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CANADIAN

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AND

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CANADIAN ELECTRICAL ASSOCIATION.

PROCEEDINGS OF THE FIRST ANNUAL CONVENTION.

THE first Convention of the Canadian Electrical Association met in the Board of Trade rooms in the city of Hamilton, on Tuesday, June 14th, 1892, at 2.30 o'clock The Executive Committee held a meeting at 11 o'clock, arranged for the appointment of a Committee to nominate officers for the ensuing year, and elected the following new members.

Active—T. W. Whiting, Local Manager Bell Telephone Co., Guelph; J. V. Hedenburg, Edison Gen. Elec. Co., Hamilton; A. R. Baker, Local Manager, Bell Telephone Co., St. Thomas; Hugh C. Baker, B. T. Co., Hamilton; R. B. McMicking, Mgr. Esquimault and Victoria Telephone Co., Victoria, B. C.; J. M. Campbell, Bell Telephone Co., Kingston; H. P. Dwight, Pres. G. N. W. Telegraph Co., Toronto; H. S. Thornberry, Toronto Electrical Works; Henry A. Everett, Toronto Street Railway Co., Toronto; F. C. Armstrong, Toronto Construction and Electrical Supply Co., Toronto; J. Norman Smith, Ball E. L. Co., Toronto; W. A. Tower, Bell Telephone Co., Toronto; P. A. Dickinson, E.L.Co., Brantford; Lewis Burran, Royal Electric Co., Montreal; T. R. Rosebrugh, Toronto, Hunt Bros., London; E. T. Freeman, Edison Lamp Works, Hamilton, S. Douglas, Manager Kay Electric Works, Hamilton, T. L. Kay, Electrician, Kay Electric Works, Hamilton; H. H. Henshaw, Royal Electric Co., Montreal, C. C. L. Wilson, Ingersoll, R. E. Kennedy, President Ham. Elec. L. & P. Co., Hamilton; Mr. Stillwell, Edison Lamp Works, Hamilton, J. V. Teetzel, Vice-Pres. Ham. Elec. L. & P. Co., Hamilton; T. Ahearn, Ottawa, D. Y. Soper, Ottawa, A. M. Wickens, Electrician, *Globe*, Toronto; H. G. Hunt, St. Catharines, James Stuart, Manitoba Elec. & Gas Lt. Co., Winnipeg, T. W. Ness, Montreal, Robert Bell, Dunnville Elec. Lt. Co., Dunnville; J. H. Eckert, Brantford.

Associate—J. S. Knapman, Peterboro'; W. C. Scott, Napanee, A. Knowles, Bell Telephone Co., Toronto; Edward B. Merrill, Toronto; C. A. Martin, Montreal; S. J. Stratton, Hamilton; W. G. E. Boyd, Hamilton Electric Light and Power Co., Hamilton; H. W. Kent, New Westminster & Burrard Inlet Telephone Co., Vancouver, B. C.

At 2.30 o'clock, the President of the Association, Mr. J. J. Wright, took the chair, and opened the convention with the following remarks:

Gentlemen,—Although this is the first Convention of the Canadian Electrical Association and our organization is not yet a year in existence, we number one hundred members. This membership includes representatives of every branch of electrical industry. The object of the Association is to conserve the interests of the industry, both from a commercial and scientific standpoint. Electricity is rapidly becoming one of the chief agents in human civilization, and consequently an Association of those engaged in the development and application of its varied uses must necessarily be one of importance and power, and will take its place in the vanguard in the march of modern progress.

The formation of the Canadian Electrical Association has been more than justified by recent events, and the wisdom of rubbing off little asperities of rivalry and banding together for mutual protection, will become more and more evident as time passes.

It cannot be said that the large amount of capital invested in electrical enterprises has received the return that the investors have had a right to expect. The protection of this capital, therefore, should be one of the chief aims of the organization. Our associate members are as much interested in this as the largest capitalist in our ranks, for the permanence and solidity of electrical investment must be the basis on which they will have to depend for their future prospects in life.

It is probable that we shall have some information brought before us, at a later period of the proceedings, bearing upon the financial aspects of electrical business, and it is to be hoped that some suggestions will also be forthcoming as to the best means of improving the condition of electrical investments.

No records are sufficiently ample and complete to give a definite and correct indication of the multitude of undertakings employing electricity in its varied forms, and it will be the duty of this Convention to appoint a special committee to complete statistical information for the use of its members in the branch of electric lighting, for instance, the number of lights in use in the various cities and towns of the Dominion, the prices obtained for them under the diverse conditions of their operation. Special endeavor should also be made to obtain information of the actual cost of operation and condition of lighting plants operated by municipalities themselves.

I would also like to foreshadow some action by this body in regard to a standard to be adopted and fixed, for describing and producing arc lights of various nominal candle power. The Dominion Government are thinking about a move in this direction, but it will rest with an assembly of electrical talent, such as have now met together, to determine on an arbitrary unit which should be recognized and referred to as the unit of the Canadian Electrical Association.

In view also of proposed legislation affecting electrical interests, it would be well for this Convention to consider the advisability of appointing a permanent committee, whose duty it would be, to keep in touch with matters of this kind, and report from time to time to the Executive, as may be necessary

I am anxious to see this Association, coming into existence under such promising conditions, become a power in the land Combining as it does, the varied branches of electrical work, being a society where light and power men, telegraph and telephone experts, manufacturers of electrical machinery, and engineers in every line of electrical development, can meet in friendly intercourse on one common plane, it should become something more than an ornamental name. It should attain to sufficient influence to be referred to as an arbitrator, whose decisions should be respected as final and weighty, and its annual gathering looked forward to as the important event of the year.

The first Convention of the Canadian Electrical Association is now open for the transaction of business. (Applause)

The following members were present:

W. A. Johnson, Manager Ball Electric Light Co., - - - Toronto.
J. A. Kammerer, Royal Electric Co., - - - - "
W. J. Morrison, Electric Light & Power Co., Cobourg, - - "
Albert E. Edkins, Boiler Inspection & Insurance Co, - - "
F. E. Handy, Ball Electric Light Co., - - - - - "
K. J. Dunstan, Bell Telephone Co., - - - - - "
Wm. Rutherford, Toronto Construction & Electrical Supply Co., "
F. C. Armstrong, Toronto Construction & Electrical Supply Co., "
W. J. Clarke, Bell Telephone Co., "
J. J. Wright, Toronto Electric Light Co, - - - - "
Jas. A. Bayles, Bell Telephone Co., - - - - - "
W. A. Tower, Bell Telephone Co., - - - - - "
Hugh Neilson, Bell Telephone Co., - - - - - "
John A. Doucett, Bell Telephone Co., - - - - "
W. J. Duckworth, G. N. W. Telegraph Co., "
H. Beaumont - - - - - - - - "
A. Knowles, Bell Telephone Co., - - - - - "
Hy. S. Thornberry, Toronto Electrical Works, - - - "
A. B. Smith, G. N. W. Telegraph Co., - - - - "
George C. Stannard, Toronto Construction & Elec. Supply Co., "
W. Bourne, Toronto Electric Light Co., - - - - "
Prof. Rosebrugh, School of Practical Science, "
J. Norman Smith, Supt. Ball Electric Light Co., - - "
Frederic Nicholls, manager Tor. Construction & Elec. Supply Co., "
C. H. Mortimer, ELECTRICAL NEWS, - - - - "
John Galt, C.E., - - - - - - - - "
D. A. Starr, Royal Electric Co., - - - - - Montreal.
Geo. W. Sadler, Robin & Sadler, "
L. Burran, Royal Electric Co. "
John Carroll, Eugene Phillips Electrical Works - - "
Geo. Black, G N W Telegraph Co "
R T. Dickinson Electric Light & Power Co. - - "
G J Stratton, Bell Telephone Co - - - - "
Thos. H. Wadland, Supt. Construction Bell Telephone Co., "
W. J. Jones, Bell Telephone Co., "
B. J. Throop, Bell Telephone Co., "
J. C. McLachlan, Bell Telephone Co "
Thos. J Kay Kay Electric Co "
D Thomson. Electric Light & Power Co, "
S. Douglas. Kay Electric Works, - "
R. W. Gardiner, Electric Light & Power "
Sam. L. Gardiner, Electric Light & Power "
R. E. Kennedy, President Electric L "

H O Fisk Peterboro Light & Power Co.	Peterboro.
I. H. Brooks, Brooks Mfg. Co.	"
F S Knapman, Bell Telephone Co.	"
J W Taylor, manager Brooks Mfg Co.	"
A. Stevenson, manager Electric Light & Power Co.	"
John Yule, Guelph Gas & Electric Light Co.	Guelph
T. W Whiting, Bell Telephone Co.	"
A I Smith, Bell Telephone Co.	Kingston
J. M Campbell Kingston Light, Heat & Power Co.	"
P A Dickinson Brantford Electric Light Co.	Brantford.
J W. Eckart, Bell Telephone Co.	"
John J A Hunt, Forest City Electric Light & Power Co.	London.
S J I Brown, Bell Telephone Co.	"
W G Fraser Bell Telephone Co.	Petrolea.
F G Pruett Bowmanville Electric Light Co.	Bowmanville.
A R Baker Bell Telephone Co.	St. Thomas.
Robert Bell Dunnville Electric Light Co.	Dunnville.
H H Powell Woodstock Electric Light & Power Co	Woodstock.
C J Leslie, Bell Telephone Co	St. Catharines.
W R McLaughlin, *Electrical World*,	New York.
E S Edmonson Electric Light Co.	Oshawa.

The President Mayor Blaicher of Hamilton will now address the Convention.

Mayor Blaicher: Mr. President and Gentlemen of the Canadian Electrical Association, - I am glad to appear here on behalf of the Corporation of the city of Hamilton, to extend to you as hearty a welcome as it is within our power to give. We feel highly complimented that such a body of scientific men should select this City as the place for their deliberations. In speaking with some of the aldermen to-day, I was informed that those present have already discovered the principle of controlling the power of electricity I have no doubt that is so, and considerable might be said on this and other points which I do not consider myself technical enough to undertake; but let me say that my principal business here is to extend to you as hearty a welcome as we know how, and to say that our Public Buildings are open to you during your stay with us; we shall be glad if you will make full use of the City Hall, Public Library, etc. Any assistance you may require in any way, just make known to Mr. C. R. Smith, Secretary of our Board of Trade, and we will try to do all in our power to satisfy your wants. You have our most hearty wishes that you may develop into one of the best associations that we have in the Dominion of Canada. (Applause).

After the Secretary had called the roll, the following resolution was passed

W. J. Morrison moved, Mr. Stannard seconded, that this association place on record their regret at the demise of Mr. W. C Palmer, of Toronto, who had been actively connected with the Canadian Electrical Association, and that a letter conveying the same be sent to the bereaved family.

President We will now hear from the Secretary Treasurer, Mr C. H Mortimer, his Annual Report.

SECRETARY-TREASURER'S ANNUAL REPORT.

In presenting this my first annual report, it seems to me that I should outline briefly the initiatory steps taken toward the organization of this Association. In the latter part of 1890 or the early part of 1891, Mr. S. J Parker, of Owen Sound, who is now a member of the Executive Committee of the Association, issued a circular to the electrical companies throughout Ontario, requesting to be furnished with certain statistical information relating to the electric lighting business. At the same time, in personal interviews, Mr. Parker suggested the advisability of forming an organization in the interests of those engaged in the electrical business in Canada. These facts having come to the knowledge of the Secretary of the present Association he began to advocate through the ELECTRICAL NEWS the immediate carrying out of Mr Parker's idea, and acting in conjunction with Messrs. Wright, Yule and others, circulars were issued inviting all persons interested to attend a meeting in Toronto during the last week of the Industrial Exhibition of 1891, to consider the advisability of forming an Association. Pursuant to this invitation, a meeting was held in the offices of the Industrial Exhibition Association on the 17th of September, 1891, at which there were present 21 persons, representing the various electrical interests. Mr. J. J. Wright was called upon to preside, C. H. Mortimer acting as Secretary. Several letters were read from persons unable to attend, expressive of their sympathy with the movement. A Committee was appointed to formulate a scheme of organization, and report to a meeting to be held on the 26th of November following.

On the 28th of September, this committee met, arranged a basis of organization and instructed the Secretary to issue circulars to persons throughout the Dominion who might be supposed to be interested in electricity explaining what was proposed to be done and inviting their co-operation On November 26th as per adjournment, a meeting of those interested was held in Toronto. The same number of persons were present as at the former meeting, though the *personnel* of the meeting was somewhat changed Mr J. J. Wright was again asked to preside. Communications were read from persons unable to attend the meeting, but desirous of seeing an Association formed It was decided after some discussion to organize under the name of the "Canadian Electrical Association," after which the officers elect were appointed, a form of Constitution and By-laws adopted, and the place and date of the first annual meeting fixed.

The first meeting of the Executive Committee was held in Toronto, on the [illegible]h of February at which meeting 22 members were elected. Names of [illegible]ns who should be asked to prepare papers for the annual meeting [illegible]ggested and subjects allotted to each Sub-committees were appointed to arrange for a place in which to hold the Annual meeting, to [illegible]mmodation for exhibitors, to interview the railway authorities [illegible]ial rates, to prepare a circular for distribution setting forth [illegible] Association and to formulate a programme for the Con-

[illegible] the Executive Committee held its second meeting, in [illegible]y was instructed to write to the manufacturers of [illegible]ada, asking to be advised if it was their intention to [illegible]ention. 17 new members were elected. The late [illegible] definitely fixed. The third meeting of the Executive [illegible] Hamilton on May 10th. In view of the fact that [illegible] of electrical apparatus had intimated their inability to make an exhibit this year, it was decided to take further steps toward holding an Exhibition. It was ordered that circulars be issued giving full particulars concerning the Convention, a programme for which was also outlined. The Hamilton members of the Association were appointed a Committee on Invitations. The Toronto members were instructed to prepare a programme, certificates of membership, badges, etc, 26 new members were elected.

The growth of the Association thus far has been very satisfactory. It is a somewhat surprising, yet gratifying fact, that although located in a much smaller field, it has up to the present made greater progress than the National Electric Light Association of the United States, at a similar period in its history. At the meeting of the National Association, in Montreal last year, the total membership was shown to be 220, or less than two-thirds greater than that of this Association, the existence of which covers only a period of 7 months. On May 31st, the close of the Association year, the membership roll included the names of 55 active members. The various provinces are represented as follows. -Ontario 50 Quebec 9, Nova Scotia 2, British Columbia 3, Manitoba and North-West Territories 7, New Brunswick 0, Prince Edward sland 0. There is also one member representing the United States. There have been elected since the date of this report 27 active members and 7 associate members bringing the present membership of the Association up to 109. The following statement will show the financial position of the Association on the above date:

Receipts.

48 Active member's fees, $5.00 each	$245 00
24 Associate members fees, $2.00 each	48 00
From Guelph Gas Company, advanced before organization	10 00
	$303 00

Expenditures.

Refund to Guelph Gas Company, amount advanced before organization	$ 10 00
Refund Associate membership fee of W. C. Palmer, deceased	2 00
Allowance to C. H. Mortimer for sundry items of expense paid by him prior to organization, for postage, stationery, printing, etc.	10 00
Hall rent for first meeting	2 00
Blank book, cash book, minutes and receipts	2 25
Exchange on cheque	15
Post-cards and postage stamps from date of organization to May 31st, 1892	24 25
Stationery and printing	32 11
Cash in Merchants' Bank	199 99
Cash in hands of Treasurer	20 25
	$303 00

There are yet 9 active membership fees remaining unpaid, which will bring the total receipts for the past year up to $348.00

Although it was understood that the members of the Executive Committee would be recouped for personal expenses in connection with attendance at meetings of the Executive, they have very generously declined to accept anything for this purpose from the funds of the Association, until such time as the organization may be considered to have reached a satisfactory financial position. I may be permitted to call attention to the fact that as the membership fees already paid in are intended to cover the present Association year, ending 31st May, 1893, the Association must depend for the financial requirements of the present year, solely upon the balance in hand, the unpaid membership fees and the fees of new members who may come into the Association during the year. Therefore there is need for personal effort to extend the membership, and for careful husbanding of resources.

Mr. Dunstan. That report reveals how greatly we are indebted to Mr. Mortimer, and in moving the adoption of it, I might say that we cannot help feeling very much encouraged with the satisfactory statement our Secretary and Treasurer has presented to us.

This motion was seconded by Mr. Carroll and the report unanimously adopted.

The President read the regrets of Mr. S. J. Parker, of Owen Sound, who was to have taken part in the Convention, but owing to important business engagements was not able to attend. He sent the statistics which he purposed laying before the meeting.

The President announced that he had been in communication with the officials of the Industrial Exhibition Association, of Toronto, who were anxious to have an electrical exhibition in connection with the Exposition. He had been distinctly authorized to state before the Convention that the Industrial Exhibition Association would be glad to meet the Association, and would be willing to do anything possible to provide all the facilities necessary for a first-class exhibit.

Letters were read from Hugh C. Baker, of the Bell Telephone Co., and H. P. Dwight, President of the G. N. W. Telegraph Co., enclosing with their applications for membership cheques for $25 as donations towards the expenses of the Association.

The President: We will now hear from the Committee on Nominations, and I might just say in explanation that this Committee was named by the Executive this morning to make nominations for the ensuing year. The nominations will not be limited to the names mentioned in the report.

