Mr. Chadwick; Council, Messrs. St. George, Rittan, Barnett, F. R. F. Brown, Masse, Wrigley, Sir Jos. Trutch, Blackwell, Peterson, Munroe, Anderson, Dodwell, G. A. Keefe, Jennings and Ketchum.

A vote of thanks to the President for his valuable efforts on behalf of the society was moved by His Excellency, the Governor-General, and adopted. The business of the meeting closed with the passing of votes of thanks to His Excellency, Mr. Wallis, the Treasurer, Mr. Chadwick, Librarian, and Professor Bovey, the Secretary.

THE ANNUAL DINNER.

The first annual dinner of the society was held at the Windsor hotel. The menu was a choice one, and the table decorations of a charming character, while the presence of the ladies gave brilliancy to the scene. Col. Gzowski presided; the vice-chairs being occupied by Mr. E. P. Hannaford, and Mr. P. A. Patterson. The former and Prof. Bovey replied to the toast of "The Engineering Profession."

"CANADIAN ARCHITECT AND BUILDER" SERIES OF PRIZE COMPETITIONS.

THE following is a list of competitions in Architectural subjects which we have decided to hold during the winter.

1st.—Details of the interior of a small house to include those for staircase, doors, architrave, base and windows. Designs to be sent in on or before 1st March, 1890. First prize, \$10; second, one year's subscription to C. A. & B.

2nd.—Design with details for four mantels, two of wood, one of brick and one of stone. Designs to be sent in on or before 1st April, 1890. First prize, \$5; second, one year's subscription to C. A. & B.

3rd.—Three designs with details, for front fence. Designs to be sent in on or before 1st May, 1890. First prize, \$5; second, one year's subscription to C. A. & B.

4th.—Essay on Heating and Ventilation. Essays to be sent in on or before 1st May, 1890. First prize \$10; second one year's subscription to C. A. & B.

The Architectural Guild of Toronto have very kindly appointed a committee from their number to judge the above competitions. We shall publish each report as sent to us by the committee. Draughtsmanship, neatness and clearness of arrangement of drawings will be taken into consideration in awarding positions.

Drawings must be made on sheets of heavy white paper or bristol board