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This Number of the **ELECTRICAL NEWS** contains a complete report of the Ninth Convention of the Canadian Electrical Association.

CANADIAN
ELECTRICAL NEWS
AND
ENGINEERING JOURNAL

OLD SERIES, VOL. XV - No. 7
NEW SERIES, VOL. IX - No. 7

JULY, 1899

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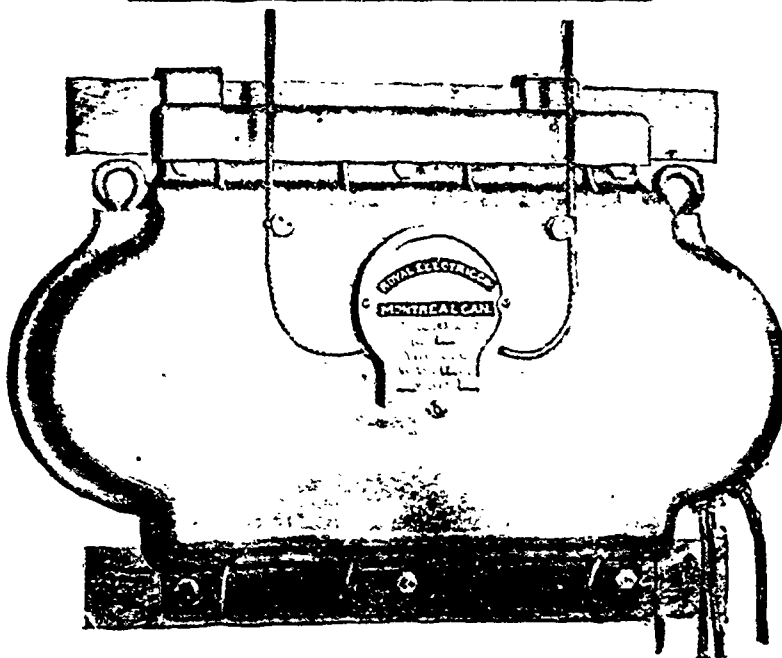
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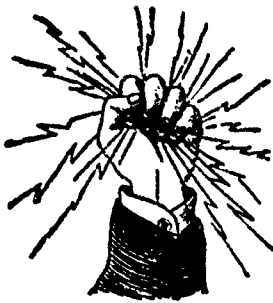
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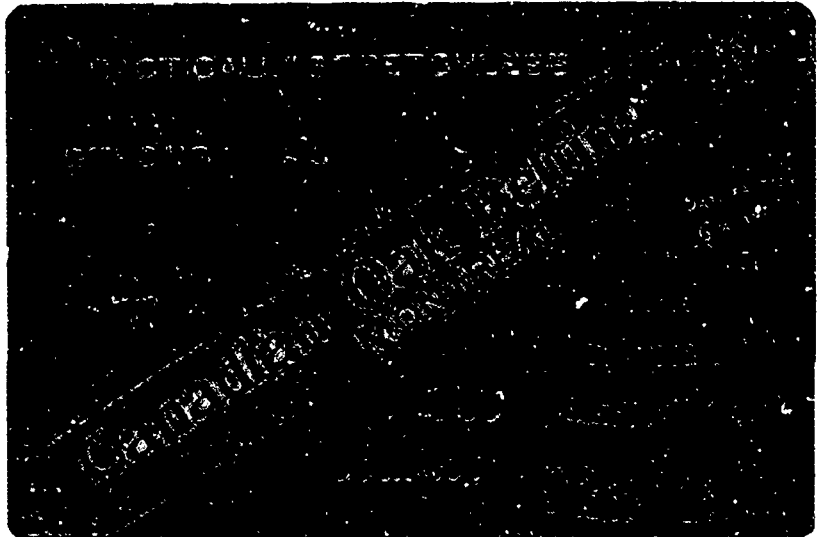
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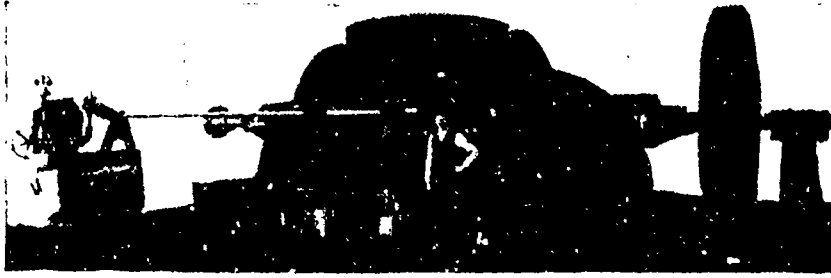
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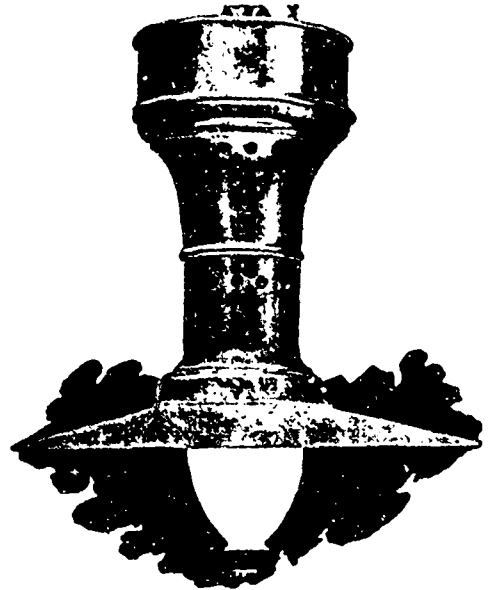
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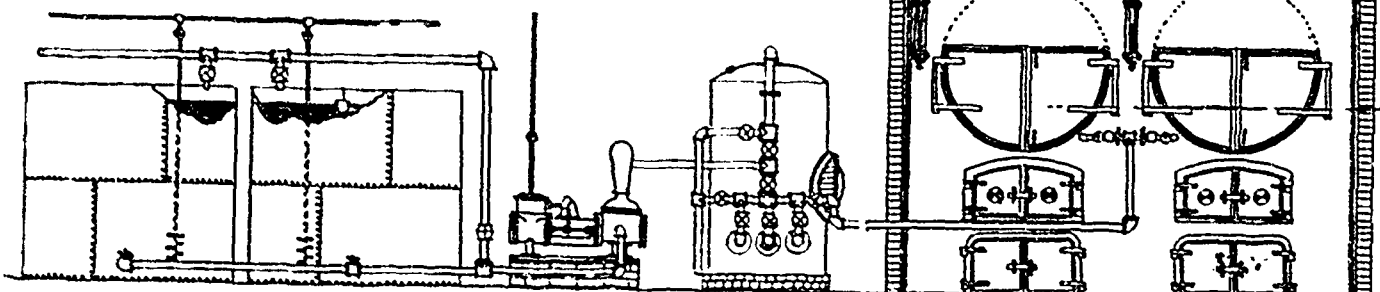
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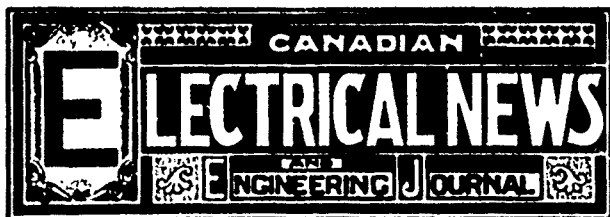
Vol. IX.

JULY, 1899

No. 7.



MEMBERS AND VISITORS, CANADIAN ELECTRICAL ASSOCIATION CONVENTION, HAMILTON, JUNE, 1899.



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EDITOR'S ANNOUNCEMENTS.

Correspondence is invited upon all topics legitimately coming within the scope of this journal.

The "**Canadian Electrical News**" has been appointed the official paper of the Canadian Electrical Association.

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The Canadian Electrical Association.

The ninth convention of this Association, held in Hamilton last month, was in every respect equal, and in some important particulars in advance of any previous meeting. The attendance was above the average, and was representative of the entire Dominion, from Charlotte-town in the east to Vancouver in the west. The headquarters of the Association was the New Royal Hotel, which has recently been remodelled and fitted up in a style of elegance not surpassed by any hotel in Canada. The weather after the first day was all that could be desired, and permitted full enjoyment of the excursions to various points of interest in the locality. The greatest credit is due to the local electrical companies and the City Council for the many courtesies extended to the visitors, and also for the attractive manner in which

the public buildings and parks were illuminated. On every hand there was manifest a desire to make the occasion one of the greatest interest and pleasure, and this desire was in the highest degree fulfilled. Hamilton on this occasion proved her right to the title of the "Ambitious City," and also to claim the new title of the "Electrical City," in consequence of being the terminus of the Cataract Power Company's lines, which, as Mayor Teetzel mentioned in his address of welcome, transmit a larger amount of current over a longer distance than is delivered to any other city east of the Mississippi river. In the Hamilton, Grimsby & Beamsville Electric Railway, the city has also the longest suburban electric railway in the Dominion. Coming back to the convention, it can be stated that the business sessions were marked by a deeper interest than on previous occasions. The value of the papers presented is evidenced by the pointed and lengthy discussions. There was a time in the history of the Association when it was a difficult matter to provoke discussion, and when papers had in a measure to be taken as read, because of the timidity of members in giving expression to their opinions. That time has now gone by. The electrical industry has, during the lifetime of the Association, made rapid advancement, and members of the Association have kept pace with the development of the industry and feel their ability to express their views, based upon their experience on subjects arising for discussion. It is unfortunate that time would not permit of the reading and discussion of all papers prepared for this convention, and it will no doubt be found necessary for the future to restrict to a greater extent than formerly the number of papers, and to exercise the greatest care in the selection of subjects, in order that the discussions may bring out information of the greatest value. One of the most important points brought out in the discussions was relative to the supplying of current for power purposes to manufacturers during the hours of least demand for current for lighting. Mr. Gossler made the important declaration that in Montreal the day load for power purposes has reached 75 per cent. of the night load for lighting, and that in a very short time it is expected the day and night loads will be equalized. The valuable work done by the Legislation Committee in having the Conmee Bill placed on the Statute Books of Ontario was appropriately recognized. There was a disposition shown to make greater use of the Association to further in a practical way the interests of all branches of the electrical industry. Mr. W. H. Browne made an excellent presiding officer, and contributed from a large personal experience much valuable information to the subjects under discussion. Mr. A. A. Dion, the President-elect, has been for several years one of the most active and useful members of the Association. Under his direction, and assisted by an excellent staff of associates, the prosperity and usefulness of the organization must continue to advance. The city of Ottawa was unanimously selected as the place of next meeting. Many members of the Association have pleasant recollections of the convention held in that city five years ago, and the success achieved on that occasion is the best possible guarantee that the next convention will be one of the highest interest.

The Chambers Electric Co., Truro, N.S., are taking out two of their return tubular boilers, replacing them with a 150 horse power "Mumford Improved" boiler, manufactured by the Robb Engineering Co.

CANADIAN ELECTRICAL ASSOCIATION

PROCEEDINGS OF THE NINTH CONVENTION



THE Ninth Convention of the Canadian Electrical Association was held in the New Royal Hotel in the City of Hamilton, Ont., on Wednesday, Thursday and Friday, June 28th, 29th and 30th, 1899.

The opening session was held on Wednesday at 2 o'clock p.m., the President, Mr. W. H. Browne, of Montreal, occupying the chair.

The following members were registered as being in attendance:

J. A. Kammerer, J. J. Wright, A. E. Payne, E. B. Biggar, A. B. Smith, C. H. Mortimer, A. P. Horner, J. J. Ashworth, J. W. Campbell, T. R. Rosebrugh, A. Esling, A. M. Wickens, A. C. McDonald, Geo. F. Haworth, W. H. Warrington, A. D. McArthur, Joseph Rogers, W. McCaffrey, J. Milne, Ed. McCormack, Toronto; P. G. Gossler, John Carroll, Wm. H. Browne, Alex. Barrie, W. J. Plews, F. H. Leonard, jr., C. H. Wright, Geo. H. Olney, D. W. McLaren, H. C. Ross, R. E. T. Pringle, Fred. Thomson, P. H. Hart, H. G. McLaren, C. A. Woolsley, E. A. Wallberg, Wm. T. Bonner, W. E. Gower, Montreal; Geo. Black, W. A. Turbayne, Gordon J. Henderson, W. G. Angus, E. Irving, F. W. Martin, H. R. Leyden, J. B. Griffith, A. J. Nelles, C. K. Green, H. W. Woodman, Hamilton; A. A. Dion, C. Thomson, W. Ahearn, jr., John Murphy, D. R. Street, W. W. Grant, Ormond Higman, Ottawa; E. E. Cary, G. A. Powell, D. H. Henderson, J. Sangster, St. Catharines, Ont.; J. E. Bilger, W. F. Green, Berlin, Ont.; Geo. W. Shand, W. Williams, Sarnia, Ont.; J. F. H. Wyse, C. H. Waterous, Brantford, Ont.; John E. Gayfer, Stephen Noxon, Ingersoll, Ont.; B. F. Reesor, Geo. Sadler, Lindsay, Ont.; A. A. Wright, W. H. Mackay, Renfrew, Ont.; John Yule, Guelph, Ont.; H. O. Fisk, Peterboro, Ont.; Geo. C. Hinton, Vancouver, B.C.; P. H. Hover, New York City; S. E. Fletcher, St. Johns, Que.; J. W. Purcell, Walkerville, Ont.; A. Sangster, Sherbrooke, Que.; L. A. Somers, Halifax, N.S.; Mark B. Thomas, Dundas, Ont.; James Anderson, Windsor, Ont.; John Phillip, Grand Valley, Ont.; J. Wardell, Charlottetown, P.E.I.

The President: Gentlemen, it is our pleasure to have our ninth convention opened by His Honor, the Mayor of the City of Hamilton, who was formerly connected with our industry and is here to offer us the courtesy of the city—His Honor, Mayor Teetzel. (Applause.)

Mayor Teetzel then addressed the convention as follows:

MR. PRESIDENT AND GENTLEMEN:—It affords me great pleasure on behalf of the city of Hamilton to welcome you to our city, and in doing so I do not think a more hearty welcome could be extended to any body of men than to the Canadian Electrical Association. I understand you did us the honor of holding your first convention here in 1892. Since that time great strides have been made in electrical discovery and invention. We are pleased especially at this period to welcome this Association here, for we feel in Hamilton almost as though perfection and completion of electric discovery had been attained; that is the way it would appear to novices; it would appear that it is almost impossible for further improvement to be made in electrical discovery and invention. We feel at the present time in Hamilton very proud of our position in connection with the science of electricity. We have, I believe, been christened the "electric city" by one of your periodicals, at any rate. We appreciate that suggestion, and I think it shall go forth from now on, that Hamilton is

the electric city of Canada at any rate. (Applause.) We may not be—I trust we will not be considered egotistical or conceited by claiming that we are the first city in Ontario, as far as electricity and the enterprises and developments that have been brought about in this particular science is concerned. There is no city, I understand, east of the Mississippi river to which so much power for such a great distance is conveyed as to the city of Hamilton. That is a distinction we are justly proud of. I understand there are cities west of the Mississippi that have conveyed to them for greater distances as much or greater power than we have in Hamilton, but I am credibly informed that there is no city on the continent east of the Mississippi river to which as much electrical energy is conveyed from such a distance as is conveyed to the city of Hamilton; and I am delighted to say, sir, that it is to be credited to the enterprise and courage of the citizens of Hamilton that this result has been brought about. We also, I believe, have the proud distinction of being the first city in Ontario that adopted the arc light for public lighting by electricity. I believe Montreal was in advance of us, but if I am correctly informed, Hamilton was the first city in Ontario that took that departure, and I had the pleasure of being a member of the city council in the latter part of 1884 and the beginning of 1885 when that innovation was inaugurated, and I have never ceased to compliment the efforts of myself and the other members of the council to have inaugurated in Hamilton the system of arc lighting. I also believe Hamilton is the first city that had in actual operation, in Ontario at least, the electric railway system. I do not suppose you expect a speech from me to-day. I have been honored by an invitation to be present at your banquet to-morrow night, and I may have a few further remarks to make on that occasion. But I will say that in welcoming this Association to Hamilton, I do so, as I said before, most heartily; I believe I could not welcome any Association of gentlemen more heartily, because I look upon the devotees of electrical science as a combination of men who have done more during the last quarter of a century to advance commerce, industry and civilization than any other body of men the world over. You have so reduced the size of the world. True, before the beginning of the last quarter of a century the size had been reduced, but during the last twenty-five years, by the application of electrical current to power, and by the telephone, communities have been brought together, industry has been stimulated, commerce has been advanced, and civilization has been advanced in consequence; and I am proud to say also in that connection that to the names of Canadians perhaps to more than any other names can be attributed much of this great accomplishment. Edison and Bell and scores of other Canadians following down the line the Thomsons, the Wrights, the Leydens, the Brownes, (applause) and a horde of other electricians, have contributed their quota to the perfection of the science. Gentlemen, I say nothing further on the present occasion than to repeat the welcome I have made, and I trust your stay in Hamilton may be pleasant and profitable. I am sure that our electrical friends here will do all they can to entertain you hospitably; if they do not, I ask you to make any complaint to me, and I will endeavor to see any grievance properly adjusted. In the meantime, so far as I have the power and up till ten o'clock on each night, so long as you remain under the charge of my friends Leyden, Kammerer, Henderson, and my friend Wright, of Toronto, you shall have the freedom of the city of Hamilton (applause); and if you should be so bold as to stray beyond their protection

that freedom will be withdrawn—not that I feel that you of your own inclination would go astray, but you might fall into the hands of those who might attempt to lead you astray. I again repeat, I wish you may have a very profitable and pleasant session, and that your deliberations will result in great good and in great profit to yourselves and to the advancement of the science to which you are devoted. (Applause).

The President: I will call upon our ex-President, Mr. Yule, to express the thanks of the Association to His Honor, Mayor Teetzel, for his kindly welcome.

Mr. Yule: I have much pleasure, Mr. Mayor, in tendering you the thanks of this Association for your hearty welcome, and I can guarantee the good behavior of all the members of our Association. I do not think it will be necessary for you to give any private intimation to the Chief of Police to see that we all get home in good time. We thank you most heartily for your kindly welcome, and we will do our best to enjoy ourselves while in the city of Hamilton.

President Browne addressed the convention as follows:

PRESIDENT'S ADDRESS.

GENTLEMEN:—Although in the declaration by the Constitution and By-laws of the general order of business to be followed, no place or time has been allotted nor provision made for such a procedure, yet it appears by the programme of events that the Committee have appointed that the convention, like the eight preceding it, shall begin with a President's address.

I would prefer to be governed by the prescribed formula of the Constitution, but as tradition and unwritten law frequently exert more control than written law, I must endeavor to emulate the good example given by my predecessors even if unable to hope to do more than emphasize by contrast the paucity of the suggestions which I may offer.

I will not undertake to occupy much of your time, because the committee have provided for our consideration a goodly array of good things. You will receive and hear read the reports of the several committees, and also that of the worthy Secretary-Treasurer recounting the condition and progress of the Association during the past year; and you will hear and discuss several very excellent papers when you find opportunity between the various events of hospitality provided in such prodigality by the local committee.

You will be particularly gratified by the report of the Committee on Legislation, through whose efforts was achieved the passage at the last session by the Ontario Legislature of an eminently just enactment having to do with the relations between municipalities and electric companies. The report of that committee will be accompanied by a copy of the enactment referred to, from which you will find that both municipalities and existing electric lighting interests are protected from unwise and hasty investment on the one hand, and from constantly impending danger of threatened annihilation of existing investments on the other hand.

The ninth convention of this Association is very appropriately held in the city where its first convention took place. Nowhere else could the extraordinary and rapid progress of electrical development be more emphatically demonstrated, nor the contrast with conditions existing only seven years ago be so sharply defined, than in this city of Hamilton. For here is tangible evidence in active daily operation of the furthest advancement of the electrical art of to-day, in the distribution of the potential energy of Lake Erie throughout the city, dispelling its darkness and operating the machinery of its manufacturers.

At the first convention of this Association, held in this city only seven years ago, the probability of such a practical, commercially successful demonstration was considered to be in the far and remote future, as appears from the record of that convention. The transmission of energy a distance of thirty odd miles, as is the case here in Hamilton, was looked at doubtfully both from a physical and commercial standpoint. To-day no doubt exists as to the physical capability of transmitting and manipulating electric currents of high potentials long distances, for the varied uses of light, power, heating, chemistry and metallurgy.

The question no longer is, "Can we apply the electric current to this and to that purpose?" but "What new fields of enterprise can it enter and develop?"

This transformation in Hamilton took place shortly after the conclusion of the convention last year in Montreal. Since that time also has been put into operation a plant at Rossland, British Columbia, transmitting about the same amount of power the same distance as here. Many of you last year visited the works at Chambly, then under construction for the transmission of current to Montreal, and it is my pleasure to announce that the electric current has been transmitted from the power house on the Richelieu river, and the waters of Lake Champlain transformed into electric energy, flow throughout the city of Montreal. Such enterprises are so much the accepted fact and indicate successful physical accomplishment so thoroughly that many other similar enterprises, covering even greater distances, are being seriously considered by conservative capitalists, keen to perceive the great commercial advantages that will accrue from the developments made in this field of electric science.

Arising from the increased uses of water powers for the generation of electric energy, and the successful application of such energy to commercial motive power uses, a condition is beginning to assume shape with every indication of increasing, which may modify existing manufacturing conditions and perhaps change habits and methods of living. Its general adoption will result in the cheapening of motive power for manufacturers as well as reduce their costs otherwise, and also cheapen electric current for lighting.

I refer to the limitation of the use of electric current for manufacturers' motive power to the hours of daylight, or perhaps more properly speaking, to the time outside of those hours when the need of illumination makes the greatest demand upon the electric plant. A considerable

objection to undertaking to seek motive power business has been the necessity of increased capital for plant in excess of lighting requirements to take care of the load which would exist during the hours when the motive power load and the lighting load would be called for simultaneously.

The idea has been maintained and acted upon that it is profitable for many, if not all manufacturers, to discontinue work as soon as the dark hours begin, for the reason that the cost of manufacturing is increased during such dark hours by the necessity of expense for illumination and by the diminished productive capability of the operatives. Besides avoiding these increased expenses, manufacturers can obtain the use of electric current for power, at a considerable reduction in price outside of the hours in which the greatest demand necessarily occurs for lighting. The cost of motive power to the manufacturer can be thus made much cheaper than he could otherwise produce it.

This additional source of revenue or increased return upon capital investment for plant and lines, will also enable the generator and distributor of electric current to sell such current for lighting profitably, at a less rate than when no revenue is derived from the plant in the day time. Less price for lighting will assist materially in the increased use of electric current for illuminating purposes. Since this idea was first suggested it has grown considerably, and its application is being gradually extended, and it does not seem too much to say that in a few years the hours of manufacturing will be restricted to the hours of daylight, with all the advantages that will result therefrom. While this condition is of the most value to the water power generation of electric current, it is of great value also to steam generation plant, by reason of the increased return upon invested capital which it will provide. The suggestion is well worth thoughtful consideration and furtherance.

In another direction also, the assembling of our convention in this city demonstrates the progress that has been made since the commencement of the career of the Association. At the first convention there were present 57 active and 24 associate members. The total membership of the Association, by the report of the Secretary-Treasurer at the present time, is 241. This increase, continuous and progressive from the first convention, indicates not only lively and hearty appreciation of the advantages to be derived from association for mutual intercourse and improvement of knowledge from interchange of ideas, but also denotes continuous growth of electric interests and the progressive development of new enterprises.

Surveying the entire field of electrical industry in Canada to-day, it may be fairly said that if all are not in thoroughly sound and healthy condition, the greater number of them are prosperous and improving. In the days of the first convention, this could not be so well said, for as many of you, no doubt, remember, conditions were precarious and the probability of success uncertain. Here again I may allude to the result recently accomplished by our Committee on Legislation, which will greatly tend to advance such prosperity. Already it has had the effect of strengthening and fortifying existing enterprises, encouraging owners to endeavor to extend and increase their business, to enlarge and better their plants, because now they feel assurance that their investments are protected and that they cannot be deprived of them ruthlessly and recklessly. This is as it should be, not only from the point of view of the private owners of such enterprises, but from that of the general public and municipal interests.

Notwithstanding that the legislation referred to is so eminently fair, just and equitable, both to municipalities and to private interests, yet it is incumbent upon the members of this Association and upon all those having interest in electrical enterprises, to adopt systematic, prudent means of preventing retrograde action in such legislation which may be aroused and agitated by persons of narrow and restricted views, who may undertake to procure alterations of the legislation referred to. It seems proper to suggest that all present members become actively interested to procure additional members for this Association throughout the Dominion; thereby to strengthen its capability for useful effort so that by unity of action procurable through the efforts of such enlarged organization, not only may the meritorious conditions obtained in this province of Ontario be maintained, but also be extended to the other provinces. To that end it is respectfully urged that every present member endeavor to add to the membership of this Association, thus to fortify and strengthen our committees in the furtherance of their efforts for the proper benefits that should accrue to capital invested in all electric enterprises.

The value of concerted action for mutual information and advantage may be illustrated in another direction by the following.

Many persons interested in electric lighting were solicitous as to the possible invasion of their business by acetylene. For the purpose of assembling authentic information as to the progress, present status and use of acetylene for domestic and commercial illumination, a circular was sent to cities, towns and villages throughout Canada having electric plants, requesting exact statements as to the conditions existing in those localities concerning its use and its interference with electric lighting. Replies were received from 103 localities. The results have been tabulated, and with some extracts from newspapers, will be presented in the proceedings of the convention so that every member will have accessible the fullest and latest information on that subject in convenient form. Here it seems sufficient to say that it may be concluded that no serious menace for the present, at least, need be anticipated therefrom to the electric lighting industry, although undoubtedly useful and profitable fields will be found for the desirable and proper use of acetylene.

The papers which will be presented and read at this convention will treat of matters of the highest practical importance, and I will not undertake to detain you longer from their consideration and discussion. They are of such character as to possess acute interest for all, and I solicit for them thorough and complete discussion to bring out any points not touched upon by the writers. The subjects selected are the results of suggestions received from many members in response to circular communication sent to the members some months since, and, therefore, may be considered to be your own selections.

With reference to these papers, on behalf of the committee having this matter in charge, I wish to say that they are particularly grateful to the writers who have accepted the requests of the committee. It is not always convenient, and probably it may be said, it is never convenient for a busy man especially (and it would seem as if most of us in

this business are always busy, to find the necessary time to devote the concentration and thought necessary to the preparation of a paper that each writer considers he should, with justice to the Association and to himself, present for consideration.

I desire to express my regret at having been unable to devote as much time to the affairs of the Association as I should wish to have been able to do, but my regret is materially modified because the gentlemen of the various committees have so thoroughly attended to the matters entrusted to them, that the interests of the Association could not in any wise suffer by want of attention on my part. I therefore wish to extend my earnest thanks to the officers and members of committees associated with me, for their hearty co-operation, and to thank you, gentlemen of the Association, for the honor so cordially bestowed upon me in electing me president, and to bespeak for my successor the continuance of such hearty co-operation and enthusiastic support.

The address of the President was greeted with loud and prolonged applause.

The Secretary, Mr. C. H. Mortimer, read the minutes of the last annual convention, which were approved and adopted as read, as was also his annual report, as follows :

SECRETARY-TREASURER'S REPORT.

The most important work to engage the attention of the Association since last convention was the effort made, under the immediate direction of the Legislative Committee, to have such amendments made to the Municipal Act as would prevent the confiscation by municipalities of private capital invested in the electric lighting industry. It is gratifying to be able to report the success of the movement, which involved many meetings and much effort on the part of the committee and those associated with them. Particulars of this important work, which serves to establish the practical utility and usefulness of this Association as a means whereby the interests of its members may be conserved, are contained in the report of the Chairman of the Legislative Committee to the Association at this convention. It will no doubt be deemed advisable to provide means for safeguarding the rights which have been secured to electric lighting companies by the Conmee Bill.

The Executive Committee held three meetings during the year. At the first of these, held on September 9th, accounts in connection with last convention, amounting to \$240, were passed, the additional sum of \$50 was granted to assist the Entertainment Committee to discharge its obligations; the resignation of one member was accepted, and one new member was elected.

On March 23rd, the committee met to consider arrangements for this convention, and other business, a committee was appointed to make the necessary local arrangements, consisting of Messrs. George Black, H. R. Leyden, Gordon J. Henderson, E. E. Cary, Wilfred Phillips, A. B. Smith, together with the following gentlemen as honorary members: Messrs. Clyde Green, J. A. Nelles, Mark B. Thomas, J. B. Griffith, with power to add to their number. A committee to arrange for convention papers was appointed as follows: The President, Messrs. E. E. Cary, A. A. Dion, J. J. Wright, John Carroll, and the Secretary. Messrs. Cary and the Secretary were appointed a committee to procure badges and buttons for the use of officers and members attending the convention. The sum of \$100 was voted to the Local Committee for entertainment purposes. The Secretary was directed to send out accounts to members for overdue fees, and to notify them that the names of members in arrears on the 1st of May would be struck from the roll. The Secretary was empowered to obtain the services of an assistant during the convention. Four persons were elected to active membership.

On the 20th of May, the committee met to receive the reports of the various sub-committees, and to complete arrangements for the convention. Five resignations were accepted, and two members elected. Accounts for convention buttons and printing, \$23.05, were passed.

The number of new members elected since last report is as follows. Active, 20; associate, 2; total 22. During the same period there have been removed from the roll 14 active and 1 associate, leaving the present membership 241, or a gain of 7 over last report.

Several members in arrears for fees have objected to make payment, on the ground that they joined the Association for one year only. It should be clearly understood that when a person joins the Association, he is to be regarded as being a member until his formal resignation is placed with the Secretary. I would respectfully suggest that the form of application for membership be altered so as to conform to this view.

The receipts and disbursements have been as follows.

FINANCIAL REPORT FROM JUNE 1ST, '898, TO 31ST MAY, 1899.

RECEIPTS.	
Cash in bank, June 1st, 1898.....	\$281.18
Cash on hand, June 1st, 1898.....	19.46
151 active members' fees at \$3.....	453.00
1 active member's fee at \$3—paid \$2.....	2.00
22 associate members' fees at \$2.....	44.00
	<hr/>
	\$799.64
DISBURSEMENTS.	
Expenses of convention	\$435.14
Grant to local committee.....	\$200.00
E. J. Jenkins, stenographer.....	40.00
Martel-Stewart (show cards).....	5.00
Convention buttons for 1898.....	64.64
Electrical News, printing account.....	101.50
Cuts for convention paper, and duty on cuts.....	20.49

Express on parcels.....	2.08
Telegrams.....	5.47
	<hr/>
	\$435.14
Grant to Secretary.....	\$125.00
Postage.....	46.18
Express charges.....	2.6
Letter file.....	.40
Telegrams.....	1.00
Exchange on cheques.....	3.60
Stationary and printing.....	19.95
Buttons and badges for 1899.....	12.50
Balance in bank.....	137.76
Balance on hand.....	17.85
	<hr/>
	\$799.64

RECEIPTS SINCE MAY 31ST, 1899.

Cash in bank, June 1st, 1899.....	\$137.76
Cash on hand, June 1st, 1899.....	17.85
52 active members' fees at \$3.....	156.00
5 associate members' fees at \$2.....	10.00
	<hr/>
	\$321.61

DISBURSEMENTS.

Postage.....	\$ 12.30
Exchange on cheques.....	1.65
Stationery.....	.55
Cash in bank, June 27th, 1899.....	296.76
Cash on hand, June 27th, 1899.....	10.35
	<hr/>
	\$321.61

We have audited the Treasurer's account and find same to be correct.

H. R. LEYDEN,
Geo. Black.

The President: The next order of business is the reports of committees. I will call for the report of the Committee on Legislation first, and ask the Chairman, Mr. Yule, to read it.

REPORT OF COMMITTEE ON LEGISLATION.

Your Committee on Legislation beg leave to report that in compliance with motion passed at convention held at Montreal a year ago instructing them to continue their efforts to secure legislation in Ontario, the better to regulate the relations between electric light companies and municipalities, where the latter desired to enter upon municipal lighting, arrangements were made for the purpose of a united effort to put before the legislature the justice and merits of our views and the injustice of the law as it then stood.

A Bill was prepared by counsel, and after being submitted to your committee, was brought before the House, the result being, as you all know, that an Act was passed extending the provision of the law regarding waterworks to lighting companies, providing for the transfer, upon fair conditions, of lighting plants to corporations, when they decide to enter upon the business of supplying electric light, and otherwise regulating the relations between municipalities and lighting companies on equitable terms.

Your committee held numerous meetings and gave the matter careful attention until what is now known as the "Conmee Bill" passed the legislature.

Your Committee do not intend, in this report, going into the details of their labor, but think it proper to inform you that the objections that had to be met and answered were of a popular and plausible nature and calculated to prejudice the minds of members until they fully understood the merits of the question.

The obstacles in the way of the Bill were increased by the hostile attitude of some of the newspapers, although the Committee are pleased to say that as the Bill became better understood, it received better treatment at the hands of the press.

Mr. James Conmee, M.P.P., West Algoma, took charge of the Bill, and the result proved it could not have fallen into abler hands. It only required a short time to convince your Committee that Mr. Conmee was fully alive to the justice of the general principle we were contending for. He had a practical knowledge of the merits of the questions at issue and the difficulties surrounding them. And what was of equal importance to us was that Mr. Conmee proved his ability to clearly, forcibly and intelligently explain the measure to his fellow members and to the House.

Mr. Conmee also introduced into the Bill, with your Committee's concurrence, various provisions to adopt such suggestions as were of value and which he considered were salutary amendments in the public interest.

Your Committee admired the patience and tact with which Mr. Conmee, on different occasions, met and discussed the matter with them and also with the opponents of the bill.

Your Committee retained, as parliamentary counsel for the Bill, Mr. Donald Guthrie, Q.C., Guelph, who drafted the Bill, and during the progress of the work he was assisted by Mr. W. D. McPherson and Mr. Edward Bayly, barristers, Toronto, Mr. Gauld, barrister, Hamilton, and Mr. Pepler, of Barrie. The measure was also supported by a number of legal gentlemen retained by different lighting companies, influential deputations from different parts of the province also attended in Toronto to assist your Committee.

The arduous and exacting work for quite a time, when the outlook was very promising, added largely to the expenses of your Committee, but they are pleased to be able to say that all accounts have been paid in full.

About fifty companies contributed to the expense fund, a statement of which is appended. In this connection your Committee desire to convey to the Royal Electric Company, Montreal, and

the Packard Electric Company, St Catharines, their hearty thanks for unsolicited and substantial contributions received from them.

The management of these companies recognized in a practical form that the stability of the lighting companies was of vital interest to them.

Before passing from the Comtee Bill your Committee desire to point out two important provisions in that Act.

First The clause providing for corporations having the right to get contract price for street lighting fixed by arbitration, where parties fail to agree, thus removing the complaint that lighting companies could make municipalities pay an unreasonable price because of there being no competition.

Second The provision made for having prices charged to citizens fixed in the same manner. These clauses very materially extend the powers and rights of municipalities.

At the last meeting of your Committee the policy to be recommended to our successors in office was discussed, and it appeared to be the opinion that while there was no probability of the principle of the "Comtee Bill" being repealed, there may be efforts made to get amendments passed that would endanger the fair working of the Act.

They would respectfully recommend that some arrangement should be made to give attention to all measures introduced in which lighting companies are interested.

For this purpose, your Committee consider it would be an economical policy for the companies to enter into an agreement, for say five years, to pay a small annual subscription to cover the expense of legal services for this purpose. The reason for suggesting the term of years is, that spasmodic and hurried efforts to raise necessary funds use up too much time and attention of your officials and members of Committee.

The members of this Committee, and in fact of all Committees, pay their own travelling and other expenses, and are of opinion that the lighting companies should not hesitate to provide them with the necessary funds to cover cost of services that have to be paid for and that are required in matters of this kind.

The foregoing is merely an expression of opinion on the part of your Committee, the result of two years experience in actively attending to the interests of lighting companies.

JOHN YULE,
Chairman Committee on Legislation.

Dated 28th June, 1899.

ABSTRACT OF FINANCIAL STATEMENT.

Balance from 1897-98	\$ 147.44
Subscriptions paid 1899	1,955.00
Total	\$2,102.44
Paid for legal services	\$1,854.87
Paid for office assistance, telegrams and telegraph messages, postage, stationery, printing and exchange on drafts	171.00
Balance on hand	75.67
Total	\$2,102.44

The following were the contributors to the expense fund for 1899. Royal Electric Company, Montreal; Packard Electric Company, St. Catharines; W. A. MacKay, Rentrew; A. A. Wright, Rentrew; Arnprior Electric Light & Power Company; Brockville Light & Power Company; Smiths Falls Electric Light Company; Lindsay Light, Heat & Power Company; Owen Sound Electric & Illuminating Company; Bowmanville Electric Light Company; R. A. Corbett, Port Hope; Guelph Light & Power Company; Ottawa Electric Company; Sarnia Gas Company; Galt Gas Company; Cataract Power Company, Hamilton; Almonte Electric Light Company; Pembroke Electric Company; St. Thomas Gas Company; St. Catharines Electric Light Company; London Electric Company; Exeter Electric Light & Power Company; Strathroy Electric Company, Joseph Knox, Stayner, O. Higman, Ottawa; John Phillip, Grand Valley; Welland Electric Light Company; Wilson & Sons, Meaford; A. M. Merkle, Morrisburg; Wm. Smder, Waterloo; R. P. Bearman, Chesley; Midland Electric Company; Perth Electric Light Company; Aylmer Electric Company; Toronto Electric Light Company; Madill Bros., Lakeshield; L. H. Reesor, St. Marys; Parry Sound Electric Light Company; Hamilton & Prout, Forrest; Stormont Electric Light Company, Cornwall; Gananoque Electric Light Company; Citizens Telephone & Electric Company, Rat Portage; Corley & Collins, Mount Forest; Gravenhurst Electric Light Company; J. A. Spence, Colborne; Robertson, Rowland & Company, Walkerton; Berlin Gas Company; Colbourg Electric Light & Power Company; Isaac P. Wiser, Prescott; Wingham Electric Light Company, Woodstock Electric Light Company.