A B Smith After looking at our Association interests from every standpoint, and thoroughly considering the most suitable men for our offices and the Executive Committee, we submit the following for your consideration. You will notice that while we would recommend that 9 members comprise the Executive Committee, we have submitted 11 names, so that it remains with you to choose 9 out of the number.

Messrs. K. J. Dunstan and J. Carroll were appointed scrutineers, and declared the following officers elected for the ensuing year:

President- J J. Wright, Toronto; First Vice-President- K J Dunstan, Toronto, Second Vice President John Carroll, Montreal, Secretary Treasurer C. H. Mortimer, Toronto, are elected, Executive Committee- Messrs. D. A. Starr, Montreal, H. O. Fisk, Peterboro', W. A. Johnson, Toronto; S. J.

Parker, Owen Sound, A. B. Smith, Toronto, Thos. H. Wadland, Hamilton; D. Thomson, Hamilton, L. B. McFarlane, Montreal; John Yule, Guelph.

Mr. Morrison, seconded by Mr. Edkins, moved that a Committee be appointed to revise the constitution and by-laws of the Association, and to report at the to-morrow afternoon session. Carried.

The following were named to constitute the Committee. Messrs. K. J. Dunstan, J. A. Kammerer and A. E. Edkins.

Mr. Yule: I would move that a Committee on Statistics be appointed, consisting of Messrs. D. Thomson, A. B. Smith and C. H. Mortimer. The motion was seconded by Mr. Wadland, and carried.

On motion of Mr. Edmondson, seconded by Mr. Johnson, the name of J. Yule, of Guelph, the mover of the resolution, was added to the Committee.

A Committee on Legislation was also appointed, composed of Senator Thibaudeau, of Montreal, and J. E. B. Powell, of Ottawa.

Mr. Smith moved, seconded by Mr. Thomson, that the ballots used in the election of the Executive Committee be destroyed. Carried.

The business of the day being over, the Chairman declared the meeting adjourned.

In the evening the delegates visited by invitation the power house of the Hamilton Electric Light and Power Company, and were shown through the new building by the manager, Mr. D. Thomson. All the visitors agreed that for solidity, convenience and the perfection of its machinery this is a model station. The visitors were regaled with cigars and light refreshments, and were made to feel that they had spent a thoroughly enjoyable and profitable time.

SECOND DAY.

The morning session was called to order at 10:30.

The President read letters from Mr. A. A. Wright, of Renfrew, and Mr. W. J. Johnson, of the *Electrical World*, regretting their inability to attend the Convention. The latter sent a substitute in the person of Mr. McLaughlin. A letter was also read from Mr. C. E. Harris, of the Bell Telephone Co., Halifax, Nova Scotia, who had purposed being present but had been prevented.

The Chairman: The first new business we should take up before we proceed with the carrying out of our program, should be to decide upon the time and place of holding our next Convention, and whether it will be advisable to meet annually or semi-annually.

Mr. Whiting. In view of the absence of some of the members of the Executive Committee, it would be advisable to leave the decision of those questions until a later hour. I move that this matter be postponed until 3 o'clock.

Mr. Thomson: I will second that motion. Carried.

The Chairman: As per program, there is an excursion to Hamilton Beach, band concert and luncheon prepared for this evening's entertainment, and Mr. Thomson wishes me to announce that the delegates will get their tickets from him before leaving. Extra tickets can be had at $1 each. The train will leave the King street depot at 8 o'clock. Regarding the railway certificates of the delegates: I will be glad if the delegates will hand in their certificates to the Secretary. You understand, of course, that in order to make arrangements with the railway officials, it was necessary to guarantee so many passengers, and unless the delegates report to the Secretary we will be unable to carry out this plan. It seems to me that a number of the members of the Association have come along to the Convention without making application for this delegate's certificate.

Mr. Johnson: I move that we request the members of the Association to register their names in the Secretary's register, so that he may have the names to show the railway company if necessary. Seconded by Mr. Taylor. Carried.

The Chairman. I have pleasure in introducing to the Convention Mr. Neilson, who will read a paper on "Long Distance Telephony," which I am sure will be listened to with great interest by all present. (Applause.)

LONG DISTANCE TELEPHONY.

The subject of long distance telephony is of such magnitude that the only difficulty in putting the matter before you, is not that I may say too little, but that I may tire you by writing too much. I intend treating the subject from a popular point of view rather than a scientific one. The large number of members who are not connected with the telephone business will, I have no doubt, appreciate this. I also think the subject, in Canada at least, must in the future always be considered from a commercial standpoint. There is no doubt as to the possibility of building lines that would work say from Quebec to Sarnia, but that wires of that length, or even much shorter, would pay, is open to argument. In Canada our merchants and others do not seem to have the money to spare, or perhaps do not transact a large enough business, to justify them in paying rates that in the United States are paid as a matter of course. I need only mention in connection with this, that while a Buffalo merchant pays $4 for a five minutes conversation to New York, or $5 for the same to Boston, it is extremely doubtful if a Montreal or Toronto merchant would pay $3, or even $2, for a similar conversation between these points.

When early in 1877 it was announced that a line was being worked by telephones between a residence in the suburbs of Boston and a factory in the same city, it is doubtful if any person imagined that in less than a dozen years, commercial and social conversations would be carried on daily between points up to seven hundred miles apart. Even the inventor, Professor Bell, is not likely to have considered such work probable. It is a fact however, that, taking New York as a centre, metallic circuit lines now run to Boston, Philadelphia, Baltimore, Washington, Buffalo, Pittsburg, Cleveland and intervening cities, and in Canada similar lines have been built in the province of Quebec, from the ancient city to Montreal and the capital, also from Montreal to Sherbrooke, St. Johns, &c., and in Ontario, from Peterborough via Port Hope, to Toronto, Hamilton, London, and places between. Other lines of the same description are now being constructed or are under consideration. On all of these lines conversation is easily carried on: so easily indeed, that even at the longest distances, voices are recognized, and communications calling for the use of figures and difficult words and sentences, are transmitted as perfectly as if the speakers were in the same room. In Canada these lines have been built by the Bell Telephone Company, and in the United States by the American Telephone and Telegraph Company of New York working in connection with the American Bell Telephone Company of Boston and the different local companies in the territory through which the wires pass.

The subject of my paper naturally divides itself into three heads: the lines, the equipment, and the rates.

LINES.

When wires were first erected for the purpose of communicating by telephone, between points at a distance, it was quite natural that as many of the officers connected with the business had formerly been telegraphers, the construction should be the same as they had been in the habit of using, and accordingly No. 9—and in some places No. 12—iron wire was used, strung on poles of the usual length—25 or 30 feet—and on ordinary glass insulators, or sometimes without insulators, the reason for the latter being that it was supposed that where two or more wires were strung, the leakage to the ground would prevent a certain amount of cross talk. It is needless to say this expectation was not realized, and that first-class insulation is now considered as essential as on telegraph lines. Many miles of such lines were erected in the States before 1885. In the Dominion, the Bell Telephone Company of Canada was early in the field, and in October 1881, a line of No. 12 iron wire was put up between Hamilton and Toronto. It was soon seen, however, that iron wires,—even of a good size,—were not satisfactory over distances of a hundred miles, and even with copper, induction was very apparent, and made conversation difficult when more than that distance was attempted. It was then seen that only by metallic circuits and the use of copper wire was it possible to do thoroughly first-class and satisfactory work over long distances.

In 1885 the American Telephone and Telegraph Company constructed a line between New York and Philadelphia, carrying twenty-six wires, or thirteen metallic circuits. As soon as an attempt was made to use these lines it became apparent that the difficulty of working, on account of induction between the metallic circuits, was as great as with single wires. A large number of experiments showed that only by a most complete system of transposition, so that every metallic circuit should maintain the same relative exposure to every other circuit, was it possible to overcome this difficulty. This involves much more work than would naturally be supposed, but it is absolutely necessary for efficient working. The success of this New York and Philadelphia line was such that the company commenced the construction of a line from New York to Boston, carrying eighty wires. This also works perfectly, as I can testify from personal use. Extensions to Albany, Saratoga, Syracuse, Rochester and Buffalo, followed, and at this date thousands of miles of poles, and many thousand miles of wire are in use, the property of the before mentioned company.

The poles used in building these lines are of the best material procurable. Cross-arms are of pine securely fastened by lag screws, and braced with iron braces so that each arm is as rigid as the pole itself. The poles are put into holes much deeper than usual, they are tamped more carefully, and in soft ground cement, sand, and broken stone, make an artificial foundation. The poles are of course closer together than is usual in telegraph construction, and on curves the distance is again shortened. It is simply impossible, looking at it from a reasonable point of view, to build pole lines in a more perfect manner than the lines of the long distance company.

WIRE.

The wire is No. 12 B. & S. G. (.104 inch diameter) of hard drawn copper, with a resistance of 5.2 ohms per mile. All joints are made with the McIntyre sleeves, which seem to give as good a connection as any soldered joints, without endangering the strength of the wire by heating. Where many wires are required, ten are strung at a time, the ends of the wires being drawn from the drums by a team of horses. A long bar to which all the wires are fastened, is drawn along by the horses, and at each pole a lineman is stationed to lift the wires to the proper place. I need not say that in Canada we do not string ten wires at a time, but if we should ever find it necessary to do so, we have the experience of our friends in the States to guide us.

While the mechanical work on these lines is so perfect, great care is also taken that when erected everything shall remain in the finest order at all times. The route for the line is selected

with a view to as little interruption as possible from such disturbing elements as trees. Contracts are entered into for trimming, or in some cases removing them altogether. Poles are not put near gateways or near other poles. Long poles are used where the ground is low, and short ones when placed on knolls. In fact it is almost impossible to mention anything of advantage in the construction of a line of poles that has not been adopted by the Long Distance Company.

In Canada we have tried to do as good work as in the States, always keeping in view the fact that we cannot hope to get as good rates, and therefore construction expenses must not exceed a reasonable amount. The new lines now in course of construction have forty foot poles. The wire is No. 13 hard drawn copper, McIntyre joints have always been used, and transposing is carried out thoroughly. In future no pole less than thirty five feet in length will be put up, except on unimportant routes not likely to ever carry more than a few wires. Care is taken that trees will not interfere, and in a general way every effort is made to secure a good working line, and one which will at all times be ready for work. In connection with this matter of perfect working lines I may point out that in long distance work, success can only be attained by uninterrupted service from day to day. In telegraphy a message is handed to a clerk: the message may be transmitted immediately, or it may be delayed for a long time. The sender, however, does not know this. In telephony, the person wishing to converse has knowledge of all delays. If the line is broken or interrupted in any way, he is aware of it, and if he has tried two or three times in a day to be connected to a person in another town, and does not succeed, he very naturally loses faith in the telephone service. Any person, giving a moment's thought to it can see, that the very essence of successful long distance work is its reliability.

EQUIPMENT.

In Canada the ordinary Blake transmitter is used on all lines. A good metallic circuit is so silent that a Blake is quite powerful enough for any line we have up to three hundred miles. In the States the Long Distance Company's offices are equipped with what are known as "long distance" transmitters, a modification of the "Hunnings," but many subscribers to the exchanges use the "Blake" for all long distance work. To subscribers who can afford it, long distance cabinet sets are supplied at a rental running as high as $60 per annum in addition to the ordinary exchange rental. Booths, handsomely ornamented, can be purchased at prices varying from one hundred to two hundred and fifty dollars. Every part is double, i. e. one box within another. When properly made and fitted such booths prove very satisfactory.

In the way of receivers, there is only one instrument to use. Practically no change has been made in the construction of the "Bell" receiver since it was first sent out fourteen years ago. It still remains the only instrument that will transform undulatory electric waves into sound waves audible to the human ear.

I can only glance at the remainder of the important points connected with equipment. The same care has to be taken inside the office—and in cables, devices for protection from electric light, lightning or other heavy currents, and in the central office switches—that is exercised outside. All instruments are bridged in, or to put it plainer, are in multiple arc, as each side of a metallic circuit must be alike in every respect—conductivity, insulation, and inductive capacity—or the line will not work perfectly.

Outside of North America the best line is that now working between London and Paris, the construction of which was complicated by the necessary cable across the channel, but all difficulties were overcome and the line works perfectly.

RATES.

In the United States the tariff is one cent per mile, with a minimum rate of fifty cents. Here it is just half that amount with a minimum of twenty-five cents. This applies to metallic circuits, but all circuits must soon be made metallic, so the foregoing may be considered as the settled rate. For short distances telephone users do not consider these rates too high, but when the distance is over two hundred miles they cannot understand why the amount should be increased. Our almost universal tariff of twenty-five cents for telegraphing a message of ten words has no doubt fostered this idea. The conditions, however, are entirely different, and telephone rates must be considered from the same standpoint as passenger or freight rates on a railway. A telegram going twelve miles, or twelve hundred miles in Canada, costs the sender the same amount, but in telephoning, as in railroading, the rate must increase with the distance. To convey a telegraph message to any point only one wire is necessary. Between large cities this single wire becomes two by being duplexed, or four by being quadruplexed. To convey a conversation by telephone we need *two* wires, so that under any condition the capacity of a telegraph line must always be double that of a telephone line, and may have four or eight times the carrying power if required. Nothing of this kind can be done with a telephone circuit. There is no practical way of increasing the capacity. In addition to this great difference in actual carrying power, the conditions in telephony are such that the disparity is still further increased. Even when subscribers are waiting to speak, it is doubtful if more than six or eight conversations per hour can be put on any line, whereas a telegraph wire will easily carry three or four times that number of messages, or keeping in view the fact that we need use two wires, it may be considered that the earning power of a telegraph wire exceeds a telephone line in the proportion of six or eight to one, and this is doubled or quadrupled if the telegraph wire is duplexed or quadruplexed. I need not point out also the great difference in the cost of construction. No. 13 hard drawn copper wire costs for metallic circuits say $80 per mile of poles, No. 9 iron wire, only $20. Long distance telephony has great possibilities before it. He would be a bold man who would consider that nothing more can be achieved. In my estimation the only difficulty is the commercial one. Next year we shall certainly see lines working from New York to Chicago, and how much further, no one can tell. Canada can claim to be the home of the telephone. In the way of use by the general public, it may be said, we lead. The villages, towns and cities of our country have more instruments in use in proportion to population, and at a lower rental, than any other country, and I have no fear that we shall ever fall behind in this respect.

The Chairman. As there are a large number of the telephonic fraternity present, I think we might have some remarks on the paper just read.

Mr. Fraser: As none of our friends feel inclined to discuss this subject, I take great pleasure in moving a vote of thanks to Mr. Neilson for the paper submitted to us this morning. He deserves a great deal of credit for the able manner in which he has handled his subject. Seconded by Mr. Throp. Carried.

The Chairman. I will now introduce to you, Mr. D. Thomson who will read a paper with "Central Stations" as its subject. (Applause).

CENTRAL STATIONS.

The time was, many years ago, when the name of central station for the supply of electric lights meant any old unused building or shed with just roof enough on it to keep most of the rain from coming through, and what did get through, which in some cases was considerable, had to be diverted from deluging the dynamos by means of oil cloth covers, &c., in many cases the dynamo attendant being compelled to dodge beams occasionally in his efforts to keep his machines in at least fair running order. The matter of dirt was only of secondary consideration most of the time. Very frequently an engine and boiler that had done duty in other capacities for a number of years was pressed into service as good enough to run a dynamo, the line shafting and pulleys frequently being some old rattle trap affairs that had worn out their usefulness long before being used to run electrical machines. No thought or attention was paid to the matter of a good lubricant for them, and as a consequence, hot bearings were the rule rather than an the exception. Of late years this seems to have all been changed, and the prevailing central station of to-day is in nine cases out of ten a model of perfection in all its different parts, the efforts put forth seeming to be to improve in some points on previous ones erected, experience, the great teacher, pointing out defects and weak spots that are remedied in the new ones under way. We now find steam engines being used that are built one might almost say expressly for the running of electrical machinery, and that are as near perfect as modern steam engineering can devise. The boilers are the best that it is possible to procure, the buildings now being models of modern architecture, the aim in designing and erecting them being to have them of the most substantial material and to be in most cases almost absolutely proof against fire, with conveniences and safeguards to protect and make comfortable those whose duty it is to live in them, as it were, for the greater half of each twenty four hours. Dirt is a factor that plays no part in its existence, things generally being kept tidy, neat and clean. Nor can we stop here, for the matter of economical operation plays such an important part in the running of the plant in these days of low prices for lighting, that every exertion is used to produce the power in as cheap a manner as is consistent with good service. In time past when fabulous prices were obtained, this was not the case, the profits being so great that a few extra pounds of coal consumed was not noticed, but now that competition has brought the prices of lighting to just barely living profits, it becomes imperative that the operations should be carried on in as economical a manner as possible if the shareholders are to receive any return for their money invested. The securing of such return is undoubtedly their right, and one that must be of foremost consideration in central station management, for without the capitalists, where would the electrical interests, both in manufacturing of apparatus and the supplying of current in its various forms, be to-day? To sum up, then, just what a central station should consist of the building should be one story high, built directly on the ground, with good and substantial walls of either brick or stone, set on well footed foundations, with peaked roof and fan lighted ventilators or windows running its entire length, the windows of which can be operated from the ground by means of levers. The material for the roof should be corrugated galvanized iron fastened to the beams and purlines, which are preferably made of angle iron, care being taken to see that the corrugated iron has some good fire proof non-conducting lagging laid under it to prevent the condensation of the moisture contained in the warm air inside the building from coming in contact with the cold roof. A proper tower should be provided at one end, or the center of the building, for the entrance of the necessary wires, markedly in contrast to the old plan of utilizing the wood work on top of any window or door that might be the handiest to honey-comb with holes for that purpose. Proper stone and cement foundations should be provided for engines

shafting and dynamos, which must not have any connection with either the walls or the foundations of the building; the floor to be preferably of concrete with a rock asphalt top of at least ¾ of an inch in thickness, except where there are pipes and pits that cannot be well covered with other material than wood, on account of the necessity of being able to get at them at any time; such wood floor should be at least 2 inches in thickness, of good red pine well seasoned, laid on good strong joists and beams, the beams being supported on brick or stone and cement piers suitably placed.

In the matter of engines, there can be no doubt that in stations of any considerable size (say from 100 H. P. up) the most suitable for the purpose are what are known as cross connected twin engines of slow speed, and where water is available for condensing purposes, they are preferably built with high pressure cylinder on one side, and low pressure condensing on the other, though where the boilers are such that very high pressure can be carried (150 lbs. or more), it is a question whether results just as beneficial cannot be obtained by using a third cylinder, and a consequent triple expansion of the steam admitted at the first cylinder at such high pressure. There cannot be any doubt whatever that such engines can be operated at considerable saving over the best of high speed engines that are manufactured, and these high speed can only be recommended for isolated or small plants where slow running single engines would be apt to cause a fluctuation in the lights when passing their centers, which in high speed is entirely eradicated owing to their velocity. In the matter of boilers, there can be but one opinion where tests have been made, and that is in favor of water tube boilers, such as the Babcock & Willcox, Crandell, Zell, or some other modification of them, for aside from the fact that they possess an element of safety that the ordinary return tubular boilers do not possess, they are quick and economical steamers and cost very little for maintenance. After the steam plant comes the belting, line shafting, and pulleys, which for satisfactory working should all be of the best. The shafting should be fitted with self oiling bearings, with oil reservoirs and ring feeders; said shafting and the necessary hangers or standards, should be constructed in such a way and of such material that they will be capable of standing a strain equal to at least 100 per cent. more than that which they will be ordinarily required to carry. The pulleys should be of the grip or clutch type, built so as to be able to carry at least double their ordinary load; such pulleys to be of such a design that if it should be necessary to stop one of the dynamos, both the pulley and the grip will stop together, and only the driving mechanism continue to revolve, thereby enabling the setting up of the grips or clutches on any one if required. This is the point that designers of central stations would do well to bear in mind. It has occurred in the writer's experience that where grip or clutch pulleys whose grips revolved with the shafting were used, it became necessary to stop an entire line of shafting together with the engine, to adjust one slipping clutch out of some four or five on the same line shaft, the pulley in that case being an elegant one in every particular but in this one point, that the clutch could not be stopped with the pulley.

Now to conclude, have your station fitted out with the best of dynamos and generators, and don't buy such apparatus simply because the price is low; in fact cheap machinery is generally the dearest in the end. Let your switch boards be models of completeness, and have them kept so continually. Bear in mind that they are your distribution points, and that if they fail you, your entire plant will be jeopardized. Have your lines and circuits equipped with good and efficient lightning arresters, so that danger from this source will be a nullity. Make this part of your plant such that it can easily be got at, and if an arc should be caused through any means, have the necessary appliances at hand to break it as quickly as possible; one of the best things for such purpose is a bucket full of dry sand. Last, but not least, let your station be a model of cleanliness and neatness; have a place for everything, and see that everything is kept in its place.

The Chairman: The meeting is now open to the members or remarks.

Mr. Edkins: Mr. President, I move that this Association extend to Mr. Thomson a hearty vote of thanks for his paper on "Central Stations." Seconded by Mr. Taylor. Carried.

Mr. Yule: It seems a pity that more discussion has not taken place on these papers. I would like to ask Mr. Thomson what he would recommend in the way of surplus power. Some stations are built just large enough for present use and inside of a few years have to be enlarged; others again go to the other extreme. What are your views, Mr. Thomson, as to the extent that surplus power and equipment can be safely carried out?

Mr. Thomson: That is a thing that is pretty hard to provide for. I know of a case in Montreal where the central station was built just large enough for present use. The building was finely fitted up and everything in good order. In six months they had to enlarge. An addition was made—just large enough to meet the requirements, and in a few months more the building had again to be added to. I do not think it is possible to anticipate what the needs will be in that direction. It seems folly to build for future use unless you are sure of it being occupied. Our present building is too small for our business, and our new building, too large, but we calculate to fill the new one up in a short time. In a city like Hamilton or Toronto or Montreal, where all the city lighting is done by electricity, it is hard to tell what the requirements will be in two or three years, and the only thing is to build a station to meet the requirements. I do not think it is possible to anticipate how much surplus power will be required central stations, especially where there is a large and steady increase in the business.

The Chairman. I would like to suspend this discussion in order to introduce to the Convention, Mr. Larke, the Dominion Commissioner to the World's Fair, who has a few important matters to present to the meeting, and whose time is limited

Mr. Larke. Mr. President, if you will permit me, I would like to correct a statement made by you just now when you called me the Dominion Commissioner to the World's Fair. The Commissioner for the Dominion, is Prof. Saunders, of Ottawa I simply have charge of the Machinery Department at Chicago As you are all well aware, it has been very properly thought by officials of the Exposition, that Canada should make a large exhibit at the International Exposition, and as Canadians we will admit that the larger half of the Continent ought to have some share in the Exposition. If Canada is to give us an exhibit at all it should be represented by the very best resources and industries, and it seems quite plain that this Association as one of the most active of its industries, should be represented there too. The exposition authorities have arrived at a proper conception of the development of the electrical industry, and have appropriated to its use a special department and special building. They are sure that there is no industry or organization in Canada which has so quickly attained the position which your industry has. The Dominion Government have seen this too, and have decided to bear the cost of transit there and return the exhibits free of charge. No duty will be levied It seems to me that we are generally omitted on this side of the line, and the purpose of the exposition is to advertise Canada. We want to get rid of this delusion that our friends on the other side of the line have, that this is simply a country of forest and and frost. I think it is not too much to ask that your Association will do its proper share of the exhibiting on that occasion It is not for me to advise you how to proceed, but I can say that anything I can do to assist you in the matter, so far as the Government is concerned, I will be delighted to do The country is not represented as it should be, unless you are there present with at least some samples of the manner in which you are doing work, in the way of electrical inventions in machinery and other things.

Mr. Sadler. I would like to ask Mr. Larke what has been done in the way of motive power. Is there going to be any provision made for us having our machinery run by electrical power? I think it would hardly be right for us to take our Canadian machinery to Chicago and have it run by American engines. It should be so arranged that two or three Canadian engines could be taken to do the Canadian work.

Mr. Larke: That has not been considered yet, and I fancy it has never been thought of. I must say that one reason why we want an early application is because of our having to economize space. We made application to the Exposition authorities for a certain amount of room and a large proportion of that room has been promised us, but if, as it is supposed, the English people will not require all the room allotted to them, we as an elder brother, want to fall heir to it. I will make the matter known to Prof. Saunders at once, and I am sure that all he can do that will be to your interest, will be done. It certainly would be a large and very difficult undertaking to carry Canadian power to Chicago, yet I would very much dislike to see Canadian machinery running by American engines. It is a point upon which the Government should aid us. The cost of transporting such large engines as would be required, would be so great that the American Government might object to spending so much money in that way; however, I shall be delighted to have the question brought before the Government.

Regular order of business being resumed,

Mr. Fisk. I would like to ask Mr. Thomson if it is possible to keep a self-oiling bearing from heating, and also what oil he finds best, and how often it requires changing?

Mr. Thomson: Circumstances alter this to a very great extent. As far as the heating is concerned, the self-oiling bearing must have attention as well as anything else, of course. The oil should be changed about once a month, and I find the best oil is the ordinary dynamo oil.

The Chairman: I will now introduce to you, Mr. H. O. Fisk, of Peterboro', who will read a paper on "Carbons."

CARBONS.

It was suggested at one of our committee meetings that I should prepare a paper for this convention on "Carbon Testing," but the time was too short to carry out a series of experiments as at first spoken of, so instead, I have prepared a short description of the process of manufacture of carbon points, as conducted at the factory in Peterborough.

Carbon is an elementary substance, occurring in nature uncombined, as the diamond and mineral plumbago. It is much more abundant, however, in a state of combination; thus it occurs in union with oxygen in the carbonic acid present in the atmosphere, and in combination with oxygen and calcium, forms in the shape of limestone a large portion of the earth's crust. In union mainly with hydrogen, it is the chief constituent of coal and mineral oils, and along with oxygen, hydrogen and nitrogen, is an abundant ingredient of animals and still more so of plants. It exists in several altropic forms, that is, forms which

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64 TEMPLE BUILDING, MONTREAL.

THE Great Western Railway of England, known as the Broad Gauge Road, recently abandoned its 7 feet gauge and adopted the standard 4 feet, 8½ in gauge. In twenty-five years it had 1,450 miles of broad gauge. This had been gradually reduced till last month there remained only about 200 miles to change The work was completed in 31 hours. Trains run on the Great Western of England at a higher speed than we have yet been favored with in Canada. The "Flying Dutchman" makes a journey of 194 miles in 4¼ hours. Another train makes 246¾ miles in 6 hours and 10 minutes. The speed of the "Flying Dutchman" would take a train from Toronto to Montreal in 7 hours and 20 minutes. When shall we get it?

MESSRS. Yarrow & Co., London, Eng., recently performed a feat in ship building worth recording. The French Government wanted a shallow draught flat bottomed boat for service in Africa. It was wanted in a hurry in order to chastise some of the natives in Dalcomey. Attempting to get one built in France it was found that four months was the shortest time in which any of *the French builders would undertake to produce the vessel.* The order was given to Messrs. Yarrow & Co. on 28th April, and on the 25th May, the vessel was in the water and steam up. On the 26th May, her official trial trip was made to the satisfaction of the French officers. The boat is 100 feet long, 18 feet broad and with ordinary load draws 18 inches. She made a little over 10 miles per hour, and can carry 400 troops.

THE 'Royal Sovereign" a recent addition to the British navy, is said to be the most powerful war vessel ever constructed. Her steaming capabilities were tested a few weeks ago, and the power developed was in excess of that called for under the contract. Engineers will be interested in knowing that the main engines are triple expansion driving twin screws in the usual way. The steam is supplied by eight boilers carrying 155 lbs. pressure. The boilers have 700 sq. feet of fire grate, and 19,560 sq. feet of heating surface With ordinary natural draught to the furnaces the power developed was 9760 horse power. With forced draught equal to 1 6/10 inches of water, the steaming capacity *of the boilers was so much increased that* 13312 horse power was obtained Neither the coal consumed nor the water evaporated, appeares to have been measured. As the engines are triple expansion, and steam at 155 lbs. pressure, it may be assumed that not more than 16 pounds of water per horse power, per hour, was required. On that basis each sq. foot of fire grate under natural draught, evaporated with steam at 155 lb. pressure, 223 pounds of water per hour, and each sq. foot of heating surface evaporated nearly 8 pounds of water per hour. With forced draught the evaporation was increased to such an extent that each sq. foot of fire grate evaporated 304 lbs. of water per hour, and each sq. foot of heating surface evaporated 11 4/10 pounds of water. The power developed was increased nearly 34% by the use of force draught and with it each sq. foot of fire grate supplied steam enough for 19 horse power. The present tendency is in the direction of higher steam pressure and hotter fires, and the results obtained from the Royal Sovereign's boilers and engines show that those who are looking for economical steam power should work in these directions. A steam boiler and engine, such as are commonly employed in factories here, and yielding 80 horse power, to be equal in efficiency to the Royal Sovereign's machinery, would require to give about 400 horse power. An ordinary tubular boiler with 20 sq. feet of fire grate would be considered as doing well if 70 horse power were obtained, but 20 sq. feet of fire grate in the Royal Sovereign gave 380 horse power.

THE present number of the ELECTRICAL NEWS is largely occupied with a full report of the first convention of the Canadian Electrical Association held in Hamilton on June 14th, 15th and 16th. The occasion, which was marked by favorable weather and the attendance of about seventy five members, must be designated a pronounced success. At the meeting of the Executive Committee immediately preceding the opening of the Convention there were elected nearly forty new members, bringing the total membership up to 110. This is equal to half the membership of the National Electric Light Association of the United States at the time of the Montreal Convention last year, and is certainly a very satisfactory record for an organization the lifetime of which covers a period of only seven months. The programme prepared by the Executive Committee proved to be sufficiently extensive and varied to fully employ the time and attention of the members throughout the convention. There was little time lost and no opportunity afforded for the proceedings to lag, from commencement to finish every body was wide awake and the meetings were marked by a zeal and interest which was highly gratifying to all concerned. The papers read, touched upon matters of interest relating to all departments of electrical progress, and opened up fields for discussion which possibly were taken advantage of to as great an extent as could have been anticipated in any assembly where most of the delegates met as strangers and consequently were inclined to feel timid about rising to express their opinions. In this connection the suggestion might be made, that if at future conventions abstracts of the various papers to be read were printed *and placed in the hands of the members at the opening of* the meeting, it would doubtless prove an encouragement to free and well considered discussions. It was a matter of some surprise to see the telephone interest better represented than that of electric lighting. Besides the fact that a much greater number of persons are engaged in the electric light business than in the telephone industry, there is popularly understood to be in the former field greater possibilities for change and improvement and consequently greater opportunity and necessity for the acquirement of new ideas. The many young and bright minds by which the telephone interest was represented at the convention, however, is in itself proof that the limit of progress in that department has not been reached. We may presume that the electric light, power and railway interests will see the importance of being adequately represented in future conventions. The visits to the Bell Telephone Company's new exchange and the Light and Power Company's new central station, were regarded as valuable object lessons by most of the delegates. The Association expressed its satisfaction with the work of the officers, by re-electing most of them for another year, while *the worth of the president, Mr. J. J. Wright, was fittingly* acknowledged by the presentation to him of a handsome gold watch. The social features of the occasion, including a drive to some of the principal points of interest in the city and a luncheon and band concert at the Beach, served to impress the visitors with the desirability of Hamilton as a place of residence and the hospitality of her citizens. In view of the desirability of holding a convention and electrical exhibition in connection with the Toronto Industrial Exhibition of 1893, it was thought advisable that a meeting should take place midway between that time and the present. It was accordingly decided that the Association would meet in Toronto in January next. A member of the Board of Directors of the Montreal Exhibition Association extended a cordial invitation to the Association to hold its convention of 1894 in that city, promising that every facility and encouragement would be afforded for that purpose. It is altogether probable that this invitation will be complied with. The question of annual versus semi annual conventions has already arisen. The fact that the National Association of the United States has abandoned semi annual in favor of annual meetings seems to be a strong argument against the wisdom of attempting to hold annual meetings of the Canadian Association. No doubt, when the matter comes up for consideration, it will be discussed from all standpoints and will be wisely decided. In the meantime it is the duty of every member to feel encouraged by the success which the Association has already achieved, and to make personal effort to increase its membership and usefulness to the utmost extent.

(Continued from page 99.)

differ from each other in many physical and some chemical properties, but which nevertheless consist of nothing but single element.

Wood carbon, or charcoal, is prepared by heating wood in iron retorts as long as it evolves anything volatile. When coal is treated in the same manner, as it is in the manufacture of coal gas, the excess of carbon is in like manner left behind, forming a hard shining light solid, valued as an economical and powerful fuel. This substance, which is literally charred-coal, and therefore best deserves the title of charcoal, goes nevertheless by the name of coke. A variety of this material is found in the upper parts of the gas retorts, and is probably formed by the decomposition of gaseous compounds of carbon and hydrogen. It is very hard and porous with almost a metallic lustre, and is a good conductor of heat and electricity, but this is of little value, if any, in the carbon business. However, 25 per cent. of this coke mixed with 75 per cent. of petroleum coke, is said to make a good carbon for low tension work. Another variety of this material is obtained from the oil regions, commonly known as petroleum coke. This is a by-product of the oil stills, and is the only kind used to any great extent in the manufacture of carbon points for the electrical industry. It is of primary importance that the coke, and in fact all the ingredients used, be absolutely free from impurities. Sulphur, iron and dirt (by dirt I mean shale sand and other foreign matter which by careless handling may get in) are the impurities frequently met with, but sulphur is by far the worst the carbon maker has to contend with; but by using the very best of coke which is obtained from Pennsylvania oils, trouble from this source is reduced to a minimum. The other constituent of our carbon is pitch. This is made from coal tar which is a by-product of the gas retorts. It may also be obtained from blast furnaces, but this kind is more or less contaminated with iron, and therefore is unfit for this class of work. Pitch for this particular purpose is difficult to obtain, as the makers do not care to expose their still to the high temperature necessary to drive out all of the oil, and reduce it to the proper specific gravity, and as the men in the factory say, "it is more or less wet."