The amounts contributed were as follows.

1 contributor paid	\$250
2 \$250 each	400
3 \$300	500
1	75
5 \$50 each	250
1	30
7 \$25 each	175
2 \$20	60
4 \$15	60
9 \$10	90
63 \$5	315
Total	\$1,955

Mr. A. A. Dion: I have much pleasure in moving that the report which has just been read be received, and that the thanks of this Association be tendered to Mr. John Yule and the members of the Legislative Committee. The amount of work performed by these men during the last two years in connection with the legislation which has been obtained has been enormous, and their zeal is beyond all praise. The manner in which they handled this question calls for congratulation from the members of this Association, and certainly we cannot say too much in thanks and gratefulness for their devotion to a question which affects our best interests, and in obtaining legislation which will be a lasting benefit to the members of this Association.

Mr. J. W. Purcell: I take pleasure in seconding that motion. I think with Mr. Dion that the Legislative Committee have had a great deal of work which the members know nothing of, and they have had more work than it was thought they would have at the time they were appointed.

The President: I am in hearty accord with the motion which has been regularly moved and seconded, and before I put it I would like to hear expressions of opinion from any other members of the Association here. I think it is entirely due to the committee that as many members of the Association present as possible should, in their own way, express their commendation of the efforts and of the result of the efforts of this committee. There will be, undoubtedly, proper time to-morrow to consider and discuss the main suggestion of this report—that is, the agreement on the part of the companies in the Association or out of it to organize for a period of years and to agree to pay a small sum annually towards meeting the necessary expenses of this committee. I will be pleased now to hear any expressions of opinion.

Mr. H. R. Leyden: I want to say a few words in connection with this matter, and I want to express what I think ought to be the opinion of the Association in respect to Mr. Yule's personal connection with this. I know, from the small connection I had with this legislation, that Mr. Yule devoted the principal part of two months to this bill; and I also know that he was in Toronto for two whole weeks doing nothing else but working on this bill. There were also a number of other gentlemen, most of them members of the committee, who labored incessantly during the meeting of Parliament in Toronto to further this measure, and I do not think the members of this Association can go too far in any direction in expressing their gratitude to the members of this committee. I also think that the Association should, in some way, show their appreciation of the personal labors of Mr. Conmee in regard to this bill. I do not think I am going too far in saying that if it had not been for Mr. Conmee's personal energy that we would have had very grave difficulty in getting this bill passed. Mr. Conmee entered into this measure with all the enthusiasm of a man with a large amount of money invested in electrical interests; he took the greatest pains and the greatest patience in explaining the details and justice of the Bill to the different members. As far as the Bill itself is concerned, I think there is one point in particular that wants to be emphasized to the members of this Association, and that is the principle of arbitration which is now embodied in the electrical interests of Ontario. All public corporations in dealing with the public are subject to various unjust claims and demands. The electric lighting industry now is placed on a basis whereby through arbitration they can obtain what is right and fair, and on the other hand municipalities through arbitration can obtain what is right and fair. This principle of arbitration, by being applied to electrical interests, is going to do more, I think, for the interests of electrical companies in a fair way than anything else we could do. Just take an instance of it; this Bill provides specifically that in cases where the municipality and supply company cannot agree upon the price, that it shall be arbitrated; that arbitration will undoubtedly be on a fair basis and give the electric lighting company a fair return for their light. On the other hand, for private lighting, how much they shall charge is also to

be subject to arbitration. If the municipalities can obtain a fair service at a fair rate, there is no call for competition of any kind. There are a great many places, in England particularly, where this principle of arbitration is carried to such an extent that they give the illuminating company a certain territory and give them the exclusive right of lighting in that territory, the only provision being that they shall give a good service and at a reasonable rate, which rate is subject to arbitration. Now, if that principle of arbitration is carried to its proper extent, the electric lighting companies, as long as they do what is fair, will enter on an assured era of arbitration. That principle of arbitration, to my mind, is one of the most valuable features of that bill.

The President: Mr. Leyden has undoubtedly struck the key note of this entire legislation, that is, the principle that investors in any enterprise of a semi-public nature will be entirely satisfied with a fair and proper return upon their investment so long as they are assured of non-interference—so long as they can be assured that when they give fair service and fair rates their investment is secure, and that principle being established by this act of legislation, it would seem, as it were, utterly impossible, if we give the matter any attention at all, that it should ever be taken off the statute books. Now, gentlemen, the motion is before you, and I ask for your approval thereof.

The motion was carried amid applause.

The President: The next committee to be heard from is the committee having to do with the Board of Fire Underwriters; I will ask Mr. Gossler to read the report.

Mr. P. G. Gossler read the report of the committee appointed to interview the Board of Fire Underwriters, as follows:

REPORT OF COMMITTEE TO INTERVIEW FIRE UNDERWRITERS.

To the President of the Canadian Electrical Association.

Your Committee, appointed at the convention of 1898 of this Association, for the purpose of interviewing the Quebec Board of Fire Underwriters with regard to the adoption of permanent rules governing electrical installations and means of enforcing compliance with the same, beg to report that they had several interviews with the secretary and with a special committee of the underwriters. The question of rules and inspection was thoroughly discussed, but no understanding towards the establishment by the underwriters of a regular and efficient system of inspection was arrived at. It was held by the underwriters that such a system of inspection, even if it covered only the principal cities of Canada, would involve a much larger expenditure than they felt called upon to undertake. They had provided rules for electrical installations, and they considered that the electric companies and the municipalities should in their own interest see that these rules are carried out. Your committee would recommend that a committee be appointed at this convention to continue the work, and endeavor to have established some efficient system of inspection, independent of and apart from the electric companies, for the protection of our own interests as well as those of the underwriters.

(Signed) P. G. GOSSLER.
A. A. DION.

Mr. Gossler: in connection with this report I wish to say that while it is short and does not seem to have involved much labor, there has been considerable work done. I have, on several occasions, in company with Mr. Dion, of Ottawa, interviewed Mr. Hadrill, secretary of the Quebec Board of Fire Underwriters. They gave us no encouragement whatever to establish a system whereby the fire underwriters would be called upon to be at any expense; they maintained that the proper way of establishing a system should be by municipalities enacting by-laws whereby the buildings and building laws would enforce compliance with the Board of Underwriters' rules as at present universally adopted. I may say that there was very little encouragement given to the committee at all, because the fire underwriters did not seem to think the fire hazards due to electric wiring were such as to warrant them going to any expense. We called to their attention the fact that the fire underwriters of other large cities had seen fit to go to this expense; but I presume they thought they would profit by their own experience rather than offer any suggestion whatever for the establishment of an inspection system. I might say on this committee was Mr. George W. Sadler, of Montreal, who at the time of his appointment, was and is at present a member of the city council of Montreal. He is also a member of a special committee

on building rules of Montreal, appointed with a view of having rules made by the council embodied in the building association rules, to enforce the established rules for electrical installations. Mr. Sadler is unable to be present, and wrote me a letter which he wished to have read in connection with this report, which is as follows:

DEAR SIR: At the last moment I find it is impossible for me to attend the ninth convention of the Canadian Electrical Association. There is no doubt but you are prepared to make a report to the Convention of the doings of the committee to confer with the insurance and the city of Montreal re the wiring of buildings. My appointment on that Committee was largely owing to my position as a member of the City Council of Montreal. I would like to say that I have found it impossible to do anything in the matter since our last meeting, the reason being that a great deal of time has been consumed in getting amendments to the Charter, and nothing could be done in connection with the by-laws until the Charter had passed the Council. Since then the various committees have had the by-laws under consideration, but very little progress has been made. I stated at the last convention that the city of Montreal has a very good new building by-law prepared, and I had hoped to have it sent up for discussion in the council; this opportunity has not presented itself yet, and it may be a month or two before the committee will report to the council.

If the Convention decides to keep the committee on this subject standing, I will be very pleased to still act with them, and do all I can to further the interest of all concerned when the opportunity presents itself.

Please convey my kind regards to the officers of the Association, and I trust that the ninth Convention of the Electrical Association will be a profitable and pleasant one to all members.

Yours very truly,
GEO. W. SADLER.

Mr. A. A. Dion: Before any action is taken upon this report, as a member of that committee, I wish to refer to a matter which this report brings to mind—it is a fact that among the members of that committee was a man who was for many years a useful and active member of this Association, and who has been carried off by death since the last meeting of this Association. I think it is a duty, though a sad one, to register in the minutes of this meeting the regrets of the Association at the untimely death of Mr. F. H. Badger, jr.

The Secretary: In connection with the remarks just made by Mr. Dion, it will have been noticed that Captain Williams, who was electric light inspector for the London district, a respected member of this Association, and a respected citizen of the city of London, has passed away within the last two or three days.

The President: The regrets of the Association will be duly recorded in the minutes of the proceedings. In reference to the report of the committee just read, while the results achieved by them are not as successful as of the Committee on Legislation, it seems that they have begun in the right direction, and while the Board of Fire Underwriters may be obstinate, the very suggestion that some method can be adopted in building laws to procure the supervision by the proper authorities of the wiring seems to point to the fact that we may ultimately accomplish the same end, and I would suggest that the Association approve of the continuance of this committee in the hope that they may be able to have incorporated in the municipal laws the adoption of some uniform plan which will be final in its action.

On motion the report of the committee was approved.

The President called for the report of the Committee on Statistics.

Mr. J. A. Kammerer read the report of the Committee on Statistics, as follows:

REPORT OF COMMITTEE ON STATISTICS.

GENTLEMEN,—As chairman of the Statistical Committee, I beg to report that we have gathered a large quantity of information and data about the electrical industries in Canada, but have not been able to get quite all that we wanted. It was perhaps a mistake on the committee's part in starting out to make the scope of the report too wide, but I can assure you that when the report is presented it will be of some value. In view of this, I would ask that the Statistical Committee be continued for another year with the same personnel, or others whom you see fit to appoint. The data and information which we have gathered will be at their service.

Respectfully submitted,
(Signed) J. A. KAMMERER,
Chairman Statistical Committee.

Mr. Kammerer: In connection with this report, I would like to say, Mr. President, that we found in all the data that we have got, especially as to prices of lighting, that our station managers seem to have the prices in a transitory stage—they are not settled. The

tendency seems to be that they want a little more money for what they are furnishing, and they are trying to find out which way they can make more, and for that reason, more than any other, the report could not be completed. It would only be a half report, and I thought it best not to make a half report when, no doubt, we could make a full and complete one later.

On motion the report as read was approved.

The President called for the report of the Committee on Meter Inspection.

Mr. J. J. Wright: That committee has had no meetings during the past year. There have been no measures taken in regard to the inspection of meters by the government that would necessitate the calling together of the members of that committee.

The President: That would appear to be all the reports. The next order of business is General Business.

Mr. A. A. Dion: There may be no other opportunity of bringing up a question which is suggested by Mr. Wright's report, and it is this: We as a company in Ottawa propose to take up with the Inspection Department the question of the possibility of making such departmental regulations as would allow of meter seals being broken for cleaning and adjusting the meters without paying an extra fee. As the law is at present, you are aware that meters have to be inspected every five years. There are not a great many meters that will run for five years without some adjustment or cleaning, and this cannot be done under the present regulations without breaking the seal and paying an additional fee. I take it that the intention of the government is not to compel companies to pay for meter inspection more than once in five years for each meter in service; therefore it is a proper question to ask them if some regulation cannot be made whereby the privilege of breaking seals will be allowed under certain restrictions. The question arises whether this Association should not take this matter up; possibly the Committee on Meter Inspection might be continued with the hope of taking this question up during the present year. I think it is one of considerable importance. The cost of meter inspection is quite a large item to some of the companies, and having to pay extra fees makes it still greater. Mr. Wright no doubt has had considerable experience in using meters in large numbers, and he can probably see the value of the suggestion.

The President: It appears that the programme of part of the proceedings to-morrow will be the election of the standing committees, which will undoubtedly result in the continuance of the committees that have been already approved of, and thus accomplish the purpose Mr. Dion has suggested. Under the head of general business I am desired to say on behalf of the manager of the Hamilton and Dundas railroad that at five o'clock this afternoon he will be pleased to give the pleasure of a trip on that road to any and all of the members of the Association who may desire to participate. I presume that you will be able to enjoy this and be back in sufficient time to also enjoy the trip arranged for this evening at half past seven, as appears by the programme, to Burlington Beach, by courtesy of the Hamilton Radial railway and the Hamilton street railway. Another topic of general business, the Executive Committee at its session this morning thought it advisable to endeavor to crystallize or make deliberate the action of the Association in making nominations for the officers for the incoming year. Without undertaking to in any way restrict the individual action of the members of the Association, but simply for the purpose of exercising a deliberation and offering suggestions, it was desired that I would appoint a nominating committee. The election, as you are aware does not take place until Friday, but I will now announce the nominating committee who will take the matter in hand and present for our consideration to-morrow the names of the gentlemen whom they offer for your suffrages on Friday morning. As I stated before, this will not prevent any and all members of the Association from making nominations on their own account in contradistinction to the nominations offered by the committee. I now appoint as the nominating committee Mr. Cary, Mr. Carroll, Mr. J. J. Wright,

Mr. Yule and Mr. Wyse, and I commend to their kind and early consideration the adoption of a ticket that I trust will meet with the universal approval of the members and will not call for any opposing nominations.

Mr. John Yule. Do I understand that this committee will nominate the members of the standing committees?

The President: No; they will nominate the members of the Executive Committee, and the gentlemen up for the offices of president, first vice-president and second vice-president.

Mr. J. Yule: Hasn't it been the practice heretofore for the President to nominate a small committee to confer in the nomination of the standing committees?

The President: That, I understand, is the action to be taken to-morrow. I may be incorrect about it, but there seems to be no provision made for any other method in the programme. I am entirely willing, Mr. Yule, to leave to this committee the selection of the standing committees for the year. If they are good enough to select the candidates for offices, they will be good enough to do that. I understand it is in the nature of an advisory board to the President in appointing the standing committees.

Mr. Yule: I think you will find the committee to nominate the standing committees was always nominated the first afternoon and reported the next day.

The President: Very well; I will entrust that to this same committee.

Mr. J. J. Wright: When is this committee to report?

The President: To-morrow; preferably as early as possible.

The President read two communications, one from C. S. Cochran, photographer, and the other from Mr. G. A. Browne, traffic manager of the Richelieu & Ontario Navigation Company.

The President: Has any member anything of general business purpose to offer for consideration now? (No response.) There being none, the next order of business is the presentation of papers. I will call upon Mr. A. A. Dion to read his paper entitled "Meters and Meter Rates." You all have copies. You will find it is exhaustive and enters into the question fully, and I hope and solicit most earnestly that, as the reading progresses, you will all make notes and bring up matters for discussion. Let us have all the papers fully discussed. I am sure that the writers of papers will feel no injury to their feelings whatever in having all sorts of discussion brought out in order to make clear to ourselves and perhaps to assist them in a further exposition of their subject.

Mr. A. A. Dion, of Ottawa, read his paper entitled "Meters and Meter Rates," which is printed on page 156.

The President: I think, gentlemen, that the Association can take exception to the last paragraph of Mr. Dion's paper in which he intimates that he has not treated satisfactorily this subject. I think in that we must disagree with him. But there is much in this paper which, while coinciding with the experience of many of us in almost every particular, ought to arouse a great amount, not of discussion in the sense that it may mean objection to what is said, but for the purpose of reinforcing what Mr. Dion has said in many particulars, and I think if I call upon Mr. Gossler, who is quite familiar with the system in Montreal and what our practice there is, it may assist in promoting further talk on the matter.

Mr. P. G. Gossler: Mr. President, before the convention comes to discuss that part of Mr. Dion's paper relating to meter rates, which I presume is by far the most interesting part of the paper to us all, there are several points in connection with testing meters which I should like to bring up for discussion for my own information. I first refer to that part of Mr. Dion's paper under the head of "meter room," where he says "The meters should be connected in series, and the circuit, which must be of large wire, should pass through a main switch and cutout, a rheostat or choking coil to adjust the voltage." It has been the result of our experience and some exhaustive tests to determine the

characteristics of the meters we have in use, mainly Schallenberger meters, that testing meters in series introduces an inductive load; that is, the coils of the meters themselves introduce a lagging current and there is an inductive load, and we find the meters run fast; consequently, the meters for proper adjustment will be adjusted to run slower. When I say they run fast, I mean when compared with what they will run on a non-inductive load such as a lamp load. This may not be detected if the meters are placed on customers' premises and then brought in and tested in the same way, but I am positive if Mr. Dion has placed his meters in series in testing them and adjusting them in series, with an extra inductive load, on a choking coil, that he will find them running considerably slower on the customers' premises. But if anyone else has had that same experience I would like to have it confirmed, because I have made rather a positive statement. There is another statement where Mr. Dion says that he has obtained very satisfactory results with only ordinary care with the Schallenberger meter. That has not been the result of our experience; we have found a great deal of care is necessary in all such meters. We found that merely placing the meter on the floor in a great many cases injured the steel pinion or pivot and also in many cases cracked the jewel. As to the statement that meters will not start with less than three per cent. of load, I am happy to say that day has gone by, because we have in use meters that will start with two-tenths of one per cent. of their load. I am confining my remarks now entirely to the testing of meters. The statement that meters will run slow on light loads is also modified by the results of our experience with meters and light loads. We have had two meters calibrated to run identical on three-quarters of the full load, and we have found one meter to run very slow on a quarter load, and the other meter to run possibly five per cent. fast on a quarter load, so that the registration of the meter under half load is entirely dependent upon the friction of the jewel. The number of lights that Mr. Dion has stated, that the Schallenberger meter will start upon, often applies to meters that are comparatively new, but after they have been in use for some time we find it takes a considerably larger number of lamps than is stated. I would like further to discuss the matter of meter rates when it comes up, but I will defer that until later.

The President: Mr. Gossler appears to agree with Mr. Dion that this subject should have been divided into two parts, for he has confined his remarks to the question of testing meters only. We will adopt the suggestion of the two gentlemen and ask for other remarks upon the matter of meters and meter testing before we take up the question of meter rates.

H. O. Fisk: I may say I have devoted considerable time to accounts of the recording watt meter, more especially of the old type. We have quite a number of meters that were made some years ago and we find they run slow under light loads, as has been stated by Mr. Dion. I have devoted considerable time to find if these meters could be brought up to date; that is, made to run accurately on light loads; and I find by putting an auxiliary coil to run with the field, that is, taking part of the shunt that acts as resistance in series with the armature and winding that so as to work with the field that it will increase it just enough, that is if the coil is proportioned right, to eliminate the friction. When you have arrived at that point your meter will run on a very light load; in fact on a 50 light meter I have got 55 watts out of 60; that is not taking a master meter, but taking an indicating watt meter and a stop watch, and having the voltage and everything as perfect as it is possible to have it. We find it a great advantage to make an accurate record of all meters we put in, especially when they are new, and when they are tested. We do not test them just as the government prescribes; we test them on one, two, three, five and ten lamps,—that is for an ordinary ten light meter,—and more for a larger meter. These tests are recorded and kept in a book. We find a customer will come in and kick about his meter being outrageous, and just

by showing him this record that was made before the meter was sealed, it settles the whole trouble. We find it a very fine thing to keep a record of that kind. But, the auxiliary coil, as I mentioned before, for old meters, is a fine thing. Take a meter even with a dirty commutator, that auxiliary coil can be made to make that meter strong enough without cleaning the commutator.

J. F. H. Wyse: Don't you ever find that the auxiliary coil makes it run without any load on it.

Mr. Fisk: We put as much as 100 ohms of No. 30 wire right on the field and that adds to the resistance in series with the armature and also eliminates the friction. It not only works out in theory, but it is also borne out by practice. I have tried it.

A. A. Wright: Deriving our revenue almost entirely from meters, we ought know more about meters than we do. I quite agree with Mr. Dion that a meter room should be provided for the testing of these meters and cleaning them, and so on. There are one or two questions I would like to ask Mr. Dion. I don't exactly understand how he keeps his record. He says that there should be a day book and entries made in the day book, and these posted into the ledger. Providing, we will say, you are installing a meter in a house for Mr. Brown, what entry would you first make in the day book, and how would you enter it?

Mr. Dion: Mr. President, the entry in the day book would be a record of what was done—"the meter so-and-so, say 20 amperes, Schallenberger, installed at Mr. Brown's house, such a number, such a street." That will be the entry in the day book. Then supposing the meter was No. 20,515, he would turn to the page bearing the same number as the meter in the ledger. There will not be in the ledger a page numbered 20,515, but there will be a page headed with the same number as the serial number of that meter, and in that page you will enter that that particular meter was put in Mr. Brown's house. So that if you come across this particular meter a year after and you want to know the history of it, you turn to that page and you find it was tested on such a date and put in Mr. Brown's house; it was taken out six months after and tested a second time and put in Mr. Smith's house, and so on; the whole history of it will be there. The principal value of the entry is to show the different tests that have been made on that particular meter. It involves some work, but it is of some value.

A. A. Wright: Supposing you wanted to turn to meter No. 2,753, do you have an index?

Mr. Dion: We have to have an index, or else enter your numbers in consecutive order.

Mr. A. A. Wright: You mention with reference to a man taking the readings when he goes around; does the man that takes the readings put it right down in the book himself?

Mr. Dion: No.

A. A. Wright: I know in our case, we have a book with the face of the meter right on it; we have January, February, March and April on one side of the book, and then on the other side, right opposite, we have May, June, July, August, September, October, November and December; there are more months on one side than on the other. At the head of this, we have the name of the party, when his meter was installed, the style of the meter, the number of the meter and everything in connection with it, the day it was installed, and the number of lights that the customer has. We have for every month the meter right before us; and when you are taking the reading, after the man has put down the location in the index, you can tell whether he is reading the meter correctly or not.

Mr. Dion: Do you mean he carries that book with him?

Mr. A. A. Wright: He carries that book with him every month.

Mr. Dion: I don't think that would be practicable with us. The readers think their book is large enough as it is.

Mr. A. A. Wright: It is practicable enough; if you have too large a book you can have a number of books.

P. G. Gossler: I think you will find with most meters that are used that the serial numbers of meters, especially the Schallenberger meter, are up in the several hundreds of thousands and you cannot index them, neither can you locate them by the man's name on whose premises they are placed, because they may be changed several times a year. We have invented a card catalogue, and find it very satisfactory.

A. A. Wright: I know nothing about the Schallenberger meter.

The President: The same idea will apply to any make of meter, because their numbers are increasing all the time, and indexing by the number of the meter will become somewhat difficult; it is well enough in the case of a small number of meters. But the card system will locate any meter at any time, and the history of that meter may be recorded on the card catalogue as forming the ledger referred to by Mr. Dion. It takes the place of a page in a book in which you recite the number of the meter, the date on which you receive it, the date on which you test it, the date on which you placed it in the customer's premises, the date on which you removed it from the customer's premises, the date on which you test it again, and the day on which you place it in another customer's premises, and so on; in other words, it is the life history of that meter.

A. A. Wright: I have no doubt that would be a very advantageous way to do it, and of course we are very thankful to receive pointers in that way. I quite agree with Mr. Dion with reference to the installing of small meters instead of large ones, that it is very much better to install them on the small than on the large side, because it works better to the station owner. He suggests the reading of meters once in three months. I don't know, I am sure, how it would work in some places; I know it causes a good deal of work, but I have always been under the impression that reading them monthly is the better way; it saves a great deal of trouble and you don't have such difficulty in collecting your bills. Sometimes your customers run away, sometimes the bill gets too large, and I think monthly reading is the better way.

Mr. Fisk: In regard to the number business, we find the serial numbers change with some manufacturers. For instance, they will come out with a meter No. 650 Type F; after a while another meter, 650 Type J, or something else. To get over that difficulty we started with our own local number, started with No. 1, and worked up, and we found it simplified things very much.

Mr. A. A. Wright: I suppose this matter of station meters could not be worked where you run both on meter and on flat rate.

Mr. Dion: Mr. President, I might say that I would take the station meter to be of special value in a case of that kind. I would compare the output of the station as recorded on that meter with the aggregate consumption as recorded in the consumer's meter; the difference would represent waste; and you could determine on that whether you were getting enough for your flat rates or not.

Mr. Wyse: I would like to ask Mr. Dion if he has adopted the method of having blanks, and having the man that would otherwise read the meter simply mark the location of the hands on those blanks, showing the location of the hands on the dial?

Mr. Dion: Yes. The man has a book and each space contains about four cards; each card is a facsimile of the meter dial, and he takes his pencil and writes the man's name and puts three or four strokes indicating the position of the different pointers.

Mr. Wyse: We make the bill out in the office and give the man those slips in duplicate, one of which he leaves with the customer showing the indication of the hands, and the other one he turns into the office, also showing the indication of the hands on the dial.

A. A. Wright: How do you keep account of these in your office so that at any time you can refer to them?

Mr. Dion: The book is made of such a size that it will last about one reading. We employ two men reading the meters and there are four books; each man

takes a book, say, to-day, and he leaves it in the office the day following, so that the records may be transcribed from the books, and when they are through with that reading the books are about filled, and they are filed away, and a new set of books taken out next time.

A. A. Wright: I have never seen anything to equal the system I use myself. We find no difficulty whatever in having the whole month, every man's reading, right in the book, and you can see everything about his meter reading any time you want to let him see what every month's consumption amounts to and all about it.

Mr. Dion: How much room in a book would one customer take?

A. A. Wright: Two pages to one customer.

Mr. Dion: We have over 3,000 meters; that would be 6,000 pages.

A. A. Wright: One man couldn't do all that work; you would have to have several books, one for each reader.

Mr. Dion: Each reader has to have a complete list unless you divide your city into districts.

A. A. Wright: Certainly.

The President: With the Royal Electric Company, we supply our meter readers with a card for each individual customer, instead of a book; that card is arranged to take the readings of one entire year; it recites the name of the customer, the number of his meter, and so on, and gives each reading so that the meter reader has before him the previous readings for all the time of the year that readings have been taken.

Mr. Dion: That is like our system, except that ours is in book form.

The President: The district is divided by the number of cards given to each meter reader; the card shows the whole history of each customer's consumption for a year. The card is numbered with the ledger folio and every man's account in the ledger folio must have an invoice rendered for it, and the card is returnable.

A. A. Wright: You have not one of your cards that we can see.

The President: There will be some presented tomorrow.

Mr. Bilger: Is a new card issued every time a meter is changed?

The President: It is noted on the card.

Mr. Wyse: Do you render your bills quarterly or how?

Mr. Dion: We have two periods of three months each, and three periods of two months each, five periods for the year.

Mr. Wyse: You don't find that there is more objection to paying them on account of the larger accounts than if they were rendered in closer periods, of say a month.

Mr. Dion: We have not tried them monthly.

Mr. Wyse: I presume the other is satisfactory.

Mr. Dion: The other works well.

A. A. Wright: You never lose anything by customers going away.

Mr. Dion: We occasionally lose a few dollars by people not paying their bills, but we have to take our chances in watching those people.

The President: I may say for your information, that in Montreal we had a large number of quarterly customers, in fact, at one time they were all quarterly customers, and new contracts were taken making them pay monthly, and after that had gone on some time we adopted the policy of rendering bills monthly. Those customers whose contracts provided that they should pay quarterly exercised that right if they wished to, but they got their bills every month just the same, with the result that practically every customer that we have now has got into the habit of paying his bills monthly. It was not forced upon them, but they were given copies of their accounts and they found it convenient to pay. It involves of course some work, extra meter reading and extra making of accounts, but we have found in practice we can get in our returns monthly quite agreeably.

Mr. Wyse: Do you find that you have better results

from that than when you rendered them quarterly?

The President: It has eliminated a great deal of complaint about heavy bills; and it also affords the opportunity of showing a customer's varying use; that is, if he got a bill for two months in the winter time he would think he had a very large amount, whereas one month may have been large and the other one comparatively small.

Mr. Fisk: Do you ever discount a customer's bill if paid on or before a certain date.

The President: We do not; our rate in Montreal was fixed by contract some years ago, but we have lately inaugurated a varying system of rates, very largely on the lines indicated by Mr. Dion in his paper. We impose a penalty of interest after the date in the month provided for in the contract, and also exercise the right of disconnection. We put that in vogue two or three years ago. On and after a given date the customers were notified that their accounts were not paid, and were called upon to pay them within a couple of days after. If they did not, they got another notice that they had not paid, and that at the end of two or three days more if the account were not paid their service would be discontinued. At the beginning we had a great many disconnections to make and reconnections were made upon their paying a dollar. It has gone on; we have lost some customers of course by it, but with no permanent serious loss, until now we have a very small percentage of customers whose bills are collected by the man who goes around to make the disconnection. That is, they wait until he comes around to pay their bill, instead of paying it to the office.

Mr. A. A. Wright: Where you distribute these accounts over three months you say the date is placed on the bill. I suppose you mean you give them the bill for January, February or March, and you merely say "this account is for these three months"?

Mr. Dion: I give the actual date of the reading. There might be only two and one-half months between the two readings, or there may be over three months, as the man who reads the meter may not get around on a certain day.

A. A. Wright: What about these meters, do you charge rent for them?

Mr. Dion: We charge a rent for them.

A. A. Wright: You add three months rent in every time.

Mr. Dion: Three or two as the case may be. We get twelve months in every year.

T. R. Rosebrugh: I would like to suggest, in investigating the question of the behaviour of recording watt meters on inductive loads, it might be well to use a small machine having six collector rings, of which three might be three phase and three six. In this way, with six collector rings, you can get the phases all the way around the circle, 15 degrees apart, and by a suitable combination of a non-inductive load, you can divide the 15 degree phases so that you can have the phase angle almost anything you please.

Mr. Dion: I would like to say a word in reply to what Mr. Gossler stated in connection with meter testing. He objects to testing meters in series because he says an inductive load is introduced which makes the meters go faster. We do not care in that particular test how fast or how slow they go, provided they are all affected alike. The master meter or standard is first carefully tested at all the loads, and it is then used as a standard in series with the meters to be tested, so that so long as the meters are all affected alike, the master meter and the others, we don't care anything about the speed, because we compare the consumption with that of the master meter to determine the accuracy of the meters afterwards.

Mr. Wyse. But then we have to lose so much revenue from having the record incorrect.

Mr. Dion: We first test the master meter for accuracy and then we test the other meters by comparison.

Mr. Wyse: Subject to the inductive load.

Mr. Dion: So long as the master meter is affected in the same manner as the others the particular speed

does not matter, because we know that the master meter is correct.

Mr. Gossler: In connection with that matter, I notice that Mr. Dion suggests counting the revolutions of the meter, and if you are going to count the revolutions you have to take the individual meters and test them. If you adjust each meter for an inductive load and place that meter to register on a non-inductive load I don't see how you are going to have it register correctly. There is another thing I would like to bring up in connection with this matter, for discussion, and that is the advisability of adjusting the meter for operating correctly on full load. The time that the meter is in operation or in service on full load is a very small proportion of the total time it is in use, and we have found that adjusting meters for three-quarters load is more equitable both to the consumer and for the company. If you adjust meters to operate correctly at 3/4ths of the load and keep within the government restrictions, I think the results will be certainly more equitable to all concerned.

Mr. Dion: If you refer to my paper you will see we test them at half load.

Mr. Gossler: I beg your pardon.

Mr. Dion: We test the master meter at several different loads but we test the others at half loads.

The President: I suggest that this discussion be not closed to-night, but that we close our business for the afternoon, with the understanding that in the morning the further discussion of this paper be taken up, and that you occupy your time all evening getting up what you wish to say on it. There is a great deal yet to be said on this subject, and it is worth a great deal to the operating companies to have it all exhausted and ventilated. We will now adjourn for this afternoon.

At 5 p.m. the members made an excursion over the Hamilton and Dundas electric railway, and at 7.30 p.m. over the Radial Electric Railway to Burlington Beach, visiting en route the power stations of the radial railway and the Hamilton street railway. Unfavorable weather precluded the enjoyment of an excursion by steamer as per programme.

SECOND DAY.

At 9.30 a.m. the President resumed the chair, and in calling the convention to order said: Before proceeding with the regular business, with reference to the Nominating Committee, it has come to my attention that some dissatisfaction exists with some of the members at the action of the Executive Committee in undertaking to appoint a Nominating Committee. I endeavored to make it clear yesterday that the action of the Nominating Committee is in no sense binding; that everybody here has a perfect right to put in the names of candidates when nominations are called for. The Executive Committee did not intend and do not wish to take out of the hands of the convention that which belongs to it, and I want to say right here and now that if there is anyone who objects to the action of the Executive Committee in appointing that Nominating Committee we should hear from them now. We believed that we were representing the sense of the convention in endeavoring to concentrate our action in nominations, but if there is any objection to it I want everyone to make objection now. If it be the sense of this convention that the Nominating Committee shall not put in nominations, we will ask to have the Nominating Committee discharged; but do not let anyone go outside and say, "Well, I don't think the Executive Committee ought to appoint a Nominating Committee." Say it right here and now. If the Executive Committee have done more than they ought to, sit down on them hard and they will get out.

A. A. Wright: I may say that for one I was very well pleased when the matter came up in the way that it did. I have no idea that this Association should be run by a clique or should be in the hands of a ring, but we must have noticed that when nominations are made miscellaneously one man nominates a friend of his and another nominates a man because he chances to know him, and this thing works wrongly. A nominating committee know all the ins and outs of this thing,

and are supposed to take the matter into deliberate consideration and see that no man is nominated without having his status and the branch of the industry which he represents thoroughly discussed. Although I am a central station man, I don't want this institution to be run by central station men. I wouldn't like to see telegraph men run this institution, neither the telephone men, but I believe we shou'd live harmoniously together. We are all here to help develop this one branch of the industries of Canada. This committee, when they nominate a man, ought to take these matters into consideration, and I believe that they will. And then, as our President has very truly remarked, we have a safeguard; if there is any man who has been left off, we have a perfect right to nominate that man and give our reasons for nominating him, and if we as a body think he should be elected we have a perfect right to elect him. But I believe this is a good way of doing the work; it has been found to work well on some other occasions. I would like to see every single branch thoroughly and well represented on the board. I don't want to see any branch enjoy a monopoly of control. (Applause.)

The President: I take it from the applause to Mr. Wright's remarks that there are no objections to the course of the Executive Committee in appointing a nominating committee—therefore I will hope to receive a report from them during the day as to the names of the officers of the Executive Committee, of the President, 1st Vice-President and 2nd Vice-President, but before coming to that point we will proceed with the regular order of business, and that matter will come up under the title of general business. The first order of business is consideration of the reports of committees. We received the reports of the committees yesterday and they were accepted and approved, but the consideration of the recommendations made in those reports would appear to be covered by this item of the "order of business"; and perhaps the first and most important recommendation is that one of the Committee on Legislation, that the members of this Association formulate some plan covering a period of say five years, whereby each company will contribute yearly a given sum towards the necessary expenses of the Legislation Committee. As Mr. Yule very properly stated yesterday when the time for legislative work begins, a good deal of the energy of the committee is lost in finding funds. They are hindered in the beginning; they don't know whether they are going to be able to carry out what they wish, because they are not in possession of funds, and funds are undoubtedly necessary to employ representative lawyers and capable people to look after matters, and besides that and beyond that, the idea conveyed by the committee's report was that the Association should be kept informed, kept in touch with all bills presented to the legislature which may affect the general interests of electrical industries. Therefore I think the first question to take up this morning is the formulation of some method whereby that idea can be put into effect, and I shall be pleased to hear from any of you as to what can be done in that direction.

Mr. John Yule: As I understand the report, our recommendation or suggestion is that our successors in office of the new Legislative Committee take that into consideration. At the same time it is brought up for hearing what suggestions may come from members of the Association to give the committee an idea in what lines to work.

The President: As a very active member and an old member of that committee have you any suggestions to offer as to the amount of annual contribution the members might pay? I bring that up merely that it may be considered here, and while perhaps not acted upon, the idea will be growing.

Mr. Yule: That question has passed through my mind several times as to what would be a proper or reasonable amount for the different companies to agree to contribute for five years, and I don't think, even from the large companies, we would want more than \$10, and going down as low as one dollar or two dollars per year. It may not be used and it may not

be necessary, but during that five years a crisis might arise in which we would want quite a sum of money, and by gathering this fund we would have it in hand. It is thought well we should retain a solicitor in Toronto, examine every bill that is introduced in the legislature of Ontario and in the Dominion house, and see that nothing is lost sight of.

The President: I trust you will not leave out the province of Quebec.

Mr. Yule: We discussed this morning upstairs the question of electing a separate committee for Quebec.

The President: Covering the same idea?