The first step in the process of manufacture is that of crushing the coke. This is accomplished by means of a machine somewhat in appearance like a mammoth coffee mill. The coke comes from this crushed to about the size of coarse gravel; it is then automatically elevated to a large bin in the upper part of the factory, and from there it is conveyed to a large iron hopper situated directly over the calcining retorts. Into these the granulated coke is conducted by means of spouts with gates arranged to control the flow of material into the several aforementioned retorts. They are then sealed up, thereby preventing combustion, with the exception of a few vents to allow of the escape of gas, arising from the heating of the coke to a state of incandescence, which point is reached in from twenty four to forty eight hours after firing. After this if the coke is not pure it will be found to have caked, necessitating in some cases the use of bars to break it up sufficiently to allow of it being drawn from the retorts. If pure it will appear crisp and dry and to have suffered a loss in weight of about 30 per cent. After retorts have been drawn sufficently long to allow of cooling, their contents are elevated to the milling department and run through a set of French burr stones incased in iron, very similar to the grist mill chop stones; then through a silk belter separating the coarse from the fine, the former returning to the milling machine, the latter being conveyed to bins with suitably arranged spouts over scales from which it may be drawn and weighed as required by mixing department. We will leave the coke here for the present and return to the other ingredient, namely the pitch. This is a dense, hard solid, very brittle and dry, and in appearance some what resembling gutta-percha. This material when it reaches the factory is incased in casks, holding about 600 lbs. each. It is then broken up by the men into a convenient size for handling, and subjected to a granulating process similar to that of the coke; finally we find it at a spout close beside the one from which the coke can be drawn.

We have now followed the two principal ingredients through the various processes which were necessary to prepare them for the mixing room. The other ingredients, if any, we shall not be able to elaborate upon, until we have reached a more confidential relationship with the carbon makers. However, upon the manipulation of the materials at this stage, I am told the success of the future carbon greatly depends, in fact the great secret lies in the mixing. We can better understand the skill and care required to properly amalgamate the mixture, when we learn that each particle or grain of coke must have its individual coating of pitch, and it may be interesting to learn that this coke is ground so fine that a grain magnified a thousand times would only appear the size of a shot. To obtain these results the materials are carefully proportioned by weight, and placed in a mixing barrel. This is a rotating cast iron cylinder within which, revolves, in the same direction and twice as fast as the cylinder, an independent shaft, to which are attached arms so arranged that every part of the barrel is covered or swept in each revolution. This is attached to a furnace in such a way that the flues follow the whole circumference of this barrel maintaining a uniform temperature of about 300° F. which is necessary to bring the pitch to a state sufficiently plastic for amalgamation; thirty minutes is the time required for each batch, which would make about 1,600 carbons. From this machine it is taken to the cooling room and spread out for ten or twelve hours to cool. Here the mixture solidifies to such an extent that it becomes necessary to pulverize it again, to perfect it for the moulds. This end is attained by means of a mill, the pulverizing feature of which is two discs thirty inches in diameter, with corrugated face plates revolving in opposite directions at the rate of fifteen hundred revolutions per minute (about one one-hundredth of an inch apart). From this it is once more passed through a bolting machine, and then finding its way down gravity tubes to a bin on the floor below (which is the moulding room) it is carefully weighed out by the workmen on peculiar little scales with clock like dials, in quantities just sufficient to fill each mould as it comes hot from the oven. It having been previously lubricated with some heavy oil, is now ready for its charge, which the operator places in it and works evenly over the whole surface with a spatula, to insure uniformity of density. The cover or top half is placed in position and the mould and its contents passes for a few moments into an oven, the temperature of which is about 300° F. As soon as the mixture has become quite adhesive the mould is placed in the hydraulic press, and subjected to a pressure of several hundred tons. This press consists of a cylinder and base, kept in position by four steel columns weighing nearly a ton each. Within this cylinder (which is eleven inches thick and copper lined) is a ram or plunger thirteen inches in diameter making a stroke of three inches. Connected with this press by a feed and return pipe is a triple cylinder pump very powerfully geared pumping a stream of water continously through the feed pipe, press cylinder and return pipe. By simply closing a valve at the press on the return pipe, the pressure at once begins to accumulate under the ram, and in fifteen seconds the enormous pressure of twenty thousand pounds per square inch is attained. Then the release valve is opened, and the whole apparatus as though possessed of life gives a groan of relief. The mould is now removed and opened, and we have a corrugated card containing sixteen or eighteen carbons, each one being joined to its neighbor by a fin which is inevitably formed when subjected to the enormous pressure before mentioned. These cards are placed on plates which are fitted to receive them perfectly. These plates with their contents are piled up and weights placed thereon to prevent warping. When cool they are broken apart, gauged for size, culled, and the fin scraped off. They are then laid in the furnace for baking. This furnace is rectangular in shape 34 x 11, four feet deep and made of fire brick, and is similar to a large vat set about two thirds below the surface of the earth. Over this when filled is placed a dome shaped cover, sufficiently high above the sand and tile which covers the carbon, to allow of a free passage of the flames, and which is continued by flues back through the sides and also underneath, thus completely enveloping the body of the furnace in flames. The carbons are carefully placed in the furnace and separated from each other with washed sand, which is brought from the shores of Lake Ontario. Some days are required to completely load a furnace, as each section will hold about seventy-five thousand carbons. The cover having been placed in position and sealed with fire clay, the fire is now started, crude oil being the fuel used, as as well as in the case of the retorts and moulders' oven. The supply is held in a 250 bbl. tank by a railway siding some two hundred feet from the building, and connected by underground pipes to the various points in the factory where required, each branch terminating in a patent burner, which to the writer very much resembles a huge lineman's torch, with the exception that steam is used to spray the oil and perfect the combustion. This fire is continued moderately for 48 hours to allow of the gas escaping without blistering the carbon; it is then forced to its utmost for from forty eight to sixty hours longer, then shut off, and the whole allowed to cool for forty eight hours before uncovering. The top, which is mounted on wheels, is then rolled off and a few carbons taken from various parts of the furnace and tested by a Wheatstone's bridge and galvanometer for resistance, as this at once determines if the baking has been carried sufficiently far. If the measurements of all the samples exceed fourtenths of an ohm, the furnace is re-covered and fired for some hours longer, but this very rarely has to be done. The writer recently tested samples from the north and south ends and centre of a furnace, and they measured 23, 22, and 24 one-hundredths of an ohm respectively. Some difficulty was at first experienced in attaching carbon to the bridge, for the resistance of this substance as you are all well aware varies considerably, as the pressure of contact, and the same carbon measured at different times would often vary several one-hundredth of an ohm. But an instrument was designed by the writer which obviated to a great extent if not wholly this trouble. The pressure brought to bear on the sample undergoing test by this instrument is determined by small weights suspended from levers attached to holders so arranged that exactly the same pressure and contact is formed on different samples of the same size. If the resistance of the samples as before mentioned, shows that the contents of the furnace have been sufficiently baked, it is unloaded, the hot carbon being handled with forks. When cold they are sorted, the first and seconds being easily determined by rolling on level steel plates. After this inspection they are ready for the plating room, where they receive their copper coat by being hung in leaden vats containing a saturated solution of sulphate of copper. These vats, of which there are several dozen, are connected in series

with a twenty ampere constant current dynamo. Twenty minutes to half an hour is the time required to complete this plating process. They are then washed in hot and cold water and placed on racks to dry, after which they go to the packing department to be rolled in paper and boxed for shipment.

I am indebted for a great deal of the above information to Mr. Taylor, the genial manager, who not only patiently answered my many questions, but allowed me, with camera, perfect freedom throughout the entire factory, thus enabling me to obtain and show photographs of some of the apparatus which will give a far better idea of the same than the meagre description you have just listened to.

The President: I think that is one of the most valuable acquisitions to electric literature. The process of manufacturing electric light carbons has been little understood, and apparently Mr. Fisk has taken a great amount of trouble to illustrate this process by means of photographs.

Mr. Saunders: I have much pleasure in moving that we tender a vote of thanks to Mr. Fisk for the paper which we have heard. Seconded by Mr. Smith. Carried.

The President: I think if we could just start a little discussion on this paper we might get a great deal of valuable information about these arc-light carbons. There are a great many users of them present.

Mr. Thomson: For the sake of discussion on this paper, perhaps Mr. Fisk will be in a position to tell us why we have long life carbons and why we have short life carbons, and why it is that sometimes out of 1000 carbons perhaps we get 900 that are short life and others that won't burn at all. Perhaps Mr. Fisk will be able to account for the fire-works.

The President: You want the earth. (Laughter).

Mr. Fisk: I might say, Mr. President, with regard to the fire-works, that that lies very much in the adjustment of the lamp. (Laughter.) In regard to the long and short life of carbons, I think I had better refer you to Mr. Taylor; he can probably account for this better than anyone else.

Mr. Thomson: No matter how the lamps are adjusted, we can get nothing but fire-works out of them. I have some carbons in from the United States, and a large percentage of these are fire-works carbons. Of course these are all right for Saengerfest occasions or special demonstrations like that, but I do not like them for general use.

Mr. Fisk: I may say, Mr. President, that my paper was a description of the factory as conducted in Peterboro', and not in the United States. I would refer your questions to Mr. Taylor.

Mr. Taylor: I would like to have been an outsider in this discussion. It relieved my mind considerably when Mr. Thomson said he had fire-works carbons from the United States. We have had a great deal of this kind of trouble too in manufacturing them. With regard to the flaming of the carbon and the long and short life, I may say that these qualities depend a great deal on the density; there is a great difference in the manufacture. At our factory we have occasionally got out a lot of carbons that lived much longer than anything we had ever produced, and the next lot, with apparently the same preparation, would perhaps be a great deal shorter. The quality of the carbon depends upon the uniformity of manipulation, and that is the cause of our getting better carbons to-day than we did six or eight years ago.

Mr. Thomson moved the following resolution, fixing the standard of current in amperes, seconded by Mr. Starr. "That it is the unanimous opinion of this Association that when the carbons in an arc lamp are the proper distance apart, to give their maximum amount of light without either flaming or frying, that the strength of current for a 2,000 (nominal) candle power arc shall not be less than nine and a half amperes; for a 1600 (nominal) candle power arc it shall not be less than eight amperes; for a 1200 (nominal) candle power arc it shall not be less than six amperes, and for an 800 (nominal) candle power arc it shall not be less than four amperes."

Mr. Johnson: Mr. President, I think this is a matter which requires a little more consideration before the question is put to the meeting. There is one thing which should be considered, and that is the voltage of the lamp. As the units are obtained both from the voltage and current, in the same measure is the light obtained. It does not profit the company or manufacturer in the slightest to force a heavy current through their carbon points, without getting the benefit of that current, and that benefit is obtained by a separation of the carbon points. It is necessary in order to adjust the lamp, to take the standard current in the line, and the average of each individual lamp or the voltage current they are all supposed to be adjusted to. If there is any standard adopted, it is only fair to all manufacturers that the resolution shall be an average on which the lamp is standardized, as it is possible to use a heavy current and waste half of it heating up the ends of your carbons. It is best to use the current and voltage proper to the lamp you intend to sell, and give the separation which your lamp and machine will stand, suitable to your own requirements. There is another point to be considered, and that is, that the final measurements must be made by some other means. It is true that the current and pressure should be taken into consideration, but there is also a voltage to to be obtained by these lamps and the position of the carbons should be defined. It would be better in measuring, to define what the height of the lamps would be and at what angle they should be adjusted. The question for us to decide is not what is best for the manufacturers, but what would be of most benefit to the general public.

Mr. Campbell. With regard to the pressure of the arc lamp, I would like to ask how you can account for the difference in the pressure at different times. I have seen lamps which one minute would be 30 or 35 volts and a minute later 50 or 55 volts, I would like to know how you can account for this change in the voltage of a lamp?

Mr. Fisk. I have seen the lamp alter 3 or 4 volts, it is true, but I do not see the necessity of its varying much more than that.

Mr. Starr: I do not think this is a matter which should be looked at from a manufacturer's standpoint. I think it is generally understood by electricians that the standard we have adopted in this resolution has already been adopted in the United States and Europe. It seems immaterial whether the manufacturer uses 10 volts and 40 amperes, or 40 volts and 10 amperes, as long as the power is produced; the results are all the same for the manufacturer. But I think the interest of the public should be looked after, and there should be some standard adopted as a safe-guard against them being swindled in any way. It is possible for a manufacturer to supply a 1200 candle power light at the same price that he gets for a 2000 candle power light.

Mr. Johnson: I certainly agree with Mr. Starr, that it makes no difference whether volts or amperes are used, but let me say that the power produced is merely nominal candle power. If we are going to take what has generally been accepted as candle power, it is usually accepted because the first company started with that rating of candle-power. Scarcely any 2000 candle power lamp is 2000 candle power or anything near it; no matter whether it is 9 ampere or 8 ampere, it is not 2000 candle-power.

Mr. Thomson: I think, Mr. President, that some of our members do not understand that a good arc of many amperes will produce so much candle power and no more, no matter how hard you try. If the current is 8 amperes strong, it will produce a certain voltage, or 9 amperes, it will produce a certain voltage, if it is a good arc. It is bound to take a certain amount of current to regulate an arc.

Mr. Nicholls: I did not intend to take part in this discussion, but as one of our members has suggested, it would be very unfair to pass such a resolution as this at the present meeting. It would be very unwise to introduce a matter that is going to cause such a disturbance. I understand that there are not more than 12 gentlemen present who are representatives of arc-light manufacturing companies, and I think that the proper way of bringing forward a resolution of this character would be to give notice of motion, especially of a question which is going to revolutionize to a certain extent the working of one department of this Association.

Mr. Dunstan: I also have taken a similar objection. This is a matter for very serious consideration, whether this Association should or should not fix this standard, and I think it would be wise to defer the whole matter until next meeting.

Mr. Nicholls: I move, in amendment to Mr. Thomson's motion, that further discussion on this matter be postponed until the next meeting of the Association.

Mr. Yule: I very heartily second Mr. Nicholls' amendment, and especially in view of the threatened legislation to fix a standard, I think our best plan is to await proceedings.

Mr. Dunstan: I heartily sympathize with what Mr. Nicholls has said. I think that this is a matter which should be referred to, and thoroughly discussed by a special committee, who could report at our next meeting.

The President: Some gentleman stated that the resolution as introduced would cause a disturbance, but I know that that idea was farthest from the mover's and seconder's mind. If any standard is fixed it is only that the manufacturers would then all be working on the same basis.

Mr. Yule: The time is not far distant when the Legislature of Ontario or the general Government will fix a standard.

The amendment being put to the meeting, was declared carried.

The morning session then adjourned.

AFTERNOON SESSION.

At 2 o'clock the members assembled at the building of the Bell Telephone Company and spent a profitable hour inspecting the new exchange.

When business was resumed at 3 o'clock, the Chairman announced that the first order would be the determination of the time and place for the holding of the next Convention.

Prof. Rosebrugh. Mr. President and Gentlemen In case it should be decided to hold the next meeting of the Association in Toronto, I should be very happy to invite you to meet in the School of Practical Science. (Applause.)

The President. There is another question, as to whether we shall hold our meetings annually or semi-annually.

Mr. Dunstan. To start this matter I might say, that it is necessary, as our President has just announced, for us to decide whether our meetings shall be annual or semi annual, and a great deal is to be said on both sides of the question. This is a young Association, and we have to feel our way we must not become too impatient all at once. The question is, whether it is wiser to divide our strength by holding our meetings semi annually, or to confine ourselves to the one meeting and make

that meeting a success. We want all the members of the institution to come to our meetings, but we must not forget that when some have to travel a long distance the expenses amount up, and I would rather see one well attended meeting than see two meetings with the attendance divided. Our Association is too young to risk holding semi-annual meetings.

Mr. R. Æ. Kennedy: As President of the Hamilton Electric Light and Power Company, I would like to say a few words on this subject. I, for one, greatly favor holding our meetings semi-annually. In the United States we find our electrical friends meeting twice a year, and the interest created by these meetings amounts to a great deal more than the expense in connection with them. I think, too, that they would be well attended, we will try to allow our manager time to go to all the meetings, and perhaps our president too, but to create interest in these meetings, we ought to meet every six months. Of course we do not expect you to meet in Hamilton every time; suppose you try Toronto, Kingston, London, etc.

The President. I would like to suggest that in view of the Toronto Exhibition, in case we decided on the institution of an Electrical Exhibition, that that cannot well be done until a year from next September.

Mr. Kennedy. Of course, taking this matter into consideration and our exhibit at the World's Fair, we would have to meet before a year from now to compare notes.

Mr. Thomson: It would be well to divide the time up, between the Industrial Exhibition and now.

Moved by Mr. Smith, seconded by Mr. Burran, that the next Convention be held in the City of Toronto, in the month of May, 1893.

Moved in amendment by Mr. Carroll, seconded by Mr. Kennedy, that the Association meet in September next, in Toronto.

Moved by Mr. Thomson, seconded by Mr. Kammerer in amendment to the amendment, that the next meeting be held next January in Toronto.

Mr. Kennedy: We want to meet twice before the World's Fair.

The President presented the question to the meeting, and the amendment to the amendment, carried.

Moved by Mr. Nicholls, seconded by Mr. Thomson, that the proceedings of this Convention, including papers read, etc., etc., be printed in pamphlet form, the Executive Committee to appropriate a necessary sum of money therefor. Also that they be distributed to all members of this Association and to all persons who might be supposed to be interested in electrical matters.

Mr. Dunstan: Before this is decided I would like to call attention to one question: Is it wise or is it not, to give the proceedings to those who are not members? I think that one of the inducements held out by this Association to bring in new members is, that the printed proceedings of these meetings will be sent to them. It is a question whether we will gain new members by distributing free to outsiders the proceedings of this meeting or by saying, "before you can get the proceedings of this meeting, you must become a member of this Association." I would like the matter discussed a little before it is decided.

Mr. Thomson: I think, Mr. President, it would be wise to distribute this report free to outsiders; it would let them see what the Association is doing. I think it would benefit us greatly to throw the report around broadcast.

Mr. Hunt: I think that any man who is interested in electricity cannot help feeling interested in us, after reading what has taken place at our meeting and that Mr. Thomson is right in his views that the report should be distributed freely.

Mr. Kennedy. We want to develop this Association, and by spreading our news all over the country, we are going to be made more popular. The more who get hold of our Reports, the more our membership roll will increase. The motion carried.

Moved by Mr. Johnson, seconded by Mr. Kammerer, that the name of Mr. E. S. Edmonson, of Oshawa, be added to the Legislative Committee. Carried.

Mr. Sadler: I would like to ask with regard to the Government Commissioner, if it is the intention of the Executive Committee to take any steps to further the interests of this Association and the mechanical interests at the World's Fair, in any shape or form? The question I asked this morning was. What motive power is to be supplied to run our Canadian machinery at the Exposition? as it is in our interests that any motors used should be Canadian motors. This is a question I want to get at. I do not want to go to Chicago and see our Canadian machinery running by American motive power. I think the Executive Committee should take some steps and interview the Government officials for the purpose of inducing them to allow Canadian motor power in connection with Canadian machinery. The Government should be asked to offer some further inducements than paying freight to and from Chicago.

The President: I think the Executive will look after that matter. Mr. Baylis will now read a paper on "Multiple Switchboards."

MULTIPLE SWITCHBOARDS.

There is nothing that marks the latter half of the 19th century more distinctly than the growth of the electrical industries, and of all the applications of electricity, there is none that has made more rapid progress than the telephone industry. Twenty years ago there was no speaking telephone, ten years ago there was but little known about it, and by many it was regarded more as a curious electrical toy than as a future important factor in the advancement of civilization. Although the industry has reached its present state in a comparatively few years, yet the growth has been gradual, and improvements have been, and are constantly being, added as *the necessities of the service demand, and it is to the needs of the operating* room that most of the ingenuity of telephone inventors has been directed.

It would be impossible in this paper to attempt to describe, or even enumerate, the many forms of switching apparatus that have been invented, or are in use, I will confine myself to describing what is to day regarded as the most perfect switching apparatus we have, viz., the multiple switch board, the most elaborate and complicated electrical switch there is.

The telephone, transmitter, and magneto, in use in a small town where there are fifty or a hundred subscribers, are practically the same as those used in a city where the list shows thousands of names, yet the switching apparatus of the central is entirely different. In an office containing from fifty to seven or eight hundred subscribers, the switching is a comparatively simple matter. The switch which is in most general use in Canada in such places, is known as the Standard Switch, and it is, on the whole, a very satisfactory machine. When a subscriber has rung for the central and his annunciator has been actuated, the operator takes up any plug upon the table and inserts it into the jack of the subscriber calling, and cutting in her telephone by means of the switch which is in circuit with the pair of cords she is using, asks the subscriber whom he wants. If the line asked for is not is use, the connection is completed with the second plug, and the subscriber rung up. When the conversation is finished, the bells are again rung, and the current actuates a drop which is in circuit with the pair of cords in use, and the operator is notified that that pair of cords is idle and *disconnects the subscribers. Now suppose a subscriber calls for another* whose line comes into a switch several feet away and the cord will not reach, then recourse is had to short trunk lines, connecting the different boards. Each switch has lines running to every other switch, and in this way each operator can have connection with all the others. This system works all right when there are not more than 800 or 1,000 subscribers. If there are more, the number of trunk lines between the switches becomes so great that confusion may arise, and connections cannot be made quickly. Then, too, there are many chances for misunderstandings between operators, and mistakes are liable to occur. Thus the want was felt for a board on which each operator could make direct connection with every subscriber in the exchange without asking another operator for it, and without moving from her seat. As a result of this want, the multiple board was invented, and, on the whole, it has proved to be very satisfactory.

Very many forms of multiple boards have been invented, but the board of the W. E. Co. of Chicago is the one that has been most favorably received, and it is some form of W. E. board that may be found in almost every large telephone exchange in the U. S. and Canada to-day, a large number have also been installed in foreign countries. The boards in use in Canada are all made in Montreal in the Telephone Co.'s own shops. When multiple switches were first introduced metallic circuits were a rarity, so the board was designed for grounded lines only, whereas now, owing to cross-talk, electric railways and other disturbing influences, metallic circ*uits have become a necessity, and, in the large cities at least, every mul*tiple board installed to-day is fitted for both grounded and metallic lines. From the time the first board was built until now, the form has been constantly changing, and even now no standard has been arrived at, and it is altogether likely that the next board built will be entirely different from all its predecessors. I suppose most of you have seen the Bell Telephone Co.'s new board here, this is a type of the most recent board in use, and it is with a switch similar to this that most of the large exchanges in the U. S. are equipped.

The general form of the board is vertical, about six feet high, and is made in sections six feet long. The upper portion of each section is divided into six panels. In these panels there is a spring-jack for each subscriber in the exchange. The jacks are arranged in groups of 100, made up of five rows of twenty. Each group is numbered from 1 to 100 and the number denoting the particular hundred is painted on the frame work of the panel. The first group (the bottom left hand one) is numbered 0, the next to the right 1, the next 2, and so on to the 6th panel, then another row from left to right, thus building upwards and allowing for future additions. Every one of these jacks appears in each board, so that the connecting places of subscribers are multiplied, hence the name multiple. The annunciators of the subscribers are situated below the jacks in a sort of trough. To facilitate answering calls, the lines of the subscribers are brought back to special jacks, which are placed below the ordinary multiple jacks, and are *called answering-jacks.*

Every thing is arranged for metallic circuits. The two wires of the subscriber's line enter the first board, one wire is soldered to the brass body of the jack and the other to a German-silver spring which rests on a brass stud. The wire coming to the body of the jack is carried right around the board from section to section. This is called the test or return side of the circuit. The other is the line side. The line after reaching the spring, passes to the stud, and from there a wire is led to the spring of the corresponding jack of the next section, and this is repeated for the length of the board. From the last section the wires from the multiple are brought back to the section that contains the annunciator of that line, and to the answering jack. Before reaching the annunciator, however, the line passes through the intermediate distributing board. The object of this board is to provide a means of placing a subscriber and any annunciator, and still not to change his position on the multiple part of the board. For example, suppose the operator looking after lines from number 225 to 300 was very busy, and say number 250 was an exceptionally busy line, by making a change on the intermediate board number 250 can be taken off this section, and put on to any spare annunciator on another board, and yet any operator wanting number 250 will find it in its regular place in the multiple part of the board.

The annunciator used now, is of the tubular form, and consists of a coil of 500 w. of 36 wire wound over an iron coil and surrounded with a tubular iron jacket, thus giving a more perfect magnetic circuit. It is very sensitive and occupies but little space. The subscriber's jacks were first made separately, but now they are formed in rows of twenty mounted in an ebonite strip. In a multiple board there may be many sections, on each of which is found every subscriber in the exchange, so it is evident that before connecting a subscriber's line on one table some means is required of ascertaining if that wire is in use at another section. A test for this is necessary on any multiple system. There have been many methods suggested and tried to provide the "busy test," but the system used on the Hamilton board is almost as successful as any yet tried on metallic circuit boards. Nevertheless, a great deal of the complication and trouble on the board is caused by this test. The test merely consists of putting one pole of a battery, the other pole of which is grounded, to the brass part of the jack. The operator is provided with a peculiar telephone having two coils joined together and the junction being grounded. Now if an operator wishes to ascertain if the line is in use, she merely touches the tip of a front plug on to the brass of the jack. If the line is idle no sound is heard in the telephone. If it is in

use a sharp click is heard, caused by the current from the battery which is connected to the plug in the jack passing to ground through one half of the head telephone. The ring off drop is 500 w bridged across the circuit, and of high self-induction and does not materially lessen the speaking effect. To ring a subscriber the two sides of a small magneto are brought into a circuit with the two conductors of a cord, at the same time the other cord of the pair is cut off, thus signalling only the party desired.

The test is the same for single and grounded lines, but in a grounded line the bodies of the jacks are grounded through 500 w This is to prevent short circuiting the test battery and also to offer resistance to earth currents which tend to throw the drop. The great disadvantage about this busy test is that one side of the line is used for the test circuit. It is found on long lines that the static charge held by the line often gives a false test, making it necessary to ground the line at the drop, as well as grounding the bodies of the jacks. Again a very little throws the test out of order, and causes a false test to be put on a line, or else no test at all. It is possible that the next board built will have a separate circuit for the test, and although this will complicate the wiring, yet on the whole it is a change much to be desired. While the circuit of our subscriber's line through a multiple board is comparatively simple, when we have several thousand such lines to be brought within the reach of an operator it will be seen that an enormous number of wires have to be dealt with, and that a good system is needed to bring the wires into small compass and to avoid confusion. The wires must be well insulated to prevent leakage and consequent cross-talk, they must be in small space, the method of wiring should allow the jacks to be accessible in case of trouble. To accomplish this in the best way a special cable is used. It is oval in section and consists of 21 pairs of 22 wire tinned and insulated with two layers of silk, and a cotton protecting covering. The wires are sewed in the shape of a comb to fit the jacks and are soldered to the jacks away from the board on a long bench. This allows of a careful inspection of the joints. When jacks for every section have been attached, the whole is carried to the back of the board and the jacks screwed in place. A glance at the back of a board will give a better idea than any amount of description. The jacks and the wiring are the most important part of the board. The least trouble with any jack will interfere with the working of that subscriber's line, and in an exchange of several thousand, when a line passes through 20 or 30 jacks it will be seen how many chances there are for trouble, and how carefully the jacks have to be made and set up. In the switch here, the troubles in the multiple average about two a day, while the trouble from all the causes inside of office average about three to four a day.

The most fruitful place for trouble is at the point where the spring rests on the contact, a little dust lodging there will open the line or else introduce such a high resistance as to render speaking very difficult, and a great deal of ingenuity has been expended in trying to devise a board without contacts in the jacks, and we hope that the next board will have this very desirable feature. The amount of work that can be done on a multiple board is very great. In Montreal the average number of calls answered by the operators average 700, and a busy operator when pushed has answered over 1600 calls a day. At one exchange in Montreal, equipped with stand ard boards and accommodating about 1400 subscribers, the average number of calls answered per operator is 475, the highest being about 1200 as compared with 1600 answered on a multiple board, so that about 25% more calls should be attended to on a multiple than on a standard board. The average time for making connection in Montreal where there are four exchanges is 35". The time required for this in a single exchange should be less than this. In an exchange wired for 1500 subscribers, each line has about 70 soldered connections and 30 contacts in its circuit Any one of these connections is a place for possible trouble of some sort. At the same time an operator may be answering two calls a minute and is liable to put a plug in a wrong jack or not to notice a busy test, so it is hardly to be wondered at if mistakes do occasionally occur though the greatest care is taken to prevent them.

On the whole as I have said before, a multiple switchboard is very satisfactory and is the best system in use to-day for exchanges of over 1000 subscribers, and though details may be altered, and we hope improved, yet the principle of this system bids fair to be the basis of the best telephone exchange equipment for some time to come.

Moved by Mr. Smith, seconded by Mr. Nicholls, that we tender Mr. Baylis a vote of thanks for the paper which we have just heard with much interest. Carried.

Mr. K. J. Dunstan then took the chair and announced that Mr. J. J. Wright would read a paper entitled "Steam and Electric Power."

STEAM AND ELECTRIC POWER.

The subject that has been allotted to me is of such a comprehensive nature that it would be impossible to do it justice within the limits of a paper that would not trespass too much on your patience to listen to. In fact this title, chosen by our worthy Vice President, would cover the whole range of electrical business from the galvanic battery of the street corner fakir to the power plant of the Niagara Falls Tunnel Company, and in the line of steam engineering it would include the hot peanut stand and the ocean steamship. Not being able therefore, to cover such an extensive field, I will venture to offer a few suggestions on the distribution of electricity for power purposes, which I hope may prove of benefit to those of our members who may contemplate the introduction of such a system. Firstly, then, your power has to be produced, and if you wish to do an extensive business by supplying power at a reasonable rate, or if you have to meet the competition of some enterprising party who thinks you are making something, and therefore wants that something for himself, you must figure to produce it at the lowest possible cost. It is scarcely necessary to state to an intelligent assembly like this, that you cannot actually create any power by means of electricity. We must leave it to the penny a line paragrapher to state as his opinion that the steam engine will be superseded by electricity, that steamers will be driven across the Atlantic by electricity, and will require no space for fuel, and so forth.

Electricity, at all events as we know it now, is simply a mode of motion or a method of transmitting power. You may call it simply an invisible line of shafting or a length of belting. Electricity is liable to the disabilities connected with these methods of distributing power, inasmuch as there is a loss by reason of distance. You may call it the friction in the wire just as you would have to reckon with the friction in the bearing of a line of shafting. To allow for the various losses in converting your power into electricity and re-converting in the shape of power again, you will always have to produce a certain percentage more than you recover. Economy in the prime mover is therefore more than ever a necessity. You are a happy man if you possess a water power within reasonable distance of a fairly good market, but it seems to me that water powers, as a rule, for some inscrutable reason, are usually located in very inaccessible places. Your line of invisible shafting becomes too long and in the end will cost you about as much as steam on the the spot. Power you must have, wind is out of the question, and water having failed, we must fall back on our old friend the steam engine. I am not going to thresh out the obsolete controversy of high speed engines versus slow speed. That question has been settled long since. Be moderate in all things. While you are avoiding the high pressure steam eating flyer on the one hand, do not go to the other extreme and build an unwieldy engine that makes one revolution to-day and another to-morrow, and, as the saying goes, carry all your eggs in one basket. Five hundred horse power is about all you should employ in a single unit but of course the size of engine will be governed very largely by the extent of the power plant you propose to install. But here let me give you a special piece of advice. If you honestly think one hundred horse power will be enough for the demand upon you, make it two hundred. If you think two hundred will suffice, make it four, and you will come out about right in the end. If you have no water for condensation, be very cautious about meddling with a compound engine. Unless the load is accurately proportioned to the size of engine, the low pressure cylinder will be a positive detriment, and it is well known that in this respect a power circuit fluctuates within very wide limits.

If water for condensation can be obtained, by all means use a compound condensing engine, but if you do so and have a good boiler and can carry at least a hundred and twenty-five pounds of steam pressure, make the diameter of the low pressure cylinder larger than the common practice, in fact nearly as large as the third cylinder would be in a triple expansion combination. I have very strong doubts whether the middle cylinder in a triple expansion engine is any good at all. It is an open question whether the slight saving of steam by the more uniform temperature of cylinder is not more than over balanced by the increased complication, weight, and friction of the extra moving parts. The reason for the existence of a triple expansion engine is that it is the outcome of a gradual evolution, first the high pressure, then the compound, then a further use of the steam to ensure the benefit of the vacuum on a very large area of piston in the final cylinder. Now drop the middle cylinder and use a large low pressure in proportion as a compound, you will get the benefit of the vacuum over the increased area, and you will find equal results will be attained with less proportionate wear and tear and risk of accident.

Now another point. If your engines are of considerable size, and a compound of the proportion spoken of would have a comparatively heavy low pressure piston, place them upright. They will take up less room, and instead of having a heavy piston of a ton or a ton and a half weight dragging along the bottom of the cylinder you have it floating in the centre. Wear and tear is reduced to a minimum and large economy in fuel and oil is the result. Let your engines move lively but at a reasonable speed, say from 85 to 90 revolutions for a 250 or 350 horse power engine, or to express it in a better form, say at about six hundred feet of piston speed per minute. If circumstances compel the use of high pressure engines, see that they are large enough to have plenty of room to take the utmost benefit from the proper expansion of the steam. An engine to be economical should not carry steam more than from one eighth to one quarter of the stroke at the outside.

Having a steam plant that we can depend on producing power at the lowest possible figure, we must turn our attention to the question of its distribution in an economical manner. This is not at all an easy problem to solve, and much will here again depend on location. The higher the pressure at which power can be distributed the greater the economy in first cost of construction and in subsequent operation, but there are two serious drawbacks to high potential, first, increased liability to derangement in the electrical apparatus, and secondly, the difficulty of building and successfully operating motors of small power. Given a certain distance to your centre of distribution, you have to strike a balance between interest on the cost of large sized copper conductors to reduce the resistance, and the extra consumption of fuel required to drive your current over small wires. I am speaking now of a system of constant potential suitable for distribution to consumers in large or small quantities, and not of the new fangled long distance alternating current exploits that require a deaths' head and cross bones painted on every pole as a gentle hint to the unwary to keep their own side of the highway. For distribution from a central station within a reasonable area, say half to three quarters of a mile in any direction, a pressure of 250 volts appears to be most suitable. Motors can be wound for current as small as a quarter of a horse power. For greater distances, a second system of five hundred volts could be utilized with advantage and at not too heavy an expenditure for copper. There are many experiments being made with a view of bringing out a power distributing system by means of alternating currents, but at pre

sent there does not seem to be anything positive in sight that would be better than a constant potential direct current system at a pressure as low as could be consistently used taking into account distance from source of power, cost of fuel and interest on cost of copper mains for its supply.