Mr. Yule: Yes. By collecting this fund we would have an amount in hand in case of emergency: We do not want any large amounts; we rather want a large number of small amounts from a large number of companies. If we got 100 companies to enter into an arrangement such as that, if the sums range from one dollar to ten dollars it would be quite a sum in the aggregate, but it would be a very small amount for those contributing. It is entirely voluntary, and you have to use a good deal of judgment in asking them to contribute. Some companies are better off than others, and some are more willing than others, and it will take a good deal of work to get this scheme organized and get it carried out, but I think it can be done. That is what passed through my mind in making that suggestion. We talked it over at the last meeting of the committee and concluded that something of that kind to successfully attend to this business will be necessary. We have attended two meetings of the legislature; I have been pretty constantly in attendance at both those meetings, and have noticed the way in which legislation is introduced and carried through. Something may arise in a town or village or city; the corporation wants something carried through and they find the act interferes with it; they lay the matter over, and they ask their member to introduce an amendment to that act that will comply with their conditions, with what they want to carry through, and that amendment has to apply either to the whole Dominion, if it is in the Dominion house, or to the whole province. It is often looked upon as not amounting to anything, while very often it is a very serious amendment to an act and it goes through without anybody knowing anything about it, or without anybody being on the ground who is posted on that particular subject to point out where it will operate to the detriment of others, where there are a larger number of people interested, although it may be an advantage to that particular village or town or city. The members do not attend to their duties as they ought to. We all ought to get copies of those acts, and that is part of their duty. I suggest to the gentlemen here now, that they should remind their members in going to either of the Houses that if a bill is introduced that affects in any way a lighting company or any other branch of the industry, that they should send copies of that bill to them. I don't know that I can say anything further to impress upon this convention the importance of this matter being attended to, and of organization for the purpose of attending to it. Mr. Wright has had a good deal of experience, perhaps he can say something. (Applause.)

The President: I understand your suggestion to be that this would be a contribution by companies and not by individuals?

Mr. Yule: By companies, not by individuals.

The President: Therefore the maximum of the expense, \$10 a year, which you suggest, would seem to be not at all severe upon any operating company?

Mr. Yule: That was the idea.

The President: While a company may have in it a number of members of the Association, as a company the amount of \$10 would not be too small an amount to be paid by any of them, and, as you say, if we could get 100 companies organized together to contribute a fund amounting to say a thousand dollars a year, it would put the Legislative Committee of this Association in such a position that the interests of all could be guarded. Being forewarned by knowledge of legislation going on or offered, it could be very easily

overcome; and I think it is proper for us to realize and scatter broadcast among those who are not members of the Association, the idea that this Association desires legislation that only is just and equitable and fair, and that we are organized together for protection against unfair legislation only; therefore our efforts are entirely proper. We have communitive interests usually, and by making our efforts in the direction of proper legislation and guarding against improper legislation, we have a concrete idea to work for which will make our Association powerful and popular and give a reason why companies who are not represented should find representation here. We should grow – and it seems to me that the kernel of that growth is now planted by this legislation obtained last year. I suggest that it be expressed as the sense of this Convention that the next legislative committee be authorized and empowered, and if you please, directed to endeavour to get every operating company in Canada as members of this Association and contributors to the legislative fund.

Mr. Yule: I would not like it to go out that the Association expects \$10 per annum from every company. I would mention \$10 as the maximum and \$1 as the minimum.

The President: It seems to me one dollar is too insignificant a sum for any company. For an individual it is another thing. There is not an operating company in Canada to-day that does not squander \$10 for other purposes without hesitation, and it does seem to me that there is not a company in the whole of Canada that would be impoverished or hurt by the contribution of \$10. The larger ones can give more if they want to.

Mr. Yule: The method might be adopted this year in sending out agreements to different companies (you know we got an agreement printed for the company to sign, and along with that agreement the amount was suggested to the company; they considered the circumstances of the company and took the liberty of suggesting to them what they thought would be a proper amount for them to contribute, and that worked very well).

The President: That had reference to a special amount which you wanted to raise, not to a continuing yearly amount?

Mr. Yule: Yes. The same principle would apply.

The President: You wanted \$100 from some of them and you were content with \$5 from others.

Mr. Yule: Yes.

The President: This, I think, is a different line. Those who have contributed \$10 yearly may, on occasion, find it necessary to contribute more.

Mr. Yule: The whole of those yearly subscriptions will not be used up each year.

The President: Not each year, no.

Mr. Yule: The committee went over the list of companies and used their judgment in suggesting to those companies the amount they thought they could contribute or agree to contribute, and I do not see why the same method should not be adopted in applying for the yearly subscription.

The President: My suggestion is not that the Legislative Committee receive as the sense of this convention instruction as to the amount that they should seek for, but to have it expressed as the sense of this convention that the most important work that we have in hand now and may have for some time to come is the procurement of proper legislation, and that the Legislation Committee endeavor to get all the companies in the country interested as contributors to a necessary fund.

Mr. Yule: I would like to explain to the Association and have it go out to the companies that the lighting companies in a great measure are handicapped, owing to the division of interests. Other interests are more concentrated; they may be under one board of management, they can bring their influence and do their work in a moment's notice. We are largely handicapped by the amount of work we have to do to get those who should be interested to take action or to support the action of the committee.

A. A. Wright: I would particularly support the

position Mr. Yule has taken with reference to the attitude central station men should take with regard to their representatives in the legislature. I think this is a good idea, if we can only get the central station men to follow it up. Take South Renfrew for instance. We have five companies in South Renfrew, and if every one of these companies annually when the local legislature met were to drop a card or letter to our representative, stating to him that they wanted him to be careful and let them know at once if any legislation of any kind whatever were introduced with reference to electric lighting or touching electrical industries if that representative got five letters, one from each of the different companies, he would begin to think there was something in it. He wouldn't want to have the antagonistic element working against him, which these companies could bring to bear, and he would be on the qui vive to keep close watch of what was going on and let these men know. The great difficulty that I see is to get central station men to do their part. It occurs to me to suggest that if this committee should strike off a copy of a letter and every year when the legislature meets should send this letter to the managers of central stations and say, "Would you have any objection to copying out this letter and sending it to your representative in the local legislature?" Certainly that would bring this matter to their attention and I don't think the central station man would object to doing that much in his own interests. My idea is that this committee which is appointed to take this whole matter into consideration I am following up what Mr. Yule suggested in order to bring ideas before this committee – ascertain how much it is going to cost to pay a lawyer to watch this thing in the legislatures, and when we get an idea of how much our expenses are going to be annually, and how much of a sinking fund is required, they would form an estimate of how much of an average would be necessary for central station men, or those engaged in electricity, to give; and that would give us an idea of what we ought to do.

J. J. Wright: I would move that that Committee take these matters up and if the resolution is put in the words that you, Mr. President, gave us a short time ago, I think it would cover the ground.

Mr. Wyse: I second the motion. I was going to say, I don't think the Association wants to give the Committee on Legislation detailed instructions. They are appointed for that business, and they should be capable of discharging it. Whether they adopt a means of looking after the legislation that may come up through central station men, or through lawyers or through both, the manner and details of looking after it should be left to them.

Mr. Yule: The duty of a lawyer would only be to look up the acts that affect us, or amendments rather, and see what the effect of those amendments are.

The President: I understand that the motion does not pretend to enter into details, but to express as the sense of this Convention that the care of looking after proper legislation be the especial duty of the legislative committee, and that they give their best attention to it. No instructions in detail whatever.

A. A. Wright: We were only giving suggestions.

H. R. Leyden: Am I to understand that this committee is look after all electrical legislation? It has been spoken of a number of times as simply taking care of legislation affecting central stations. My idea is that they should include the telephone, the telegraph and other electrical interests as well. Although the Bell Telephone Company have an attorney acting for them, still our attorney would work in conjunction with him. There has been considerable dissatisfaction with the method that has been employed heretofore in looking after this legislation, and there has been friction between telephone, telegraph companies and central station men, and I think the scope of this committee should be broadened sufficiently to allow them to take care of all electrical interests.

Mr. Wyse: I think, in that case, the telephone companies and telegraph companies, as well as central station men, should contribute their quota towards the

expense of looking after this legislation, and not alone central station men.

The President: Both suggestions, I take it, are fundamentally correct.

Mr. J. J. Wright: I think if our Association would co-operate with them, I have not the slightest doubt that they would be willing to meet a subscription covering expenses.

The President: I have no doubt that the Association would be very glad to afford to telephone, telegraph and street railway companies, information which they might obtain in regard to legislation going on, and perhaps in that way make it manifest that our action is beneficial to them as well as to ourselves.

The President put the motion, which, on a vote having been taken, was declared carried.

The President: Is there any other report or recommendation of committees to be considered? (No response.) That appears to be all the consideration you seem to want to give to reports of committees. The next business on the programme is the election of the standing committees, and we will receive the report of the Nominating Committee on that. The Nominating Committee recommend as the Committee on Statistics: Mr. J. A. Kammerer, Toronto; Mr. A. A. Wright, Renfrew and Mr. J. F. H. Wyse, Brantford, Mr. Kammerer to be chairman of the committee. Does this recommendation meet with your approval? (Carried.)

The President: Committee on Meter Inspection—Mr. A. A. Dion, Ottawa; Mr. E. E. Cary, St. Catharines; Mr. J. J. Wright, Toronto; Mr. Dion to be chairman. Does this meet with your approval? (Carried.)

The President: Committee on Legislation—Mr. J. J. Wright, Toronto; Mr. B. F. Reesor, Lindsay; Mr. C. B. Hunt, London; Mr. John Yule, Guelph; Mr. H. R. Leyden, Hamilton; Mr. A. A. Dion, Ottawa; Mr. W. H. Comstock, M. P., Brackville; Mr. A. L. Briethaupt, Berlin; Mr. Wright to be chairman. Does this committee meet with your approval? (Carried.)

The President: In the report of the committee to confer with the Fire Underwriters there was a suggestion, perhaps not definitely expressed, that it might be well to continue that committee, not with the hope of doing very much with the Underwriters, but perhaps in the hope that municipalities might ordain certain ordinances which would bring about the inspection of wiring by the civic authorities instead of by the fire underwriters. Do you wish to have that committee continued with that object in view or let it die?

Mr. J. J. Wright: That refers principally to the province of Quebec, I understand. I don't know that I should be in a position to criticize. If that was referring to Ontario, I should certainly object strenuously to have any power of that kind put into the hands of the municipality, taking into account the manner in which municipalities handle those matters as a general thing.

Mr. Gossler: I might say for Mr. Wright's information that Mr. Hadrill, Secretary of the Board of Fire Underwriters, which I think covers the Dominion, stated that the Fire Underwriters hoped and expected that the municipalities throughout the Dominion would enact by-laws that would make the enforcement of the Fire Underwriters' rules part of the building laws, and he said that was being done in the United States; there were over sixty municipalities there that had included in the by-laws enforcement of the Fire Underwriters' rules, and there had been two towns in the Dominion of Canada, the city of Winnipeg and the municipality of Brandon, so evidently the fire underwriters were starting out with the idea of making inspection part of the municipal by-laws.

Mr. J. J. Wright: My experience of municipal representatives is that they are competent to handle things of that kind.

Mr. Woolsey: In the States in the last few years they have had this matter up before the councils of the various cities there, in relation to the fire underwriters' rules and regulations, and the majority of the cities

have taken those rules and placed them among all their other building rules and regulations. Not only have they gone that far, but they have also appointed a man who has to pass a civil examination electrically as an inspector of electrical work and apparatus installed in those cities. Besides that, the underwriters themselves have an inspector or inspectors, who cover a certain territory, and before any work is done electrically in any way, they have to apply to the various electrical inspectors of the various cities in which the work is done before they go ahead. They must get a permit from him before they do any work. After the permit is given they have to apply to some of the managers of the board of fire underwriters in the various localities and secure a permit from them before they can go any further. After that permit is granted they go ahead and do their work, and then the inspector must inspect it before any current is turned on. They have made it a very rigid rule, and in consequence the work is being done far better than it has ever been done before. There has been less trouble in the last five years in electrical wiring than in all the years before, and it is all through the municipalities adopting rules and regulations laid down by the board of fire underwriters.

Mr. Wyse: I think the municipalities adopting those rules and trying to enforce them would only be an assistance to what we want at the present time, perfect wiring.

The President: In the Province of Ontario it happens that one of our very oldest members has the matter of inspection in charge, and it is undoubtedly through his personality that common sense application of these rules is given, but elsewhere the whole difficulty with the situation is that there is no centralized authority anywhere which can call upon and be called upon to see that any given set of rules is carried out, and the sense of the convention last year was that the advantage of the operating companies was to have some authorized authority who would look after this matter and see that any rules, be they whatever they may, be carried out. Now, whether it be by the municipalities or board of fire underwriters, is immaterial. If the municipalities take the rules of the board of fire underwriters, and make them the law of their municipality, then it becomes incumbent upon everyone having to do with them to execute the law. Thereby we get a responsible centralized authority, and, as Mr. Woolsey said, any corruption or mismanagement is guarded against in the States by the board of fire underwriters in addition giving a certificate. Therefore, if there be any contradiction between the action of a municipal inspector and the underwriters' inspector, it is discoverable at once. If the corruption extends to the inspector of the board of fire underwriters as well as to the inspector of the municipality, then of course the company or customer suffers. But when you establish a certain principle by law, then you have a lot of inspectors, that is, you have the general public and the law itself. Last year it seemed to be our view that we wanted somewhere in some place somebody authorized to supervise this thing intelligently.

J. J. Wright: I think the whole loss falls on the fire underwriters; they are the proper parties to see that the work is done according to their ideas.

Mr. Gossler: In regard to that, the committee tried to explain to the sub-committee of the fire underwriters that the fire insurance companies were really the losers in the matter, but they did not seem to see it in that light. It seems to me they are perfectly willing to accept the certificates of the electric lighting companies if they will certify to the fact that the wiring has been done in accordance with the board of fire underwriters' rules; but for the lighting companies' and power companies' own protection I think there should be an independent inspection from an outside source. I speak of that for this reason—when it is left to the electric lighting companies or electric power companies they are liable to draw on their imagination as to what constitutes compliance with the board of fire underwriters' rules. I know of several cases where very objectionable installations have been put in and objected to by

one company, and another company has come along and taken them right on those lines.

The President: Is it your wish, gentlemen, that this committee should be continued, to report at the next convention what they find can be accomplished? (Motion carried to continue committee.)

A. B. Smith: Who are the committee?

The President: Mr. Dion, Mr. Gossler and Alderman Sadler. There was another member, Mr. Badger, and it would be proper to appoint someone in his stead, and I will be glad to receive suggestions. Mr. Badger was appointed because he was in Quebec. Mr. Sangster, would you be kind enough to act as the other member of the committee? Mr. Andrew Sangster will be the remaining member of that committee. Now, the next business before us is the selection of the place and time for the next meeting of the convention.

Mr. Dion: I desire on behalf of Ottawa city to extend a cordial invitation to this Association to hold its next convention there. I can assure you of a very hearty reception, and I do not think it is necessary for me to say very much in support of this invitation, because it would seem as if it were Ottawa's turn to get it. We have not had a convention of this Association for five years; since that time it has been in Toronto and been further west and also further east. Ottawa is a central place, and I have spoken to a number of members about it and they seem to be quite agreeable to the idea. At any rate, I propose Ottawa, and I hope the convention will decide to come there. (Applause.)

The President: It does not seem to be any use to ask for any who are contrary minded to speak—therefore it will be Ottawa next. (Prolonged applause.) The next item on the programme is General Business.

Moved and seconded, that this Association express to Mr. James Conmee its appreciation of his earnest efforts in securing equitable legislation concerning the electrical industries of the province of Ontario, and that the combined Executive and Legislative Committees be instructed to convey this expression to Mr. Conmee in a proper and fitting manner.

A. B. Smith: I would move, seconded by Mr. Yule, that our Secretary be allowed the usual grant for the year. Carried.

The President: Now, gentlemen, we arrive at the question of papers, and we adjourned yesterday with the discussion upon Mr. Dion's paper unfinished. We had, perhaps, fully exhausted that element of the subject having reference to testing and methods of reading and so forth, but have not taken up the question of rates. If there be anything more to be said on the matter of meters, meter placing, meter testing and meter reading, we should be pleased to hear from you now, and I want to repeat what I said yesterday, that I hope that everyone here will take an active part; if necessary, rap another fellow over the knuckles in order to get some fire into our discussion.

Mr. C. H. Wright: Mr. Dion in his paper at page 2, section 4, says, "The current should be calculated from the indications of a Siemens dynamometer. If none is available, the wall ampere meter, which should be frequently calibrated, may be used instead." I think a Weston ammeter will be found more convenient and reliable. Last year Mr. C. E. Haskins, the meter expert, provided a plan of testing meters in houses. He takes a bank of lamps of a lower voltage than those in use on the company's wire and calibrates them at different voltages, and he can test the meter without any disturbance whatever, and this removes any doubt that may be in the consumer's mind as to the accuracy of the meter. On page 3, under the heading "Station Meters," Mr. Dion says, "The practice of metering the output of the central station, which is becoming quite popular, is a move in the right direction. The data obtained through the use of station meters is not otherwise available. It is sure to lead to economies in the station, and will be of material assistance in making and re-adjusting rates." I doubt the reliability of this data. Further back Mr. Dion refers to the size of meters in relation to the load. When we install a large meter for measuring the total output, this meter at certain hours of the day will work on a very light load. Take the case of hotels, where the lights are burning late, you

will have lots of meters working on practically full load, whereas your large meter in the station is working on low load; in fact, after twelve o'clock it is no uncommon thing to see this large meter stop altogether. You take and add up your house meter readings and check them against the main meter in the station, and the difference is altogether too great. Large differences in stations, perhaps, are to be looked for where we have transformers. In one station where I was employed, we thought there was something the matter with the meter, and had it recalibrated; in all cases we got difference of from 20 to 30 per cent. between the total readings of the house meters and the main meter in the station. I know we calculated our other losses to be about 5%, and the transformer loss could not have made up the 25 per cent. difference present. So that the fact of these large meters working on small load, looks to me as though the data thus obtained is not perfectly reliable.

A. A. Wright: We had as high as 36 per cent. loss once in a large bank of transformers. You promised to show us that card.

The President: That will come up in the reading of the next paper. Is there anything further desired to be said on this question?

Mr. Leyden: I want to say a word as to what Mr. Dion said as to when a customer objected to the reading of the meter, immediately removing it and replacing it by another meter. To my mind this is not the best way out of the difficulty. Mr. Dion states that it is not the proper method to test a meter on the premises. While you might not be able to get as accurate results on the premises as you would in your own testing room, still, if you do get any results at all, and they are anywhere nearly correct, the customer is a great deal better satisfied, and is very much less liable to complain the second time than if you take the meter out and put in a correct one. If you can show to him right on the premises that the first meter is correct, you are not liable to have much further trouble.

Mr. Fisk: I do not think it is hardly the right thing to do to have to humor every customer into believing his meter is right. We pay the Government for informing the public as well as ourselves that these meters are correct, and it a record is kept of the original test of these meters, and that is shown to the customer, I think that is far enough. If he is dissatisfied, then the law provides that by him depositing the proper amount the meter can be verified, and then there is no doubt about it at all. If you try and humor every customer that is dissatisfied, you have a big job on hand. If you take one man's meter out and put another one in exactly the same, perhaps his conditions will change a little; he gets better results and he at once says, 'I know what is the matter, that other meter is wrong'. He tells all his friends, and you have got to change everybody's meter; whereas probably the meter is all right. We pay the Government for testing these meters, and they have the option of depositing their fee and getting the certificate themselves, and if they do that, this certificate not only answers their purpose, but it also gives the lighting company another lease of life for five years on that particular meter, which I think is the proper way.

Mr. Dion: Have you any competition in your town, Mr. Fisk?

Mr. Woolsey: This meter question I think would apply to the province of the legislative committee. In several cities in the States that same question of doubt has arisen with the subscriber or with the consumer as to the meter being correct or not. It has gone into the board of electrical control of the various cities. When the consumer makes complaint or has an idea that his meter is not reading right, he applies to the board of electrical control, the inspector of it is the inspector of all electrical work, and the customer has to take his meter out and take it to the inspector's office, or else the inspector comes to the house and inspects the meter, and then if the meter is found to be out, or is found not to be correct, the company has to pay one dollar to the inspector and put in a meter that is right, but if it is found to be correct then the customer has to pay the dollar to the inspector.

Mr. Yule: Our practice has been to explain to the custom-

ers complaining of the meters that our measures are certified to by the government as being correct, that we have practically no control over the meter, that it is tested and sealed up and put on the premises, and we refer them to the inspector without giving them any information as to making a deposit or anything at all. In nine cases out of ten we do not hear anything more from them. The inspector explains to them what the operation of the law is and what is necessary.

Mr. Henderson. In reference to testing meters in houses, you take a meter that has been changed from store to store and the meter has been running slow, it is moved to this new place and through transit it has jarred the jewel and it is running slow, whereas in the last installation the meter was probably running fast. Another point in changing meters: A man complains of his bill, it is true that the meter, from his previous readings or accounts, is running fast, at the same time, if that meter were tested in that house without removal, it would obviate the danger of jarring the jewel and it would be a great advantage.

A. A. Wright: It is very fortunate that Mr. Dion introduced that clause into his paper. You can not give any hard and fast way in which these things can be adjusted. A great deal depends on the man that has to deal with the woman. (Applause.) You have to be guided by circumstances. I am not particularly touched with the blarney stone of the Irishman, but still I find it necessary to use the persuasive element with a great deal of dexterity and a great deal of suavity of manner to get over these difficulties, you can't handle any two alike. When all fails I tell them that of course it is possible this meter may be running wrong, but we believe it is right, and if they are prepared to put up sufficient money to pay the expense, we will bring the government inspector and have it examined, and if it is wrong we will pay all expenses, but if the meter is correct and found to be going right they have to pay the expense. I never found that to fail in satisfying the woman.

Mr. Yule: The only way is, if they think it is desirable to have an inspection made of the meters on the premises, let the Government inspector do it, he is the most neutral. If officials of the company go there for the purpose of persuading the people that the meters are all right, it will have little effect.

Mr. Dion: I find in Ottawa that the Government inspector refuses to test meters on the premises, you have to take the meter down and take it up to his office, so that unless the owner of the meter comes along with his meter, there is no certainty to him that the meter has not been tampered with before it reaches the inspector. I would like to know what the practice is in other places?

A. A. Wright: One other scheme I have adopted with reference to this—when the first complaint is made I say, "really, I don't think there is anything wrong with this meter, for this reason, that the meter we have put into your place is a test meter that we got from the factory expressly to test our meters by. (Laughter.) It is not any ordinary meter that you have in your place, but it is a test meter."

J. J. Wright: May I ask Mr. Wright what particular church he stays away from when he does not go?

A. A. Wright: Mr. President, I am a leading member of all the churches. (Applause.)

Mr. Gossler: Three or four years ago the Royal Electric Co. had numerous complaints from customers of their meters either humming or running too fast, or not in accordance with the light consumption, and we undertook to maintain that our meters were right, although we didn't know quite ourselves whether they were or not. But we undertook to say they were right. We started an investigation, with the idea of being able to maintain that those meters were right or else finding out for ourselves whether they were right or wrong, we started out with a very thorough investigation, and made tests. I may say safely that we had hundreds of complaints of meters running fast. Since that time we have gone into it not with the idea of humoring the customer, or using blarney, but maintaining that what we said was correct. We reduced our complaints down. We have some 3000 meters in use, about 3000 customers, and I am safe in saying we have not within the last year had 25 complaints. We have, in every case, undertaken to show the customer that the meter was correct, we then tell them that the meter has been subjected

to our own test, and has been passed by the Government inspector, and if they so desire they can call in the Government inspector to verify our statement; and we have practically eliminated complaints from customers. We use several meters—the Schallenberger meter principally, the Siemens meter, and some Duncan meters. I don't think it is a question of humoring the customer at all, it is maintaining the fact that you are right.

J. J. Wright: The unfortunate part of this business is that meters very often do go wrong?

Mr. Gossler: I may say in connection with that question that we have taken up the matter so thoroughly that we do not find that many of our meters go wrong.

J. J. Wright: That would refer more particularly to alternating current meters, which you know are very much more reliable than the meter used on direct current.

Mr. Street: I find about the easiest way to satisfy a customer making any complaint is to maintain that the meter is correct, and to at once refer to the account and say, have you compared your account for a period this year with the corresponding period last year; and on doing that (it can be done in a very few minutes in the office), I find the customers are very easily satisfied; that in many cases it can be shown that the accounts are not any higher, very often less, and they go away quite satisfied. I find that a very satisfactory way.

A. A. Wright: That is a good way; that is one of the ways I have adopted too, when everything fails.

The President: Apparently you all realize the same thing. After all, the most effective way of dealing with your customer is to take him entirely into your confidence; explain to him fully all the workings of the meter, explain to him why his meter operates, why it registers, and why it registers a certain quantity; inform him as much as you can, give him all the information you have on the subject yourself, and he then realizes that you are intending to give him what he pays for, and that you desire him to know how he can determine it for himself; and I may say that I have found that method effective rather than when any reference to the government inspection or any test or examination was offered. The very fact that you tell him all that you know about it, so that he will understand that you take him into your confidence, satisfies him. If there be no other remarks on that branch of the subject we will take up the question of meter rates. For the purpose of starting the discussion, I may say that in Montreal we have practically three systems, one of them is the single rate, another is payment of a given amount for the first hour per lamp per day, and a very small amount for anything in excess of the first hour per lamp per day; the third method is to charge a fixed monthly sum, that being ascertained and determined by the leakage current of the transformer having been ascertained and a value put upon that; then the value of the transformer ascertained and a percentage of that amount added to the leakage current value, and in addition to that a sum representing the interest or return that you want upon the capital invested in your entire plant for that amount of current that that man wants as represented by his transformer capacity. We have figured those out for all the various sizes of transformers so that our canvasser is able to say to a man, if you want a 50 light capacity transformer you will pay us so much per month and without any reference to your burning, and in addition to that pay us a sum for the current register. That plan is perhaps the most fair to all parties, but it is not accepted by some of the customers because it calls upon them to pay more than they would pay upon the single rate plan, thereby determining that they as customers upon the single rate plan are a loss to us, because the fixed sum that we determine in that way covers the cost of current that we give him in leakage, covers the cost of the investment we have made to be able to give him the service up to that capacity, then the amount that he pays for the current that he uses represents the costs of making and delivering that current to him, plus whatever profit we want on the transaction. Thereby every customer is placed upon an even footing, each man pays his proportion of the investment that is made for him, and he actually pays the cost of manufacturing the current which he actually uses. I may say that we have on the first hour per lamp per day plan, and upon the transformer leakage or energizing plan, customers to the extent of nearly 2000, our single rate customers being principally residences and some small stores. Either of those plans cultivates the long hour user,

or the use of the current for a longer period. When you make the price for the excess over the first hour per lamp per day small, the user does not feel the necessity of economizing and cutting off the light, that is, he feels he can burn another hour with very small cost, and that encourages, therefore, long burning. On the other plan the man realizes he is paying for the current he actually consumes and a small amount to excess to make the total price less per hour when he uses more current.

Mr. Fisk: When you have a number of customers and varying loads on one transformer, how do you arrive at it then?

The President: We undertake to determine the maximum transformer capacity of each customer and rate him accordingly for the transformer energizing term.

Mr. Bilger: Do you give the customers a chance of changing to either one or the other of these methods?

The President: Not after he has made his contract, we have that determined at the beginning, and I may say we try to point out to the customer what the effect of the different plans would be.

Mr. Wyse: Do you endeavor to put all your customers on contract?

The President: We have none that are not; we won't take a man that is not.

A. A. Wright: How long is your contract made for?

The President: We have nearly 2000 for five years and none less than one year. We will not take a contract for less than one year, except that which is known as temporary service, and for temporary service the customer pays the cost of installing and the cost of removal, and then ordinary current rates if the service is in the summer; if it be at the time of our heavy load in the winter, we make him a special price. We take no one without a signed contract.

A. A. Wright: What do you mean by removal?

The President: The cost of removal of the installation. Suppose a man wants to put up 100 or 200 lights for illuminating, he has to pay the cost of putting up and taking down.

A. A. Wright: That is when it belongs to you.

The President: Yes. We don't wish to give a customer the right to withdraw at any time he pleases; we must formulate and arrange our business so that we know what we have in sight, what we can prepare for; the question of competition does not enter into it at all; when we make arrangements to supply a man we want to make arrangements to supply him for a given period of time, and that period of time we know, and it is fixed by contract.

Mr. Wyse: Doesn't competition enter into it very materially then, though indirectly, because if you didn't have any contract he would have the right to go to a competing company at any time?

The President: A more important feature would be that he would have the right to give up using the service and go to candles if he wanted to.

Mr. Wyse: If there wasn't some competing company that could give an equally good service, say for instance in electric light, there wouldn't be any inducement for him to change.

The President: Perhaps I might better say that it is competition, because it is competition from candles. A man who is not under contract with you and is dissatisfied either with fancied error in his bills or the personality of the manager, may in revenge give up the use of the light, and if he cannot get gas, burn kerosene oil and candles; in fact, we had one case in Montreal where a man wouldn't pay the price we asked him for some temporary purpose who said he would go back to candles rather than burn electric light, and he did, as a matter of fact. The purpose is to hold your business in hand for a certain specified time.

Mr. Wyse: And against any or all competition.

The President: It has that effect.

Mr. Bilger: How would that act with a customer who was put out of his premises.

The President: We endeavor in taking a customer to ascertain his financial status, and if he would be such a one as would be likely to be put out for non-payment of rent, we request him to provide a deposit sufficient to cover about two months' use of his service.

Mr. Dion: In the case of a man discontinuing the light through no fault of his own, having to leave town or something of that sort, do you enforce the contract strictly.

The President: No, we do not. Where a man honestly is unable to carry out the contract, we exercise the discretion

of waiving our rights, but the object of the contract and the contract throughout all its phraseology is intended to protect the company against wrongdoers, and not against the man who wants to act honestly. I may say that we have customers who object to signing our formal contract on the ground that it is too restrictive in favor of the company, but by calling their attention to the fact that it is only restrictive as against those who want to be dishonest, every reasonable man accepts it.

Mr. Noxon: Is your five year basis upon the same basis as the one year, or does it anticipate the probability of reduction in rates before the end of that period? Is there any anticipation or provision for that?

The President: The five year contracts are fixed for five years at that rate; the five year contracts are, as I say, on either of these two basis that I spoke of, so much for the first hour per lamp per day and a very small amount in excess of that, or transformer energizing current and a small revenue. The single rate contracts are all subject to change in price.

Mr. Noxon: In consideration of a man giving a fixed contract for five years, would you make any reduction in the price for the five year term over and above the price for the one year term?

The President: Yes, these rates I speak of are a reduction.

A. A. Wright: What do you mean by the first hour?

The President: The first hour per lamp per day means the first ampere hour of use, or the first 50 watts hour of use, and it is arrived at in this way. An installation of say 25 lamps should register the equivalent of 25 ampere hours per day. At the reading at the end of the month we will say that the reading of the meter shows that the number of hours is 1200, one hour per lamp per day times 25, or 30 times 25 would be 750 ampere hours to be charged for at the rate of the first hour, and the difference between 750 and 1200 at the lower rate.

A. A. Wright: That causes some labor.

The President: Not very much labor. It is one calculation for the year or one calculation for five years. You have 25 lamps and 750 hours, and that is simply noted on a man's account, or rather 750 hours is charged for at the first price and anything in excess of that is charged at the other rate.

Mr. Fisk: How do you keep informed as to the actual number of lamps a man has?

The President: We endeavor to do that in several ways. Where customers have lamps added, as they frequently do, we endeavor to establish the rule, and for their own protection to guard them against being out of a service, to notify us of that addition, and we have made a great many of our customers think that it is to their advantage as well as to ours that they should give us that information, but it frequently happens that they forget it or they do not do it, therefore we periodically make a recount of the lamps in the customers' premises, and our lamp renewing man and our meter readers are cautioned to look out for anything in the way of new work since their last visit.

Mr. Wyse: May I ask how often your meters are read and the bills rendered?

The President: Every month.

Mr. Dion: Mr. President, we have had a good deal of information about your company which is very useful, I would like very much to hear from Mr. Wright, of Toronto, representing a large city, as to meter rates there.

J. J. Wright: If you have any questions to ask I shall be glad to answer them. We have simplified the matter in Toronto very greatly, and at the same time we have the advantage in that way of the demand system, by separating the commercial lighting from the residential lighting, and making two discounts, very largely in favor of the residences. We allow 40 per cent. for commercial premises and 60 per cent. for residential premises, for this reason, that the man at the residence is the long hour burner; he burns his lights every night in the year and for three or four hours per night, probably, whereas the man in the store closes at five or six o'clock and burns his lights only for about a month or two in the winter time, and that only for an hour probably, therefore we make the discount so much greater for residences.

The President: Except when he is off on his vacation.

J. J. Wright: The meter goes just the same. (Laughter.)

A. A. Wright: That would not apply to a barber or men of that kind that burn their lights till 12 o'clock at night.

J. J. Wright : We have to make exceptions ; we sell our light in Toronto very much in the same way that the huckster sells his fish or the farmer his potatoes, we get all we can for it ; and we regulate our rates by the amount consumed, by the number of hours that the consumer burns his light, and we make an estimate very often in each case as to what the rate shall be. This applies more particularly to flat rate customers, of which we have a large number. It is quite as much in order for us to go to a man's premises to make an estimate from the information he gives us and from the knowledge we have of his business and his probable requirements, of the amount of light he is going to use, as it is for a carpenter when he gets a specification for a building ; he comes and reads over that specification and looks at the general plan of the building, and what extras there may be, and he estimates what that is going to cost him, and what profit he is likely to get out of it. We go and make a general estimate from our knowledge of the business and from the knowledge of their requirements as to what we can afford to do. I find the plan to work very well. We have very severe competition from the gas people ; gas in Toronto is 90 cents per thousand, and that makes it interesting for the electric light people. But I started out with the assumption that we have got to have this business, and if we can't get it at one price we have got to have it at another. I find that works pretty well. As customers become undesirable we drop them off. We have a check meter on all the flat rate customers, and if we find they are abusing our generous confidence we tell them so, and give them a hint that if they want to get a renewal of the contract they will have to moderate their transports or they will not get it again, and that generally brings them to time. So in that way I don't think we lose as much by the flat rate as is commonly supposed.

Mr. Henderson : The two rate system in Hamilton has met with great success. Where we have lost a customer through the gas company, and have had his records of a year's consumption, we have approached the man and made a flat rate with him in this way, by taking the readings for the previous year, and where he was only getting a discount of 25 per cent. we would make it 33 1/3, and at the same time making it an inducement to him to reduce and keep his lighting rate down, whereas before with the flat rate he used it extravagantly. We have got quite a number of our customers back in that way. This summer we purpose going in for window lighting, placing them at a fixed rate, and the contract will be that he is to burn the lights until half-past ten or eleven, as the case may be, and then we will have to switch the whole system off. In that way it will illuminate the town and make our light more popular, and be a splendid advertisement for the business men. On the first of May this year we increased our discount on residential lighting, and so far we have received quite a number of customers through it, and in that way, in the course of a few months our residential lighting will increase very largely through the additional discount. We make our residential discount 40 per cent., it has been 25 per cent. heretofore.

The President : It is now a quarter to twelve and we have several more papers to be read, and we are to be back here at half past two ; I thought, however, it might be proper to take the necessary time to read another paper, and as the one I have in mind is almost in the same line as the matter we have been discussing, that is, having reference to rates and so forth, and is non-technical, whereas the others are somewhat technical, we might have this paper read just before we close this session now, and after dinner we will be able to discuss it. Before Mr. Hart reads his paper I would call upon some of the members of the Association to express the very earnest thanks of this Convention to Mr. Dion for his paper.

Mr. J. J. Wright : I have great pleasure in moving that the thanks of the Association be tendered to Mr. Dion for the very able and interesting paper he has read on this question.

Mr. Gossler : I, in seconding that motion, would like to call the attention of the Association to the great detail that Mr. Dion has brought out in his paper, and the great value that it certainly must be to anyone who looks over it carefully, I take great pleasure in seconding the motion.

The President put the motion, which, on a vote being taken, was carried amid applause.

Mr. P. H. Hart at this point read his paper entitled

"Central Station Accounting from a Business Standpoint." (See page 163.)

The reading of this paper was greeted with applause.

Mr. Hart : The various forms that I refer to in my paper are here for your inspection, and by an examination and inspection of them I think you will grasp the meaning of the paper much more readily.

The President : It is now nearly ten minutes after twelve, and the next session will begin promptly at half past two. Are you desirous of spending a little more time before we close this session ?

Mr. A. A. Wright : Will these forms be published ?

The President : They will be published.

Mr. Leyden : I don't see that we can discuss this paper very much without having the forms before us, because the forms are the substance of the paper ; Mr. Hart has outlined his general ideas, but the details are not given in his paper and we can't discuss it until we see these forms.

The President : Suppose we spend a few moments in circulating them around.

On the suggestion of the President the forms were inspected by the members present, after which the President declared the Convention adjourned until 2:30 p.m.

AFTERNOON SESSION.

The President in the chair called the Convention to order and said : Gentlemen, before we take up the discussion on Mr. Hart's paper, I think it is desirable to announce now the names of the officers proposed by the nominating committee. The election of officers will take place to-morrow morning, it will be the first order of business so that you will have before you between now and then, the names of the officers the nominating committee have thought advisable to present for your votes :

"For President, Mr. A. A. Dion, Ottawa ; for 1st Vice President, Mr. Geo. Black, Hamilton ; for second Vice President, Mr. P. G. Gossler, Montreal. Of the old board of the Executive Committee the five to be re-elected are Mr. J. J. Wright, Toronto ; Mr. A. B. Smith, Toronto ; Mr. O. Higman, Ottawa ; Mr. E. E. Cary, St. Catharines and Mr. John Carroll, Montreal ; the new members of the Executive Committee to be, Mr. D. R. Street, Ottawa, Mr. W. H. Browne, Montreal, Mr. A. Sangster, Sherbrooke, Mr. J. F. H. Wyse, Brantford, and Mr. B. F. Reesor, Lindsay."

The President : This is purely and simply in the way of an announcement. Now for the question of Mr. Hart's paper.

Mr. Dion : Mr. President, Mr. Hart gives an account in his paper of how orders for work of various kinds are issued and I would like to ask him if he experiences any difficulty on account of these orders being mislaid by the men who handle them, or whether he has any system of keeping duplicates of orders.

Mr. Hart : I might say for Mr. Dion's information, that when an order is issued a duplicate of it is filed away. The orders are all in book form, the original is taken out ; a perforated form is taken out and handed to the man, and the book is filed away serially, a record of unfinished orders is also kept and checked up so that any unfinished order can be checked and called in, and the reason why it is not completed seen.

Mr. Street : The statements in Mr. Hart's paper might almost be taken as a suggestion from him that there should be a committee appointed to standardize the system of accounting throughout Canada ; I think this certainly would be excellent, although it might take three years to do it. There is one committee now, it might come under the head of one of the present committees, the committee on statistics ; possibly they might consider this. It seems to me this is something that is wanted very much. It would give the smaller companies, in fact, every company, a chance of comparing the particular branches of expense and the particular branches of revenue. At present now, for instance, one company cannot tell very well, supposing he has several hundred lights installed, whether he is getting sufficient revenue from those lights as compared with some other company, and there must be a reason for the difference ; the expenditure may be two or three times as great in one company as in another. If there was some systematic way of distributing the revenue expenditure among all the companies this comparison could be arrived at. I don't know whether a motion to that effect is in order ?

The President : A motion to appoint a committee for

the establishing of a standard system is certainly in order.

Mr. Street: I would have great pleasure in moving that a committee be appointed to standardize the system of accounts.

Mr. Bilger: I second that.

The President: The motion is that a committee be appointed to arrange if possible a standard system of accounting for central electric lighting stations belonging to this Association. The question is open now for discussion, and in process of the discussion of that motion you can probably further take up the points of Mr. Hart's paper. Does anyone wish to raise any objection to the appointment of such a committee?

Mr. Hart: Speaking to that motion of Mr. Street's, the wording of the motion hardly, I think, covers the idea I wish to convey in the paper, which is, to appoint a committee to standardize the system of accounting for central stations operating in Canada. That is the idea of the paper. Mr. Street's motion is as to the stations the managers of which are members of this Association. I think if the motion were put to read, "the accounting is to apply to central stations operating in Canada," it would more properly cover the point, than simply putting his motion in that form, that the standard system be applicable only to members of this Association.

Mr. Street: I am quite willing to change the motion, in fact the motion may be worded in any way that is suitable. I am quite agreeable to change it as Mr. Hart suggests.

A. A. Wright: If I remember, about four years ago the National Electric Light Association arranged for a thing of this very kind; blanks were furnished and every member of the National Association received a copy of these blanks, but nobody else. Of course, it is not necessary we should follow their rules, but they considered that subscribers or those who assisted in this way should get the full benefit, and those who remained at home in the manger should stay there.

Mr. Gossler: If I understand the paper rightly, the main object of it was to impress upon all the necessity of keeping a system of accounts whereby the cost of production would be obtained, and I really believe there are very few of us who can tell exactly what the cost of production per arc lamp hour is. While I would not for a moment discourage any movement to establish a systematic or standard method of accounting, it seems to me that the first thing to be impressed upon us is to be able to tell exactly how much it costs us. I think the object of the paper is to establish the fact that a system of accounting to obtain those ends is the first thing to be gained.

The President: As I understand the paper, it is a recommendation that some general system that can be used by stations of all sizes, and be of a uniform plan, should be recommended for adoption by the members of the Association, and that the author of the paper has undertaken to show by a system already in vogue, how the costs can be ascertained, and how they can be ascertained in the various forms—the various details of those costs. And the purpose of the motion now offered by Mr. Street, I understand, is to carry out the suggestion of the author of the paper, that a uniform plan be adopted by this committee, and report to the Association as being one that is feasible for all companies to use, and recommend that all companies do use it, so that they will have some basis upon which to compare their various costs of operation, and the various sorts of revenue. Having different methods of accounting, one man is able to say, well, the inspection of my lamps costs me so much; another man is not able to say whether it does or not, because he has it involved with something else. One man is able to say how much it costs him per hour of output for fuel; another man is not able to say that because he has incorporated with the cost of fuel wages of the men, handling, and so on, and I take it that the purpose of the author of the paper and the mover of the motion is, that this committee will take this matter in hand, and endeavor to recommend some uniform plan which will achieve the result. Am I correct?

Mr. Hart: Quite correct, as far as my paper is concerned.

Mr. Street: Yes.

The President: I would like to hear any objection that there may be to this, if any.

Mr. Noxon: I can not see how there can be any objection to it on the part of any person, excepting the committee. This is a thing that is offered to the Association, as I

understand, without money and without price. They can use it as they see fit; we don't have to do any work in connection with it outside of the committee. I don't see why we should kick if the committee will do this work; I don't see that we can raise the least objection; I think, on the other hand, that it is a thing that would be of very great benefit. There is no doubt, whatever, that every person connected with electric lighting interests knows that the matter of keeping accounts, and to tell what your light is costing, and what you are producing it at, and what you are getting for it, is one of the most important things in connection with the business, especially in this business where the margins are fine. If this committee will take upon themselves to do this work I certainly think this Association, instead of taking up the matter and debating every question, should be very glad to accept of their kind offer to do so.

The President: I take it, however, gentlemen, that the assentive action of this Association to the formation of such a committee carries with it some application by making use of the results of that committee's work.

The President put the motion, which, on a vote being taken, was declared carried.

The President: I will now appoint as that committee, the mover of the motion, Mr. Street, the author of the paper, Mr. Hart, and I think our friend Mr. A. A. Wright, of Kennewick. (Applause.) Is it desired to have any more talk on this paper? If not we will proceed with the other one. Before proceeding to the reading of the next paper, as the result of our question box up to date, we have one question, and I will call upon Mr. Leyden in the hope that he may be able to answer it. "What is the watt gain in transmission on the line of the Cataract Power Co.? How do you explain it? Could it be possible that the line is crossed with the Radial Railway?" (Laughter)

Mr. Leyden: Of course, most of you understand that there is no watt gain at all; there is a gain in the rise of electrical potential; we have a higher potential at this end than we do at the starting end; at no load it is ten per cent. and then it varies as the load comes on; the moment you equalize that by self induction due to transformers or motor load of any kind it disappears. There is no gain in watts at all, and the weight of evidence is that while you have 10 per cent. higher voltage on this end of the line, you have a current flowing into the line from the other end that may have 20,000 volts; we have about 18 amperes per phase on 2,000 volts, and it is shown that there is no load on this end at all, that the current coming in here just counterbalances the rise of potential at this end, and when we put a small load on this end the current at the other end still shows up about the same rate; that is, we can put say five amperes of current on this end and it won't increase the current at the other end at all, because there is the 18 amperes originally going in there, and that decreases as the load increases. There is still, however, with a very considerable load on, a matter of a thousand h.p., a slight rise in potential at this end over what it should be, but there is no gain in watts. There couldn't be. But it is a phenomena that is well understood and known as the Ferranti law, and it is figured out beforehand to determine the capacity of the line, and you know exactly what the effect will be. But there is no gain in watts at all, just an apparent gain in potential.

The President: We have a few other questions which have arrived, one is "Where is the proper place to begin charging customers for wiring—at the property line or inside of the building, or any other place?"

J. J. Wright: I should charge right from where it touches the building, then if it burns the fellow down he can't saddle you with the cost of it. Charge for the wiring the moment it touches the property line, that is, the building itself, or gets on the property of the consumer; it is his wire, and he is responsible for the safe keeping in every respect.

The President: What about the meter?

J. J. Wright: The meter, of course, would be excepted, but the wiring would be the property of the consumer.

A. A. Wright: The cut-out and the switch?

J. J. Wright: Yes.

Mr. Leyden: I should say that all property on the premises, beginning at the property line, should belong to the customer, with the possible exception of the meter, for this reason, that all fixtures on a property are subject to seizure for debts; anything that is attached to the property is subject to seizure. Of course, as to the meter, you put it on the property and you put it on at your own risk, but even that meter is subject to seizure for debts, as I understand it.

The President: In that connection I should do as was mentioned in an argument I had with a certain gentleman some years ago, have the charter changed, or perhaps better, have the law changed whereby the landlord would not have the right of seizure of the property of the company after they had been notified that the company had property on that building. I may say the charter of the Royal Electric Company was amended in that respect, and all we have to do now is to notify the owner that we have that property there subject to that law.

Mr. Leyden: What do you do in the case of a mortgage on the property?

The President: Send a notice to the mortgagor.

Mr. Gossler: I don't agree with the suggestion of Mr. Wright or Mr. Leyden, because in many cases you install primary installation, and you would hardly charge for primary wiring and transformer; I should suggest all secondary wiring attached to or on the premises.

Mr. Leyden: If you put it on there, you put it on at your own risk.

The President: The suggestion made by Mr. Gossler is one worth thinking about. As our business grows older and more extensive, undoubtedly it will happen that very frequently transformers will be placed in the buildings, and it would be a doubtful question as to whether you would want to sell your customer the transformer, whether you might not wish to retain the transformer in your own hands, and if so you would still have another piece of property on the premises. The danger apprehended by Mr. Wright that you are going to cause damage by your property or accident to life—I am afraid you would hardly be able to avoid that. If there are any conditions arising which would cause danger due to your fault, whether it be in wiring belonging to you or somebody else, you would undoubtedly be responsible for it. Mr. Dion, what would be your views?

Mr. Dion: The company should own, I think, all the primary installation. I do not see how you can avoid that. There is no question that in some cases it may involve you in a suit for damages, especially if the necessity arose for placing transformers inside the premises, as it is, I do not know whether that is being done in this country or not, but I know transformers are being placed in buildings in many places, and still I do not see how you can avoid owning and paying for all the primary installation. I should say that the company's responsibility should cease at the secondary terminals of the transformer.

The President: Still retaining the ownership of the meter?

Mr. Dion: Yes. I would like to sell the meter, but the conditions of meter practice are such, with the necessity of changing meters and that sort of thing, that you cannot very well do it. But, as a matter of principle, we should sell the meter. We should own nothing from the secondary terminals of the transformer inside.

Mr. Woolsey: I might say to the members of this Association that I have been in all the principal cities in the United States, and that the rules over there have been, regardless of where the transformer is placed, (the transformer is generally placed in the scuttle hole in the fore part of the basement, or else above the transom, above the stores or dwellings, or on the side of the dwellings,) that it has always been held as the property of the lighting company, the furnishing of the wires and running them into the building to the point of the meter. They also have a clause in their contract with the companies there that all material used belonging to the company, placed with screws, is always the property of the company furnishing the power; there is also a clause in

their laws which says, that in case anything is placed with screws in the building, that is, not nailed, regardless of whatever may happen, and of how the trouble occurs, it cannot become the property of anybody but the person who put it there.

The President: How about the question Mr. Wright raised of the responsibility to the operative company for damage which may be done on the premises to the property of the company? Mr. Wright is speaking from personal experience on that point, I believe, and undoubtedly has good reason for what he says.

J. J. Wright: It is not only the damage, but the alleged damage. It just occurs to me, I have had an elaborate contract drawn up; it is not one that would scare a customer at all, but it has been very carefully drawn, and as a consequence of the study of several clever legal minds to cover this point of damage; and any member of the Association who has a mind to drop me a post card after I get back, I shall be most happy to send them a copy of it; it covers the point most clearly and as completely as it can be done legally. If I had thought I would have brought a few copies over. (Applause.)

The President: The next questions I have are: "Should rent be charged for meters? If so, what would be a reasonable rate?" "Should rent rates for power and light meters be the same?" "Should a higher rate be charged for larger than for small meters?"

J. J. Wright: We charge meter rent on all watt meters. The only kind of meter we use which we don't charge rent for (because it is only used for our own personal guidance), is the Edison electrolytic meter; but all watt meters and mechanical meters are charged rent for, the smaller meters at the rate of 25 cents per month, and the larger watt meter, direct current, at the rate of 50 cents per month. We find it necessary to do so on account of the large amount of repairs these meters take and the high original first cost. The consumers complain in some cases and say that the gas company does not charge for meters. They are thinking now of charging for them, however.

The President: The fact that you charge for it indicates that you think it should be charged for.

J. J. Wright: Yes.

The President: Do you make any distinction between power and light meters?

J. J. Wright: No, about the same price. There is also the government fee to be taken into account in charging for these meters—the government inspection fee of \$2, which also has to be paid out of this revenue.

Mr. Anderson: Do you charge meter rent on all accounts?

J. J. Wright: On all accounts where meters are used. There is no absolute hard and fast rule; there are exceptional cases, but the rule is to charge on all accounts.

Mr. Anderson: In our case in Windsor, if the account does not run to \$5, I charge 25 cents; as soon as ever it reaches that point I drop the rate; when a meter earns that amount of money I can afford to throw that meter rent off. A meter rent is a very obnoxious charge, as you all know. The customer of course brings up the claim that the gas company makes no charge for meters. We have to meet that with the argument that the electric meter costs about three times what the gas meter does, and is subject to a great many more enemies. But there are a great many cases where it is very hard to charge a meter rent, and where you have accounts running \$5, \$10, \$15, \$20 and \$30, a meter rent is not worth arguing with the customer for. If you get a meter rent on accounts running under \$5 you are getting all that you practically require. The meter rent comes out of the people, I claim, the residential consumers. If you reach those customers by a meter rent, you are practically reaching, I claim, all that is required. Commercial lighting will generally run over \$5, so that for commercial lighting we hardly ever get any meter rent; \$3 a year is perhaps a pretty fair investment to collect on an \$18 or \$20 investment.

The President: Do I understand that \$5, without rental for the meter, is regardless of the number of lights a customer has? If he had 100 lights and

brought in \$5, would that warrant you in dropping the meter rent?

Mr. Anderson: As soon as his account runs to \$5 he would pay no rent for the meter. I do not care how many lights he had, as soon as his account ran to \$5 per month, I would charge him no meter rent. However, I believe the practice with a great many companies is that they charge on all accounts. In Detroit I find that the custom prevails very much as I speak of. I have followed them very closely, because their rates are similar to ours, and we can always meet the consumer in Windsor by stating that our rates are just as low as they are in Detroit, and that practically cuts off any complaints that we may have. In Windsor we use the Schallenberger meter largely. We charge a cent and one-half per ampere hour, with a discount of from 5 to 33 $\frac{1}{3}$ per cent.

J. J. Wright: You can afford to throw off the meter rent at that.

Mr. Anderson: I do not claim we can do as cheap lighting as Mr. Wright can in Toronto, or Mr. Hunt in London, but still we are not out for doing business for nothing.

Mr. Leyden: I think the proper business principle of running an electric light station is to make every department, if possible, pay for itself. A proper system of accounting should have a separate department for operating and maintenance of meters, and it is possible to make that department self-supporting. For that reason I think it is only fair and right that the customer should pay the rental of that meter, and I think that \$3 a year is a very small rental; I hardly believe it will reimburse the station manager for the expense of buying and maintaining that meter. What we usually do here is to fix a meter rental of about 20 per cent. of the cost of the meter for each year, whether it is a small or large meter. Lighting meters usually run about the same price; there is not a great deal of difference between a ten ampere meter and a large meter.

Mr. Hart: On what basis do you arrive at 20 per cent., charged to the customer on the meter as a rental?

Mr. Leyden: I always figure that you have to get about six per cent. return for the money invested, then the depreciation of that meter is easily eight or ten per cent., that makes 16 per cent.; then for inspection and any incidental charges, 4 per cent. is a very small allowance, so that 20 per cent. will hardly pay you.

A. A. Wright: Our custom is where we put in meters from 7 $\frac{1}{2}$ to 10 amperes, we always charge 25 cents a month rental; and as the last speaker says, I believe every department should maintain itself. When you take into consideration the facts that you have to have a room to clean those meters; have to have a man to go around and clean them and look after them; and when you consider also that fire occurs frequently and you lose one or two meters a year, and when you pay for inspection and one thing and another to keep things in order, I don't believe \$3 a year is more than a good christian man can stand.

Mr. Leonard: I would like to call the attention of the convention to one matter which slipped through yesterday without creating any discussion, that was this matter mentioned by Mr. Browne in regard to a day load for lighting stations; he proposed an idea which it seems to me is a good one. The idea is this, to help out your day load and even up the curve and reduce the peak in comparison with the other parts of your load, by getting on customers that use power during the day at hours when you have no use for it for lighting. We have made a contract with the Royal Electric Company covering the use of 3,000 h.p. for power purposes, whereby we use the power only during such hours as it would not ordinarily be required for lighting; we have a perfect right to use the power any time during the summer up to seven o'clock in the evening. In the winter months we are obliged to shut down our power at four o'clock, which accommodates the lighting station to such an extent that they can utilize the same apparatus, the same lines and general equipment for power purposes, and then utilize it again in the evening for lighting purposes. I don't think our

case is any different from the case of many others, and if our users had this thing presented to them in the proper light, I believe that a large amount of business could be obtained by local lighting companies in this way. It is a fact, I think generally recognised, that there is very little work done in a shop after the lights are lit; the quality of the work is inferior. I think we notice that in connection with cotton mills particularly. I am referring in this case to 3,000 h.p. in connection with the Dominion Cotton Mills Company of Montreal. Now, small manufacturers and such institutions as that would regulate their hours of work so as to enable them to use this cheap power, which, perhaps, they could not afford to use at the higher price they have to pay for it if they use it when it would be required for lighting. Lighting companies, on the other hand, can afford to let power under those conditions very much cheaper, because the same generating capacity and station equipment, as well as the lines, are utilized so as to make a double earning capacity. I would like to hear other opinions in regard to this, and create a little discussion on the subject.

Mr. Leyden: In connection with Mr. Leonard's remarks, I might say we have made quite a number of contracts here for power on the basis of which he speaks—that is, during certain months in the year, from the 1st of October to the middle of March; the customer agrees not to use power after half past four or five o'clock. Here we are a little differently situated to what they are in Montreal, in that the city time is about half an hour beyond the standard time; that is, the sun goes down here twenty odd minutes later than it does in Montreal, so that we carry our contracts about half an hour further on than they do in Montreal; but I find comparatively very little difficulty in persuading manufacturers to accept this method of buying power, because, in the first place, there are a great many manufacturers that shut down during the winter for a couple of weeks to take stock, and nearly all the manufacturers are running comparatively light during those months. The manufacturers here in town are largely iron manufacturers, and it happens, fortunately for us, that their light season is in the winter. While a great many have objected strenuously to the idea when it was first broached to them, when you have explained to them all the workings of the thing and the advantage on both sides, and the advantages of a cheaper rate for power, because you can make a very marked difference in your rate for power, taking all the advantages into consideration, it is not a very difficult matter to get them around to your way of thinking. We have made quite a number of contracts on that basis.

Mr. Dion: May I ask Mr. Leyden how he controls that. Have you separate circuits for them?

Mr. Leyden: We have to trust to their shutting down at the time the contract calls for. We have a strongly worded contract; if they use it beyond the contract we have the privilege of charging an extra price for what they use.

Mr. Gossler: In reply to the inquiry of Mr. Dion, I might say we have quite a number of contracts that apply to power users after four o'clock, and relying upon their honesty, it is comparatively an easy matter to determine when they do or do not use it, because we know the circuits they are on. This matter of using power before four o'clock, I presume, has been carried out a little further in Montreal than in any other town in Canada, at least, to my knowledge. And I may say that last winter, at the time of our very heaviest lighting load, our day load represented about 75 per cent. of the very highest peak load that we had at first. I think that was rather extraordinary, at least from the records I have been able to obtain, and at present our day peak load is very considerably beyond the peak load at night.

Mr. Noxon: I would like to ask these gentlemen who have had experience with the day load whether they have many requests from parties using power for running extra time, or an amendment to the arrangement to allow them to use it after four o'clock, which would materially affect the business of lighting? Because I infer that many manufacturers having made that arrangement would, at certain seasons of the year,

find themselves hampered during a rush of business by having to shut down at four o'clock.

Mr. Leonard: I think I can give you an idea that will clear up what you have in mind, and relieve you as to the matter of interference of the two loads. If the contract provides that the manufacturer close down at four o'clock, I don't think there will be any difficulty in getting the load back again by 7 o'clock, and at 7 o'clock you have generally passed the peak of your load; after those hours anything you can get is very welcome.

The President: I think, perhaps, I can assist that a little further by a personal example. We have one case of about 450 h.p. where their contract provides that they shall have the privilege of using about 450 h.p. during twenty hours of the day, and during the other four hours of the day the maximum of their requirements shall be 300 h.p., thereby getting about 33½ per cent of their capacity in consideration of that reduction. By that means they get a very much lower rate for their 450 h.p. during the twenty hours and 300 h.p. during the four hours than they would otherwise be able to get, for the reason that the company would be obliged to get the full return on the 150 h.p. that was cut off as if they sold it in light, consequently the power consumer would have to pay a very high price.

Mr. Noxon: I would merely ask if this phase of the business would be advisable. The reason I ask this is, because we are proposing to go into furnishing power by making a contract. Would it be advisable in making a contract, provided they wanted to use the power continuously, which of course would be an object, to stipulate that we would make a provision that the hours from four to eight should be entirely exempt in any case; that they could use the other twenty hours in any way they wished.

Mr. Leyden: That is a form of contract we use.

Mr. Wyse: I would like to ask Mr. Gossler if his day load is equal to his peak load in winter? I understood him to say that his day load was equal to or greater than his peak load at night; does that apply to the peak load in winter.

Mr. Gossler: If I remember correctly, I think I said that our day load last winter at the time of our very heaviest load was approximately 75 per cent. of the night peak load. Next winter we expect to be in excess of the night peak load.

Mr. Reesor: Mr. Leyden said a minute ago that it would make a material reduction to a customer. I would like to ask how much reduction do you propose to make between a customer that uses it from 7 to 6 and one that uses it from 7 to 4 in the afternoon.

Mr. Leyden: I don't know that I can give you any positive figures, but I figure it would be about 25 per cent. difference. It makes a very great difference to you. You can figure about how much your full capacity is, so much horse power delivered. If you can sell it twice, if you get 75 per cent. of the value of it for each time, you are getting 50 per cent. more than you would in the rates, taking it the other way.

Mr. Reesor: If a customer says I want 50 h. p., and I will agree to take it from 7 to 4, what percentage would you say?

Mr. Leyden: 25 per cent., at least.

The President: In my address at the opening of the convention I took occasion to refer to this, for the reason that I regarded it as being probably the most important question for operating companies. In answer to the question put to Mr. Leyden just now as to the difference between the man who would use up to four o'clock in the afternoon, and another one who would require to use up to six, you can arrive at it by determining how much revenue you would get out of that amount of power during those two hours from lighting. Lighting during those two hours is a necessity, you can't get along without having the light; therefore, assuming that you can sell electric lighting, how much revenue can you get from the lighting for those two hours out of that amount of power? Having determined how much revenue you want from the power for the entire day, you will be able to know how much you can afford to get out of it during those two hours of lighting, and

the balance devoted to selling the power at a cheaper rate. In other words, you have a given plant out of which you must get a certain return; that certain return for lighting only must come out of those two hours. If you can get that return, plus 50 per cent., by selling the power during the rest of the day, outside of those two hours, evidently you can afford to sell that power for only 50 per cent. of what you get for the other two hours. I will now ask Mr. Plews to read his paper, entitled, "The Protection of Low Tension Wiring against Dangerous High Potential Currents." It is a short paper, but it is on a subject that is very likely to engage your attention very thoroughly, and it will, undoubtedly, call for a considerable amount of discussion. In order to assist Mr. Plews in the demonstration of his paper, and to enable him to answer any questions you may wish to put to him in a way that will appeal to you, Mr. Wickens has kindly loaned us a blackboard which we will have set up before you, and Mr. Plews can mark his diagram on that.

Mr. Plews then read his paper. (See page 162.)

The President: This is perhaps the most important paper that we have had for some time; it is one that interests us all very keenly, and we must very highly compliment Mr. Plews if he has accomplished successfully the device which he has set forth here. It is something that should be immediately put into service if it is one that can be relied upon to accomplish what he says, and we certainly thank him very highly for bringing it to our attention.

(Mr. Plews at this point drew a diagram on the blackboard illustrating the apparatus described in his paper, and by means of it answered many questions which the members asked as to the method of use, its reliability, etc.)

The President: I think the most cordial thanks of this convention should be extended to Mr. Plews for exploiting what he has done so far, and even if it be not complete, it certainly is a step in the right direction, and we should certainly assist him all we can to accomplish the results desired, without introducing other elements of danger. I move that the thanks of the convention be extended to Mr. Plews. (Applause.) Now, we will hear from Mr. Leonard.

Mr. Leonard read his paper, entitled "Transformer Economy." (See page 154.)

The President: Gentlemen, it is too late to undertake any remarks to-night on this paper, but I think I can say that it is one that every one of us can take home when we get the printed form, read it over carefully and attentively, study it, and bring it to the attention of our associates in our companies. It strikes the key note of one of the most important economies of central station operating. I hope that to-morrow morning, after the election of officers, upon the resumption of the papers you will be prepared to take up the discussion of this paper thoroughly.

The convention adjourned at 4:45 p.m., to re-assemble on Friday morning.

At 5 p. m. the members and friends were privileged, by courtesy of the Hamilton, Grimsby and Beamsville Electric Railway Co., to enjoy an excursion over the company's lines, 21 miles in length, traversing one of the most picturesque and beautiful districts of Canada. On returning to Hamilton a visit of inspection was made to the terminal station of the Electric Light & Power Co.

THE BANQUET.

Upwards of one hundred members and guests participated in the annual banquet. It was the first event of the kind held in the handsome dining hall of the New Royal hotel. The menu, as well as the service, displayed the skill of the management. The President, Mr. W. H. Browne, discharged in an acceptable manner the duties of chairman and toast master. The following gentlemen occupied places of honor: His Worship, Mayor Teetzel, Hon. J. M. Gibson, Hon. Mr. Shepherd, United States Consul, ex-President J. J. Wright, President-elect A. A. Dion, Mr. A. F. Pirie, ex-president A. B. Smith, Mr. Fred Thompson, Mr. John Moodie, Mr. John Knox, Mr. John Patterson.

The following toasts were duly honored: "The Queen," followed by the National Anthem; "Our Association," responded to by Mr. J. J. Wright, first President of the Association; "Our Guests," replied to by Col. Shepherd, U. S. Consul; "Our Rights and Wrongs," response by Mr. Stephen Noxon, of Ingersoll; "Hamilton, the Electric City," response by Mayor Teetzel; "The Press," response by Mr. A. F. Pirie.

The proceedings were further enlivened by excellent instrumental and vocal music.

THIRD DAY.

The convention resumed at 9.30 a.m. President Browne called the convention to order, and said: Before proceeding to the normal order of business, I have a telegram which should have been read at our entertainment last evening. It is as follows:

"OTTAWA. For Banquet to-night. Report passengers carried by electric railways in Canada last year reached the 100 million mark. George Johnson, Statistician."

The President: The first business we have to attend to this morning is the election of officers, and for the office of President the Nominating Committee has mentioned the name of Mr. A. A. Dion, of Ottawa. (Loud and prolonged applause.) After that it is not necessary for me to ask for any other names. I think I can safely say, with the approval of the convention, that Mr. A. A. Dion will be our next president.

Mr. Dion was declared elected to the office of President.

The President: The Nominating Committee has offered for the position of 1st Vice-President the name of Mr. Geo. Black, of Hamilton.

Mr. Carroll: I have much pleasure in presenting the name of Mr. E. E. Cary, and in doing so call for a ballot. I think we need young blood and active workers in the Association.

The President: Mr. Carroll offers the name of Mr. E. E. Cary.

Mr. Leonard: I think I can heartily approve of the name Mr. Carroll offers, and of the suggestion that we need young blood; and while we all appreciate Mr. Black, those of us who enjoyed the hospitality of the rear end of the room last evening cannot help but feel that there is a possibility of a whole lot of young blood being proposed or offered by Mr. Cary, and to the intent that we may receive the sense of the Association in that matter I have pleasure in seconding Mr. Carroll's nomination.

Mr. Black: Will you allow me to withdraw from nomination. I would like to see the nominations go in unanimously. My nomination was a surprise to me at the time; I was not in the room yesterday when the committee reported, and if you place Mr. Cary in the position of 1st Vice-President you will have a good man there.

Mr. Kammerer: As Mr. Black, who is my choice as first Vice-President of this Association, has seen fit to withdraw, I desire to say a few words. The Canadian Electrical Association is an association of central station men, telephone men and telegraph men, and as such I cannot support Mr. Cary. Mr. Cary is a supply man; I am a supply man, and I think we should not take a leading part in the principal offices in the Canadian Electrical Association. As members of the Executive Committee, it is all right; we serve our place in that way, but as I said before, it is an association of central station managers, of central station people, of telephone people and telegraph people; let them take care of it, let the supply men step down and do the entertaining if you like; that is what we are here for. I have much pleasure in nominating a central station man whom I think you will all join me in saying is a good bright fellow, and that is Mr. Noxon, of Ingersoll.

Mr. Carroll: I think those remarks come with ill grace from our friend, Mr. Kammerer, for this reason, that he has been on the board himself, and he is a supply man; and I have been on the board myself nine years and I am a supply man.

Mr. Kammerer: I think our friend Carroll has misunderstood me. I spoke with reference to an executive officer of the Association—president, 1st vice-president, or 2nd vice-president. As members of the executive

board I distinctly stated I would like to see supply men on it

Mr. Leonard: I think Mr. Kammerer is making a wrong assumption when he assumes this is an Association of telegraph, telephone and electric light men. I think that the supply men, perhaps, make the largest contingent that we have with us, and if it was not for the support and strength the Association receives from the supply men, I think we would have a very uninteresting and very small society. Supply men have, of course, personal interests to work for, but I do not think that there is any member here who is in the supply business who would be elected to an office such as the first or second vice-president of this Association and would so demean himself as to work that position for his personal benefit or for the benefit of his company. (Hear, hear.) I firmly believe that this Association should be run in the interests of central stations, and what is the interest of the central station is the interest of the supply man. Of course, we have heretofore had a number of central station men, representative men who have the management of the largest stations in the country, and it is difficult, I think, for some of the smaller central station men to fill this position so well as some of our supply men. The largest central station men have had their turn. I think now it is about time to give the supply men a chance, and see what they can do. Let us try it once.

Mr. Higman: I would say that the original intention, so far as I understand the matter, was that this Association should include all branches of applied electricity, and I have heard complaints made within the past year or two that there has been a tendency to make it wholly an electric lighting association. Personally, I have no objection, but if we are to maintain that broad character of the Association, I think we should keep in touch with the other branches, and personally there is no one in this room to-day whom I would sooner see in the office than my friend Mr. Cary. Those are my sentiments. I think we should try and keep the broad lines of the Association, and include all of them in its management.

Mr. Bonner: I would like to ask a question. If it were not for the supply men, how long would our good friends in the lighting business and in the telephone business and in the telegraph business continue in business, or when would they have gotten into business? If they are so dependent on the supply men in a business way and for the furtherance and improvement of all their interests, why can not the supply men serve an Association of electric light, telephone and telegraph men in the same manner? I think the whole thing works in together; we are interested alike for one common purpose, the improvement and success of the business as a whole, and why should we not work together in our Association?

Mr. Woolsey: As far as I am concerned personally, I have no objection to Mr. Cary's appointment as vice-president, but from years of experience in the electric lighting field among the various associations connected with it in different parts of the country, it has been found that the election of supply manufacturers or their employees, or the manufacturers of apparatus, as officers, from the president down to the secretary and treasurer, has never been found to the advantage of the Association itself; it has been tried time and time and again, and especially four years ago in the State of New York, it was tried to the detriment of the association—not that the men of the supply department or the manufacturers are not men who are responsible and capable of holding those positions, but it was found to be a detriment. The people in connection with lighting companies are men who are just as intelligent as the men who are representing manufacturers. I believe we can find to-day men amongst those who are representing the electric light companies who are as capable as we to fill those positions, and it is no more than right that these men be given the privilege before the men outside are taken in. It is well enough for us to take a part and to assist in every possible way, but as to our taking an active part in these offices, I think it is entirely wrong.

Mr. Dion: I wish to say that I am sorry this question was raised at all. Until now I think the question

of a division between supply men and central station men was never raised. I think it is a mistake to raise it; this Association is not old enough or large enough to draw any lines between any classes of members; we want all the members, we want their assistance, we want their work. This association has two principal objects, one is the furtherance of the interests of the companies which the members represent generally; the other is the acquirement of knowledge in our calling. We know that for both of these objects, and especially for the last one, we have to depend in a very large measure on supply men. The papers which are read here and which contribute so much to the increase of our knowledge, are generally the result of the study and experience of men engaged in manufacturing, or the supply men. Then if you admit that we owe a considerable part of our success and the success of our Convention to the efforts of the supply men, if you put them on your committees and get them to perform the work of the Association as they have done, some of them in such an efficient manner, is it right to debar them from the only little reward we can offer them in the way of honors? I do not think it is fair; undoubtedly it would be wrong to allow men, if they must be considered apart from the other members as a class, to control the affairs of the Association to the exclusion of the station men. There is no question that that would be wrong, but I do not think there is any danger of that for some years to come at least, and in the meantime I should like that we should forget that there is any division between us whatever. (Applause.)

Mr. Bonner: I should like an opportunity to qualify a statement I made to this extent. It is possible the members here may have understood or inferred from what I stated that I had an impression that station men and telephone men and telegraph men were not as equally capable of developing the business as supply men; that was not my meaning at all. It is simply this, that we are in the business of supplying apparatus, and even so, we are at the same time greatly dependent upon the station men to give us ideas regarding the practical effect or operation of what we supply, and to that extent we are dependent upon them, but it is simply the working together of the two interests that makes us, as I feel, equally interested in the success of this Association.

Mr. Kammerer: While it may not be written in the laws of the Association or in the by-laws of the Association that supply men are not competent to hold the position, yet it is the unwritten law, and one in which the older members that are here now will bear me out in (I refer particularly to Mr. Yule, Mr. Black, Mr. J. J. Wright and Mr. Thomson), that it was always understood to be an Association of central station managers, telephone people and telegraph managers, and those actively interested in that business, and not of supply men. While Mr. Dion says he has never heard the question raised before, I may say I have attended the Association since 1892. I think eight or nine meetings

and at three of those meetings I did hear it mentioned and discussed, and finally settled with the old members, that it was not the thing for supply men to hold the position of president or first or second vice-presidents.

Mr. Yule: Mr. Kammerer was vice-president one year himself.

Mr. Kammerer: Let me set you right there. At the time I held the position I was proprietor of a central station.

Mr. Carroll: I would like to say this, that that sentiment has really crippled our Association to some extent, and you have crippled your telephone interests and your telegraph interests by just such remarks as those from Mr. Kammerer. Why should we draw the line between the telephone and telegraph and central station and the supply men? What he says sounds very nice, but it does not follow out in the history of this Association. I have been a member nine years and I know the history of it. You have crippled your telegraph interests and your telephone interests, and if you continue on with your supply interests you are going to have fewer members than you have got here now.

The President: As between Mr. Carroll and Mr.

Kammerer, it would appear that the withdrawal by Mr. Black of his name takes out of the discussion the question of distinction between telephone and telegraph men and the supply men, and the nomination of Mr. Noxon leaves the question entirely between central stations, electric lighting stations and supply companies. Mr. Black has withdrawn, therefore I think any further reference to the question of telephone and telegraph men has been taken out of the discussion by Mr. Black's own action. The situation would now appear to be as between the supply department and the operators of electric lighting stations.

Mr. Higman: I think it is a little unfortunate to make that division. I would lose sight, if possible, of the occupation of those who have been nominated—I would not say it was between the supply men and electric light men.

The President: I will accept Mr. Higman's correction. The idea that I had in mind was that Mr. Black, by having withdrawn his name, took out of the discussion the question of telephone and telegraph interests, but Mr. Higman is correct in saying that it is not a question between supply men and electric lighting companies, but it is a question of having all interests represented. Therefore I will withdraw my remark.

Mr. Leonard: I move we proceed to ballot.

Mr. Noxon: I feel it a great compliment to have my name mentioned in connection with the Vice-Presidency of this Association, but I hope further that my nominator will do me the justice—do me the kindness, at any rate—of withdrawing my name from connection with this position. I certainly would feel that I would be under great obligation to the Association were my name acceptable to them in that capacity to serve to the best of my ability, but at the same time I do not feel that I have any claim whatever upon the consideration of this Association for such an honor as that, and I would therefore kindly ask my nominator to withdraw my name from the convention altogether.

Mr. Gossler: I second Mr. Leonard's motion to bring the question to a ballot.

Mr. Carroll: I cannot see how you can have any ballot, as there is only one name before the Association; Mr. Noxon has withdrawn his name.

The President: I cannot agree with you; Mr. Noxon has only asked that his nominator withdraw his name, but Mr. Noxon has not withdrawn himself. Before I put the question I desire to know if there be any other nominations desired to be proposed for the office of 1st Vice-President?

A. A. Wright: Will you allow me to draw the attention of this Association to one thing—that this tempest in a tea pot has not been raised by central station men.