It might be possible in very large installations or where the ground to be covered is considerable in extent, to establish a system of high tension mains to distribute an alternating current to central points and there transform it to a lower potential and utilize it to drive a motor dynamo. This would again produce a direct current at the pressure desired. Except for small powers it would seem as if the complication introduced in a method of this kind would make the power realized about as expensive as steam on the spot. The position of a pessimist in electrical matters is a somewhat risky one to take at the present day, but it does appear to me that some of the schemes proposed for long distance power transmission are a trifle outside of the limit of commercial success. The line must be drawn somewhere at a spot where the expense of maintaining costly electric apparatus and the interes on the original expenditure will about counterbalance the cost of fuel and maintenance of a steam engine. It will also e found very much cheaper to locate a factory requiring a large amount of power at the source of power itself, than incur a continual expenditure to transmit that power to a distance. As an instance, the elaborate scheme of water power which is now in course of evolution at Niagara Falls may be cited. The American scheme, however, has crystallized into action, and large works are already undertaken. The primary object is to locate consumers at the power, but incidentally it is proposed to transmit a large quantity to the City of Buffalo. Time will show to what extent this may be commercially feasible, but when the complicated nature of the operation and its cost is considered, there is room for a pretty large sized note of interrogation.

First we have the proportion of the cost of the water power to begin with, royalties, cost of rock excavation, cost and maintenance of turbine wheels and attendance. The electrical outfit must be first, low tension dynamos producing alternating current, then transformers to raise the pressure sufficiently high to overcome the twenty miles and more of conductors to the city; the cost and maintenance, and above all the protection of this twenty miles of line; then again transformers to reduce the pressure to a manageable point; low tension, alternating current motor to convert the current again into power; and finally the cost of its distribution. This expenditure will have to compete with coal at a cost for steam purposes of from a dollar to a dollar and a half per ton. Wonderful things have been done by means of electricity and this enterprise may be successfully accomplished, financially I mean. Its practicability from a scientific standpoint has been already demonstrated.

There are locations, however, in our own country, (a country, where a paternal government is doing its best according to its light to further the interests of its people by imposing a duty on fuel), and these places are at such a distance from the source of supply that freight is very costly. Here, if anywhere, will the cost of long distance power plants and their existence be justified. But the distance must not be too great or the maintenance of the insulation of the conductors and transformers will become a difficult task as an everyday business operation. Sufficient has been accomplished experimentally, it only remains for it to attain permanent success. I remember the time, and not so very many years ago, when we considered it a big thing to operate a dynamo in one room and arc lights from it in the next. In those crude and early days it was often necessary for the operator to have his eyes on both of them at the same time. Now arc light circuits of twenty miles in length are not uncommon. It may be feasible in the near future to carry high tension secondary currents for long distances in grounded tubes containing oil, and connected to transformers in metal vessels also containing oil, and so protected as to preclude the possibility of accident from contact with them. Probably after a system of this kind is perfected and installed, it will be a fine thing, but it will be more or less risky to the experimenters before the perfect system is reached. I have often thought that a cheap and effective motive power might be devised from the repeated detonation of small quantities of high class explosives in situations where the power generated would do the most good, say behind a piston as gas is exploded in the cylinder of a gas engine. The difficulty would appear to be in separating at each stroke a minute quantity of explosive without making injurious connection with the whole stock in hand. It might be made successful, but at the expense of several relays of inventors

Elaborating these high tension systems may have a similar effect on the available stock of electricians at the outset, but I have no doubt that before very long we shall become accustomed to much higher potentials in electrical matters than we now have any idea of. Now, I remember when 8 lights was the average size of an arc light dynamo and a 12 lighter a monster, and shall not readily forget when, after much consultation, it was decided to build a 16 lighter, with what amount of respect for its power we approached the task. When it was completed, it was a creation to stand off from and admire at a distance. It was merely a repetition of history. At one time a speed of ten miles an hour on the railway was considered simply as flying in the face of Divine Providence. It is unnecessary to state what the limit of prudence in this respect is considered to be now. This brings us to another development of electricity as a motor, and that is the proposed electric railroad projected between Chicago and St. Louis. We have very little information as to the methods to be adopted or the voltages to be employed. We are told, however, that the speed is to be 100 miles an hour, and that the line is to be perfectly straight. It will be necessary. If the projectors had said further that it is to be fenced in with boiler plate it might, to some extent, relieve the feelings of the farmers along the right of way. We are to have some information on the possibilities of electric railroading a little later, so I must not anticipate. The possibilities and the probabilities are rather wide apart at present. The electric tramway fills the bill to perfection for city and suburban passenger traffic, but you must admit when you see a steam locomotive handle a freight train a quarter of a mile long or so, that the electric motor has a fairly hard row to hoe before it will take possession of a trunk line of railroad.

We have said nothing about the primary battery in this question of electric power. The consumption of fuel, usually zinc and acid, is so much greater and more costly than in the case of the steam engine that excepting for very small outputs, its use is out of the question. Even for the small quantities used for the purposes of the telegraph companies, dynamos driven by steam or electric motors are rapidly being adopted. The storage battery also, while having its own particular uses on a small scale, is being universally abandoned where large powers are in question. An exhibition of the transmission of power by electricity on the smallest and most minute scale is to be found in the operation of the telephone. The prime mover in the exemplification of transmission is the wave in the air produced by the human voice. The minute current induced by this motion, almost too small to be measured, after passing in some cases through hundreds of miles of wire, has still sufficient power to move the diaphram of the receiving telephone and reproduce the original sound. Electricity is a subtle power. Its wonderful adaptability to the varied purposes of life is seen in this contrast. The same invisible power may be set in motion by an infant's whisper, or a steam engine of many thousand horse power. It is the same wonderful development of physical force whether it is heard in the well known tones of the voice of an absent friend or accompanied by the thunderous crashing of heaven's artillery. It may carry a message of love, or life, or death, across the ocean with a movement as light and noiseless as the footfall of the seraphim, or do the mighty work of the world in travel, or manufacture, or mechanical force, with the power of a thousand giants' hands.

Mr. Hunt moved a vote of thanks to Mr. Wright for the thoroughly enjoyable paper he had submitted to the meeting. Carried.

Mr. Campbell: In regard to the transmission of power, apparently Mr. Wright is in favor of slow running engines.

The President. It seems to me that the medium speed appears to be the most successful and most permanent Build large engines and get them to move lively, and by so doing you get the maximum of economy. Mr. W. A. Johnson, will now read a paper on "Possibilities of Electric Railroading."

POSSIBILITIES OF ELECTRIC RAILROADING.

The last ten years have seen great changes. We recall to memory, that in 1883, the company with which the writer is still connected, placed in operation in a rather crude and temporary manner, the first electric railroad ever operated in the Dominion of Canada. This road was constructed on the grounds of the Industrial Exhibition Association of Toronto. The electric machinery and car were hastily put up. The electric generators were two-six arc light 14 ampere Ball dynamos of the type first designed. The motor was a similar arc dynamo, and was placed on an ordinary railroad flat car and connected with car axle by a belt. One rail took the place of the modern trolley wire and the other rail formed the return circuit.

Upon the first trial of the car everything moved off in good style, the apparatus working well. The flat car was loaded with all the people that could get on, and notwithstanding the small power of the motor it ran at very fair speed. Unfortunately, however, before the opening of the Exhibition, the officers of the Association added so much extra weight to the car by building an awning and placing seats and iron railings, together with locomotive head-lights, etc., that the motor was overloaded and the car came to a stand still when going up the grade. The trial was sufficient, however, to give an idea of what could be done with electric power. The following year, 1884, Mr. Van Depoel equipped the same road with apparatus designed on purpose for the work and erected the first trolley wire in the Dominion. The road was operated with more or less success for several years following. These experiments served their purpose in directing attention to the great possibilities of electric railroading. It only remained for the electric manufacturing companies to design apparatus properly constructed, mechanically as well as electrically—such as would be able to stand the great wear and tear inseparable from such work.

Machinery is now manufactured by several well known companies that is adapted to operate street railroads and tramways with economy. Electric railroad construction and the apparatus now being used in connection, has, in all probability, reached its final stage of style of design as far as relates to efficiency and general utility. The trolley will undoubtedly remain in full sway, with possible exceptions, however, for short lengths of roads in the very largest cities, where first cost is sometimes a secondary object. Generators operated at a pressure of about 500 volts will undoubtedly continue in use for supplying current for city street service. With many others I confidently expect in the near future that a great many steam roads will adopt electric motors. Several short roads have already been equipped and are quite effective as feeders and connecting links to trunk lines. The enormous total horse power generated by the steam boilers of the locomotives now in use would, if concentrated in large units and located at stations situated at convenient points along the main line, prove extremely effective

when used in connection with electric power. There are many fine water powers in all parts of the country that can also be utilized for this purpose. About the time the trunk line roads begin to think seriously of equipping electrically they will be inclined to take into careful consideration the great cost of copper for feeders and trolley lines necessary on 500 volt circuits. Higher pressures, at least for feeders to the trolley lines, are bound to come. The recent experiments with alternating and multiphase high frequency currents have lately attracted much attention and great results are expected from the practical tests that have been and are still being made in the transmission of large amounts of power by these methods.

The changes that have followed one upon another in the last ten years in all electrical industries seem to indicate that much more is possible in this direction, as instance the evolution from the double reduction to the single, then to gearless motor. Call to mind the great number of successfull electric roads now in operation, compare the steam locomotives of the past, using gears, and the present fast mail flyers, all this indicates progress. The double reduction and single geared motors are particularly adapted for short hauls, where traffic is heavy as in city streets. The gearless motor can probably not be excelled for high speeds and long distance traffic to which it is particularly adapted, as with high speeds it is advisable to keep the armature revolutions as low as possible and the greater weight necessary will be of service in securing traction. Connecting rods can no doubt be used with advantage between the drives of motor cars for through lines, same as are at present used on locomotives. Steam railroad companies, who equip with a proper electric motor system in conjunction with electric block signaling and the lighting of both track and trains, (current being obtained for all from the same source of power), will have available at all times all power along the line whether from steam plants or the numerous water powers, of which there are many in all parts of the country. The railroad companies will be most decidedly convinced of the beauties of electric service as soon as adopted, and can then render much better service with less annoyance to the public, as trains can run equally as fast and in many cases faster than at present; more frequent service could be given by using shorter trains and more of them.

In connection with this subject of long distance railroading, the new and very interesting progress now being made in the use of alternating currents, it seems to me we should not lose sight of the well known direct (series) current. There are already manufactured generators giving 5,000 volts at 8 to 10 amperes; these can be safely coupled together to give pressure of from 10,000 to 30,000 volts, and without danger of injury to the insulation of any of the generators. The generators of most all the arc stations in Canada can thus be utilized if need be, either for new lines of tramways between adjacent towns, mines, etc., or for helping out the trunk lines. The question arises however, how is this to be done? I am indebted to Mr. Royal E. Ball for some suggestions in reference to this question, which he set forth in a letter to me written in 1891. Right here I might say that our company had on exhibition at the Franklin Institute Electrical Exhibition held at Philadelphia, Pa., in 1884, a regenerating motor dynamo, or as it may be called, a constant current transformer. This machine has been lately perfected by making it automatic, so that it can be located anywhere on a serious high tension circuit or as many of them as may be required, whether for power or for lighting purposes or both. They can be wound for any potential, 500 or 1,000 volts or over.

For long distance railroading, the current can be obtained from any generating station (within say 50 miles) from automatic arc dynamos, using for a circuit comparatively small sized wires and pressure varying according to distance. With an automatic series wound dynamo at the power station and with corresponding automatic motor at the sub station, we have a simple and economic method of long distance transmission of power whether for railroad or stationary motors or for lighting purposes. The regenerator wound to deliver required pressure for trolley line can be located at convenient stations along the line. The machines will consist in a dynamo having an incandescent armature on one end and an arc armature with its regulator on the other. The direction of rotation to be reversed from that of regular arc practice (this is so that the arc or motor armature may cut down in the proper way for motors, i. e., in direction opposite to rotation without having to alter position of movement regulator). Field to be shunt of the low tension armature. Arc armature to be in circuit with source of supply. The field (or at least that part on the arc end) comes from the low tension armature and is dependent for its strength upon the speed of machine, and that this field depending on speed, operates the brushes of the arc armature so as to make it run faster or slower according as field changes. It will be seen that this arrangement must keep field and potential for the low tension armature constant, while the position of brushes on arc vary to meet the load. With water power at one end with automatic dynamo, and with corresponding automatic motor at the other end, you have the problem solved of long distance transmission of power. The field of your motors to be fed from small generators belted from motor so that its speed depends on speed of motor. You will see that in this you have constant speed from constant current circuit. Should you wish to operate a small electric car over long distance (say up to 50 miles on each side of generating plant), it can be done in same line as above. In this case the small field generater is in the control of motor man, and he, by changing the position of brushes, changes speed, and by reversing brushes of small field generator he can change direction of car. While position of brushes of field generator remains unchanged, speed of car is constant, whether going up or down grade, if current of supply is kept constant. In short the new automatic dynamo and regenerator solves the question of series transmission of power with constant current. By a block or sectional trolley system, as many trains may be operated as wished. In this case also, a motor dynamo is to be placed in each train precisely as last referred to. Some of my hearers may think such a method a little far fetched but it is certainly as practical and in as fully developed shape as any other methods proposed, and it would not be nearly as difficult to secure high insulation. I certainly desire as much as others to see the success of the alternating plan and the investigations and suggestions of all are necessary to reach the end in view. The field for the electric road is immense, and if the apparatus of the present central stations can be utilized, so much the better for them.

Within the last few days Dr. Wellington Adams has brought out his scheme for an electric railroad between St. Louis and Chicago, 250 odd miles this is a move in the right direction. Railroad corporations cannot be led to take notice of the electric system until they find their custom disappearing, which very quickly brings them to time. Some of the short lines of steam roads already equipped electrically have been forced to do so through competing electric lines. The electric system for through railroads, once it gets a start will without doubt cause the removal of most of the present locomotives within the next 15 years, and the factors that are going to accomplish this end are high pressure whether with direct alternating or rotary currents and gearless motors for either system. Results will be safety to passengers and train men, also saving of much time in transit, as 80 to 100 miles will be easy work, due care being taken to keep the train on the track or we shall have a flying machine before we are aware of it.

Mr. Thomson: I would just like to ask Mr. Johnson if he is not mistaken about the originator of the electric railway in Canada. I understood it was Mr. Van DePoele who made the first successful experiment in operating an electric railway in Canada.

The President. Mr. Van DePoele was the first successful operator of the electric railway in Canada. He was the inventor of the trolley system. The Ball machine was placed on the track at the Industrial Exposition in 1883 and it ran down hill and it would run no other way. This is the true position of affairs.

Mr. Johnson. I have possibly made a mistake in making that statement. I have it on the best authority that the Ball car operated but I only mention this as showing one of the first experiments of electric railroading which was brought to the notice of the public in Canada, not representing it as a success, although I think it served its purpose.

Moved by Mr. Dunstan, that a vote of thanks be tendered to Mr. Johnson for his valuable paper. Carried.

The President: We will now hear the Report of the Committee on the Revision of the Constitution and By-Laws.

Mr. Whiting: Regarding the privilege of members speaking twice on a subject, I think that while the By-laws are being revised it would be well to take that into consideration. It would be a pity for a member who had spoken to a question to be debarred from speaking again, if something new were to come up in his memory. I think it would not be well to allow Parliamentary rule to interfere with free discussion.

The President: We have power to alter this if it is the wish of the Association.

Mr. Dunstan. In accordance with "Article 9" of our Constitution, I move that consent be given for the consideration of these proposed changes. Mr. Whiting seconded. Carried.

Mr. Dunstan: When will the annual meeting be if we hold a meeting in January of next year and again in September? which will be the annual meeting of 1893 when the election of officers will take place?

Mr. Johnson. In all Associations such as this, it is usual to have a fixed date for the annual convention, and then if anything turns up to prevent the holding of it on that date, the meeting can be changed until a desirable date. We should have a fixed date for the holding of our annual convention.

Mr. Dunstan: The Executive I understand have not the fixing of the date of the Convention at all. The date and place of the next Convention is fixed by this present Convention, and has already been fixed to take place in January next, in the city of Toronto. A desirable day of the month is to be chosen later. For instance, if it was to be held in September, we would want to make it fit in with the Exposition. I do not think it would be well to decide on any particular day of the month. The Executive have no power to prevent the annual meeting.

The Chairman: We will now hear from the Committee on Amendments to the Constitution and By-laws.

"Your Committee on "Revision of Constitution and By laws" beg to submit the following

REPORT.

In Article 1. Strike out the word "named" and insert "known as," making the article read: "This organization shall be known as the Canadian Electrical Association.

Article 2. Objects—After the word "enterprise" on 5th line, add, "and for the discussion and interchange of opinion among its members," making the article read: "The objects of this Association shall be to foster and encourage the science of electricity and promote the interests of those engaged in any electrical enterprise and for the discussion and interchange of opinion among its members."

Article 3. Membership—After the word "members," strike out "the former" and insert "by the term active members it is meant." After the word "Association" in the 7th line, strike out the words "and the latter" and insert, "by the term Associate members is meant." This will make Article 3 read: "The Association shall consist of active and associate members. By the term "active members" it is meant to include all persons actively engaged in electrical business, and who shall be entitled to vote at all meetings of the Association, and by the term "associate members" is meant those interested or actively engaged in any electrical pursuit, and who shall be entitled to attend all meetings except those of the Executive, and take part in all discussions, but shall not be entitled to vote or be eligible to office. Honorary members may be elected by a two-thirds vote of the Association."