Mr. Anderson: Mr. President, I am only a new member of this Association; this is the first convention I have attended; I have never heard of the jealous feeling that is said to exist in this Association. I wish to endorse what the last speaker said—I do not believe it comes from the central station men. I regret very much that the remarks have been as pointed as they have been. Perhaps I may strike the key note when I say it may arise from a little jealousy on the part of the supply men, because I do not believe it arises from the central station men. As far as the success of this Association is concerned, it depends largely, sir, on the manner in which we hold together. As far as the supply men are concerned, I think they are linked together with the central station men, and we cannot deprive them of their right as members of this Association to hold office and get part of the honors, while I believe it would be in the interests of the Association to divide these honors fairly and equally. I just wish to express my sentiments in this way, that in union is strength; do not let these jealousies creep into our Association and thereby injure it. There is no supply man on the floor but what I would welcome and be glad to see hold one of the offices of this Association. My acquaintance with Mr. Cary is limited, but I think he would make a splendid man for the position, and as a central station man I have no hesitation in supporting any supply man for one of the vice-presidencies of this Association.

Mr. Kammerer: One word. My motive has been questioned by Mr. A. A. Wright, of Renfrew. My motive was to carry out what the Association was originally intended for and started for, and I challenge Mr. Wright to prove or to say that I am not right in what I am contending for this morning.

Mr. Carroll: I challenge him, for he was one of the officers, and was a supply man at the time. (Cries of question, question.)

A. A. Wright: I suppose I have the right of reply to Mr. Kammerer.

The President: You have the privilege from the President of replying.

A. A. Wright: I do not want anyone to think that I was casting any slurs upon Mr. Kammerer, but I merely wished to draw attention to the fact that central station men were anxious to have this thing run evenly, smoothly and nicely, and I believe Mr. Kammerer is acting in good faith and is speaking what he believes; I do not doubt it in the least. Whether he is right or wrong is a matter for us to decide when we vote, and it is not necessary for us to go into this thing particularly, but vote as we like and have no disturbance.

Mr. Carroll: There is a second nomination for 1st Vice-President; I have not heard it seconded.

The President: I was not aware it required to be seconded, but that there may be no question—

Mr. Thomson: I second it.

The President: Before I put the question, I desire to say, the position of the President in this matter is rather different from what it is on matters ordinarily before the convention; and I hesitate to make any remarks whatever, and will absolutely refuse to express my opinion pro or con. On everything else except the nomination of officers, I, during the time that I have been and will be President, propose to have my say, and I think I have exhibited that tendency in this convention, but I do wish that the result of this vote shall be, not the creation of any ill-feeling, not the creation of any severance, but the cementing together of all the interests belonging to this Association. (Applause.) I would have preferred that the candidates for this office should have been confined to one name, or if there must be more than one name, several names; and I was rather pleased when I found that Mr. Black had been proposed by the Nominating Committee, and that Mr. Cary had been proposed by independent nomination. The issue would have been better for all of us if Mr. Black, Mr. Cary and Mr. Noxon had been offered for our votes, but as Mr. Black has withdrawn, the question is left for you now to decide as to whether you believe it is desirable in the interests of the Association that a man who is representing an operating company, or a man who is representing a supply company, both of them personally very popular men, shall represent the interests of this Association in an official capacity. Now, gentlemen, the ballot will be taken by each one writing the name of his candidate upon a piece of paper, and I will appoint as tellers Mr. Black and Mr. Anderson. Associate members are not entitled to vote, therefore when the tellers pass around and receive the ballots of each one, you will kindly see that they are active and not associate members. Gentlemen, in order to facilitate our progress this morning, while the tellers have your votes for 1st Vice-President before them for consideration, we will take up the question of the election to the office of 2nd Vice-President, and the name presented by the Nominating Committee is Mr. P. G. Gossler, of Montreal. (Applause loud and prolonged.)

The President: I cannot find anybody who has got the name of anybody else; therefore Mr. Gossler is 2nd Vice-President. (Applause.) The names presented by the Nominating Committee for members of the Executive Committee, for re-election from the old board, include that of Mr. E. E. Cary, who has been balloted for for the office of 1st Vice-President. Should it occur that he will have a majority of the votes for that position, some other name will require to be presented for the Executive Committee; therefore I will at the moment offer for your consideration only four names of the old committee: Mr. J. J. Wright, Toronto; Mr. A. B. Smith, Toronto; Mr. Ormond Higman, Ottawa; and Mr. John Carroll, Montreal.

Mr. Higman: I would ask you to withdraw my name, I have been on the committee now for a long time, almost since the flood I was going to say since the formation of the Association—and I would like to give place to somebody else.

The President: Mr. Higman can only give place to somebody else on this occasion by nominating somebody else.

Mr. Wickens: I would like to nominate Mr. Black to fill that position.

Mr. Carroll: While I would like to see Mr. Black on the committee, he has got to go in on the second ballot. Under the constitution we have to elect five of the present board.

The President: I have mentioned the names of only four of the five because Mr. Cary is under consideration by the tellers for the office of 1st Vice-President. In order to make the road clear for the election of five gentlemen of the old board, I can announce now the result of the vote for the office of 1st Vice-President: Mr. Noxon has received 26 votes, Mr. Cary 19. Mr. Cary therefore is declared to be, by the choice of this convention at present assembled, 1st Vice-President for the incoming year. (Applause.) Now, therefore, we have to consider for the Executive Committee entitled to be re-elected from the old board: Messrs. J. J. Wright, A. B. Smith, O. Higman, John Carroll, and one other, and Mr. Wickens has nominated Mr. Geo. Black. Are there any other nominations?

Mr. Cary: I would request Mr. Higman to give his consent to serve, because we will be in Ottawa next year, and outside of the great value of Mr. Higman's services in the past, and what I know they will be in the future, I hardly think he realized that we were going to meet in Ottawa, and really we cannot possibly get along without him. I know that from past experience, and if he will

only kindly consent to serve I think we will all feel grateful to him.

The President: I didn't take Mr. Higman's remarks in earnest at all. (Applause.)

Mr. Higman: I was going to say that I will serve in any case whether I am on the committee or not. My idea was to give a chance to those who had not had the opportunity hitherto, but if it is the desire that I shall remain on for this year, I certainly will.

The President: Then the names presented to you now are Messrs. J. J. Wright, A. B. Smith, O. Higman, G. Black, and John Carroll for the Executive Committee consisting of five members to be re-elected from the old committee. (Carried, amid applause.) Now for the five other members of the Executive Committee. And right here, gentlemen, I want to say that, with the exception of Mr. Carroll, Mr. Kammerer and Mr. Wickens, you seem to have forgotten the fact that everyone of you are entitled to nominate somebody else if you want to, and in this case I want somebody else to nominate another fellow. The names presented by the Nominating Committee are: Messrs. D. R. Street, Ottawa; A. Sangster, Sherbrooke; J. F. H. Wyse, Brantford; B. F. Reesor, Lindsay. Now for the last name on this list I want somebody to substitute another for, and that is Mr. Browne, of Montreal. As Mr. Higman said, Mr. Browne of Montreal can be of some value to you if he is not a member of the Executive Committee, and I think from what I know of him he would be really of more value to you if he was not on the Executive Committee, because he has not very much time to devote except in an entirely unofficial way. When I can give the time I can give it and will give it, as I have in the past, freely and willingly, but for official occasions it is not always convenient for me, therefore I ask somebody else to nominate someone in my place.

Mr. Wyse: With all due respect to your request, Mr. President, I think it is to the benefit of this Association that this Association take your request as you took Mr. Higman's, not at all in earnest.

The President: And as Mr. Higman did, I will do likewise. (Applause.) It is so much a matter of course and so much the regular thing that the nominating committee omitted to put on this document any officer or any name for the position of Secretary, Treasurer, and I, following their example and realizing that there was no other thing to be settled, forgot to say that we had to elect somebody for the position of Secretary and Treasurer.

(Cries of "Mortimer." Carried amid applause.)

The President: It was not necessary to put it on paper.

Voices: "No." (Applause.)

The President: We have but a very short time left to us this morning, and I suggest, if it meet with your approval, that instead of discussing Mr. Leonard's paper now, that we have read first the other two papers that are stated on our programme, and if we have time then we can discuss all three of them practically as one. While they are not of the same kind or character, yet they all refer to the technical line of our business. I would like to have nearly a day and a quarter left to discuss Mr. Leonard's paper, and I have no idea how much time I would like to have left to discuss Mr. Cary's paper, and I am sure as far as Mr. Turbayne's paper is concerned you will all employ the next few weeks in discussing amongst yourselves the value that it represents to you as operating men, because I presume that in the very near future the question of long hour burning arc lamps will be the most practical one we will have to deal with. I will therefore ask Mr. Cary now to read his paper on the incandescent lamp.

Mr. Higman: Before dealing with the system of arc lamps, I would like to place a resolution before the Association so that it will go in with Mr. Leonard's paper. During the last few years our officers have been greatly bothered to arrange settlements between electric lighting companies and municipalities in respect of arc lighting. Frequently—too frequently, indeed the contract is made in the terms of "candle power," a lamp of 2000 nominal candle power. That may mean something or it may mean nothing; I am inclined to the latter view of it, because it is extremely hard to determine the actual candle power of an arc lamp; it is dependent on so many things; so many conditions of the lamp when it is in operation arise that it is almost impossible to make a correct measurement of the light. There is the angle at which you take the light to be considered; there is the purity of the carbons, the mechanism of the lamp and several other things, the length of the arc and the time that the measurement is taken. And you all know that it is almost impossible to get a correct measurement of the candle power. So that in those cases where "candle power" is stated in the contract, we have been able to give little or no assistance. In other cases where the contract has been made in the terms of volts and amperes, we have been able to do something. I might cite a case. In Toronto a couple of years ago the municipality retained something like \$18,000 of the company's money under the plea that they were not getting what the contract said they should get. After a good deal of wrangling I was called in by both sides, and after testing the various circuits and a large number of lamps, and travelling all over Toronto for a couple of nights until daylight, I made my report, and found that the company was not only fulfilling its contract, but had been supplying 25 per cent. in excess of what the contract called for. This was borne out by the measurements that had been made by the city electrician, whose report or statement they refused to accept. Now, the consequence of that report was this, that the \$18,000 was paid over the next day. So you will see, if we have a means whereby we can determine what is being done, it will work out to the advantage of the electric lighting companies. I might say in passing, that at Ottawa at the present moment there is one of these disputes going on. The crude city solicitor there has stated that a nominal 2000 candle power lamp means an actual 2000 candle power lamp. How he makes that out, I leave him to determine. The resolution I move is practi-

cally the same as was adopted by the National Electric Light Association of the United States, and it has been found to work well there during the last four years since the arc lighting came into vogue.

I will move, seconded by

"Recognizing the difficulty, if not impossibility, of measuring with any degree of accuracy the illuminating power of the arc lamp, and the great necessity for a more precise definition and statement of the obligation of the producer of electricity for illuminating purposes to the consumer thereof, be it resolved, that in the opinion of this Association, what is ordinarily known as a two thousand candle power arc lamp is one requiring on the average four hundred and fifty watts for its maintenance, the measurements being made at the lamp terminals, where no sensible resistance is included with the arc. In case such resistance is used, it must be excluded in the measurement."

Mr. Henderson: I second that motion; I think it is a move in the right direction.

Mr. Gossler: I would like to ask if that resolution is not just a little incomplete. The advisability of placing more lamps on the street of a smaller candle power is very seriously considered in many large cities, and in some cities has been adopted, and to simply confine this to the 2,000 candle power lamp I think is a little incomplete. I also think this is a resolution that will stand consideration and deliberation of longer standing than passing this resolution hurriedly in this Association. 450 watts at present seems all right, but I think it would stand consideration. I would not like to see it passed hurriedly.

Mr. Higman: Of course, it will not be obligatory for anyone to adopt that as a means of making their contract, and the 450 watts only serves as a basis; there can be no objection to add a proportionate part of that for any arc lamp. Of course, if the Association were to pass this resolution it would then be a matter for consideration to be determined whether the government should give it the stamp of an Order-in-Council, so that our men might act with some standing in the matter. I am quite willing to let it stand as a notice of motion until next year.

Mr. Thomson: 450 watts straight current will give more light than 450 watts alternating current. I believe, according to the measurements, there is at least 200 candle power difference between the alternating lamp using the same watts as compared with the straight current, so that in stating 450 watts, it should be stated whether it was straight current or alternating; and there is a lot of difference between the enclosed arc lamp and the open.

Mr. Dion: Since this is a question that, as Mr. Gossler has said, deserves careful consideration, especially as it may form the basis of an Order-in-Council which would go out throughout the country and have to be accepted as law, would it not be better to appoint a committee to make a report at the next convention. It is true it would delay the matter for twelve months, but in those matters it is better to go slow than to make any mistake. A committee of two men could be appointed to consider the matter carefully during the year, and make a report at the next meeting which would be adopted or rejected.

Mr. Turbayne: I think the lamps under the candle power system can be read on the wattage basis, and I think they are.

The President: As I understand the purport of Mr. Higman's proposed resolution, it is not the establishment of a fixed quantity of energy for a defined candle power, but to have this Association give its sanction to the adoption of the idea that candle power as an element of measurement shall be abolished, and that measurement in energy shall be the basis of a contract; and I believe, and I submit it to you for your thoughtful consideration, that if Mr. Higman will modify his resolution in this respect, and instead of referring to 2000 c.p. or to 450 watts, make the resolution to read "that the basis of contracts shall be upon the basis of energy supplied," we can all agree with his resolution immediately. We do not have to appoint a committee, we do not have to wait a year, we can settle the question now; that is, that this Association recommends not only to its own members but to the governmental authorities, that in making a contract for service it shall be upon the basis of energy supplied to the lamp, regardless of what nominal candle power or actual candle power may be, and I request, if that meets with your approval, that Mr. Higman modify his resolution in that respect, and in that respect, if it is approved by us, I think it will undoubtedly form the basis of future contracts with municipalities.

Mr. Dion: While there can be no objection to the motion, altered as you suggest, it would hardly cover the ground. If I understand Mr. Higman right, he refers to contracts that are already made, as well as those to be made.

Mr. Higman: No, you cannot affect them.

Mr. Dion: Suppose he wanted some definition of what a 2000 nominal c. p. lamp meant, so that he could determine—

The President: I don't understand that to be Mr. Higman's idea.

Mr. Higman: No; it is to deal with contracts when they come up in future.

Mr. Gossler: I agree with Mr. Dion, and repeat what I said, that there are so many things to be considered that I do not see how you can make this matter the subject of a resolution to be passed now. When we say "on the basis of energy," where is that energy going to be in feeding the mechanism or the arc?

The President: Mr. Higman's resolution is, energy yielded to the lamp.

Mr. Gossler: That opens the question right away, where is your energy going to be consumed? You may have one-half of that energy used in the mechanism of the lamp. The object of the lamp is light, not having the energy consumed in the mechanism. I don't see how you can make this the matter of a resolution to be passed hurriedly. It means an awful lot of trouble if you do, in my opinion.

Mr. Nexon: I quite agree with the last speaker, and also with

Mr. Dion, that it would be far better to leave this matter over and have whatever is done done upon such a basis that there will be no injustice in the future. What I would be afraid of would be that any resolution passed by this Association would be taken as authoritative by the government, because this is the highest electrical authority that we have in the country as a body of independent individuals; they would naturally assume that whatever legislation this body made with reference to matters of that kind, would be an indication of the wishes of the electrical fraternity throughout the country, and it probably might be crystallized into law. If that is the case, it is better before such a thing is done that we know exactly the ground we are taking. It may be that it is all right; I am not particularly familiar with it. I am interested in this question from the fact that I am one of the parties having contracts with municipalities, and, of course, you can't get municipalities to understand what is meant by watts, in all their dealings, so far, through the nominal candle power, they have a sort of an idea, although very hazy, what that means; and when you come to get them to accept the thing in watts, a thing they know nothing about, you will have difficulty in convincing the authorities that you are not trying to take some advantage of them.

Mr. Higman: I brought this matter up casually before in Montreal with a view of having the Association take it up. We do not want to interfere or legislate in the slightest degree, but we are called upon to settle these disputes. Now, as a matter of fact, the so-called 2000 candle power gives only from 500 to 700 candle power. It is better to call a spade a spade and not say it is an axe.

Mr. Wyse: I would like to move that a committee be appointed to deal with this question. It is too serious a question to be disposed of by motion hurriedly. It immediately appeals to a central station man; that is, the great advantages of it appeal to the central station men, in the idea that you give 450 watts and receive pay for 2000 c.p. regardless of how that energy is consumed and the amount of light; but, unfortunately, there are two parties to the contract. The other party is the municipality, and what they judge, regardless of nominal candle power or actual candle power, or watts, or anything else, is the amount of apparent light or useful light they get from an arc lamp, and that is going to be their basis of contract. They would immediately inquire as to why the alternating current arc lamp, taking 450 watts, was not giving as much light as the direct current arc lamp, taking the same amount of current; and where you might make that a basis you would have to refer to the apparent candle power represented by a given number of watts, that is, you would have to refer to something that would appear to the people a given amount of light; 450 watts, whether alternating current or direct current, would have to represent to the people a certain amount of light which they could understand or see. I move that a committee be appointed to deal with the question.

Mr. Thomson: I second the motion.

Mr. Higman: I fancy my position in this matter has not been quite understood. I have simply brought it up in order that our inspectors might be of as much use as possible in trying to straighten out the little kinks that electric lighting companies have in many cases; that is the sole object. If the Association is not prepared to take the matter up, I will withdraw the motion and you can take it up at some future time.

Mr. Yule: I remember some years ago Mr. Higman brought this matter up and the discussion was much the same. He recommended then that all contracts that were afterwards made should be made on the basis of energy. We attended to that in Guelph, and had it fixed in that way on the suggestion of Mr. Higman.

The President: I understand Mr. Higman's motion just as he has offered it, I think, that is, he would like to have first determined a measure, approved by central stations in body assembled, by means of which his employees could interpret not only future contracts, but perhaps present contracts. I recognise that Mr. Higman is in a difficult position because a great many contracts recite that the light furnished shall be of so many nominal candle power. It would facilitate his work a great deal if it were possible to have an expressed opinion from us that a nominal 2000 c.p. arc lamp should not require at the terminals of the lamp more than 450 watts. The point raised by Mr. Gossler that 450 watts may be consumed to the extent of two-thirds in the mechanism of the lamp, and that only one-third shall be applied for useful effect, does not, I think, coincide with Mr. Higman's idea. His purpose, as I take it, is that the 450 watts of energy delivered to a lamp shall be employed by a lamp of the very best character of construction obtainable to-day, so that the maximum of the resultant energy shall be given to the municipalities by the company who delivers 450 watts to the lamp.

Mr. Leonard: Measure the energy across the arc and I think you will get rid of the difficulty.

The President: I take it that Mr. Higman's purpose here is to obtain some defined plane upon which the government, the municipality, the private consumer and the company may meet without any possible chance of error or equivocation; and while it is desirable, as suggested by Mr. Dion, Mr. Gossler, Mr. Wyse and Mr. Thompson, that we be not hasty in determining what candle power may represent in energy, I do believe that we should now support Mr. Higman in some declaration to the effect that energy shall be the basis of calculation on which future contracts will be made, and if possible the basis upon which old contracts may be interpreted.

Mr. Thomson: I believe that 450 watts from carbon to carbon between the carbon points of an arc lamp would give what is known as 2000 candle power nominal, straight current—450 watts between carbon points with a series arc lamp or straight current arc lamp.

Mr. Higman: The difficulty, of course, is not so much that I want to state what the actual voltage of the lamp should be, but that the energy shall be the basis of the contract, so that we may have some ground to stand upon. This matter came up in Chicago in 1893, in an almost similar resolution to this, to make it the standard of arc lighting. There are many reasons why you cannot make an absolute concrete standard unless you eliminate two things: first the quality, that is, the purity of the current, and the mechanism of the lamp; those would not be eliminated in that resolution and consequently we could not make it an absolute standard of lighting, but we are dealing now with the practical question of supply. Assuming that the carbons will be good and the lamps good, if energy under those conditions is applied to the terminals of the lamp, we will get in 99 out of 100 cases the nominal 2000 candle power. But the important point is to bury out of sight for all time the words "candle power" in regard to arc lamps.

Mr. Wyse: I would like to ask Mr. Higman whether he insists on withdrawing his resolution?

Mr. Higman: Or you might refer it to a committee.

Mr. Wyse: That is what I think might be more advisable.

The President: I understand the position now is, Mr. Higman has withdrawn his resolution?

Mr. Wyse: No, he has not; he allows it to stand, and I make a motion that it be referred to a committee, and the motion is seconded by Mr. Thomson.

Mr. Higman: Allow me to move that the committee be comprised of Mr. Gossler and Mr. Thomson.

The President: As I understand the position now, Mr. Higman withdraws his original resolution in the form he presented it, but offers a new resolution in lieu thereof, that the subject referred to in the resolution here proposed, be referred to a committee consisting of Mr. Gossler and Mr. Thomson, who will report to this Association at next convention what, in their estimation, is the best means of meeting the question at issue. Am I right, Mr. Higman?

Mr. Higman: That is the whole question.

Mr. Noxon: Seeing that the convention is practically unanimous upon the main issue—that is, making the energy the basis—would it not be better for Mr. Higman to make his resolution to that effect, and leave the question of what that shall be to this committee?

The President: I will take the liberty of answering that. The committee are now given broader powers than that; that is, they take up the entire question, and they make their recommendation in any particular they deem necessary.

Mr. Higman's motion is presented.

Mr. Yule: I think the gentlemen here do not sufficiently recognize the courtesy they receive from Mr. Higman in this matter. He has brought this up more than once, and is apparently not anxious to take any action but what would meet with the approval of the Association, and I feel he has received scant courtesy.

Mr. Higman: Not at all.

Mr. Yule: We ought to work in with him better than we are doing. I second the motion.

The President: I tried to take away the atmosphere of scantiness of courtesy by endeavoring to interpret Mr. Higman's desires, and I believe the rest of the members of the Association here appreciated the fact that I was interpreting Mr. Higman's intention to deal fairly with this Association and the members of operating companies.

Mr. Thomson: I believe Mr. Higman should be on that committee.

Mr. Higman: Let the mover and seconder be on the committee.

The President: The motion is before you, that a committee be appointed, consisting of Mr. Higman, Mr. Gossler, Mr. Fred. Thomson, Mr. Yule and Mr. Wyse, to consider the question of the interpretation that should be given to the delivery of current for arc lighting and to report at the next convention their recommendations in that respect.

Mr. Higman: Might we not have it "for the purpose of rating arc lamps on a basis of energy"—that would cover the whole thing.

The President: All right.

The motion carried.

Mr. Carroll: Under the head of General Business, I would move that the papers be held as read, and printed and incorporated in the proceedings of this convention.

The President: I object to that emphatically. (Hear, hear.) These gentlemen have gone to the trouble of writing these papers for us, and in one instance I know that the chairman of the committee on papers, in order to supply us with papers, took upon himself the task of writing a very important paper; it would be very scant courtesy indeed for us to adjourn now without those papers being read.

Mr. Yule: I move that the thanks of this Association be cordially voted to the Mayor and Corporation of the City of Hamilton, the Press, the Grand Trunk and Canadian Pacific Railway Companies, the Hamilton Street Railway Co., the Radial Railway Co., the Hamilton & Dundas Railway Co., the Hamilton, Grimsby and Beamsville Railway Co., the Cataract Power Co., the Hamilton Electric Light Co., the proprietors of the New Royal Hotel, the Local Committee, and others, for courtesies extended in advancing the interests of this convention.

Mr. Leonard: I second that.

(The President put the motion, which was unanimously carried.)

The President then called on Mr. Cary to read his paper. (See page 160.)

Mr. Cary: Owing to the short amount of time at our disposal, may I request you to allow Mr. Turbayne to read his paper in

advance; Mr. Turbayne has written that paper at my special request.

The President: Mr. Cary is our next 1st Vice-President and we will be glad to do anything he asks.

Mr. Turbayne read his paper entitled "Long Burning Enclosed Arc Lamps," (see page 159), which was greeted with applause.

Mr. Cary: In moving a vote of thanks for Mr. Turbayne's paper, I think the members would be interested to know that in response to our President's request upon central station men for subjects upon which they would like papers written, a number of replies were received, requesting a paper on the enclosed arc lamp and its use, and therefore I was particularly anxious this paper should be read. I suppose my turn comes next, and as I have received honor enough from the committee on papers, and as the inner man is entitled to something before we leave, I wish you would kindly excuse me from reading it and trespassing further upon the patience of our members. If there is anything valuable in the paper it is tabulated there in clear form. I am sorry to disappoint my good friend Mr. Gossler, who has his keen knife all ready for me when we got into discussion, but I think it would be wiser to allow the paper to drop.

The President: Some people have suggested that as Mr. Cary is so good natured and so willing, as he always is, to work hard, that he will read this paper on the train on the way down to DeCew Falls, but I hope when we leave here now we will leave to enjoy ourselves. When we leave, our business of this convention will be closed; there will be no opportunity of reopening it until the next convention, and my duties and my opportunity of talking to you as I have just now will cease. I only desire to say in closing this convention that I have not had in all my lifetime's experience, and it has been somewhat varied, as grateful an opportunity of realizing the good fellowship and the thoroughbred honesty of purpose of people who may not always agree with me, as I have found since I have been president of this Association. You took me up last year and unannouncedly, as you have for my successor, appointed me; it was a surprise, and if I had had time I would have refused. I have tried to do my utmost for the Association, but I have not been able to do all that I should do or wished to do, and I am particularly gratified that my successor is a man who will be able (and if he is not able he will find the opportunity to be able) to fulfill all the duties of President of this Association. I now resign in favor of Mr. Dion. (Applause.)

The newly-elected President, Mr. A. A. Dion, took the chair amid applause and said: Gentlemen, I do not propose to detain you at this late hour except to say that I am exceedingly grateful to you for the honor you have conferred upon me. I do not know that I ever did anything to entitle me to this honor, except in taking an active interest in the affairs of the Association, and in being a thorough believer in the usefulness and value of the Association. You can understand that following in the footsteps of Mr. Browne, after what you have seen of him during this Convention, I have not an easy task to perform, if I am to be judged by the standard which he has set. However, you may be assured that whatever little ability or knowledge I may possess will be applied industriously to the interests of the Association, and what I may lack in those qualifications I shall endeavor to make up in zeal, and zeal born of a thorough faith in the value of the Association. I thank you very much for the honor you have done me. (Applause.)

Mr. Higman: I beg to move, as briefly as possible, that this Association tender to the retiring President a hearty vote of thanks for the very able manner in which he has filled that office during the past year. (Applause.)

Mr. Dion: Might I be allowed to suggest that we include the names of the other retiring officers.

Mr. Higman: Yes.

The President, Mr. Dion, put the motion, which, on a vote having been taken, was declared carried unanimously, amid loud applause.

The Convention closed at 12.15 p.m.

Friday afternoon was spent as the guests of the Cataract Power Co. in making an inspection of the Company's extensive electric power development works at DeCew Falls.

NOTES.

It was fitting that the two pioneers of electric lighting in Canada, Mr. J. J. Wright, of Toronto, and Mr. Fred. Thomson, of Montreal, should occupy prominent places of honor at the banquet.

Several attractive and useful souvenirs of the convention were in evidence, among them being a nickel plated pocket match-box, having celluloid sides on which appear the name of the Royal Electric Co. and views of the Cataract Power Co.'s generating station; a stickpin surmounted by a miniature incandescent lamp and a union jack in the form of a bow, the gift of the Canadian General Electric Co.; a pen knife and case bearing the name and compliments of the Packard Electric Co.; a diamond-shaped eraser by the Canadian Rubber Co.

The Packard Electric Co., Limited, of St. Catharines, and R. E. T. Pringle, of Montreal, had their headquarters in parlour K at the new Royal Hotel, where they entertained their friends, as has been their custom in the past. They exhibited a full line of C. P. supplies, including the ordinary porcelain supplies and slate base switches, artistically arranged upon a board, the background of which was black and white. In addition to this they exhibited the new Diamond meter, which is claimed to be correct on inductive load, and a full line of the D. & W. enclosed non-arc fuses and cut-outs. The exhibit of the latter was the same as that on exhibition in Madison Square Garden, New York, during the Electrical Exhibition in May last.

RECORD OF ACETYLENE GAS PLANTS INSTALLED THROUGHOUT CANADA.

(TABULATED FROM REPORTS SUBMITTED TO THE CANADIAN ELECTRICAL ASSOCIATION.)

Town	Number of Generators installed	Number discontinued	Number in use	Period of Use	Capacity in Lights	Number of Accidents	Advantages	Disadvantages	Remarks
Arthur, Ont.	3	3	0	2 years.	20-16 c. p.	1 explosion.	They have light when required.	Much trouble with Acetylene Gas.	Explosion occurred by gas leaking.
Annapolis, N.S.	1	1	1	2 years.	20 lights.	No accidents.	Cheapness.	Bad odor. Extra labor in looking after.	Does not give satisfaction. Formerly had Electric Light. Imagined Acetylene Gas cheaper. By strict economy costs 75% of Electric Lighting. If used as freely as Electric Light would cost more.
Aurora, Ont.	1	0	1	2 years.	40-16 c. p.	Explosion.	Cheapness.	People afraid of them, there being so many accidents.	Man's hands and face burned. Boy left generator open, caused explosion. Only a short time established.
Avonmore, Ont.	1	0	1	6 months.	30.	None.	Cheapness claimed, but not as cheap as expected.		
Alton, Ont.	3	0	3	2 years.	8 to 10 lights	One explosion; man badly burned.	Better light is claimed.	Strong smell. Danger in handling. Labor and inconvenience in manufacturing.	These Plants are used here because no other light obtainable except coal oil.
Berlin, Ont.	5	1	4	4 years.	8 to 10 lights	None in Berlin			College authorities gave this matter a thorough test. After using it for a few weeks they threw out the entire Plant, and now use Gas and Electric Lighting for their buildings.
Blenheim, Ont.	4	0	4	Some 1 year; some 2 mo.	15 lights ea.	1 explosion by lighting match where gas had escaped.	Cheaper than electric light.	Think after being in use for some time valves will stick and clog, and probably cause explosions from high pressure. May explode any time from gas escaping when a light is near them.	One man nearly lost his eyesight when the explosion occurred.
Blythe, Ont.	3	1	2	Less than a year.	3 to 6 lights.	None.	Claimed costs half cost elec. light.	Owner would prefer electricity.	Has been a benefit to Electric Light Plant.
Bridgewater, N.S.	1	0	1	6 months.	12 lights.				Plant is situated about 9 miles from Bridgewater, hence reason for using Acetylene Plant.
Brantford, Ont.	1	1	0	5 months.	20 jets.		Claimed to be cheaper, but not so.	Floor light. Machine did not work right.	The people who have the machines are not satisfied with them. Two out of the three generators will not work.
Brampton, Ont.	3	1	2	6 months.	10, 20, & 75 lights.	None yet.		No advantage. Incandescent lamp is far superior. Cost too much and are dangerous.	
Brandon, Man.	4	4	0	1 year.	20 lights ea.	None.	None.	Dirty, unreliable, costly, etc. (Not sufficient brains to run the machine.) (First-class elec. light system.)	
Brigham, P.Q.	1	0	1	1 year.	5 to 20 lts.	None.	Cheaper light.	Very bad odor. Risk of explosion, etc.	Have been told that some who have Acetylene Plants here have since admitted that it is no cheaper than Electric Light. (One of these Plants in Ashton, seven miles from Carleton Place.)
Carleton Place, Ont.	7	1	6	From 2 mths to 1 year.	20 to 75 lts each; total 350 lights.	None.			What is installed in Chatham is no advertisement for Acetylene Gas.
Chatham, N.B.	3	0	3	About 4 mths	30 to 40 lts.	None.	Cheaper than elec. light, for which charge is made 10c per 1000.	Two of the parties also kept Electric Light and have to use it so often that their bill is about the same monthly. Late in evening light gets dim and then they have to turn on Elec. Light.	
Charlottetown, P.E.I.	2	0	2	About 1 year	10 & 20 lt.	None.	No advantage.	Carbide too expensive.	
Clinton, Ont.	3 and 2 more to be installed.	0	3	About 1 year	1-75 lt. 2-40 lt.	None.	Cheapness and good light at any and all times.	One owner of a gas plant informs that it is not as cheap as he was led to believe.	
Coaticook, P.Q.	1	0	1	6 to 8 mos.	20 lts.	None.	Cheapness.	Great danger of explosions and damage to property, high insurance rates, etc.	Agents trying to establish Plants here so far unsuccessful. So many explosions in Ontario, people in Colborne are afraid of it.
Collborne, Ont.	0	0	0						Man got his hand nearly blown off.
Cowansville, P.Q.	1	0	1	1 year.	5 to 20 lts.	One.	That it is cheap as coal oil & cheaper than electricity.	Satisfied that it is not as cheap as electricity.	Machines are manufactured here.
Dunham, Que.	1	0	1	1 year.	5 to 20 lts.	One exploded while being recharged.			
Dundas, Ont.	4	1	3	1 year.					
Dunnville, Ont.	0	0	0						Party had one on exhibition for some weeks; unable to sell even one Plant. Natural Gas here as competitor with Elec. Light, used through Auer burners.

TOWNS.	Generators Number installed.	Number discontinued.	Number in use.	PERIOD OF USE.	CAPACITY IN LIGHTS.	NUMBER OF ACCIDENTS.	ADVANTAGES.	DISADVANTAGES.	REMARKS.
Edmonton, Alta.	3	0	3	1 year	30, 30, & 20 lights.	Slight explosion.	Cheapness & good light.	At times shortage of carbide, and being so far away has caused loss of light for short period.	One party returned machine after 3 mos. use. Wanted Electric Light at price of coal oil, so tried Acetylene for spite.
Exeter, Ont.	1	0	1	2 years.	20 lts.		Cheapness & white light; pay for what used only.	More expensive, troublesome and dangerous.	Small Plant is being put in a tavern, which will make 3 installed.
Fenelon Falls, Ont.	2	1	1	9 & 6 mos.	15 or 20 lts.	None.	Can't establish any claims in favor of acetylene gas.	Too expensive.	
Florence, Ont.	1	0	1	6 to 8 mos.	50 lts.		To get even with the monopolists; the gas and elec. companies.	Users do not say.	
Frelighsburg, P.Q.	1	0	1	1 year.	5 to 20 lts.		Light on dark days when no current is generated in day.	Cost, bad odor, danger of explosions, time and trouble looking after generator.	One party has come back to electricity. One party uses electricity in his workshop.
Galt, Ont.	2	1	1	6 months and 1 year.	10 or 12 lts each.		That they would be cheaper.	Numerous; when doors of store are opened, the lights are blown out as many as 8 and 10 times in one night when high winds prevail; disagreeable odor from gas escaping.	
Gananoque, Ont.	3	1	2	1 year.		One explosion caused by looking for leak in generator with lighted candle; man badly burned.	Cheaper than electricity.	Bad odor and dangerous.	
Glencoe, Ont.	3	0	3	5 months.	16 lts.	None.	They have the light when they require it.	Much trouble with it.	Don't think they'll last.
Georgetown, Ont.	1	0	1	Over a year.	20-16 c. p.		Cheapness of light, only means accepting kerosene oil.	No cheaper than Electric Light, dangerous, more trouble and care, and not as sure.	
Grand Valley, Ont.	3	0	3	2 years.		Explosion in church; burned parson's face.	Nothing said as to advantages.	Bad odor. No cheaper than gas or Electric Light.	Some other contracts taken but not erected. Agents guaranteed too much, probably.
Grimsby, Ont.	2	0	2	7 or 8 mos.	40 to 50 lts. each.	None.	Claimed cheaper than elec. light.	Think parties would not have it installed again.	Firm very jubilant at first, but owing to expense of carbide and danger of explosion, do not say much about it. Electric Company been asked to wire Post Office building to be built this summer.
Hatley, P.Q.	1	0	1	6 or 8 mos.	20 lts.		Prefer it to coal oil; no chance to electricity.	Danger of life and property from explosions which may occur at any time.	Parties talking of putting it in on account of its being cheaper than Electricity.
Holstein, Ont.	1	0	1	1 year.	10 lts.	Explosion; burned face of young man.	Cheapness of cost of lighting.	More explosive than electricity.	The party who has this Plant installed narrowly escaped with his life; badly burned about the face. Think Plant will be discontinued.
Ingersoll, Ont.	2	2	0			None.	Sore heads.	Trouble, expense and risk.	One party who discontinued Acetylene Gas has installed Electric Light; other two who discontinued always had Inc. Lts. User is agent for Acetylene Gas; other users have grievances against Elec. Co.
Kentville, N.S.	1	0	1	1 year.		None up to date.		Now not so cheap. An everlasting bother and unsafe.	No Electric Plant here. Gas has been a benefit to Electricity.
Louisburg, C.B.	1	0	1	3 mos.				Give considerable trouble.	
Lachute Town.	1	0	1	1 year.	40 lts.	One; plumber repairing leak; gas came in contact with fire, causing explosion.			
Lakefield, Ont.	2	1	1	8 mos.	40 lts.	None.			
Lindsay, Ont.	6	3	3	6 or 8 mos.		None.			
Listowel, Ont.	2	2	0	4 & 12 mos.		Reported explosion, but denied.			
Lonsdale, Ont.	1	0	1		16 lts.				