Article 4. Officers—In the third line, strike out the words "who may be one person" and insert after the word "quorum" on the 7th line, "The offices of Secretary and Treasurer may be held by one person," which makes Article 4 read. "The officers shall consist of a President, two Vice-Presidents, Secretary and Treasurer and an Executive Committee consisting of nine members, together with the President and Vice-Presidents, five of whom shall form a quorum. The offices of Secretary and Treasurer may be held by one person."

Article 5. Fees. Insert the word "annual" after the word "the" in the first line, making this Article read: "The Annual fees shall be, for Active members, $5; Associate members, $2; payable in advance."

Article 6. Election of Officers. In the 5th line, strike out the word "meeting" and insert "annual session," which will

make Article 6 read: "All officers and the Executive Committee shall be elected by ballot at a general meeting of the Association, and shall hold office until the close of the session at which their successors are elected, such successors to be elected at the first general meeting after the expiry of one year from the date of the previous election. Vacancies in office shall be filled by the Executive Committee to cover the term until the next annual meeting of the Association."

Article 7. To remain as it is.

Article 8. Voting—After the word "officers" in the 4th line insert "and these shall be limited to not more than one proxy vote to one member" making the article read: "Voting by proxy shall not be allowed at any of its Committees except for the purpose of the election of officers and these shall be limited to not more than one proxy vote to one member."

Article 9. To remain as it is.

Article 10. In the first line after the word "ten" insert the word "active" making the article read: "Ten Active members of this Association shall be a quorum, for the transaction of business."

BY-LAWS.

Section 1. To remain as it is.

Section 2. Duties of the Vice-Presidents: In the first line after the word "or" insert, "in his absence the" "The first, or in his absence the second Vice-President shall act in the absence of the President."

Sections 3, 4 and 5. To remain as they are.

Section 6. Dues—In the first line insert the word "annually" after the word "payable," making the article read: "Dues shall be payable annually on the first June in advance. Members in arrears for dues shall not exercise the privileges of membership."

Section 7. To remain as it is.

Your Committee in making this report do not by any means think that the Constitution and By-laws are what they should be, but owing to the limited time at their disposal for making the changes it was impossible to make any changes excepting those essential for the governing of the Association for the coming year. There are many points which your Committee desired to elaborate, but taking into consideration that the time for the Convention is fully taken up, and that it would be unwise to provoke any long discussions at the present time, your Committee would recommend that the President appoint a Committee of 3 or 5 who will draft for us, during the coming year, a Constitution and set of By-laws which shall in their judgment cover what is required. This Committee to make its report to the Executive Committee at least 3 months before our next annual session, and that a copy of their deliberations be sent to each of the members in circular form, by the Secretary, at least 3 months before the annual session. This will enable all members to become familiar with the proposed changes and place them in a position to discuss them fairly, intelligently and impartially when they are brought up for disussion and action. In the three months intervening between the sending out of the copy of their report and the annual session, Mr. Mortimer has kindly consented to allow us the use of the pages of the CANADIAN ELECTRICAL NEWS for such discussions and enquiries as the members may see fit to make. Among the changes and additions to the Constitution we would recommend for consideration, are the manner in which the place shall be selected for our annual meetings; the payment of the Executive officers' expenses when on business of the Association; the manner in which our Secretary-Treasurer shall be remunerated; the appointment of a sub or advisory board to be chosen from among members of the Executive Committee who shall act under direction of said Committee in carrying out the details of the Association business where it is not considered advisable to bring together a full meeting of the Execntive; the advisability of electing 3 members of the Executive Committee for one term, 3 for a two year term, and 3 for a three year term, and following this election that at each annual meeting only three of the Executive Committee be elected for a term of three years. This would always leave a majority of the Committee in touch with the past year's work, and might expedite the transaction of business.

We would also recommend for consideration, that the offices of President, 1st and 2nd Vice Presidents, should not be held for two terms consecutively by one person. This would not debar the said one person from eligibility of again holding one of these offices after the expiration of one term.

The Report of the Committee on the Revision of Constitution and By-laws, was accepted as read, and the afternoon session adjourned.

THE EVENING AT THE BEACH.

The evening proceedings were of a most enjoyable nature. The delegates were entertained at a luncheon at the Beach, and a large number of excursionists went down by train and boat to enjoy the music given by the Thirteenth Battalion Band. Every car of the long train that left the King street station at 8 o'clock was filled. On arriving at the Beach, the band took up a position immediately opposite the dining hall of the Ocean House where the finest selections could be heard to the best advantage, alike by those who were on the Beach and by the merry party that gathered around the well supplied tables. The electricians and their wives, sisters and daughters—there was a fair representation of ladies—sat down at 9 o'clock, and after a few words of welcome had been said by Mr. D. Thomson, chairman, and Mr. R. Æ. Kennedy, vice-chairman, proceeded to the enjoyment of the following bill of fare:

Spiced beef.
(Current style.)

Sugar-cured ham.
(H-ampere Meater.)

Jellied tongue
(Watt's that?)

Roast turkey.
(Electrocuted.)

Veal and ham pie.
(High resistance.)

Chicken salad.
(Served in coulombs.)

Lettuce salad.
(Low resistance.)

Rolls and butter.
(Receiver and transmitter.)

Crosse & Blackwell's pickles.
(Long-distance line.)

Lea & Perrin's sauce.
(Cabled across.)

Sliced tomatoes.
(1 1000 ampere, 100 volts.)

Sliced cucumbers.
(10 ampere at 5,000 volts.)

Charlotte russe.
(Duplex quality.)

Wine jelly.
(20 ohm relay.)

Vanilla ice cream.
(Quadruplex.)

Fancy cakes.
(97 per cent pure.)

Lady fingers.
(Mild flashes.)

Macaroons.
(Ceiling rosettes.)

Strawberries and cream.
(Circular mills.)

Bananas.
(Long arc.).

Oranges.
(Ball lightning.)

Raisins
(Pole line work.)

Nuts.
(Keyless sockets.)

Cheese.
(10 H. P. motor.)

Crackers.
(Porcelain cut-outs.)

Coffee.
(A burn out.)

The after dinner proceedings were brief but decidedly pleasant. In calling the assembly to order Chairman Thomson announced that Mr. A. B. Smith, of Toronto, had something to say.

Mr. Smith, on rising, said: A very pleasant duty has fallen to me to-night. It am sure it is a matter of congratulation that our first convention has been such a success up to date, and I think I can safely speak for the future proceedings. A great deal depends always upon the leading spirits—the brains at the head of any organization—and we have officers at our head of whom we may well be proud. This morning a movement was started to show our appreciation of our presiding officer, and so rapidly did it spread that to night I hold in my hand a handsome non magnetic gold watch, which I take pleasure in presenting to our esteemed President, Mr. J. J. Wright. (Loud applause.)

After the company had sung "For He's a Jolly Good Fellow," Mr. R. Æ. Kennedy, President of the Hamilton Electric Light and Power Company, made a few remarks, re-echoing the sentiment expressed by Mr. Smith.

Mr. Wright replied briefly. He said the convention had been a surprise to him in more ways than one. He had been surprised as well as delighted to find such a representative gathering when the convention opened, and after other surprises the great one came in the event which had just taken place. He heartily thanked the members of the Association for their appreciation of his humble efforts and for the manner in which they had shown it.

Mr. John Hunt, of London, proposed the toast of the Hamilton Electric Light and Power Company, referring to the splendid manner in which the directors had treated the delegates in throwing open their new power house to them and in helping to entertain them.

President Kennedy suitably responded.

THIRD DAY.

The last session of the Convention assembled at 10 a. m. when President Wright read the following telegram:

BUFFALO, N. Y., June 15th, 1892.

Regret can not accept your kind invitation to meet you and my Canadian friends at your dinner to night. Please accept my best wishes for the prosperity of your Association. May you thrive like a green bay tree.

C. R. HUNTLEY.

The President. Mr. Wadland, on account of very pressing business engagements, has been unable to complete his paper and in view of this let me introduce to you Mr. A. B. Smith' Toronto, who will address you on the subject of "Safe-Wiring."

SAFE WIRING.

In presenting the few remarks I shall make under the head of safe wiring, it is not my intention to enter into a lengthy description of what may be termed mechanically safe construction. It would be impossible to do this, as the conditions to be met in general work are so diverse. In fact it may be said that no two installations in existence are exactly alike. On a few points there are some rules that apply invariably, but I intend rather to look at it generally from a "moral" standpoint. For instance, it is well known that dampness is a mortal enemy to successful results. To guard against this, it is necessary that every man engaged in an installation, from the highest and best paid men to the mere laborer, should conscientiously do his part. I need scarcely point out to you that the interests of the electric lighting fraternity and that of the insurance companies are identical. A failure to get good results or a risk of serious loss, is a detriment to one as well as the other I lay great stress on the importance of conscientious work by individuals rather than on the laying down of rigid rules. It is impossible to make a hard and fast rule to cover every minute detail of an installation, and therefore without this dependence on the honesty of the workman very little in the way of safe guards can be actually accomplished. Safe wiring is more a matter of men and material than of method.

I know of no business on the face of the earth where the public and the insurance companies have to depend more on the individual reliability of the workmen than on this one. On account of the immediate concealment of work almost before it is completed, opportunities to do negligent work are

abundantly offered, so that it requires more than ordinary conscientiousness in men engaged in the work, and circumspection in its oversight.

While in a few instances much trouble and annoyance is caused by unskilled electric men, who have an idea they possess more knowledge than can be carried by one single brain, still there is a source of trouble to electric light people and the underwriters which is most serious. What I refer to is, the ignorant and clumsy interference with good wiring by plumbers, steam and gas fitters and other pipe men, and our friend the ubiquitous bell hanger. These individuals, with supreme contempt of others' rights, or through ignorance, not realizing the danger of their practices, are constantly making mischief. Nine cases out of ten, where trouble is located in an otherwise perfect piece of work, these mates are to blame. It is a common occurrence to find gas or water pipes resting upon electric wires, these pipes or other iron work, having been placed in position after the electrical work has been completed. Furthermore, there is a certain class of men, especially gas fitters, who really have an idea that they do know something about electricity, and who believe that because wires are sometimes run in pipes, that it is their special vocation to do it. It is true in this as in other matters, that a little knowledge is a dangerous thing. Unfortunately the public have no protection against these half baked electricians, and it is against this class of work that the insurance companies have to fight their greatest battles. Serious loss has only been averted by constant and skillful supervision, and were it not so, the loss from this source would be vastly greater.

There are only one or two points in reference to construction work of general application which I would like to refer to. One of these is the use of cleat work in cellars, and other places liable to dampness, unless a sufficiently protected wire with a superior insulation to ordinary weatherproof is used, in fact I would much prefer to prohibit absolutely the use of cleats altogether in places liable to the slightest dampness.

Also a word of warning will not be out of place, against the indiscriminate use of porcelain knobs for outdoor purposes. These knobs are good and useful in their proper place, but the average lineman seems to imagine that porcelain is a panacea for all the evils that afflict a wire.

In closing, I desire to sincerely congratulate the members of the Association on the cordial relations now existing between the underwriters and the electrical fraternity. The future maintenance of this happy condition remains in your keeping. By employing none but thoroughly reliable men and using good materials, the present insignificant percentage of loss by fires of electric origin will be rendered still less.

Mr. Burran: Mr. Smith seems to think that the greatest trouble in the matter of safe-wiring, is in the men doing the work, and perhaps he is about right. Could there not be some scheme started to have the workmen pass an examination and certifying their ability to work properly, such as the engineers have. I think this is a thing which this Association might take up.

Mr. Kammerer: I think it would be a good idea for the Association to have these men pass an examination to see that they are thoroughly competent, and let every competent man be given a certificate. It would be a good thing for the central station people. They would then be guaranteed that the men they employed were capable of doing the work. And another thing in regard to wiring which I think Mr. Smith has gone into, and that is central station work. Too much care cannot be taken to have fire proof switch boards, and we cannot be too careful to have good insulation at all points. It costs a little more to put up insulated wire than naked wire, but makes a much better job.

Mr. Dunstan: I think, Mr. Chairman, that a great deal of the insulation that is used is not much better than no insulation at all. People get the idea that because insulation is used there is no danger, but they are mistaken; and I think that this Association should impress upon people that it is a wise policy to spend money for the very best material that can be obtained.

The President. Would a resolution appointing a Committee to investigate the matter meet your views? said Committee to pronounce on the advisability of putting employees through an examination on something like the same basis as the Canadian Association of Stationary Engineers. The Committee of course, would formulate some idea and report to the next meeting of the Association. Yet there is another point which should be considered: the Legislature is proposing a measure that nearly covers the same thing, and if we took any steps in the matter just now, it would look as if we were in a measure playing into their hands.

Mr. Dunstan. It is a matter which would have to be dealt with very carefully. We would have to have a copy of the Bill, to see the exact wording, as we would have to know just where we differ in its construction and draw a distinction between what we purpose to do and what they purpose to do.

Mr. Burran. What our President suggests is for the Committee to consider the advisability of the scheme, not to bring it into force.

Mr. Kammerer. It would be better to leave the matter in the hands of the Executive.

Mr. A. T. Smith. Is it the intention of this Committee to take into consideration the telephone linemen as well as the electric light linemen. We require safe wiring in the telephone business as well as the electric light.

The President. It is left in the hands of the Executive Committee to deal with it as they may see fit.

Mr Dunstan. Yesterday I voted against the resolution fixing the standard, on the ground that this Canadian Electrical Association had to deal with all the different branches of electricity, telegraph, telephone, electric light, etc. It was hardly in a position to deal with all the different branches of electric light alone. Or if a matter comes up in connection with the telephone business, which we considered and decided upon, I would not like to have it go before the country as the decision of the Canadian Electrical Association. When those matters come up which are thoroughly of a sectional character, they should be decided by those members of the Association interested in that particular line, who might form a section. For instance, if a question in connection with electric lighting is decided it would go out as the verdict of the Electric Light Section of the Canadian Electrical Association, and not of the whole Association, where a great many of the members know perhaps nothing about electric lighting. The same with the telephones and telegraph. I think we will have to face this question before we take any steps either in fixing a standard or about safe-wiring.

Mr. Burran: I think in a case like this, we should have an examination which would cover both points. A good telephone man should understand electric light wiring, and a good Electric Light man should find no difficulty in putting up telephone wire.

Mr. Dunstan: We must not forget that we have no power to say that this man has to pass an examination on this subject. We have to go to the Legislature, and I think we should leave this matter for the Executive Committee to consider. The difference between wiring for telephone purposes and wiring for electric light purposes is very great, and our opinions are not yet sufficiently formed to know exactly what is wanted. Let this be one of the things to be brought up later on.

The President. I think myself, that Mr. Campbell's idea would be impracticable. There are a large number of men who are perfectly skilled in electric light wiring and I think it would be hardly fair to debar them from working because they did not understand putting in a telephone. I think, therefore, with the vice president, that this business had better be left alone at present.

Mr. Dickinson: There does not seem to me, to be a great deal of difference between the two wirings. Take the outside construction work, electric light wires are run very similarly to telephone wires, and a man to be thoroughly competent should understand both methods of wiring.

Mr. Dunstan: You would not have a telephone man know at exactly what gauge the wire should be for an electric light current. I might mention that if Sections are formed, the electric light Section might take up matters of this kind for electric light purposes, and the same for the telephone, but these two branches should not be included in the same examination. If we form Sections they can be taken up separately.

Mr. Dickinson: I quite agree with you in that respect, and I would have the electric light portion particularly pass a very strict examination.

Mr. Whiting. It appears to me that if there is to be a Section at all, the Section should be to divide the men, one part of the men to do all inside wiring and the other part of the men to do all outside wiring. They should all pass the same examination as regards the relative position of the line wires.

Mr. Campbell: I think the matter has been discussed long enough, and we had better leave it to the Executive to consider.

Mr. Thomson. I move a vote of thanks be tendered to Mr. Smith by the convention, for his interesting paper. Carried.

The Vice-President, K. J. Dunstan, then took the chair.

Mr. Dunstan: I will now ask Mr. Wright, our President, to read a paper prepared by Mr. Parker, of Owen Sound. Mr. Parker has been unable to be with us, but has sent his paper to be read by Mr. Wright.

FINANCIAL ASPECTS OF ELECTRIC LIGHTING.

It is true that the science of electricity as applied to electric lighting may be said to be yet in its infancy. We must however acknowledge, that as an infant, it has early assumed wonderful proportions, an infant whose energies have been rapidly developed, and practically applied to the creation of light.

A dozen years ago, I question if there was more than one installation in Canada and not many in the United States. To-day, how changed! Hundreds of plants costing millions of dollars have been installed in the great Republic to the south of us, and our own Canada has employed this brilliant illuminant in all of its cities, most of its towns, and many of its villages.

The new world may be said to have completely distanced the old, in its method of street lighting. Germany, France, and Switzerland (which I had the pleasure of visiting last summer) have employed the system of arc lighting to some extent in their public places and on a few of their streets. Great Britain has been slow to move in the matter of arc lighting. London, while adhering to its murky gas for its streets, is rapidly introducing incandescent lighting for its shops and public buildings.