Town.	Generators installed.	Number dis-continued.	Number in use.	Period of use.	Capacity in lights.	Number of Accidents.	Advantages.	Disadvantages.	Remarks.
Millbrook, Ont.	2	0	2	6 mos.	20 & 60 lts.	One explosion - done much damage.	Hotel can have it all night. Elec. Plant only runs till 12 p.m.	Explosion caused while charging machine while in operation.	Parties regret putting in Acetylene
Madoc, Ont.	4	0	4	3 mos.		One.			
Morden, Man.	10	4	6	12 mos.	From 20 to 100 lbs ea.	One explosion; man's face scorched, also head.	Offensive odor; sooty deposit; nuisance of having to clean out and charge at regular periods. Costs twice amount of Elec. Lt. without counting man's time. Irregular supply of carbide. The fact of an explosion which shook a large 3-story stone building is enough.		
Napanee, Ont.	1	1	0			Exploded first time used; never tried again.	Labor in connection with it. Danger from explosion.		
Norwood, Ont.	1	0	1	2 mos.	20 lts.		Claimed cheaper. Cheapness.		
Orangeville, Ont.	2	1	1	8 mos.					
Owen Sound, Ont.	0	0	0						
Oxford Elec. Lt. Co.	1	0	1	4 mos.	50 lts.	None.	Cheapness and efficiency. Don't know that any are claimed now.		One party bought Acetylene Plant, but after enquiry purchaser refused to take it. People here have no use for Acetylene Gas.
Parkhill, Ont.	3	0	3	1 year.	100 lts ea.	One; nearly blinded man.		Trouble keeping pipes clean and generator in good working order.	
Parry Sound, Ont.	1	0	1	2 1/2 mos.	30 lts.	None.	Cheapness.	Unpleasant odor; comparative inconvenience and more or less danger. Light also, although strong, is unpleasantly glaring.	People will not use it here on account of reported accidents.
Pembroke, Ont.	0	0	0						
Perth, Ont.	3	0	3	4, 6, & 12 mos.	20, 20, & 60 lights.	None.	Cheap; good light; local control. Less cost.	Danger of explosion. Disagreeable odor throughout premises; trouble in lighting.	
Prince Albert, N.W.T.	2	2	0		50 & 7 lts.	None.		Dangerous; unclean; destroy goods by smoke. Supplies cannot be obtained when wanted.	
Port Hope, Ont.	1	0	1	9 mos.	10 lts.	None.	Say it is cheap.	No cheaper than Electric Light here, while it is a dangerous explosive and very offensive.	
Rat Portage, Ont.	4	2	2	18 mos.	10, 20 & 40 lights.	Escaping gas caused explosion.	Not any; would stop if money were not invested	Trouble of frost in winter. Burners blocking with carbon and fluctuating.	Explosion blew out front of building, which put effect-ual stop to installations of Gas Plants.
Regina, N.W.T.	2	1	1	6 mos.	60 to 80 lts. each.	None.	Cheap light.	Have to protect generators from frost; generator located in cellar where furnace is. Ins. Co. will not allow this. Burners clog up; require too much attention. Foul smell, which in one case ruined stock of groceries. Plant thrown out.	
Sackville, N.B.	1	0	1	6 mos.	25 lts.	None.	Cheapness.	Bad odor, and also that water in gasometer freezes in bad weather.	Electric Light substituted and vendor of plant com-pelled to stand damages. Adjusted by arbitration.
St. Mary's, Ont.	7	1	6	1 to 2 years;	10 to 20 lts.	None, but looking for them daily.	Economy, able to light when de-sired.	Danger, smell, soot, smoke, apt to freeze up, as they nearly all did here last winter.	Claims for economy thought to be false. If Electricity were used as carefully as Gas the economy cry must stop.
Sarnia, Ont.	2	1	1	Few mos.		None.	A refuge when one quarrels with the local company.		
Seaforth, Ont.	4	2	2	6 mos and 1 year.	16 & 20 lt.	None.	Cheaper than elec. light.	Hard on eyes when reading. Amt. of attention and expensive.	Only way to make it cheap is not to burn it. Parties who have discontinued use of gas now use elec. light. Not overly satisfied with the gas.
Shelburne, Ont.	1	0	1	5 mos.	10 or 12 jets.	None so far.		Trouble in charging and disagreeable odor.	Acetylene people are trying to introduce and push their business, apprehensive that they will injure electric lighting very materially.
Smith's Falls, Ont.	5	0	5	18 mos.		One or two explosions.	Cheapness.	Cost of attention and danger from explosion.	Reports of accidents knocked prospects of Acetylene Gas out.
Stayner, Ont.	0	0	0						
Strathroy, Ont.	1	0	1	1 1/2 years.	15 or 20.		Have heard of none.	Lights not burning sometimes; do not know cause; trouble, inconvenient, bad odor. Some person has to take charge of it.	About 1 1/2 years ago Plant was started for exhibition. Something went wrong with generator, which was taken outdoors, where it exploded.

Town	Generator installed	Number discontinued	Number in use	Period of Use	Capacity in Lights	Number of Accidents	Advantages	Disadvantages	Remarks
Stratford, Ont.	4	4	0	About 2 yrs.		One.	Cheapness & good for matching colors.	Need much attention; accumulate a kind of coal on the jet, causing them to smoke; very dirty.	
Stouffville, Ont.	4	2	2						
Sussex, N.B.	1	0	1						
Sutton, P.Q.	6	0	6	About 1 year.	5 to 20 lts.	One; attributed to tinkering with not soldering iron.	Cheapness.	Unsafty; unpleasant odor; dirties rooms where used; expense of maintenance.	Consumers of Acetylene Gas not satisfied.
St. Thomas, Ont.	7	4	3	8 mos.					
Sault Ste. Marie, Ont.	12	0	12						
Thamesville, Ont.	1	0	1	5 or 8 mos.	5 to 50 lts. en. total 3,000 lts.; 146 lts. in operat'n.	One; caused by using lighted lamps near generators.	Cheapness.	Strong smell of gas; trouble washing out tanks; cleaning burners; offensive smell; danger having goods near jet. Dry goods merchants cannot dress their windows as is possible with electricity.	Uses it just in morning. Uses Electricity.
Tilsonburg, Ont.	6	1	2	11 mos.	10 to 20 lts.	None very serious.	None; sorry they got them.	Too expensive, bad smell and dangerous.	
Whitechurch, Ont.	1	0	1						Cannot learn cause of trouble. No Electric Plant.
Walkerton, Ont.	4	2	2	1 1/2 years.	30 and 7 lts.		Cheapness, as they do not have to pay for lights not in use.	Complete failure.	One Gas consumer (discontinued now.) Uses Electric Light.
Wallaceburg, Ont.	2	1	1	8 mos.	50 and 75.	None.	Superior light and cheap.	After burning a number of hours, if not carefully watched, ruins everything in room by emission of fine particles of soot or carbon. Does not admit of fancy window dressing. On account of thinness of gas it leaks through a very small hole, and in consequence smells most offensive.	
Winona, Ont.	1	1	0	2 or 3 mos.	30 or 40 lts.	None.	Claimed to be cheaper.	Much more expensive, not as good a light and very dangerous.	
Waterloo, Ont.	4	2	2	2 years.		Two; not very serious.	Cannot say.	Dangerous; dirty; black dust which forms on burners, soiling carpets, etc.	One party tried it, soon had an explosion and threw it out.
Windsor, Ont.	0	0	0						Tried for a time for advertising purposes, then taken out.
Woodstock, Ont.	1	0	1	3 mos.	50 lts.	None.	Cheaper, and can run all night; electric light runs only till 12 p.m.	Go out occasionally. Leave dust and liable to explosion. Freeze up.	
Warton, Ont.	1	0	1		12 jets.	One explosion; no damage.	Good light.	Cannot depend upon it at all times. Disagreeable and expensive.	Owner of the Gas Plant uses Arc lamp sometimes, and had 27 Incandescent lamps put in in Jan. last.
Wingham, Ont.	1	0	1	1 1/2 years.	17 lts.	Explosions, but no damage.	Less cost.	Much bother in attendance; unsafe; offensive odor.	
Woodstock, Ont.	5	3	2	2 or 3 mos.					Nearly all parties who used Acetylene are using Gas or Elec. Light again. Competition not felt.
Vancouver, B.C.	several	all n/ly	0	Within a yr.			After being in use a time—none.		
Zurich, Ont.	1	0	1			One; blew side and end out of a store; damage over \$100.			
Halifax, N.S.	3	0	3	Eight mos.	2-50 lb. 1-10.		One man pertinently remarked that the only advantage of using this gas is, that no difficulty is experienced in locating a leak in the pipe.	Obnoxious odors emanating from the apparatus. Disagreeable nature of the refuse material. Difficulty in keeping apparatus clean. Continual clogging of jets. Danger of explosion and extreme care necessary in handling and keeping the raw carbide. Decided nuisance. Dazzling nature of light from gas also objectionable.	Two plants operating successfully. The system has not proved a great success in the vicinity of Halifax, at least.
Dartmouth, N.S.	2	0	2		3-10 light.				

SUMMARY: Total generators installed, 217; number discontinued, 62; number in use, 155; number of accidents, 30. NOTE.—Data probably inaccurate as to number of generators, discontinued, in use, capacity of lights, period of use, etc.

RESULTS OF THE USE OF ACETYLENE GAS

AS GIVEN IN ABSTRACTS OF REPORTS FROM CANADIAN NEWSPAPERS.

The *Erin & Brennan Company* appeared in the City Hall, Guelph, last night. An acetylene gas generator exploded during the proceedings, caused by one of the performers passing the generator with a lighted candle, which ignited the escaping gas. Explosion after explosion followed, and some of the scenery took fire. The caretaker had his hands badly burned, and the stage carpet and scenery were scorched. *Brockville Recorder*, March 28, 1898.

An acetylene gas generator exploded in a house in Oshawa recently. The machine was blown to pieces, a portion of it making a hole through the ceiling. *Quebec Telegraph*, April 23, 1898.

The blowing up of an acetylene generator in the rear of Fuller's cigar store yesterday caused much excitement in the neighborhood. The upper part of the machine was blown upwards, the pipes and valves twisted, the galvanized tinwork dented, and the west wall of the room singed. There was very little gas in the generator, otherwise the results would have been more serious. The origin of the fire was peculiar. Over the back door of the room where the generator was placed there was an overflow pipe extending out from the building. A match being thrown down ignited the overflow gas, the flame travelling along the tube to the generator and igniting with the larger supply of gas there. *Woodstock Sentinel-Review*, April 5, 1898.

Our reporter has just had an interview with Mr. Brick regarding his experience in lighting the Vendome Hotel. Mr. Brick contracted for a 75 light acetylene gas plant. The generator was outside in a separate frost-proof building, partly to meet insurance requirements and partly to obviate the objectionable stench in cleaning it out daily. After a trial of over three months Mr. Brick has discarded the acetylene gas plant, and has had the entire hotel fitted up with 66 incandescent electric lights from the town plant. He claims that electricity is not only cheaper than the gas, but the objection to the acetylene is its offensive smell and its getting out of order. *Teeswater News*, January 4, 1898.

Acetylene in the liquid form is extremely dangerous, but that used in bicycle lamps is not much more harmful than the same amount of kerosene. *Hamilton Spectator*, June 3, 1898.

By the explosion of an acetylene generator, Mr. E. H. Morse, dry goods merchant, of Bienheim, Ont., received injuries that may possibly prove fatal. The generator had been leaking for some time, and Mr. Morse went to the cellar to make an examination. Lighting a match, he was examining the joints for a leakage, when the gas exploded with great force, burning his face terribly. *Brockville Recorder*, October 8, 1898.

A serious acetylene gas explosion occurred at Cobden, Ont., yesterday evening, as a result of which Mr. A. G. Best had his face and right hand severely burned, and it is possible that his eyes may be injured. Mr. Best was engaged in installing his first plant in Arne's jewelry store, when the explosion occurred. It was caused by Mr. Best opening the carbide chamber and holding a lighted candle over it. *Ottawa Free Press*, November 3, 1898.

Alfred Head, of Calgary, N.W.T., was fatally injured as the result of an explosion of acetylene gas, which occurred while he was endeavoring to locate a leak with a match. *Guelph Herald*, December 17, 1898.

A serious explosion of acetylene gas took place in W. Nixon's hotel, Avonmore, on Friday last. The carbide chamber of his acetylene gas machine had not been properly closed, and a leakage of gas took place. Before Mr. Nixon could extinguish the light, the escaping gas reached the flame and a terrific explosion followed. Mr. Nixon was terribly burned, and his wife and an employee were slightly injured. The building was also damaged, nine windows being blown out. *Winchester Press*, March 30, 1899.

An acetylene gas machine, located in Merner Bros' general store at Zurich, Ont., exploded yesterday, completely demolishing the building. The force was so great as to blow out the east side and front of the building, also wrecking several buildings on the opposite side of the street. The loss on stock is estimated at \$1,000. *Guelph Advocate*, March 16, 1899.

The acetylene gas apparatus at the Marbleton hotel exploded on Friday, setting fire to the hotel and destroying apparatus. Several persons were badly burned. *Stanstead, Que., Journal*.

The new acetylene gas machine lately put in by Mr. W. H. Todd is not giving the satisfaction anticipated. *Stouffville Sentinel*, February 3, 1899.

Acetylene gas caused a violent explosion in the Barker House, Fredericton, N.B., a short time ago. The generator was being moved from one part of the building to another, and after the pipes were disconnected and the generator removed, a lighted lantern was taken into the room where it had been, when the escaped gas exploded. The building was badly shaken up and the plate glass windows blown into the street. *Canadian Engineer*, February, 1899.

The acetylene gas machine on the premises of the A. B. Scott Co., general merchants, exploded yesterday afternoon. The plate glass windows were almost totally wrecked and other damage done. Mr. Scott was slightly burned, and Miss Walls was struck on the head by flying debris. *Toronto Mail*, January 6, 1899.

UNDERWRITERS REGULATIONS AS TO THE USE OF ACETYLENE GAS.

The United States National Board of Fire Underwriters have approved of a set of rules for governing the acetylene gas hazard, because of the attempts to introduce acetylene gas as an illuminant in various parts of the country. These requirements provide that the generating and gas holding apparatus, when installed for lighting buildings in the closely built up portions of towns and cities, must be situated in an outside, fireproof and well ventilated building; that bicycle and other portable lamps in which gas is generated and supplied direct to burner, should not be approved until such lamps are so constructed that they will cease to generate gas immediately upon the extinguishment of the flame; that the storage of liquid acetylene in any building, or the use of liquid acetylene gas, should be absolutely prohibited; that in regard to the separator and gas holder, it is recommended that only wrought iron or steel, capable of resisting an internal pressure of twenty pounds per the square inch, should be used.

TRANSFORMER ECONOMY.

By F. H. LEONARD, JR., Montreal.

The practical use of A. C. Transformers covers a period of little more than a decade, and yet in so short a period they have been developed into the most perfect piece of apparatus known to the art of electrical engineering. Transformers having a full load efficiency of 98% in the large sizes are not unusual, and in the very large sizes even this high figure is exceeded, and with the best designs the no load losses are less than one-half the full load loss, permitting an exceedingly high efficiency to be maintained over the entire working range.

While the commercial application of transformers is so recent, the principle was demonstrated more than 67 years ago by Faraday, whose investigations gave to the electrical engineer the principles on which are based the science of dynamo-electricity. Faraday in 1812 made a crude transformer, which is identical in general principle and construction with the commercial article of to-day. There are many types and modifications of details, but the commercial transformer of to-day may be summed down to two general types, known as the shell type and the core type; the one first talked of hedge-hog transformer so stoutly championed by Swinburne having dropped out of the race entirely. There are still strong adherents to both of the first mentioned types. The adherents to the core type of transformer will tell you that the coils are more easily wound and the core itself more easily insulated, that the copper coils being on the outside radiates the heat due to internal losses more quickly. Notwithstanding these seeming advantages to the casual observer, the Johnston & Phillips Co., Ltd., of London, England, who first manufactured this type of transformer from the designs of Gilbert Kapp, after extensive experience with them, abandoned their manufacture and became adherents to the shell type.

For an equal investment in material and labor it has been demonstrated that with proper design a better transformer can be built of the shell type than of the core type. The double magnetic circuit of the shell type gives a shorter average path for the lines of force, which, combined with a smaller number of breaks or interruptions in the magnetic circuit, call for a less number of ampere turns or magnetizing force, and result in giving the shell type the advantage of a better power factor at light load.

With proper machinery the coil for the shell type transformer can be wound and carefully insulated with but little more trouble than the core type, and the waste in copper in turning the ends of the coil will be no greater than is necessary in the cylindrical coil used with the core type, which touches only at the four corners of the core, which for commercial reasons is made of a rectangular cross section, leaving considerable space inside the coil not filled with iron.

There are many points of view from which comparisons can be made, too numerous for the limits of such a superficial treatise as this, which, generally speaking, favor the use of the shell type, which we believe will be the standard as improvements are made and the results of careful tests are more thoroughly understood.

The sub-division of coils in a transformer is one of the most important features both as regards the safety of its insulation, owing to the corresponding reduction of potentials between adjacent points, and also as regards regulation. With proper sandwiching and subdivision of coils in both primary and secondary, the drop due to magnetic leakage may be reduced to a negligible quantity, so the drop in voltage as the transformer loads up may be practically confined to what is due to the ohmic resistance in the copper. This is essential, as the regulation of transformers plays a most important part in the quality of service to customers. Good regulation means from 2% in the small sizes to one per cent. in the larger sizes. No one has yet discovered a satisfactory method of compounding transformers so as to maintain the voltage as high at full load as at light load, and as line drop in the primaries as well as in the secondary and inside wiring tend to aggravate and magnify this condition, the importance of guarding against everything tending to drop the voltage will be appreciated, particularly when it is more clearly understood that a variation of one per cent. in voltage will make a difference of about 5% in the candle power of lamps.

Too much importance cannot be attached to hysteresis or the core loss of transformers, which calls upon the generators for a continuous supply of energy to overcome this loss as long as the transformer is in circuit, regardless of the conditions of load being the same when no current is drawn from the secondary as when fully loaded, and if the power factor of transformers is low

the apparent flow of current on this score is greater at no load than at full load. Good transformers should, in the small sizes, not require more than 2% of the full load energy to cover this loss, and large transformers less than 1%.

While the copper loss of a transformer remains constant for any fixed load, throughout its life the core loss—if proper precautions are not taken in the selection of iron and provisions made in the design to maintain it at a low temperature—may increase considerably, often doubling this source of loss in a very short period, and accordingly reducing the all day efficiency, and this increased loss has to be supplied from the central station, for which it receives no income.

From the foregoing hints it will be seen that well designed, modern transformers should give a full load efficiency, depending upon their size, of from 95 to 98% or better, which with good design and proper selection of materials will maintain this efficiency unimpaired.

It is only recently, however, that such transformers could be obtained, and the matter of ageing of the core plates has but recently received attention. It is not more than three years ago that one of the largest electrical manufacturing companies in the United States sold to a large central station, under guarantee of certain efficiencies for the various sizes of transformers covered by the contract, and were obliged to take back every transformer before they had been in service four months, on account of the rapid increase in the core loss, which in many cases, in the short space of time mentioned, had doubled the losses shown in the original factory tests. The iron was taken off the coils and a different quality of iron substituted, which, though not giving quite such good initial results, was able to maintain its efficiency unimpaired, exhibiting no apparent ageing after repeated tests extending over a period of eight or nine months.

By careful experiments with various samples of iron of known chemical composition we have been able to determine which is the best for use in transformer cores, and samples of every lot of iron are submitted for tests for hysteresis loss and for chemical composition. Without such precaution no assurance of results of transformers in service can be secured. Even with the best of iron ageing will take place to a slight extent unless precaution is taken to operate the iron at low inductions, and provide sufficient radiating surface to prevent the transformer becoming too much heated, it having been observed that iron will age much more rapidly when subjected to high temperatures.

As the energy losses in transformers exhibit themselves in heat precaution should be taken to get efficient transformers which operate at a low temperature, obviating the tendency to charge the insulation, at the same time saving the dynamo capacity necessary to overcome these losses and avoiding the ageing of the iron and subsequent augmentation of losses.

Oil may be used in small transformers, and where the losses are large the oil helps materially in radiating the heat. The life of a low efficiency transformer may be considerably increased by filling the case with oil, but this is unnecessary in small transformers of good design. In large transformers of 100 k.w. or more it becomes necessary to use some method of dissipating the heat, as the proportion of radiating surface rapidly decreases as the transformer increases in size, and oil or an air blast becomes necessary even in transformers of over 98% efficiency. We have designed and built 60 cycle transformers of 60 k.w. capacity having a full load efficiency of 98%, which, with only the natural air circulation, have shown a rise of temperature, after 10 hours continuous run at full load, of less than 50 C. This same transformer operated at 125 cycles will run at a higher efficiency with a smaller rise in temperature. Such transformers are rather expensive, however, and where slightly lower efficiency will suffice, an oil transformer can be used at a much lower cost of construction which will give no greater rise of temperature.

Lightning discharges are less dreaded now by central station managers than they used to be. Formerly every thunderstorm brought with it wreck to some of the transformers on the line; this has, however, come to be the exception rather than the rule owing to the substitution of modern transformers, in which the better insulation, together with the greater choking effect, which follows with higher efficiency and reduced core loss, results in forcing the oscillatory high frequency lightning discharges to take some easier path to equilibrium of potentials. Notwithstanding this, do not neglect to install lightning arrestors, for though the improved transformers offer a more difficult path, yet if there are no lightning arrestors through which these potentials can discharge, the best transformers are liable to be punctured. The suggestion has been made to ground the secondaries or the case of the transformers. Either method makes it safer for the consumer, but both result in greater strain on the insulation of the transformer.

We have had frequent inquiries as to whether the 60 cycle transformers will work on 125 or 133 cycles. A transformer suitable for 60 cycles or 7200 alternations will work better on 125 cycles or 15000 alternations than on the 60 cycles, as the core losses are reduced, though the regulation due to increased magnetic leakage is not quite so good. It is quite the opposite when a 125 cycle transformer is used on the 60 cycle circuit, as in this case the core loss is increased about 30%, and the efficiency correspondingly decreased. If the transformer is not a very superior one, at 125 cycles it is quite likely to overheat, due to the increased core loss at 60 cycles, gradually charring the insulation until it finally breaks down, in the meantime probably showing an increasing core loss followed by further development of heat and bringing about the end at an earlier day.

As the difference between two lots of iron from the same manufacturers may make a difference of ten or twenty per cent. in the core losses of transformers, otherwise identical, it is of the utmost

importance for manufacturers to make careful tests of each shipment of iron as it is received, and when this is not done the central station has no protection unless they possess the instruments to make proper tests on the transformers themselves as they are received.

For their own protection we would urge central station managers to equip themselves with standard wattmeter, dynamometer and voltmeter, with which it is a simple matter to determine whether they are getting what they pay for or not.

The tests are quite simple and any central station can equip for making them at very small expense, amounting to but little outside of the cost of the necessary instruments, which are almost a necessity for any central station in checking up switchboard instruments, recording meters, &c.

Central station practice has not yet settled down to uniform methods of installation, but the trend now seems to be in the direction of larger transformers with secondary networks, preferably on the thin wire system; the general introduction of meter basis of charge making it possible to safely connect double the rated transformer capacity in lamps to the secondary network—whereas with the older systems providing a separate transformer for each connection it was necessary to provide transformer capacity equal to the lamps connected.

With separate transformers of small sizes necessary for individual supply, the aggregate core losses become a serious drain upon the central station. We have frequently seen banks of small transformers serving a single customer or group of customers, this condition being brought about by the gradual growth of demand for light exceeding the capacity of the original transformer installed, a further growth exceeding the capacity of the second, and so on. In such cases the substitution of a single large transformer of modern design displacing the small ones would save its price in less than a year, if credited at the usual selling price, with the amount of current saved. Don't put a modern transformer of good regulation into a group of antiquated transformers of poor regulation; if you do you will lose your new transformer, which is likely to be unjustly condemned for trying to improve the regulation of its bad associates. Placed in such company the new transformer tries to maintain the good regulation for which it was designed, while the lazy, old shirks with which it is connected, steeped in the vice of bad regulation, throw their entire load onto the new comer, which good naturedly carries it all till it can no longer stand the strain and literally roasts out and breaks down under the load.

In most of the smaller stations and in many of the larger ones, money can be saved by remodelling the system of distribution, and at the same time improving the service by laying out a net work of secondary mains, starting first in the business portion of the town with the installation of a few large transformers, reserving the small transformers which these replace—if they are modern and worth keeping—for extensions in the more remote sections where for the time the secondary network is impractical. It may occur in some cases the secondary network will be practical in several different sections, and these separate sections will, in most cases, gradually grow together, allowing taps to be made for new customers at intermediate points. In most cases, where prices are based on meter rates, such an arrangement can be installed at no greater first cost than the individual transformer system, the saving in cost of transformers on account of their larger size and less total capacity required paying for the copper mains. Such an arrangement always results in more satisfactory service to the consumers, at the same time greatly reducing the leakage current necessary to magnetize the transformers or supply the waste in core losses.

A few figures may serve to impress the idea more firmly in your minds. Let us take the case of a station having an average load equivalent to 1000 lights, most of which average four hours burning per night, and, making due allowance for belting, dynamo, line, transformer and secondary wiring losses, we will allow that 10 lights are obtained per h. p. at full load. In the first case we will suppose an individual transformer system is installed, using 10-10 light, 10-20 light, 10-30 light, 5-40 light, and 4-50 light transformers; even with modern transformers these would have an aggregate core loss of about 200 watts.

If we substitute for this arrangement 6-150 light transformers, connected with secondary mains, retaining the 10 small transformers for isolated customers so scattered as to make it impractical to connect them to the secondary mains, our core losses will be reduced to 692 watts, or a saving of 438 watts for every hour the plant is run, which, for twenty-four hours a day, would amount to 3920 k. w. hours per year, which at 10c. per kilowatt hour would be \$392.00, or 6% on more than \$6500.00, a sufficient amount to more than pay for the change if no consideration is made of the transformers left on hand, which would be superseded by the new arrangement.

In the case just mentioned we have assumed the original arrangement to be modern transformers. Had we assumed them to be old types the saving would have been three or four times that shown, and would have allowed us to make a good or a better showing had we only charged 3c. per kilowatt hour, which would be less than the cost of production in a station of 1000 lights capacity.

Some of our friends may argue that these losses cost them nothing, as they are running on water power, but we would like to remind them that the capacity in their generators, water wheels, or whatever prime movers they use, represent capital invested, which add to the fixed charges their pro rata of interest and depreciation for which it makes no return; whereas, if the capacity used in overcoming these losses could be rented at the usual rates, a material difference in the capacity to pay dividends would be shown.

METERS AND METER RATES.

By A. A. Dion, Ottawa.

There are few things of more importance to owners of electric light plants, or having a more potent influence for the financial success or failure of electric supply undertakings generally, than meters and meter rates; and all those interested in the satisfactory solution of the problem "how to increase profits from electric supply" should give the subject of this paper thorough and serious consideration.

In these days of close competition in lighting, in common with all other industries, where we feel the need of constant study and investigation in order to find, if possible, means of reducing the cost of production, should we not devote ourselves with equal energy and perseverance to the task of increasing the earning power of our plants?

Upon this question, meter rates have a direct and important bearing.

METERS.

It seems hardly necessary at this time to make a plea for the use of electric meters. Experience has established, beyond question, the fact that the use of meters increases the earning power of a plant. A change from flat to meter rates invariably lowers the peak of the station load curve to such an extent, that the lamp installation may be doubled before the peak regains its previous value; the average earnings per lamp installed will be such as to show an increase in the total revenue, unless indeed the flat rates previously charged were so high as to confine the use of the lights to long-hour consumers.

The use of meters also places the owner of a plant in a position to compete successfully with gas and other illuminants for all classes of consumers, thereby facilitating the extension of his business. This cannot be done under a flat rate system, except by making all sorts of special rates, to meet special cases; a proceeding which is certain to produce dissatisfaction among consumers and often works injustice to the supplier.

No attempt will be made to give in this paper a history of the electric meter; not even to enumerate the many forms that have been produced in the process of evolution, to which we owe the modern recording meter. Too much valuable time would be taken up and no very useful purpose would be served by the recital, as far as this Association is concerned.

Those who feel any interest in the subject may be referred to a paper read by Mr. George W. Walker, before the American Institute of Electrical Engineers, May 21st, 1891. Later meters have been described and illustrated from time to time in the electrical press.

It is necessary to the full success and popularity of the meter system of charging for current, that the meters should be direct reading, in other words that the record of consumption should appear in plain figures on dials available to the consumer, as he has long been accustomed to in gas meters.

The Canadian Electric Light Inspection Act prohibits the use of any but direct reading meters, therefore the choice of meters lies between the different forms of these meters, generally known as "motor meters."

These meters are essentially electro-motors operated by the current to be measured and whose rotating member actuates a train of registering wheels and dials.

They may be divided into two general classes, namely:—

First. Those operating on the inductive principle, wherein an armature consisting of a ring, disk or cylinder of metal, generally iron, is carried around by a rotating magnetic field. This field results from the current to be measured passing through a coil or coils of wire, and the current induced in a closed secondary coil, of low resistance, set at angle with the first; and, second, those embodying the well known principle of the direct-current motor; a wire wound armature rotating within a magnetic field.

Meters of the first class are suitable for alternating currents only, and must be calibrated for the frequency at which they will be operated. They have no commutator nor brushes. Those of the second class may be used for either direct or alternating currents of any frequency. They have a commutator and brushes. That is their weak point, as dirt and moisture will affect the commutator, and the meter will in time run too slow unless it is cleaned occasionally, which is a troublesome proceeding, now that meters are sealed by the Government. They require delicate and careful handling.

Meters of either class may be "current meters" recording in amperes-hours, or "energy meters" which register in watt-hours.

In meters of the first class, which are generally current meters, the torque is approximately proportional to the square of the current, and the speed is proportional to the torque. Such are the "Schallenberger," "Duncan" etc.

In meters of the second class, generally energy meters, such as the "Thomson," the torque is directly proportional to the power applied and the speed is proportional to the torque.

All meter armatures left free to revolve, run so fast at high loads as to seriously impair the accuracy and durability of the meter, and means had to be provided to restrain their speed. This was done in two ways. Small vanes or air fans were attached to the end of arms rigidly fixed to the armature shaft. These fans lie at right angles to the direction of rotation, and the retardation is due to the resistance of the air against them, which is approximately proportional to the square of the speed, so that this device may only be used in those meters where the torque is proportional to the square of the quantity to be measured. The other way was to attach to the armature shaft a copper disk revolving between the poles of permanent magnets. These exert a drag on the eddy currents generated in the disk by its rotation in the magnetic field. This magnetic drag is proportional to the

speed, and is employed in meters where the torque is proportional to the quantity to be measured.

The majority of meters will not start with less than three per cent. of their full loads, and tend to run slow at light and high loads. This is a serious drawback, but there appears to be no effective remedy for it at the present time.

In choosing a meter the first point to be settled is whether to use a "current" meter or "energy" meter. At first sight it would seem that the energy meter would best suit our purpose, as it records the actual expenditure of energy, but where energy is supplied at a constant voltage, the record of the current meter in volt amperes is proportional to the energy. With alternating currents, and especially with inductive loads, the record will be slightly in excess of the energy, but will be proportional to the machine capacity employed, which is a perfectly reasonable charge against the consumer, since it is the maximum load in volt-amperes that determines the size of the plant and the fixed station expenses. The current meter has the advantage of simplicity, ease of adjustment and less cost. It lends itself admirably to the lamp hour-rate of one cent, as its record shows the lamp hours. Rates may be varied to suit all conditions by a system of discounts from the one cent rate.

The desirable characteristics of a meter are: Initial accuracy, constancy, simplicity of mechanism and indicating dials, durability, ability to exclude dirt, insects, etc., and to withstand tampering. Examination and test will determine how far these characteristics are possessed by a meter, except those of constancy and durability, which can only be established by a test of time in regular practice. Both however, depend on good design and workmanship, especially in the jewel bearings which should be of the best quality, accurately ground and thoroughly polished.

The writer has for some years used the "Schallenberger" current meter which has met all the conditions of actual service in quite a satisfactory manner with only ordinary care. He had some experience with a certain type of meter in which so much heat was developed at normal full load as to roast the varnish on the outside of the wire coils. It is needless to say that such a meter should, under no circumstances, be used.

METER DEPARTMENT.

The importance of a well organized meter department and properly equipped meter room, wherein testing, adjusting and repairing of meters may be intelligently carried on, cannot be too strongly urged. This department should be given in charge to one man who may be carefully instructed in his duties and educated to perform his work in an efficient and systematic manner.

When meters are received from the factory they should be examined, tested and adjusted if required before they are sent for government inspection.

Records of these and all meter tests, of meters certified by the government, installed or taken out, and of meters repaired, should be kept in the meter room in a day book for that purpose where entries may be made from day to day, designating such meter by the serial number, size and make. There should also be a ledger into which, day-book entries should be posted. A page to be headed, for each meter in use, by the serial number, size and make. In this way each page will contain a complete history of one particular meter and this will be found very useful for reference.

No meter should be installed, removed or tested without orders from some one in authority. It is a mistake to allow any employee in the office to order meters changed and tested.

METER ROOM.

This room should not be accessible to any employees except those of the meter department.

There should be in a well lighted corner of this room a work bench with such tools and appliances as will be required in repairing and adjusting meters.

A substantial wooden rack should be erected against a solid wall, quite free from vibrations, where the meters may be hung up in rows, by means of hooks or catches, fashioned to hold them firmly in a level position. Flexible wires ready to be inserted in the binding posts of the meters and short-circuiting plug devices, allowing the cutting out of any meter without opening the circuit, should also be provided. The meters should be connected in series and the circuit, which must be of large wire, should pass through a main switch and cut-out, a rheostat to adjust the voltage, a good dead-beat wall ampere meter and a master meter used as a standard in making tests. There should be also, connected across the circuit, a reliable voltmeter, dead-beat if possible, and a bank of incandescent lamps of various candle-powers, say 16, 10 and 5, to adjust the load.

The "master meter" or "standard" should be tested once a month.

The following directions for testing will be found useful. If the master meter is a "current" meter, proceed as follows;

1. Adjust the current to full load of meter.
2. Count the revolutions of the armature by means of the tell-tale index at the top of the shaft or otherwise, for a number of seconds, depending on a constant furnished by the makers for each size of meter. (This constant represents the time taken by the armature for one revolution when a current of one ampere is passing).
3. The revolutions should be counted for a number of seconds equal to several times the constants, in order to secure accuracy, and the revolutions counted during that time, multiplied by the constant of the meter and divided by the number of seconds, should equal the amperes passing through the meter during the test. If the amount is greater, the meter is running fast, if less, the meter is too slow.

4. Repeat the test at half load and quarter load.

The current should be calculated from the indications of a Siemens dynamometer. If none is available, the wall ampere meter, which should be frequently calibrated, may be used instead.

For an "energy meter" proceed as above, adjusting the voltage carefully to normal as well as the current and use a watt-meter instead of the ampere meter. A stop watch is better for this test. If no stop watch is available, two men should make the test, one counting the revolutions, the other holding an ordinary watch. The case should be on the meter during this test to avoid the disturbing influence of air currents, the rotation of the armature being observed through a small window in the top of the case. The voltage should be quite steady.

There may be a separate master meter for every kind and size of meter if desired, but that is hardly necessary.

Meters can be adjusted by altering the angle between the primary and secondary coils in inductive meters, or by shifting the position of the retarding permanent magnets where these are used.

When it is desired to test a number of meters, examine them and see that the armatures are turning freely and the shafts resting properly in the jewel bearings; hang them upon the testing rack, connect them in series, and put the cases on, then

1. Close the circuit, adjust the voltage and turn on one 5 candle-power lamp and see if meters start. (Meters of ten amperes should start on this lamp, those of twenty amperes on one lamp of ten candle power, those of forty amperes on two similar lamps, and those of eighty amperes on two lamps of sixteen candle-power. Meters that fail to start as above should be tagged for repairs.)
2. All the meters on test being of the same size, adjust current to full load and watch the pointers on the last right hand dials; run the meters, including master meter, cutting them in and out of circuit until all the pointers are exactly over a number in the last right hand dial.
3. Open the circuit and take readings of all the meters.
4. Close the circuit, adjust current to half load and allow the meters to run several hours, after which readings may be taken and the "consumption" compared with that recorded by the master meter.

A meter testing over three per cent. slow or fast should be given a second test to confirm the first.

The advantage of a long run in series with a standard meter is, that it makes it easy to detect and measure very small percentages of error.

When a meter is brought in for any reason it should be tested before it is taken out. When it becomes necessary to test a meter after it has been installed, it is better to bring it to the meter room, putting another one in its place, as no proper test can be made on the consumer's premises. Several methods have been suggested for domestic testing, but none are quite satisfactory, besides it pleases a customer better to change his meter when he has lost faith in it.

INSTALLING.

Meters should be of as small a capacity as may be used without inviting their total destruction. It is better to take chances of an occasional burn-out, than to install meters that will run during seventy-five per cent. of their working hours on less than half load and thirty-three per cent. of the time on one-quarter load or less. Under these circumstances meters, as we know them, cannot be expected to do the supply company justice.

It is impossible to entirely eliminate friction in meters, and they stand on the order of their going as it were. They are also slow on light loads. The most effective remedy is to use small meters. It is true that they are also slow on high loads, but the high loads seldom come and never stay long.

The importance of using small meters may be fully realized by reference to an experiment reported by Mr. Lyman C. Reed, where a load varying from one to ten incandescent lamps was passed through two meters in series, one of $7\frac{1}{2}$ amperes capacity, the other of 100 amperes. The small meter registered thirty per cent. more than the large one.

Mr. Duncan suggests the following rule for his meter.

For 3 to 7 lights install a 5 light meter.			
8	14	"	10
16	20	"	15
25	35	"	25
40	65	"	50
70	100	"	75

No hard and fast rule can be laid down; much depends on the class of consumers to be served. In private residences, for instance, a ten light meter would do up to twenty lights, a twenty light meter up to thirty-five lights, and a forty light meter up to seventy-five lights in the majority of cases.

It has been suggested to put two meters in parallel on large installations, one large and one small meter with a mercury switch actuated by the current and intended to automatically cut out the large meter whenever the load fell below a predetermined amount. The suggestion is worthy of consideration.

Great care must be exercised in carrying meters through the streets. A light express wagon with a box partly filled with straw, wood fibre or other packing, in which the meters may be placed on their backs, is a good thing to move them in. They may be safely carried by hand, also on a bicycle, but in the latter case the rider must be careful to avoid sudden jars.

Whenever a meter is taken out for installation the reading should be taken and left on record in the meter room, in case the reading or "start" is not taken at the consumer's premises.

Meters should not be installed on shaky partitions or those containing doors liable to slam, or on walls subject to vibrations. They

should be in a dry place, easy of access and open to daylight or otherwise lighted, and, if possible, they should be protected from extremes of temperature. Meters should not be placed on or too near the floor, nor too high. You cannot expect your meter reader to stand on his head or to carry a step-ladder. In such cases he will attempt to get the reading at a distance and probably get it down wrong.

A little missionary work among electric wiremen and contractors will lead, in time, to the practice of arranging a place for the meters in accordance with the above recommendations.

Before connecting the meter it is well to try lamps here and there about the place, leaving meter loop open, to make sure that there are no branches taken off outside of the meter.

Meters should be levelled and rigidly fastened to the wall. After installing the meter, one or more lamps should be turned on to ascertain that the meter starts readily. For this purpose meter cases should have a window through which the movements of armature or shaft can be seen.

No openings should be left between the cover and the back of the meters where insects may go in. They seem to find comfortable quarters there, and spiders weave their webs around the moving parts, retarding and sometimes stopping the meter. This is more likely to happen where houses are vacated during the summer holidays. The writer has used a stick of pine wood about four inches long, one-quarter inch wide and one eighth inch thick between the cover and back casing of Schallenberger meters, at the top, with good success. It has been suggested to squirt soft putty with a syringe, so as to practically seal the cover to the back, but this is seldom necessary. It is a commendable thing, however, as it excludes dust as well as insects.

The connecting wires should be pulled through the binding posts until no bare copper is accessible from outside the meter case. The cover over the binding posts should be sealed with a lead seal bearing the mark of the meter department. It should be the duty of employees installing meters to see that there are no bare places or cut-outs on the mains between the meter and the service switch and main cut out, and to see that the latter is supplied with copper tipped fuses of the right size properly put in.

READING.

Meters should be read monthly if practicable, as "short accounts make good friends," but the large amount of clerical work involved in this practice often makes it preferable to have only quarterly readings. However, this makes very heavy bills in winter, which is objectionable. A good plan is to divide the six summer months, May to October, inclusively, in two periods of three months each, and the six winter months in three periods of two months each. The shorter winter periods will make the difference in the bills less pronounced and facilitate the collection of accounts. This compromise is confidently recommended as one that works well and gives satisfaction to consumers.

The dates of the readings should appear on the bills, as they will show the number of days covered by the amount and frequently explain apparent overcharges.

Reading meters correctly is not as easy as it looks. Men should be trained in the work and not changed unnecessarily. An unreliable meter reader is dear at any price. Errors in reading are mostly due to the fact that each dial is read by itself. Experience teaches that when a pointer is near a number, it is necessary to consult the next lower dial to determine whether the first pointer is short of or past the number. That is because the pointers are sometimes blunt, improperly set, or have a little side play. A plan which has been very successful in preventing errors, is to furnish the reader with books printed with fac-similes of the dials of a meter. The reader does not read in the ordinary sense, he merely copies in his book the position of each pointer, which is represented by a pencil stroke. The reading is done in the office.

A great saving of time may be made by using numbers to designate customers. Thus the meter reader would enter a reading taken at "A. G. Richardson, 319 Waverley street west as '958, Richardson." The number is the page of Mr. Richardson's account in the ledger, and the addition of the surname makes identification of the reading more certain.

The clerk entering the readings in the meter ledger should make each day a list of all readings which appear quite wrong from his knowledge of customers and their previous record in the ledger. This list would then be sent to the meter department with instructions to re-read the meters. Many errors will be corrected in this way before the bills are sent out, and meters that stop will be detected.

Consumers sometimes complain that their bills are too high, and some have been known to express the opinion that the meters run too fast, but the writer once encountered a consumer who said his meter was too slow; that was in Ottawa.

When complaints are made, it is a good practice to get an extract from the complainant's account showing the total net cost of the light for a year. This will often be a pleasant surprise to him, as he has likely figured it out in his mind by taking his highest bill and multiplying it by the number of readings in the year, forgetting the summer bills.

The period complained of should be compared with the corresponding period of the preceding year, if possible, and the preceding period should be investigated to see if meter was not under-read. In any case, offer to re-read the meter. If the first reading is confirmed and the bill really seems wrong, it is better to change and test the meter.

When a customer makes general statements as to the small quantity of light he has used, you should get him down to details. Figure out with him the probable use of each lamp or group of lamps separately. Hold him down to facts. When you come to

add it up he will be surprised, and the meter will generally be found to be not such a liar after all.

STATION METERS.

The practice of metering the output of the central station, which is becoming quite popular, is a move in the right direction. The data obtained through the use of station meters is not otherwise available. It is sure to lead to economies in the station, and will be of material assistance in making and re-adjusting rates.

METER RATES.

In making meter rates, it has been customary to copy the practice of the gas companies, sanctioned by long usage, of a single rate, with or without discounts off large bills. The conditions under which electric light generating plants operate are, however, very different from those of a gas plant. The gas plant is fully utilized, and works at the point of highest efficiency for a many hours as may be desired, storing the product that is not immediately required. For an electric light plant the contrary is the case.

Forced to run our plant from sixteen to twenty hours per day at a small percentage of its total capacity, which must be such as to meet the large demand which will be made upon it for a few hours every day, we find that the great bulk of our expenses are incurred, not in running the plant, but in getting ready to run.

The charges assumed for each consumer connected to our lines, in order to be ready to supply him, are fixed, whether the lights are to be used ten minutes or ten hours per day. The cost of supplying current after the first ten minutes is only from one-third to one-sixth of the fixed charges previously incurred.

It is easy to understand, therefore, that a consumer using his lights only a short time every day, which is likely to be during the period of highest load at the central station, may not be a source of profit and may sometimes be a source of loss.

Does it not seem reasonable that this consumer should pay such a meter rate that his yearly payments shall cover the fixed expenses made on his account according to the number of units held in reserve for him and subject to his call?

This rate being applied to all consumers for, say, the first hour of the use of their lamps, would fully protect the supply company from loss on account of fixed expenses, so that any additional current would only need to be charged with the variable expenses of running, and could be sold at such a low rate as would encourage the further use of current during the hours of light loads at the central station.

Such a method of charging for current naturally tends to lower the peak of the station load curve somewhat, but specially to build up, if not the lowest, at least the intermediate portions of it, and thereby to increase the earning power of the plant.

The above considerations have led managers of electrical supply enterprises to devise various methods of charging for current in harmony with the principle of differential treatment of consumers, according to their value to the supply company as a source of profit.

Mr. Arthur Wright, electrical engineer of the municipality of Brighton, England, who has devised a system of meter charges known as the "Maximum Demand System," wishing to show the injustice and loss involved in the old single rate plan, cites two cases, his worst and his best customers.

The first employed for his maximum requirements 177 h.p. of the generating and distributing plant, capitalized at \$36,066, costing, for interest, sinking fund and depreciation only, \$2,582. He used in one year the equivalent of all his lights, burning 61 hours, and paid, on the single rate plan, \$823.

The other employed 1.9 h.p. of the plant, capitalized at \$394 and costing \$27.70 annually. He used in one year the equivalent of all his lights, burning 2,604 hours, and paid \$288.

Thus the large consumer who paid \$823, and who would under the single rate plan be entitled to the larger discount, was actually a source of loss to the supplier to the extent of \$1,759; while the small consumer who paid \$288 netted the supplier a profit of \$260 on the capital charges, and the variable expenses were also much less in his case, as he received only 3,867 h.p. hours, while the large consumer used 10,797 h.p. hours.

These are extreme cases; yet if similar statistics were compiled from the records of electric supply companies in this country, many cases would no doubt be brought to light which would show the injustice to supply companies and long hour users of the single rate system of charging, in a manner almost as glaring as in the example just given.

The greatest difficulty in the way of these improved methods probably lies in the fact that customers, especially the short hour consumer, will not look at these things through our own glasses. He is not concerned about the unfavorable conditions under which our own plants are operating, and seriously objects to pay a larger average rate than his neighbor, no matter how conditions may differ. It is sometimes argued by advocates of differential rates that the supply company should leave these consumers alone and seek for business rather among the smaller but longer users; but it is well known to those who have had to fight opposition that it is advantageous to have the patronage of the large business houses and to light the more prominent buildings, mostly short hour consumers, on account of the advertising value of such installations.

Among the many systems proposed, the following are the most worthy of notice:

1. The Wright maximum demand system.
2. Differential meter rates based on the installation.
3. Two rate meters.
4. Fixed price per light to cover fixed charges wholly or in part and low meter rate.

The Wright system aims to charge the higher rate for the first hour's use of the maximum current used at any time during a given period without regard to the size of the installation.

The maximum current is indicated by the "demand indicator," an instrument invented by Mr. Wright, which is installed in series with the main current wherever a recording meter is used. It consists of a "U" shaped glass tube with a bulb at each end, partly filled with colored sulphuric acid and hermetically sealed. A strip of platinoid is wound around one of the bulbs. The current is made to pass through the platinoid strip, which becomes heated and the air within the bulb expands, driving the liquid up the other leg of the "U" shaped tube until it reaches the other bulb, when it overflows down into a branch tube, which is graduated to indicate, by the height of the liquid within it, the maximum current that has passed through the instrument; the expansion of the air being proportional to the heat developed, therefore to the square of the current. When this instrument has been read it may be re-set by tilting it until the liquid runs out of the branch tube. The cost of this indicator is about ten dollars.

In Brighton, England, where the system has been working very successfully for about three years, the rates charged were in 1898 fourteen cents per kilowatt hour for the first hour's daily use of the maximum current recorded on the Wright meter, and three cents per kilowatt hour for any additional consumption. It will be seen what inducements are offered to long hour users. This was found to be equivalent to an average rate of 6.64 cents per kilowatt hour.

The system may be modified to suit local conditions; thus the higher rate may be applied to less or more than one hour's daily use, and again this quantity may vary according to season. The Chicago Edison Co., who use this system, charge for fifteen hours' use of the maximum demand per month in summer at one cent per lamp hour. For the six winter months the rate is applied to forty-five hours' use per month. Additional consumption is charged at half rates. The Edison Electric Illuminating Co., of Boston, make the hours' use to be charged at the one cent rate vary from month to month. The hours are ten in July to fifty in January.

Whatever may be said against the Wright system, there is no doubt that the use of it or some other differential system would enable us to better compete with gas in the case of such long hour consumers as drug stores, hotels, etc.

The demand indicator will not record demands lasting less than fifteen minutes, but a consumer may require an unusual number of lights on some special occasions, and he is unwilling to have his bill increased by an amount out of reasonable proportion to the privilege required. In cases like that, experience has shown that it is necessary to read the indicator before and re-set it after this unusual demand, and to take no account in the bill of this special maximum. This proceeding in a large city would involve considerable expense and trouble and complicate the system somewhat.

When the indicator has been read and re-set there is no record left of the indication except in the company's books which may lead to disputes with consumers difficult to adjust.

A device intended to combine with an ordinary recording meter the advantages of a demand indicator has been put on the market by Mr. Edward Halsey, of Chicago. It can be applied, it is said, to any meter using magnetic drag as a retarding device. The armature shaft is divided horizontally in two parts and they are connected by a ratchet coupling. The upper part carrying the armature has a pointer rigidly attached to it, and the lower part carries the copper retarding disk, which is graduated. The pointer normally stands at zero over the copper disk. The operation is as follows: As the demand increases the speed of the shaft and the magnetic drag also increase. The lower part of the shaft lags behind the upper part by an angle dependent on the torque or the energy passing through the meter, the ratchet coupling maintains the angle between the parts when the current is afterwards reduced, and the position of the pointer over the copper disk may be read as the maximum demand.

Another method of charging, probably ante-dating the Wright system, and aiming at the same results, consists in charging the higher rate on the first hour, more or less, of daily use of all the lights installed.

While this method removes the necessity of the extra meter or indicator it is open to several objections.

It puts a large burden of charge on the short hour consumer and discourages the installation of lights with the probable effect, that the consumer will install electric lights where the daily use of them will warrant this proceeding and employ gas or some other illuminant for the lights that are seldom used. While this may cause no direct loss to the supply company, it is not conducive to the popularity of electric lighting, which would be considered somewhat of a luxury.

It is not as equitable as the Wright system, inasmuch as our fixed charges are not governed by the total installation as much as by the maximum demand, and two consumers with equal installations may show great differences as to their maximum demand on the station. The system for instance does not discriminate between a consumer using say thirty lights (all his lights) one hour and another using ten out of his thirty lights three hours.

Residence lighting which should be specially encouraged, would be discouraged by this system.

The expense and difficulty of ascertaining the number and candle-power of the lights installed would be considerable. Constant checking would be required, involving frequent domiciliary visits by the inspector, and there would always be uncertainty as to data so obtained.

Still another variation of differential rates is found in the use of the two-rate meter of the General Electric Company. This

meter has two sets of registering dials and armature is connected by a clutch by one or the other, at any predetermined time, by the agency of a clock contained in the meter and automatically wound up by the current.

Thus, the left hand dials for instance will record the consumption taking place during the few hours of station peak, which will be charged at the higher rate, and the left hand dials will record the consumption at all other times, which will be entitled to the lower rate.

This system does not discriminate against the short hour consumer to the same extent as the two systems previously described; he is only charged the higher rate for such use as coincides with the station peak, and only to the actual amount of such use from day to day, and in its tendency to straighten out the station's load curve it is the equal of the other systems.

Those short hour consumers whose local peak never coincides with the station peak would, under this system, get a lower rate, which is no doubt quite just.

The two rate meter does not need re-setting and preserves its record so that errors in reading may be rectified at any time.

The meter costs about \$25 more than the ordinary recording meter.

There is a class of consumers that are undesirable under any system of meter charges. I refer to the very small consumers who use less than \$10 per year, and while an electric supply company may not refuse any business without inviting public criticism, there should be a minimum charge of \$10 and upwards per year for each customer.

In some cases the minimum is made large enough to cover the fixed charges, or a large percentage of them, and a very small meter rate is charged in addition. This is a sort of compromise between the flat and meter rates, and should be a popular plan for certain classes of customers.

It offers to the consumer the advantage of knowing practically the amount he will have to pay and equalizes the winter and summer charges, and the small meter rate will prevent useless burning of lights. It is not a system suitable for general application, but it may well serve, however, as a transition from the flat to the meter rate, and might be tried with advantage by those charging flat rates exclusively.

There is so much to be said for and against the various systems which have been proposed, that supply companies still charging a single meter rate find themselves face to face with a very difficult problem. With so many things to choose from, it is perhaps a case of "how happy could I be with either," or they hesitate to make a change which may cause them temporary loss of revenue. The single rate certainly has the advantage of simplicity and is thoroughly understood by consumers, but so long as it will be used, so long will it be necessary to make special contracts of all kinds, and the flat rate will continue to flourish with more or less vigor.

In conclusion it should be said that meters and meter rates is too broad a subject to be treated satisfactorily within the limits of a convention paper. If the two topics had been separated and each formed the title of a separate paper, the results would no doubt be of greater value to the members of this Association.

LONG BURNING ENCLOSED ARC LAMPS.

By WM. A. TURBAYNE, Hamilton.

THE major factor of expense coupled with the operation and maintenance of arc lamps arose from the necessity of frequently renewing the carbons, which, in the sizes adopted in practice, had a life of some seven or eight hours only. As the all-night lighting of streets demanded that lamps should be capable of giving an uninterrupted service of from twelve to fourteen hours burning, various means were devised whereby this period could be covered by a single trimming of carbons. Innumerable types of lamps were designed with this end in view but there remained to be adopted as standards the double carbon lamp, which burned two successive pairs of eight hour carbons and, as an alternative, the single carbon lamp fitted with circular or elliptical carbons of sufficient cross section to insure a life of fourteen or sixteen hours.

Aside from the matter of trimming, however, the carbons themselves were a source of heavy expense, and early endeavors were made to perfect some means whereby their life could be materially prolonged without at the same time incurring a sacrifice of the light. It was clearly understood that the rapid wasting away of the carbons was caused mainly by their combustion or oxidation in the open air, and it naturally occurred that if the arc could be maintained in a transparent chamber, from which the oxygen of the air had been excluded, that this combustion would cease and that then the only waste would be that due to vaporization.

Experiments along these lines were conducted and the results would undoubtedly have been encouraging had it not been chiefly for the fact that, in burning in an enclosing chamber, such a deposit soon accumulated on its inner surface as to seriously obscure the light and thus render the arrangement unpractical and, therefore, as these attempts to increase carbon life proved futile, fourteen or sixteen hours per trim was, until very recently, accepted as the burning period of an arc lamp.

The great demand within the last eight or ten years for interior arc lamps operating from incandescent lighting circuits was met by a marked improvement in carbon manufacture, until finally a practically pure article was obtainable, the advent of which made possible the maintenance of an arc in an enclosing chamber and allowed of the development of the long burning lamp as we have it to-day in which a carbon in size equal to the eight-hour carbons of open arc lamps has a life of one hundred and fifty hours or more.

This longevity is effected by the method which failed some years ago on account of the lack of sufficiently pure carbons; in

short combustion is prevented by a removal of the oxygen from the space immediately surrounding the arc, the oxygen not being literally removed by exhaustion, but rather by a process of chemical conversion wrought by the action of the arc itself. The carbons are surrounded by a glass globe of small area, closed at the base and only sufficiently open at the top to allow of a free passage of the upper carbon. On the formation of an arc the air contained within this globe is heated and rarified, the surplus finding an outlet through the upper opening; the remaining oxygen is reduced by combustion with the carbon to carbon monoxide (C.O.), a gas which is somewhat lighter than air, having a specific gravity of .969, and although combustible will not support combustion. This, together with the nitrogen which is liberated, completely fills the chamber and prevents further combustion of the carbon, although a small amount of air diffuses through the upper opening—a condition essential to satisfactory operation, as otherwise the vaporized carbon would condense and appear as a sooty deposit on the inner surface of the globe, while as it is, the oxygen of the entering air unites with this vapor and forms a gas. A slight deposit of silicon accumulates, which, however, does not seriously absorb the light, and which may be readily wiped off during trimming.

As a result of the absence of oxygen in the enclosing globe the ends of the carbons do not become tapered by burning but remain flat and blunt, and the device could not be adapted successfully to the existing lamps in use, which maintain a potential difference of some 45 volts across the arc, as, in the small separation of one-eighth inch or under consequent upon this voltage, too much of the light would be intercepted by the lower carbon. It was therefore imperative, in order to obtain proper distribution, that the carbons be more widely separated, and it was found that in the enclosure an arc of approximately $\frac{1}{2}$ inch in length could be maintained with an E.M.F. of some 75 or 80 volts. Meanwhile it is necessary that the current employed should not exceed $6\frac{1}{2}$ or 7 amperes, for obvious reasons associated with the cleanly burning of these lamps for long periods, and in order further that the watts expended may correspond with those expended in an open arc lamp of like rating. While a so-called 2000 candle power lamp of the latter type operates with a current of 10 amperes at an E.M.F. of 45 volts or 450 watts, an enclosed lamp of like rating may operate at 6.5 amperes and 70 volts, or at 5.5 amperes and 82 volts, the higher E.M.F. and reduced current resulting within certain limits in better operation.

Enclosed arc lamps in general require special features in the feed mechanism, although the governing principles are identical with those obtaining in the open lamps. As it is necessary to separate the carbons from $\frac{1}{2}$ or $\frac{1}{2}$ inch it is usual to have the magnets act directly on the upper carbon without the intervention of levers, and this calls for a long range magnet of considerable power. In order also to obtain good regulation it is desirable that the moving armature be of considerable weight, as compared with the weight of the carbon to be lifted, as therefore decrease in weight of the carbon is not accompanied by an appreciable lengthening of the arc.

Enclosed lamps will operate efficiently in series on direct constant current circuits employing currents not greater than 6.8 amperes, and on alternating current circuits in conjunction with constant current transformers. In these instances the lamps must be of the differential or shunt feed type, and must be further provided with short-circuiting cut-outs such as are found in the well known open series lamps. A similar type of lamp is required for operating in series multiple on street railway and power circuits, but in place of the short-circuiting cut-out a device for shunting a resistance, equalling that of the arc, across the terminals is used in order that if one or more lamps cut-out or proved defective the current traversing the remainder would not rise. It is necessary also that a steadying resistance be placed in series with each group of such lamps.

Enclosed lamps for operating in parallel on direct and alternating current incandescent lighting circuits require a very simple feed mechanism and contain neither shunt magnets nor cut-outs. For adjusting the carbon a single magnet only is required connected in series with the arc. Such a magnet responds to variations in the current strength and tends to maintain this factor constant irrespective of variation in terminal voltage, but as this latter is a constant factor the magnet therefore in keeping the current factor constant must likewise keep the arc resistance and length constant also.

A retarding device such as a dash pot is required in these lamps to allow of a gradual separation of the carbons, alternating lamps especially demanding a comparatively slow separation.

As direct current lamps usually operate on circuits of 110 volts it is necessary to interpose a resistance in order to reduce this to about 80 volts as required across the arc, and, while this resistance wastes energy, yet it is necessary to the successful operation of the lamps. The alternating lamps are more fortunate in this respect inasmuch as a reactance coil may be placed in series with the arc which will reduce the voltage to that required across the arc with but little waste of energy. They may also be operated direct from transformers delivering the necessary arc voltage, or from economy coils, or auto-converters.

A type of lamp which represents simplicity in the extreme is that in which the separation and feeding of the carbon is effected by the expansion and contraction of a strip of metal interposed in the path of the current. Such a device, while not satisfactory when used in conjunction with open arc lamps, appears to be excellently adapted to parallel burning enclosed lamps, in which the arc is protected from draughts of air, and which feeds only at long intervals. For this particular purpose, as compared with electro-magnetic feeds, the advantages all appear to be with the thermal feed. Such lamps strike their arc quietly and slowly

without being necessarily retarded in their action by dash-pots, their feed is positive, and slight frictions in the moving parts introduce no noticeable error; they may be operated at will on direct currents, or on alternating currents of either of the standard frequencies. On alternating currents the power factor of a load of these lamps would be high as compared with a load of lamps having large magnet coils and cores, and in the matter of maintenance there appears to be nothing about such a lamp to suggest repairs, although the replacing of an occasional regulating strip would be much cheaper than the renewing of magnets.

Aside from the economies of enclosed lamps resulting from the increased life of the carbons they possess other advantages peculiar to themselves. As a result of the absolute enclosure they burn quietly, being free from hissing or flaming even though not accurately adjusted, and, as it is impossible for sparks to make their exit, all possible fire risk is eliminated, a feature which meets with the unanimous endorsement of the Boards of Fire Underwriters generally.

By virtue of the long arc which is maintained more perfect distribution of the light over large areas is obtained than is possible with open arc lamps. Direct current lamps of the latter type exert their greatest illuminating effect at an angle of about 45 degrees from the vertical so that a very intense light is noticeable within a radius slightly exceeding the height of the lamps from the ground while beyond this the illumination rapidly falls away. Enclosed lamps on the other hand spread their rays more horizontally, their angle of maximum intensity being about 75 degrees, and as a result the light is more regularly diffused over a large area and does not assume the form of concentric zones of rapidly diminishing intensity.

The economy in maintenance however affords the most striking example of the advantages of enclosed lamps over the open and the gain will be clearly noted by a comparison of the two systems. As an example we may compare the maintenance costs of 450 watt open and enclosed alternating current lamps operating 10 hours per day per year of 365 days, assuming for the former a life of 14 hours per trim of carbons costing \$36.00 per 1000, while for the latter a life of 80 hours per trim of carbons costing \$30.00 per 1000. In this comparison the matter of interest and depreciation allowance may be dismissed on the assumption that it will be similar in each case and thus there remains to be calculated the cost of carbons and trimming.

As the open lamp requires two new carbons per trim it will in a year therefore, on the above basis of 10-hour runs per day, require some 261 pairs of carbons, costing \$18.80; on the other hand the enclosed lamp requires but one new carbon per trim and in a year will consume but 46 carbons, costing \$1.38, so that an annual saving of some \$17.42 per lamp is effected by the use of the enclosed lamps.

The cost of trimming will depend largely upon local conditions but we may assume that one man at \$2 per day can trim one hundred open lamps or one-half as many enclosed lamps, which will make the cost per trim, therefore, 2 cents and 4 cents respectively. On the 10-hour basis the trimming, therefore, will cost approximately \$5.62 per open lamp per year, as against \$1.84 per enclosed lamp per year, resulting in a further annual saving in favor of the enclosed lamp of \$3.78, making the total saving \$21.17.

With direct current lamps the saving will be in like ratio, allowances for differences in the life and cost of carbons being necessarily taken into consideration, but whether direct or alternating the advantages of the enclosed lamp are so apparent that before a great period elapses not only will they largely supplant the open arcs, but they will further enter the arena in competition with large incandescent lamps and regenerative gas lamps.

THE PROPER EFFICIENCY OF INCANDESCENT LAMPS FOR CENTRAL STATIONS, INCLUDING A DESCRIPTION OF THE NERNST LAMP.

By E. E. CARV, St. Catharines.

Few questions in the field of electric lighting are of greater importance to central station managers than that of the efficiency of incandescent lamps. This problem of suitable efficiency, many may justly think could be handled more properly by the central station manager than by the manufacturer, but it must be borne in mind that the manufacturer is in close touch with many stations and is thus able to observe the inauguration and development of theories incident to the subject. Few questions seem so thoroughly misunderstood, and yet the fault is not entirely with the central station. In the first place, only the larger companies will invest in the necessary apparatus, and surprisingly few of these will purchase enough apparatus to determine the efficiency of their lamps. The initial outlay, including photometers and instruments will more than pay for itself in the first year. In the absence of the proper outfit, the managers have to depend upon the statements of manufacturers or more often upon those of their representatives, and what is the result? Dissatisfaction. One maker will supply lamps guaranteeing them to be of a stated efficiency, and these lamps will give satisfaction. Should the next order be placed with another company and the same efficiency guaranteed, chances are strongly in favor of the second consignment not giving satisfaction, assuming the specifications call for efficient lamps. Both lots of lamps may consume the same current at the stated voltage and in reality be intrinsically equal, yet one will be thought well of and the other condemned. A situation such as this, upon the face of it, seems incredible, yet such is the daily experience of every lamp manufacturer until, by long and often costly experience he becomes thoroughly acquainted with the actual state of affairs upon the lines of all his customers.

For many years generators, and later transformers, have been rated in light capacity upon the basis of fifty watt lamps. Multiples of fifty are convenient quantities to handle mentally, though, when this unit of capacity was adopted, everyone felt confident of the universal adoption of fifty watt lamps.

It has been unfortunate that 3.1 watt lamps have become such a household term, as their use has often proven very costly to companies before experience made them alter first ideas.

Everyone will probably agree that it is desirable to use the most efficient lamps possible, consistent with fair life where current is supplied upon the meter basis. Two questions immediately arise: what should be considered fair life, and at what efficiency under conditions existing upon the lines can this life be most economically obtained. Hardly two managers will agree upon the first question, and very few have at hand the necessary information to answer the second.

Every lamp maker, however worthy of the name, has on record the results of many tests showing the average life to be expected of lamps of different efficiencies when operated at normal or at voltages other than normal. Below in table 1, will be found the efficiency and average life of lamps at various voltages. Though these results are in one sense approximate only, yet they are the average results of many tests.

Before discussing the table, it is well to state that the efficiency of an incandescent lamp is generally given in watts per candle. A lamp radiating sixteen candles when operating at fifty volts, and one ampere of current, consumes fifty watts, and has therefore an efficiency of 3.1 watt per candle. When lamps are tested for efficiency, one grievous error is generally made. The voltage is taken carefully as labelled on the lamp instead of being taken at the point of the lines where the lamp will be used. For example any lamp, whatever its normal efficiency may be, can, and often is operated at a much higher efficiency. For instance a four watt lamp is often burned at three watts, and a three and a half watt often burns at two and a half watts. This is simply to show that when a manager talks of using more efficient lamps, he may be operating at that very time, lamps at a higher efficiency than he contemplates using.

EFFICIENCY AND AVERAGE LIFE OF LAMPS AT VARIOUS VOLTAGES.

Efficiency in Watts at Normal Voltage	95 per cent. of Normal Voltage	96 per cent. of Normal Voltage	97 per cent. of Normal Voltage	98 per cent. of Normal Voltage	99 per cent. of Normal Voltage	100 per cent. of Normal Voltage	101 per cent. of Normal Voltage	102 per cent. of Normal Voltage	103 per cent. of Normal Voltage	104 per cent. of Normal Voltage	105 per cent. of Normal Voltage	106 per cent. of Normal Voltage
Average Life in Hours	Actual Life in Hours	Actual Life in Hours	Actual Life in Hours	Actual Life in Hours	Actual Life in Hours	Actual Life in Hours	Actual Life in Hours	Actual Life in Hours	Actual Life in Hours	Actual Life in Hours	Actual Life in Hours	Actual Life in Hours
Efficiency in Watts at Normal Voltage	Actual Watts per C.P.	Actual Watts per C.P.	Actual Watts per C.P.	Actual Watts per C.P.	Actual Watts per C.P.	Actual Watts per C.P.	Actual Watts per C.P.	Actual Watts per C.P.	Actual Watts per C.P.	Actual Watts per C.P.	Actual Watts per C.P.	Actual Watts per C.P.
4.5	4.85	4.34	4.21	4.06	3.92	3.8	3.38	3.3	3.26	3.2	3.18	3.1
4	4.31	3.86	3.74	3.62	3.48	3.38	3.3	3.26	3.2	3.18	3.1	3.05
3.5	3.77	3.35	3.27	3.16	3.05	2.96	2.9	2.87	2.8	2.77	2.7	2.62
3	3.34	2.99	2.9	2.8	2.7	2.62	2.55	2.5	2.46	2.4	2.38	2.3
2.5	2.69	2.41	2.34	2.26	2.18	2.11	2.06	2.0	1.96	1.9	1.87	1.8
	3500	2600	1830	1600	1400	1240	880	800	710	620	550	490
	2000	1500	1100	1020	940	860	780	700	620	550	490	430
	1200	900	700	620	550	490	430	370	320	280	240	210
	700	580	460	400	350	300	260	220	190	170	150	130
	350	260	210	190	170	150	130	110	100	90	80	70

If a station is using 3.5 watt lamps and had absolutely steady voltage, an average life of 900 hours could be expected. If the voltage however, is two per cent. high, this life is reduced to 700 hours, and the efficiency increased to 3.27 watts. If however, the voltage is four per cent. high the life is reduced to 550 hours, and the efficiency increased to 3.05 watts. Though the candle power is increased, the total watts consumed is not proportional and the station suffers doubly in consequence. Four per cent increase in voltage of a sixteen candle power lamp increases the light emitted about 20 per cent.

This table will probably impress on central station managers how vitally important it is to know the voltage at which their lamps are operating upon different portions of their lines. Unless the regulation throughout the system is unusually uniform, it is most profitable to have the entire system divided into sections or zones, and order lamps of different efficiencies adapted to give the life settled upon as desirable. If the fluctuations are comparatively the same in the different zones, then the same efficiency can be used, only the lamps should vary in voltage, the voltage to be used to be the same in each zone. The manager immediately states that this causes too much confusion, etc., yet it is good business, and is a no more confusing problem than many others in manufacturing. When a method like this is carried out, very black lamps would disappear, average life be greatly increased and customers would be much better pleased. Take a customer upon your lines where the voltage is four to six per cent high, not to speak of twenty per cent. as is often found, and when you replace burned out lamps what is the result; the new lamps may emit from twenty to thirty-two candles and the old lamps eight to ten. Naturally the customer complains that the old lamps are worthless, and to keep peace, you replace these also and he starts with practically all new lamps, the same trouble to be gone through with later on. In the meantime you are apt to write the manufacturer that his lamps are blackening badly and return these specimens as fair samples. Troubles arising from causes similar to this have forced manufacturers oftentimes, who cannot or will not investigate the trouble, to send out their lamps uniformly of a higher voltage than is marked on the labels. This is in one sense self protection which the manufacturer is forced to do if he wishes to retain the trade which is often at such a distance that he cannot afford to investigate personally.

Most lamps imported from the States to-day, are much higher in voltage than indicated on the label. Yet the central station if it has not due regard for the light emitted, will be pleased with the lamps as they may last almost indefinitely. The most welcome information a manufacturer can receive is to the effect, that a central station does not wish a lamp to last forever so to speak. Consider for a moment how small the expense of the renewal item is under normal conditions. Assuming only six hundred hours average life at the low average meter rate 6/10 cents per lamp hour the income is 3.60. Good lamps can be purchased for 20c. each or less than 6% of the income.

When lights are furnished upon the flat rate basis, and the renewals are paid for by the consumer, highly efficient lamps are not desirable.

When central stations will determine intelligently the proper efficiencies of lamps which they should use, and take means to hold manufacturers to their specifications, then their lamp renewal account will considerably decrease and the legitimate lamp maker prosper proportionally.

Below is given another table of current in amperes taken by lamps at various voltages and candle powers at different efficiencies, which may be found useful for reference.

CURRENT IN AMPERES TAKEN BY LAMPS AT VARIOUS VOLTAGES AND CANDLE POWERS.

3.1 Watts per Candle.

Candle Power.	50 Volts.	55 Volts.	60 Volts.	65 Volts.	70 Volts.	75 Volts.	80 Volts.	85 Volts.	90 Volts.
8	.50	.45	.31	.26	.25	.24	.23	.21	.11
16	1.0	.90	.62	.52	.50	.47	.45	.41	.33
25	1.6	1.4	.97	.82	.78	.74	.70	.65	.35
32	2.0	1.8	1.3	1.1	.99	.94	.90	.83	.45
50	3.1	2.8	2.0	1.7	1.6	1.5	1.4	1.3	.71

3.5 Watts per Candle.

Candle Power.	50 Volts.	55 Volts.	60 Volts.	65 Volts.	70 Volts.	75 Volts.	80 Volts.	85 Volts.	90 Volts.
8	.56	.51	.35	.30	.28	.27	.26	.23	.13
16	1.1	1.0	.70	.59	.56	.54	.51	.47	.26
25	1.8	1.6	1.1	.92	.88	.84	.80	.73	.35
32	2.3	2.0	1.4	1.2	1.1	1.1	1.0	.94	.51
50	3.5	3.2	2.2	1.9	1.8	1.7	1.6	1.5	.80

4 Watts per Candle.

Candle Power.	50 Volts.	55 Volts.	60 Volts.	65 Volts.	70 Volts.	75 Volts.	80 Volts.	85 Volts.	90 Volts.
8	.64	.58	.40	.34	.32	.31	.29	.27	.15
16	1.3	1.2	.80	.68	.64	.61	.58	.54	.29
25	2.0	1.8	1.3	1.1	1.0	.95	.91	.84	.45
32	2.6	2.3	1.6	1.4	1.3	1.3	1.2	1.1	.58
50	4.0	3.7	2.5	2.1	2.0	1.9	1.8	1.7	.91

Before describing the Nernst lamp I will say in reference to 220 volt lamps that great progress has been made in their manufacture during the past year or two, but that little further is necessary in making them more efficient before they will be on a par with 110 volt lamps. In addition to this, plants must be installed calling for a range of 220 to 240 volts before the cost of the lamps can be brought to its proper level by the manufacturer.

During the past year vague rumors have occasionally been wafted across the water of the discovery of a new light, although details of the discovery were entirely lacking until Mr. Swinburne delivered his now famous lecture before the Society of Arts in London, February 8th. I will quote from this lecture a few descriptive remarks and then give some criticisms of the lamp from other sources. Mr. Swinburne in speaking of Nernst's discovery says: "Nernst's like most great inventions, is exceedingly simple as soon as it is understood. The efficiency of an incandescent body, as far as radiation goes, depends simply on temperature of the filament only, providing there is no loss by convection. The carbon will not stand a sufficiently high temperature. Nernst therefore chose a material that would stand higher temperature than carbon, and his material has the incidental advantage, that its specific resistance is so high, that strong rods can be used for high pressure instead of thin filaments. Nernst takes highly refractory oxides as his material. It does not seem promising, because such oxides are notoriously good insulators. But such insulators are electrolytes when hot; Nernst therefore, heats the rod to make them conduct, and then heats them electrically, preserving a temperature which is within the limits that the material can bear without softening."

The material is worked up into little white rods. Each rod is mounted on two platinum wires, a little paste made of refractory oxides being applied to the joints. The little rod with its two wires, is then mounted in holder which fits ordinary electric light fittings. As the rods fall in resistance as the temperature increases, after the manner of electrolytes, an increase of current produces a decrease of resistance. This tends to give some instability in running in parallel on supply circuits. This instability is corrected, as in an arc lamp which has analogous properties due to a different cause by a series resistance. The Nernst rod has therefore a resistance in series. This is made up of exceedingly fine wire, and for ordinary circuits amounts to 10 or 12 per cent. of the whole resistance of the lamp. The consumption, including the resistance is 1.5 watts per candle for large lamps, and 1.6 for small lights of low pressures. In small or low pressure lamps the loss of heat at the ends is larger in proportion.