It is extremely gratifying to look back and realize in how short a time we have emerged from Egyptian darkness into a light equalling Luna's softest rays, and coping with the brilliant mid-day sun, at the same time the question will naturally present itself, does it pay as a commercial investment, do the parties who have invested their millions in giving the public this brilliant illuminant receive an adequate return for such investments? I am afraid the results prove otherwise. Mistakes were undoubtedly made and money foolishly squandered in the initiation of many plants, which if the work had to be done over again to-day, would not be repeated; at the same time, even with the knowledge that experience has taught us, are we realizing or can we realise, at present prices, the golden harvest which the manufacturer, or rather his agent, pictured in such glowing colors? Such has not been my experience, and desiring to ascertain how my brethren in other parts of the country had fared, I, a few months ago, addressed to them certain questions from which I gathered that out of 25 stations with a capital of about one million dollars, fourteen of them had paid dividends (in many instances not until the third year) of from 4% to 8%, while the remaining eleven had not paid one cent of a dividend and some of them had not met expenses. Of these 25 plants, 13 with a capital of over $700,000 were using steam as their motive power, of which only five paid any dividend. Three were run partly by water and partly by steam, of which two paid a dividend, nine were run by water, and eight of them paid dividends. From these returns I gathered that out of a capital of nearly one million dollars, dividends had been declared on only about $400,000, while the investors of the remaining $600,000 had not received one cent of interest for their money, and this state of things had existed from one to three years. In analyzing these returns I found that the small plants run by steam paying a dividend were getting for their arc lights (of from 1,200 to 2,000 c.p.) twenty five cents for midnight, and about forty cents per all night lights, while the plants run by water power could declare a profit on prices ranging from 10% to 12½% less.

More recently my friend, Mr. Yule, of Guelph, made similar results. He found that out of 52 stations only 30 were paying any dividend, of which 15 were associated with other businesses, carried on during the day, and the

lamps shut off at midnight, the remaining 22 were not realizing any profit, and some were eating up their capital. Of the 30 dividend paying ones,

Seven were using a 9 to 10 ampere current.

25	"	"	8	"	"
1	"	"	6	"	"
7	"	"	4	"	"

Of the 22 profitless plants,

Four were using a 9 to 10 ampere current,

11	"	"	8	"	"
4	"	"	6	"	"
3	"	"	4	"	"

Appended to some of the enquiry sheets were replies not very complimentary to electric lighting as a profitable investment. One person who had been running a steam plant of 29 lights (8 amp) at 35 cents per night for 300 all nights in the year, says in answer to the question, was it a paying investment, No electric light apparatus cost too much, more than double what it is worth. There's no money for the central station man in it." Another with water power plant at 22 lights to 1.30 a.m. of 284 nights, at $64 per year, says, "No- if we had our money out of the concern some one else could run it. Another rather laconically says, No never knew of any plant making money, expenses, depreciation in plant, etc., consume the whole returns. Sell gas at $1.50 to $2 per M, and short circuit your electric light plant. Similar remarks were made by many more of the 52 who answered the questions, so much so that I am led to the conclusion that to many who have engaged in the electric light business it has not proved the Eldorado which their imagination so fondly pictured. Such a state of affairs is unfortunate; surely a remedy can be found.

It is quite evident that the price received for the quality and quantity of light supplied is entirely inadequate to the outlay necessary for the production of such light, and the sooner this is understood by municipal corporations and others requiring the lights, the sooner will the business of electric lighting be placed on a sound commercial basis. While discountenancing any attempt at forming monopolies, still I think the time has arrived when there should be a closer union of the central station men as well as the manufacturers, whereby the senseless and ruinous competition so frequently engaged in, may be avoided, and contracts obtained at a fair remuneration. In cities using large numbers of lights and employing the plants 365 nights in the year, the present prices may afford fair profits, but not enough, I am afraid, to provide a sinking fund to meet the necessary depreciation in plant. A field is, however, opening up for city plants which is not available to those situated in small towns and villages. The development of the transmission of electricity for power has within the last few years made considerable progress, and its use may fairly be counted upon in the near future in displacing horse power on street railways, and the motor run by electric light plants during the day may find employment in a thousand and one places where hitherto steam, horse or man power has been employed.

These advantages do not, however, and will not for years to come, extend to our town and village plants. Here we find installations of from 15 to 30 arc lamps operated by steam power, running to midnight, and employed not probably more than an average of *six hours* out of twenty-four and only getting from 15c. to 20c. per lamp per night for 300 nights in the year.

It does not require the wisdom of a Solomon to recognize the fact that no dividends can be expected in such cases, and that it is only a matter of time and a very short time at that, when either better prices must be obtained or the plants shut down.

Even in the neighbouring republic, where much better prices are obtained, we find that as a commercial investment it has not met with that success which would warrant capitalists in again investing in like enterprises.

Mr. Wiman in his paper read before the Buffalo Convention of the National Electric Light Association of the United States, quotes as follows from a western correspondent:

"I am the president and manager of five electric light companies, but three of which have actually survived financial pressure and bankruptcy. One of these three with a capital of $150,000 fell behind nearly $100,000 in seven years, and last year the stock holders voluntarily came up with an assessment of $60,000 to save it from bankruptcy. Another, working under the strictest economy, is but barely able to meet operating expenses. The other paying no salary to its executive officers, after 18 months operation declared a dividend of 3%." The same correspondent pertinently remarks, "books can be kept so as to show an earning, but this in many cases at the expense of a constantly depreciating capital investment."

From this, and similar information, I gather that our electric light brethren in the States, even with big prices, are not doing a great deal better in the way of paying dividends than we in Canada are.

I submit a few of the prices obtained on the other side, from an excellent table prepared early in 1892, by Mr. Chas. Baillairge, Engineer of the City of Quebec. The prices are reduced to the basis of all night, and every night in the year.

NAME OF CITY.	NO. OF LIGHTS.	PRICE PER NIGHT.
Albany, N. Y.	600	43c.
Boston, Mass.	1125	40c.
Buffalo, N. Y.	1700	40c.
Detroit, Mich.	827	38½c.
Milwaukee, Wis.	650	31¼c.
Minneapolis, Minn.	500	48½c.
New Orleans.	75	54¾c.
New York, several companies, about	2000	40 to 60c.
Philadelphia, several companies, about	1560	30 to 55c.
Rochester, N. Y.	1274	27c.
San Francisco, Cal.	125	$1.10
Syracuse, N. Y.	522	30c.
Washington, D. C.	206	61 1/5c.

The following prices of Canadian plants, I selected from the answers I received to enquires made:

CITIES AND TOWNS.	NO. LAMPS.	PRICE PER NIGHT reduced to a basis of all night and 365 nights.
Brockville	29	35c.
Brantford	29	28¾c.
Belleville	41	28¾c.
Chatham	49	33c.
Hamilton	310	28c.
Kingston	—	28c.
London	275	28½c.
Ottawa	300	30c.
Owen Sound	30	24⅝c.
Quebec	308	22c.
Sherbrooke	52	34c.
St. Catharines	62	30c.
St. John, N. B.	220	25½c.
St. John, Nfd.	43	42⅝c.
St. Thomas	29	28c.
Toronto	900 to 1,000	29¼c.
Winnipeg	100	75c.

While not desiring to be considered a pessimist in the matter of electric lighting, I think that the most sanguine will acknowledge that the present condition of affairs cannot last for any length of time. A remedy must be found either in better prices or less cost. The sooner this remedy is found and applied the better for those whose capital is locked up in this business. We ask no bonanza, but we do contend that capital invested in electric lighting should be as profitable as that employed in other legitimate enterprises. I have very imperfectly brought this important matter before the convention, but I trust that, however imperfect my work may be, it will be the means of provoking discussion from those who have given the subject greater thought and time than I have, and who may be able to throw out suggestions which may prove valuable to those struggling under no dividends. In conclusion, we may I think be permitted to gather consolation from the concluding remarks of Professor J. Houston, who in a lecture recently delivered before the Department of Electricity, at Brooklyn, N. Y., says. "I know how dangerous it is, even under the most favorable circumstances, to assume the position of a prophet, yet I desire to venture a few suggestions concerning what seems to me electric science has in store for the human race in the near future."

1. A cheaper means for the production of electricity than is now obtainable by burning coal for the purpose of driving a steam engine, which on its part turns a dynamo electric machine. This invention will probably be found in some improvement in thermo-electricity, whereby coal will be burnt directly to produce electricity, and not through the double intervention of the steam engine and dynamo.

2. The entire replacement of the steam engine by the electric motor.

* * *

3. The replacing of the electric light of to-day, with its preponderance of useless and injurious heat energy, by some means of electrically produced light, which shall possess a smaller proportion of the useless heat rays and a larger proportion of light rays. * * *

Mr. Dunstan: I am sure that paper should produce some discussion by electric light men.

Mr. Campbell: It is the greatest wonder to me, how these small electric light plants pay expenses. If they ran the electric light business the same as any other business, no doubt they would make money. The best Gas Company in the world cannot do free piping. You go into a city where you have to do free house wiring and it is an utter impossibility to make money. If these electric light men would do as gas companies do, take it to the door and make the user pay the rest, there might be more money made.

Mr. Thomson: I think Mr. Campbell's experience must have been in a town or city where no gas is in existence. He will find if he wants to do electric lighting where there is a gas company, he has got to do free wiring. since we have done free wiring in Hamilton, we have added 1500 lights to our number. The gas companies do not do free piping, but why? When gas started some years ago, there was no light in use but candles, but when electric light came, it had to take second place, and there are some people who will stick to gas because it is a little bit cheaper. Of course, if you go into a city where there is no gas, you can charge for your wiring. The reason, I think that so many plants cannot pay for themselves, is mismanagement. I move that Mr. Parker be accorded a vote of thanks for the paper he so kindly contributed, seconded by Mr. Carroll. Carried.

Mr. Dunstan moved, seconded by Mr. Thomson, "That this Association pledges itself to do everything in its power to secure a large and satisfactory exhibit of Canadian manufactures of electrical plant, at the World's Fair, to be held in Chicago next year."

Mr. Dunstan. You all heard what the Commissioner said yesterday that this Association should do all in its power to aid the Commissioners in their work, by making a thoroughly satisfactory exhibit of Canadian manufactures in the electric line, at the exhibition next year.

The resolution was unanimously adopted.

Moved by Mr. Dunstan, seconded by Mr. Carroll, "That a hearty vote of thanks be tendered the Board of Trade, Hamilton, for their kindness in placing their Board room at the disposal of this Association, also to express its indebtedness to the courtesy and assistance of Mr. C. R. Smith, the Secretary of that Board." Carried.

Moved by Mr. Campbell, seconded by Mr. Thomson, "That the CANADIAN ELECTRICAL NEWS be recognized as the official organ of the Canadian Electrical Association. Carried.

Mr. Mortimer. On behalf of the CANADIAN ELECTRICAL NEWS, I beg to express my sincere thanks for this expression of regard for the paper. We will only be too glad to do all in our power to assist in any way in promoting the interests of this Association.

Mr. Black. Before the Convention closes, I would like to make a suggestion. It has occurred to me, that in large centres, like Toronto, Hamilton and Montreal, where members can be got together easily, we might have a local Association, meeting monthly or otherwise. I was astonished to find so many Hamilton men in this Association, and I think we have facilities here for a good local Association. The work of the Canadian Association would be helped in every way, and I think that those who took part in the meetings would be benefitted thereby. I believe it is a good idea to meet together and discuss matters relating to electricity.

Moved by Mr. Thomson, seconded by Mr. Carroll, that a vote of thanks of the Association be accorded the press, and particularly the Hamilton press, for the very efficient manner in which they have reported the proceedings of this Convention. Carried.

Moved by Mr. Edkins, seconded by Mr. Carroll, that the thanks of this Association be tendered the Hamilton Electric Light and Power Company, the Bell Telephone Company and the Great North Western Telegraph Company for the manner in which they have contributed towards the expenses and entertainment of the Convention. Carried.

Mr. Dunstan: Before this meeting adjourns, I will move a vote of thanks to our Secretary, Mr. Mortimer, for the time and labor he has spent on this Association. We all know that a great deal of time and trouble must necessarily follow the formation of a Society of this kind, and both of these, also the columns of the ELECTRICAL NEWS, Mr. Mortimer has kindly placed at our disposal. The paper has been a very great assistance to us. I think as the last act of this Association, we should tender to him a very hearty vote of thanks. Carried.

Mr. Mortimer: I thank you very kindly for this vote of thanks. I may say, that I feel amply repaid for anything I have done for this Association by the very satisfactory manner in which everything has passed off at this Convention. I feel that this Association is bound to be a success.

Mr. Kammerer: As there does not appear to be any more business before the convention, I move that we adjourn until next January, the day of the month to be fixed by the Executive Committee. Carried.

President: I declare this Convention adjourned, until next January.

After the close of the Convention, the delegates, accompanied by their lady friends enjoyed a drive to various points of interest in the city.

NOTES.

The Royal Electric Co. and the Eugene Phillips Electrical Works, of Montreal, occupied a parlor of the Royal, with a display of their goods.

SPARKS.

At the annual meeting of the Chaudiere Electric Light Co. the officers were re-elected.

Mr. John Langton, Superintendent of the Edison Works at Peterborough, has been succeeded by Mr. Andrews, while Mr. Fair has succeeded Col. Francis as auditor. It is reported that Mr. Langton will engage in business in Toronto as an electrical engineer.

Some prominent business men of Montreal met a few days ago, for the purpose of organizing a new telephone company. Messrs. F. X Moisan was elected temporary chairman, and after some discussion a board of provisional directors was elected as follows Messrs. J S. McDougall, Lucien Huot, I. M. Marcotte, F. X Moisan, O Vanier Joseph Archambalt C. J. Beauchemin, Edward Dagenais and H M Tannell, the Canadian agent of the Edison General Electric company It was decided to call the new company the Merchants Telephone Company, with a capital stock of $500,000 in shares of $25 each. It was also decided that the rates for telephones should not be over $25 per annum, and, if possible, less. The provisional directors will meet in the near future to organize the company and secure a charter

TRADE NOTES.

The Canadian Mineral Wool Co. publish a notice in our advertising pages warning persons against attempting to infringe upon their patents, and citing the judgments of the Courts in their favor in previous actions for infringement.

The Waterous Company shipped a car load of 28,000 lbs. of pulleys and shafting to the Kingston Works last week, and have received from Hunt Bros., of London, a fifth order for two 62x15 pulleys on a double driver, pulleys to be 2 inches apart, and to be got into a space of 36½ inches.

PUBLICATIONS.

The eleventh annual issue of J. A. Berly's *Universal Electrical Directory*, for a copy of which we are indebted to the publisher, shows the rapid increase of all electrical industries and the numerous subsidiary trades connected therewith. There is an increase of 65 pages over the 1891 edition; the 1892 book contains 200 pages of new matter. The book is a very useful one to all those who are engaged as electrical and machanical engineers, manufacturers, traders, and contractors.

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PERSONAL.

On the 11th of June the employees of the electrical supply firm of T. W. Ness, of Montreal, presented Mr. Wm. B. Shaw, electrician, with an address and a handsomely engraved gold locket as a token of their esteem on the occasion of his retirement from the service of the firm. Mr. Shaw carries with him to his new sphere of action the best wishes of his old associates.

SPARKS.

The Royal Electric Co.'s new buildings now nearing completion will cost about $100,000. The Company are seeking legislation to enable them to increase their capital stock to $1,000,000.

The National Electric Light Association whose proceedings provide so many excellent papers, have as a badge the well-known formula $C=\frac{E}{R}$. In view of the Thomson-Houston-Edison combination and the proposed amalgamation of the Edison Association with the National, it is suggested that the badge now ought to be $E=\frac{T}{H}$.—*London Electrical Engineer.*

On Monday evening, June 13th, the Citizens' Telephone & Electric Co., (Ltd.) of Rat Portage Ont. held their first annual meeting and after adopting by-laws regulating the company, proceeded to elect their directors, which resulted as follows: Messrs Carmichael, Cameron, McCrossan, Gardner, Holmes, Rideout and McLeod. The officers are F. Gardner, President, H. Rideout, Vice-President; A. Carmichael, Treasurer, and J. A. McCrossan, Secretary and manager. The company intend utilizing a water power of 17 feet head, situated half a mile from the centre of the town, and putting in a plant of 1500 incandescent and 30 arc lights, as well as a telephone system. The new company are meeting with every assurance of success and already have contracts for a large number of lights.

Acting on the example of the electrical fraternity in this country, the Canadian representatives of the electrical companies have formed an association and issued a call for a convention, beginning June 14th, at Hamilton. * * * It will not be restricted to any particular line of electrical work, but will, on the contrary, endeavor to embrace all. There is really no reason why this should be a difficult matter. The several branches do not naturally conflict, though the policy of some companies in this country have caused controversies within the fraternity. The Canadian association has an excellent field, and if the men who have the direction of affairs will exert themselves in extending the scope of the organization, it may do much toward advancing and protecting the electrical interests in the Dominion. It is to be hoped that the new organization will start out well, and that its promoters will be men of judgment and ability. The Canadian Electrical Association has the best wishes of the electrical interests in this country.—*Western Electrician.*

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Charles H. Ivey, R. W. Puddicombe, A. M. Smart, J. B. Shuttleworth and Thomas S. Hobbs ask permission to build a trolley, or such other electric railway system as shall be decided or agreed upon at London, Ont.

A young man who has suddenly jumped into prominence in the financial and electrical world is A. O. Tate, T. A. Edison's chief aide and manager of the Edison Manufacturing Company. Mr. Tate came to New York from a small Canadian village about nine years ago.