Such a lamp as I have described will not light up of itself, for the rod is an insulator when cold. The simplest way to start it is to warm it with a match, or better with a small spirit lamp. Such a lamp as this is not only very cheap as regards first cost, but economical in running. The life of rods, running at an efficiency of two-thirds of a candle per watt, including the resistance, is already more than 500 hours in good specimens. If the Nernst lamp advances as much in the first years of its existence as the carbon lamp did between 1880 and 1882, it will soon be made so well that the rods will last a lifetime. When the rod is worn out, a new rod with its little mounts is all that is replaced. The whole lamp is not thrown away at all. The small lamps and the lamps of medium size are in practice started by a heating resistance. This is arranged close to the rod, and in shunt to it. As soon as the rod is hot enough to conduct, its current works a tiny cut-out in the resistance circuit. In large lamps the heating system is a little more elaborate, as the resistance arrangement is arranged as a sort of hood which covers the rod. As soon as the rod conducts, not only is the resistance circuit broken, but the electro-magnet lifts the little hood clear off the rod. In all these forms, the rod and its mounting are replaceable without interfering with the rest of the lamp.

The above extracts give a very clear idea of the Nernst lamp, as first described to the public by those interested in promoting a large company for its exploitation. There are however serious practical difficulties involved in the practical operation of these lamps at the present time. Assuming however for the sake of argument that the Nernst lamps can be operated successfully in practice, the relative cost of this operation compared to arc and incandescent lamps is what chiefly interests the central station manager.

The English Electrical Review recently published an article by Mr. John I. Hall upon "The Nernst Lamp vs. The Arc and Incandescence Lamps." I quote for your information a part of this article, giving comparisons in cost between the Nernst and Arc lamps. These are the only figures that have been recently published. After speaking of various methods of lighting, Mr. Hall writes: "But at present the position of the various illuminants may be summed up as follows:—

1. The Welsbach system is an advance over the ordinary method of lighting by gas.
2. The enclosed arc lamp is an advance over the open arc.
3. The Nernst system is an advance in incandescence lighting.

The electric lamps are placed in the order they will occupy in regard to cost of maintenance, for as the Nernst lamp supersedes the enclosed carbon lamp, so does the arc lamp supersede the Nernst lamp.

Mr. J. Swinburne, in the prospectus of the Nernst Electric Light, Limited, states that: "It will, I believe, oust the arc lamp in nearly all cases." On examination it will be found that it will not oust one arc lamp at present in use, as the following particulars will show:

The Nernst lamp is said to give 1 C.P. for an expenditure of 1.5 watts. The arc lamp (2,000 N.C.P.) absorbs 500 watts and actually gives 1,200 C.P. The Nernst lamp to give 1,200 C.P., will require an expenditure of 1,800 watts, or 3.6 times more energy than the arc lamp. 1,800 watts = 1.2 kilowatts per hour, which will cost to the consumer 36d. per kilowatt per hour.

The arc lamp absorbs 0.5 kilowatt per hour, and this at 3d. per unit equals 1.5d. These figures are for public lighting; for private consumers the cost is, of course, increased. Allow a liberal amount for carbons, trimming and cleaning, &c., say, 0.5d. per hour, then there is 1.5 + 0.5 = 2d. per hour as the cost of the arc lamp against 36d. as the cost of the Nernst lamp.

The figures given above are for the open arc lamp, but for the enclosed arc lamp the cost would be about 16d. against 36d. for the Nernst lamp. In other words, instead of our corporations running their street arc lamps for, say, £18 per annum per lamp, they will, by adopting the Nernst lamp, run them at £0.4, or spend £46. more per lamp.

It will therefore be considerable time before the municipal electrical engineer is found who will be ready and willing to come forward and suggest the ousting of the arc by the Nernst lamp.

The Nernst Electric Light, Limited, prospectus further states that "there is no difficulty in running in parallel on 1,000-volt circuits without transformers. It will be of some interest to the electric light engineers to find the 1,000-volt circuits without transformers amongst the electric lighting stations. However, the merits of the 1,000-volt lamps can be considered as against the arc lamps.

Suppose the advantages of the Nernst lamps are considered running in parallel on 1,000-volt mains. Is there any economy in conductors to be secured under these circumstances? Take a section of, say, 20 arc lamps, with transformers, running in parallel and controlled from a substation. The current required will be

$$\frac{20 \times 500 \text{ watts}}{2,000 \text{ volts}} = 5 \text{ amperes primary current.}$$

For 20 Nernst lamps the current will be

$$\frac{20 \times 1,800}{1,000} = 36 \text{ amperes primary current.}$$

Thus it will be seen that, taking the most favourable conditions set down by the prospectus of the company for the Nernst lamp to compete with the arc lamp, a cable of seven (7) times the sectional area will be required, in addition to the transformer, for them to run on existing installations where the F.M.F. is 2,000 volts.

The cost of the lamp cases and posts now remains to be considered. It may be taken that the lamp-posts will cost about the same in both cases. The arc lamp complete, with hood and globe, costs, say, £6, and the Nernst lamp £1. This appears to be a fair price, allowing for promotion anticipations without actual figures as to cost.

The first cost, and maintenance for 12 months, may now be considered, voltage 2,000 lamps in parallel: -

Arc lamp and transformer, say	£12 0 0
Say cost of cables	8 0 0
Maintenance for 12 months	2 0 0
Total cost	£22 0 0
Nernst lamp and part cost of transformer situate in sub-station (Voltage 2,000 to 1,000)	£1 0 0
Cost of cables	1 0 0
Maintenance for 12 months	4 0 0
Total cost	£6 0 0

There are other considerations of cost, such as conduits, depreciation and interest on capital outlay, which the electrical engineer will observe are not in favor of the Nernst lamp, and so they are, in kindness, omitted.

To summarise the foregoing particulars, it is pretty plainly to be seen that the rosy and light-hearted view taken by the Nernst Company as to ousting the arc lamp will need some slight modification, especially on the score of first cost and economy. Unfortunately for the new comer there are such things as cables to be taken into account and maintenance.

So, then, the manufacturers of open and enclosed arc lamps, are not yet to put up the shutters, stop the machinery, and discharge the workmen; but it is not so pleasant an outlook to the carbon lamp manufacturer unless he commences to make the Nernst type of lamp (under license, of course) or improve the carbon lamp, as will appear later on.

But there are other considerations to be taken into account where the advent of the Nernst lamp will be most beneficial, and where it will be appreciated, as we shall have for street lighting two illuminants to choose from, and where one is not applicable the other will be most serviceable.

It may be considered that for lighting large areas such as squares, public markets, &c., and main streets and roads, the arc lamp will not be superseded, but for the lighting of narrow streets, public halls, &c., the Nernst lamp will be a most valuable acquisition, on account of the increased economy in running.

In all the circumstances it must be considered that the lamp is automatic in its action, as the match-assisted lamp is out of question in 1899, excepting, of course to the promoters. The engineer and manager of one of the most successful gas works in the country said to me, when discussing the merits of the Nernst lamp. "Why, you will be going back to the old barbarous times of gas lighting if you use a match to light your incandescent lamp, and

all the advantages of the enclosed filament lamp will be dispensed with."

Before closing you will probably be interested in one or two experiments upon the Nernst lamp.

THE PROTECTION OF LOW TENSION WIRING AGAINST DANGEROUS HIGH POTENTIAL CURRENTS.

By W. J. PIRKES, Montreal

All persons in connection with electrical supply companies, especially in lighting service by alternating currents, have long recognized the necessity of some reliable apparatus to prevent low tension service wires inside buildings from becoming a possible source of danger to human life, or as regards fire, in event of contact with high tension conductors. That this condition often exists, and that the danger therefrom can hardly be over-estimated, is a well known fact to all Electricians who have had experience with alternating current systems.

Some years ago, the principal element of danger was the liability of transformers to break down between the primary and secondary coils. Of late, however, conditions have changed considerably, the more recent types of transformers being a vast improvement on the older ones. While the contingency as regards transformers is not now so great as in former years, the change in the system of secondary distribution, involving as it does the use of large secondary units and a network of wires covering a great area, has given rise to another and if anything a more important element of danger, namely, the increased liability of accidental contact between high and low tension conductors. This change in secondary distribution has been rendered necessary from an economical standpoint, and as it is not at all likely that anyone will revert to the old system, the proper course seems to be the protection of individual equipments.

The contingencies previously mentioned have proven a frequent cause of fire, and in some instances have resulted in fatal accidents. Recognizing these dangers, various earthing devices have been contrived to cope with the difficulty. It seems, however, that the idea has been to afford protection from the breaking down of transformers only, by means of blowing the primary fuses, the inventors apparently not having taken into consideration the contingency of accidental contact between local and foreign conductors, whereby a large volume of current at a high potential may flow over the secondary apparatus and destroy both it and the protective device, in which event the protective device itself would probably become a source of fire.

Several of the cases which have come under the observation of the writer, wherein conditions as mentioned have existed, have been of such a nature that any earthing device, depending upon the blowing of a fuse for its action, would have been a positive fire hazard. One instance in particular was a cross between a fallen secondary and a trolley wire. In this case had there been any device of the type mentioned, a volume of current would have flowed through the apparatus sufficient either to destroy it or blow the secondary fuses; this latter occurring, it is reasonable to assume that the high tension current would have maintained an arc across the terminals of the cutout, (one such as generally used for low tension wiring) and produced disastrous results.

As far as the writer's knowledge extends, the principle, common to all safety devices of this nature, heretofore developed, has been to disconnect the local system from the source of danger by means of blowing fuses. This principle appears to be radically defective, the blowing of a fuse under such conditions being an uncertain element, attended at times with undesirable results.

In any apparatus designed to protect local low tension systems from currents of higher potential than they are constructed for, or expected to carry, it would seem more rational to employ a device that will automatically and instantaneously disconnect the high tension current from the low tension system to be protected, without depending upon the uncertain action of fuses. It is also believed that a device of this nature should be one in which the amount of current necessary for its successful operation is a known quantity, and that this quantity be as small as possible, so as to avoid dangerous arcing.

Considering the matter from this point of view, the writer believes that an apparatus can be constructed which will embody the desirable characteristics, and it is to this possibility that your attention is respectfully invited.

One form of such an apparatus, which is on exhibition here, is similar in action to a double pole knife switch, and is so constructed as to automatically open the circuit instantaneously, whenever the low tension wiring is brought into connection with conductors charged with dangerous high potential currents, either through a break-down in a transformer, or a cross between secondary and primary, or other high tension conductors.

The great advantage claimed for this apparatus, is that no matter how large the volume of current may be, only a small fraction is required to operate the device, and this only for an infinitesimal period of time, the device in opening, disconnecting both the safety apparatus and the interior wiring from the outside source of danger. Another advantage is in the fact that the device provides special facilities for rapidly testing the local system for grounds, without the use of other apparatus.

During the past few years many fires have originated from high potential currents accidentally traversing secondary systems and breaking down the insulating joints which intersected the junction between fixtures and gas pipes. From the manner in which first-class electric light wiring is installed at the present day, it would seem impossible for a current at a potential of say two thousand volts, to cause a rupture between secondary wiring and ground, and the writer's experience leads him to the conclusion

that if the so called insulating joints properly performed their function, fires from this cause would be extremely rare.

If on the other hand low potential systems are so arranged that there is no chance for high potential currents to rupture to ground, there remains the danger of some person receiving a fatal shock while handling the apparatus.

In view of these facts, it would seem advisable to equip all low potential systems, which are exposed to the contingencies herein mentioned, with an automatic device that in time of need will operate effectively.

CENTRAL STATION ACCOUNTING FROM A BUSINESS STANDPOINT.

By P. H. HART, Montreal.

MR. PRESIDENT AND GENTLEMEN, Before proceeding to a description of the system of accounting which I will offer for your consideration, it seems appropriate to state a few of the reasons why a standard system of accounting for central stations ought to be adopted.

The reasons why are many and substantial.

The individual owner of a small plant is as much interested in having accurate knowledge of the condition and details of his business and a determinate method of obtaining such condition and details, as the manager or directors of a large joint stock company.

A proper system of accounting should show to the directors, manager, proprietor or other interested party (and for the sake of brevity I will hereafter refer to such parties as manager) besides the profits or losses of the business, the cost of producing what is sold, and should demonstrate this cost in such manner as to enable him to learn what the product costs in its various details, and particularly the costs separately of generation and distribution.

These being determined and ascertained in the ordinary progress of business and due account being had of interest on investment and depreciation of plant, the manager can compare costs and determine where excesses arise, whether in the generation or distribution, and the reasons therefor. It should also show promptly and definitely the condition of affairs of a business at any and for given periods, which is a decided requisite and absolutely essential to sound business administration. It should be such as to enable the manager to determine the advisability of soliciting or catering for any particular line of business that may be offered or obtainable and indicate the most profitable, and be a guide, preventing indiscriminate investment in pole line construction, apparatus, etc., and show at all times the value of the investment for such purposes as insurance, arbitration, assessment, etc., etc. With such information created, compiled and formulated in the regular progress of the business, the manager will be enabled to consider intelligently operating costs and the advantages or disadvantages of further investment.

I may here call your attention to some interesting information which appears in the 14th annual report of the Board of Gas and Electric Light Commissioners of Massachusetts, Public Document No. 35. This shows that out of 58 electric light companies operating in that state, with a total investment of over \$17,000,000, five of the companies appear not to have earned expenses, and 32 have not earned sufficient to warrant the declaration of any dividend; thus very near 10% of the electric light companies operating in that state do not earn expenses, and \$1,630,000 are not earning sufficient to make a return to the investors on their capital. Many of them, no doubt, may have believed they were doing well until a rigid system of accounting had been applied.

These commissioners are doing much to standardize the system of accounting in use by electric lighting companies in that state, and this statistical information is the direct result of a uniform method adopted by these commissioners in adjusting the statements submitted by the various companies.

Mr. H. A. Foster, who investigated in detail 160 electric lighting stations of the United States, for the United States census, in a work based on the information gathered by him in the taking of this census and recently published, entitled "Central Station Bookkeeping," regrets the lack of system in accounting shown by the various electric lighting stations which came under his notice, and lays particular stress on the necessity of accurate accounting in central station work, for obvious reasons.

In addition to other reasons for and the advantages of a standard system of central station accounting, I might say that in the event of the question of municipal ownership or purchase arising the manager should have definite knowledge as to the cost of investment, cost of operating, etc., to compare with assumed cost of municipal operation.

I will now present to you a system of accounting at present in use, having the objects above outlined in view, the results of which have been highly satisfactory, and in connection with it a system of records which form necessarily a part of a thorough accounting system. In the presentation I will indicate some of the various books and forms in use.

Central station accounting from a business standpoint should proceed from and be based upon an order system, guiding, directing and allotting in advance, the distribution of expenditure for investment, operation or maintenance and of revenue to the several distributions or sub-divisions of those general items that may be deemed desirable. And here I may say that such sub-divisions should be as numerous as the several details of a business and when arranged for and determined upon beforehand, becomes, in practice, very easy of allotment or apportionment.

A written order should be issued covering each and every transaction, indicating the character of the transaction and the accounting to which the expenditure incurred therefor is to be

charged, or the revenue derived therefrom is to be credited. This to be determined and declared in the order before the expenditure is made or the revenue derived.

Such system necessarily means that for every debiting entry to an account, something must be credited and all entries and accounts must result in a perfect balance, so that double entry bookkeeping is absolutely necessary to the practical working and comprehension of this system.

The system referred to herein, and partially illustrated by various forms or blanks, can be readily put into operation by any company and practically at any time desired. Under the system described as at present carried out, the accounting is eventually grouped into what may be designated as general accounts, which are kept in a general ledger. All the other accounts, subordinate to these general accounts, and forming what may be designated as the working accounts, and which lead up to and are finally grouped into general accounts, are kept in other or subsidiary ledgers. This subdivision of books or ledgers is done in this instance simply as a matter of convenience, because the volume of business is large and necessarily requires to be attended to by a number of persons; but the principle involved would permit carrying all the accounts in one set of books if the volume of business were so small as to make that desirable.

The general accounts consist of the assets and liabilities, and may be sub-divided in accordance with the wishes of the manager — as, for instance, the asset account of merchandise might, if desired, be sub-divided into fuel, line supplies, station supplies or wiring supplies, etc., such accounts representing materials on hand for use as required, either for any addition to construction or for operation or maintenance of plant.

The asset account of plant and construction account may be sub-divided into station construction, lines and poles, real estate, buildings, etc.

The feature of the general accounts is practically no different from that of any other double entry bookkeeping system of accounts. The method in which this system may vary from ordinary methods of bookkeeping is principally in what may be known as the working accounts, and it is here that the formulation of the accounting and the determination to which account work under any given order shall be entered, arises. In the forms shown will be noticed the titles of sub-divisions of the working accounts representing expenditures. They show construction accounts, operating accounts and maintenance accounts sub-divided into the various details, upon which it has seemed desirable to accumulate and record information.

All orders involving expenditure recite thereon the account and sub-account to which the expenditures made thereunder are to be charged, and all returns of labor, material or expense incurred upon such order are reported, quoting the number of such order (all such orders being numbered serially.)

Expenditures which are continuous during the entire year, such as, for instance, labor and material and expense for the operation and maintenance of the station, or labor and material required for the trimming and inspection of arc lamps and lines, may be dealt with by orders covering the entire year or parts thereof, say monthly, the latter being preferable. Monthly orders for work of this character are preferable to yearly orders, because as soon as the expenditure authorized under an order has been completed, such order is turned in to the office or bookkeeper, marked as completed, and thereafter no expenditure can be made chargeable to that order.

It will be observed that the purpose sought to be accomplished by these orders is the localizing and sub-dividing of the expenditures to the particular parts of the work being done upon which the management deems it necessary to have accumulated and specific information. In the forms submitted, there are sub-accounts representing different parts of the operation within the station, sub-dividing it into boiler room, engine room and the electrical generating room; similarly it sub-divides the work outside, the inspection, trimming of lamps, lines, the additions to the plant, whether within the station or outside, and also seeks to separate the different classes of service.

It is, of course, important that the returns made upon these orders be in accordance with the instructions contained in the order. Thus, for instance, an order authorizing the inspection of lines should not have charged to it or reported against it the coal consumed under the boilers, and experience has demonstrated that employees very soon become accustomed to reporting and sub-dividing their work in accordance with the designations of the orders under which they are acting, so that in practice the allotment of expenditures for labor, material or other expense becomes automatic, with the result that the bookkeeper can indicate at any time the amount expended for any sub-account. By using subsidiary ledgers for this purpose, arranged similar to blank or Form No. 1, which, as will be perceived, is a re-arrangement of the items upon the Form No. 2, and total up monthly by month or day by day as they may be recorded thereon, the costs of each sub-account. Periodically, say monthly, the totals of these accounts are transferred either to asset accounts or to the debit of the revenue accounts, according to their character.

The bookkeeper in debiting the returns on these orders to their various accounts, must make corresponding credit to certain other accounts; labor to credit of labor account; material or merchandise to credit of material or merchandise accounts, sub-divided as it may be; expense to expense account, and the totals of the credit of these accounts must, of course, balance with the totals debited to the accounts represented by the orders. When the labor is paid, the amount paid is debited to the labor account, thereby checking the accuracy of the pay rolls, which may be made up either from the returns upon the orders or by independent returns, but all labor represented by either the independent re-

turns, time sheets or otherwise as may be used, must balance with the accounts credited as above to labor account, and debited to the accounts represented by the various orders.

In the detail working under these orders, through a number of employees, means of obtaining material and making returns under and to these orders become necessary, and where a large number of employees are engaged, these necessarily require the adoption of other forms or blanks, as, for instance, the requirement of material necessitates for the execution of any order that an application be made that the employee needing that material to the store room or storekeeper, where such material is kept on hand, or through whom it will be purchased if need be. In the system described, this becomes what is known as a requisition, blank No. 6, and in filling out such requisition the employee requiring the material quotes thereon the No. of the order on which he intends using it. Similarly in making returns of labor or time, the time ticket or labor return blank specifies the order No. authorizing such labor. Blanks or forms authorizing the return to store-room of any surplus material that may have been taken out on an order, also recite thereon the order No. to which it is to be credited or upon which it is returned. In all these returns or reports, besides quoting the No. of the order, the accounting of such order is also recited, the object being to prevent the error of charging a wrong account through a mistake or transposition of the order Nos.

Revenue accounts may also and in the system herein referred to are sub-divided or classified into various accounts of service from which the revenue is obtained, as, for instance, alternating current incandescent lighting, alternating current motor service, direct current motor service, arc lighting, etc., and this sub-division may be made as minute as the management desires.

Dealing with a large number of customers, it is important that means be adopted whereby none shall escape from the grasp of the bookkeeper or collector. Therefore no customer should be connected with the service lines except under an order, as above described, authorizing such connection and supply of the service called for. Upon completion of such order, it is returned to the bookkeeper, with notation thereon that connection has been made and supply of service begun. Meanwhile, that is, as soon as the order to make connection has been issued, the contract signed by the customer upon which the order has been issued, is transmitted to the bookkeeper, who immediately opens in his ledger an account with such customer. On the return of the completed order, the bookkeeper notes in his ledger at the customer's account, the date of starting, which is also marked upon the contract. The customer's contract is not filed or put away or considered as being in operation, until such notation has been made.

As an additional precaution, when the account is opened in the ledger, a card similar to Form No. 7 is prepared by the bookkeeper, giving the customer's name, address, ledger folio and number of contract (and all contracts are numbered serially), character of service, and generally the main details of the contract and service. This card is filed according to ledger folio, and accumulates the record upon which the debit side of the customer's account in the ledger is created.

In cases where meters require to be read, these cards constitute the guide to the meter readers as to what meters are to be read. In sending out accounts to customers for service, every card must be accounted for by an invoice, and the fact of such invoice rendered noted thereon. In other words, the card is used to make out the invoice against the customer and the invoice is used to enter the account in the ledger, and every account in the ledger must be represented by an invoice.

The use of the method of making the entries in the day book and ledger from the invoice instead of making the invoice from the record book, is to hasten the transmission of accounts to customers, in order that they may not have any cause of complaint for delay in the opportunity to pay their accounts.

In practice, the invoices are made out during the month as far as possible, leaving only the final entry to be made when the amount of the invoice has been determined, so that it becomes possible to transmit a large number of accounts within practically one day after the meter readings have been taken.

The cards, in fact, constitute the history of the relations of the customer with the company, and at a glance show the variations in the use of service, for, as will be perceived, they are made to cover the year's transactions. They apply equally well for "flat" rate customers as for meter customers, though they are for recording meter readings. In the case of meter customers, they indicate the variations of use and afford a guide to the bookkeeper to inquire into the accuracy of the meter reading reported, any falling off or unusual increase in the use of the service as indicated by a reading immediately attracts the attention of the bookkeeper or billing clerk, thereby causing him to institute an immediate inquiry into its accuracy. In the case of "flat" customers, it declares at once the proper amount of the account to be rendered, by the record of the account previously rendered.

The debits to customers are credited to the several sub-divisions of the revenue accounts, that is, the customer may be using several kinds of service, the amounts for which are debited to his account, but credited each to the revenue account to its individual class of service. This results in determining the revenue obtained during any period from each kind of service, the total of all, of course, representing the entire revenue obtained and offsetting the expenditures made therefor.

Companies having to deal with a large number of customers and various classes of service, and varying discounts, resulting from special or large consumption, will necessarily require for the convenience of the cashier, a secondary or subsidiary cash book in which can be noted the special discounts or allowances made,

as well as the cash received for the various classes of revenue. A form of such cash book is indicated in blank No. 8. This cash book, or rather entry book, for the receipt of cash and discounts, applies only to discounts stipulated in the contract. Other allowances, rebates or credits are made only by authority of order issued specially therefor in each case.

Assuming this system of accounting to have been properly and carefully carried out to the end of the fiscal year, we would now have before us the total revenue from the business in its various classes. On the other hand, we would have the total cost of operation and maintenance, general expense and the total expenditure on capital account for the year; taking the total revenue derived and deduct from that the total cost of operation and maintenance, will give the gross profit. From this gross profit is to be deducted the general expense. The general expense account should include only such items as are purely general. By that I mean expense which cannot be charged to any specific working account, and is purely general in its relation to the business, such as interest, office expenses, directors fees, salaries of officials, legal expenses, travelling expenses, for instance expenses incurred in attending Electrical Association Conventions.

Deducting the general expenses from the gross profit will give the net profits of the business for the year, exclusive however, of depreciation. This question of depreciation is usually determined by the management. It always has been a much discussed question, and authorities find it very difficult to agree on a uniform method of application, the changing value of apparatus being so widely different.

However, one of the definitions of depreciations, given by Mr. E. Hartley Turner as "The re-payment of capital out of the total gross revenue earned during a given period of such proportion of the original capital outlay as has been absorbed or consumed in earning such gross revenue" is very good, could the amount so absorbed be readily determined. A definite plan, however, is to apply to property in which a residue of value under any circumstances must remain, a graduated percentage upon its changing value as representing depreciation. The amount of this depreciation, however, will be governed to a great extent by the amount of the expenditure on maintenance account.

In the presentation of this paper, I have endeavoured to follow out the question of Central Station Accounting from a business standpoint solely. With this in view, it has been confined almost entirely to the question of the method of ascertaining costs of generation and distribution, and recording from whence revenue has been derived and the methods of assuring the obtaining or all the revenue derivable. I have assumed that the important features are the knowledge of costs and the sources from which the revenue can be most profitably obtained.

The question of purchase of material and the recording of these purchases have not been touched upon, this method being practically similar to all lines of business; neither has reference been made to the obtaining or keeping of records pertaining more particularly to the Engineering Department, for the reason that this subject has been exhaustively considered in a paper entitled "Some Central Station Economies," submitted by Mr. P. G. Gossler at the annual convention held in Toronto in 1897.

Whilst, no doubt, the system herein described may appear elaborate and extensive in detail, and perhaps seem to entail expenditure for labor beyond the reach or desire of managers of small stations, I see no reason why the principle involved may not be used in any station at a slight expense. For while perhaps not requiring to employ all the sub-divisions indicated upon the blanks or forms shown, yet many of them can be utilized and put into practice with such modifications as the local conditions demand without imposing upon the manager or employees any labor or expense beyond that which can be afforded, and if I have succeeded in conveying ideas and information that may serve towards the adoption of a general system of Accounting for Central Station practice as suggested by the authorities referred to in the beginning of my paper, I will feel myself amply compensated.

PROPOSED POWER DEVELOPMENT.

The annual meeting of the shareholders of the Canadian Electric Light Co. was held in the city of Quebec on June 27th. The report presented by the directors stated that the \$200,000 of capital required in virtue of the prospectus had been subscribed, that the Chaudiere Falls water power would be acquired immediately, and that the directors were in negotiation with the Council of the town of Levis for furnishing light and power. It further stated that the services of Mr. Raoul Girouard, of Cumberland, Maine, had been secured as manager, and that Mr. A. R. Henry, M.E., of Quebec, would probably be appointed electrical engineer. The directors have two plans under consideration for the development of the water power of the Chaudiere Falls, one made by Mr. J. M. McCarthy, C.E., of Montreal, and the other by Messrs. T. Pringle & Son, of Montreal. According to their figures a minimum of 5000 horse power is obtainable. Arrangements are said to have been made with the Chaudiere Valley Railway Co. to construct and operate electric railways in the counties of Levis, Bellechese, Dorchester and Lotbiniere, obtaining power from the Canadian Electric Light Co. Directors were elected at the meeting as follows: President, John Breakey; Vice-President, Hon. L. P. Pelletier; H. M. Price, Gaspard Lemoine, James King, R. Audette, R. Wilson-Smith, H. S. Holt and H. T. Machin.

Difficulties having arisen in connection with the carrying out of the contract for the Ragged Rapids transmission scheme at Orillia, Ont., it is probable that the work will again be opened for tender.

SPARKS.

The Robb Engineering Company, Amherst, N.S., are building two 350 horse power engines for the San Paulo Railway, Light & Power Co., Brazil.

Messrs. Eager & Sanderson, of Winchester, Ont., are installing a 500 light dynamo. The entire plant was furnished by the Royal Electric Co., of Montreal.

The warden of St. Vincent de Paul penitentiary, near Montreal, has called the attention of the Dominion Government to the necessity of installing an electric light plant.

Messrs. Grafton & Co., Dundas, Ont., are operating their tailor shops by S.K.C. two-phase motors, current being supplied by the Dundas Electric Co.'s two-phase plant.

Messrs. Steinhoff & Gordon, of Wallaceburg, Ont., will probably establish a heading mill at Tweed, Ont., and in connection therewith put in an electric light plant for lighting the town.

Price Bros., of Anqui Mills, Que., have their entire saw mills, docks and yards lighted by electricity. The plant, which was furnished by the Royal Electric Co., started up a few nights ago.

A new company, to be known as the Lorette Electric Light and Power Co., has been formed at Lorette, Quebec, and will under-

Ald. Peck, of New Westminster, has received the appointment of Inspector of Steam Boilers for the province of British Columbia, a position created at the last session of the Legislature.



MR. E. E. CARY,
1st Vice-President Canadian Electrical Association.

The new 75 k.w. S.K.C. dynamo was put in operation at Grand Valley, Ont., a few days ago, and is now supplying from one phase of the machine, the town of Grand Valley with 500 incandescent house lights and some 50 c.p. street lamps. From the other phase of the same machine, which is wound for a 5000 volt current, they are supplying the town of Athol, 12 miles



MR. A. A. DION,
President Canadian Electrical Association.

take the lighting of that village and of the Indian and Parish churches; the capital stock will be \$10,000.

A report from Barrie, dated June 20th, stated that the Royal Electric Co. had made application to the council for a franchise for an electric railway between Barrie and Allandale, a distance of one mile, with privilege to extend to other points.

The manufacturing warerooms of Mr. Geo. Bean, of Dundas, Ont., have been changed from the old motive power to electricity, the Dundas Electric Co. furnishing the current, and the Royal Electric Co. a two-phase S.K.C. motor to drive the establishment.

Dr. J. T. Nicholson, late professor of Mechanical Engineering at McGill University, Montreal, was made the recipient of a testimonial from his colleagues in the Faculty of Applied Science, on the occasion of his leaving for Manchester, Eng., where he will in future reside.

The town of Liverpool, N.S., is about to establish an electric light plant, tenders for the supply of which will be received by Mr. D. C. Mulhall, mayor, up to Friday, July 28th. The contract for constructing dam, power house, wheel-pit, conduit and tail race in connection therewith, has been awarded to F. W. Clarke, of Bridgewater, N.S.



MR. P. G. GOSSLER,
2nd Vice-President Canadian Electrical Association.

away, with about 600 incandescent house lights and five enclosed arc lamps, as well as fifteen 32 c.p. incandescent street lamps. This plant is one of the most unique and complete in Canada.

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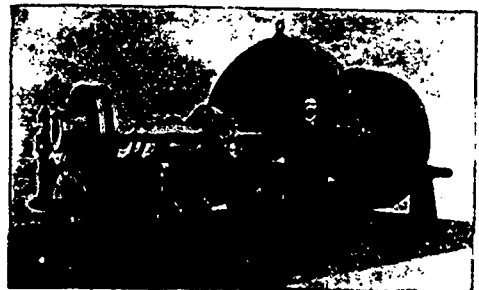
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RECENT PLANTS INSTALLED:—Lachine Rapids Hydraulic & Land Co., Montreal, Que., 12,000 h.p.; Chambly Manufacturing Co., Montreal, Que., 20,000 h.p.; West Kootenay Power & Light Co., Rossland, B.C., 3,000 h.p.; Dolgeville

Electric Light & Power Co., Dolgeville, N.Y.; Honk Falls Power Co., Ellenville, N.Y.; Hudson River Power Transmission Co., Mechanicsville, N.Y.; Cataract Power Co., Hamilton, Ont.



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MR. W. W. GRANT.

We have pleasure in presenting to readers of the ELECTRICAL NEWS the accompanying portrait of Mr. W. W. Grant, who has recently been appointed by the Westinghouse Electric & Manufacturing Company, of Pittsburg, Pa., to act as their representative in Canada in conjunction with Messrs. Ahearn & Soper, of Ottawa. The following brief particulars of Mr. Grant's career will suffice to show his capability for this position.

Mr. Grant is a native of Ottawa, and a son of Sir James Grant, K.C.M.G., of that city. He is a graduate of the Royal Military College of Kingston, which is recognised as one of the foremost educational institutions in Canada. Owing to his standing at this institution, and the marked perseverance displayed during his college course, he was awarded a commission in the Royal Engineers of England, which is the highest branch of the British military service. After due consideration, however, he declined this offer, recognizing that there were larger possibilities in America.

After having graduated, Mr. Grant was engaged in practical work in Canada for about two years. In 1892 he entered the



MR. W. W. GRANT.

employ of the Westinghouse Electric and Manufacturing Company, of Pittsburg, Pa., starting at the bottom of the ladder in the factory, and thence passing through all departments of the company's extensive works. In 1893 he was appointed one of the erecting engineers on the Hamilton Street Railway during the reconstruction of the road. In 1895 he was transferred from the construction to the business department of the Westinghouse Co., where he became associated with Mr. Maurice Coster, who is recognized as being one of the most prominent and successful engineering salesmen connected with the company. In 1896 he removed from Pittsburg to the company's New York office, and in recognition of the value of his services during the two-and-one-half years of his residence in New York, he was chosen to fill the important position which he now occupies in Canada. There is no room to doubt that from the steady advancement which Mr. Grant has made in the past, due to his ability and faithful performance of duty, he will fully meet the requirements of his present position.

Messrs. Taylor & Co., of Dundas, Ont., have placed an S.K.C. two-phase motor in their work shop, and will hereafter operate by electric current furnished by the Dundas Electric Co. Dundas will soon follow the lead of Hamilton, and become, with all its factories, a smokeless city.

SPARKS.

The citizens of Medicine Hat, N.W.T., are considering the question of granting a franchise for electric lighting to a local company.

The Cataract Power Co. is announced to have secured control of the Hamilton Street Railway system. As a result, it is understood that the construction of the contemplated electric roads to Guelph, Galt, Berlin, St. Catharines and other points will be undertaken at an early date.

Messrs. A. C. Miller & Co., of the steamer "Alexandria," have placed their order with the Royal Electric Co. for a complete electric lighting plant for this new steamer. The work of installation is going on now, and on completion it will be one of the best electrically equipped vessels on the lakes.

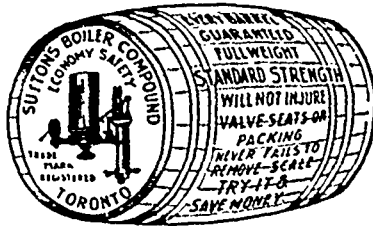
The first meeting of the shareholders of the Victoria Telephone Co., Limited, was held at Woodville, Ont., recently, at which directors were elected as follows: President, J. G. Eyres, Woodville; vice-president, J. G. Campbell, Orillia; treasurer, C. E. Weeks, Woodville; secretary, Wm. A. Robinson, Cannington. The directors decided to build lines to Beaverton, Orillia, Midland, Barrie, Lindsay, Peterboro, and other places as soon as possible.

Messrs. Geo. Wilson & Co., of St. Catharines, who operate a large planing mill and sash and door factory, where they have plenty of refuse for steam purposes, have found it cheaper and more satisfactory to operate their mill by electricity, and have entered into an agreement with the St. Catharines Electric Light & Power Co. to furnish them with from 50 to 75 h.p. They have also placed their order with the Royal Electric Co. for a 50 k. w. S. K. C. synchronous motor. There are also a number of other firms who contemplate making changes from steam to electricity.

A circular from the International Correspondence School, Scranton, Pa., states that the United Correspondence School and the American School of Correspondence have recently been established, using many of the copyrighted instruction papers of the International Correspondence School. Suit has now been entered by the Colliery Engineer Co., in the United States Circuit Court, to restrain these schools from using their papers, and for infringement of their copyright, and students are warned against having such pamphlets in their possession, in case the Colliery Engineer Co. are successful in establishing their allegations.

The St. Catharines Electric Light & Power Co. have enlarged their water power, and are in a position to furnish power and light throughout the twenty-four hours. They have lately installed a 200 K.W. S.K.C. two-phase generator, from which they are supplying light on their single-phase mains throughout the city during the hours of lighting, and during the day are furnishing two-phase alternating current to the various industries throughout the city. This company had been supplying arc and incandescent lights only, but as there was a considerable field for power, in which one plant, a 500 volt direct current system, was already engaged, they decided to put in something which they could use for both purposes, hence they have only one investment in using the poly-phase system instead of two using the direct current power system and an alternating current lighting system

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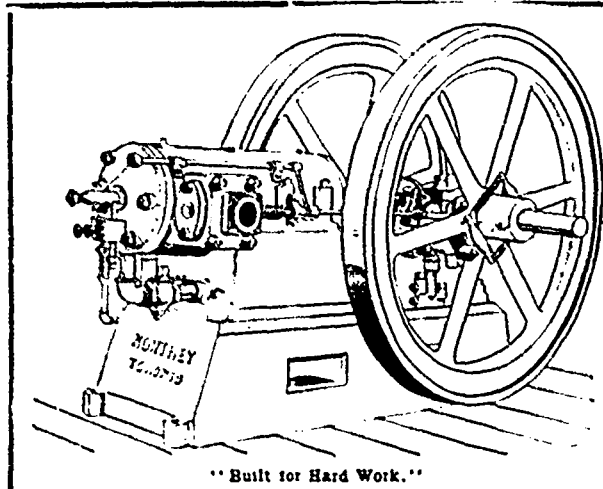
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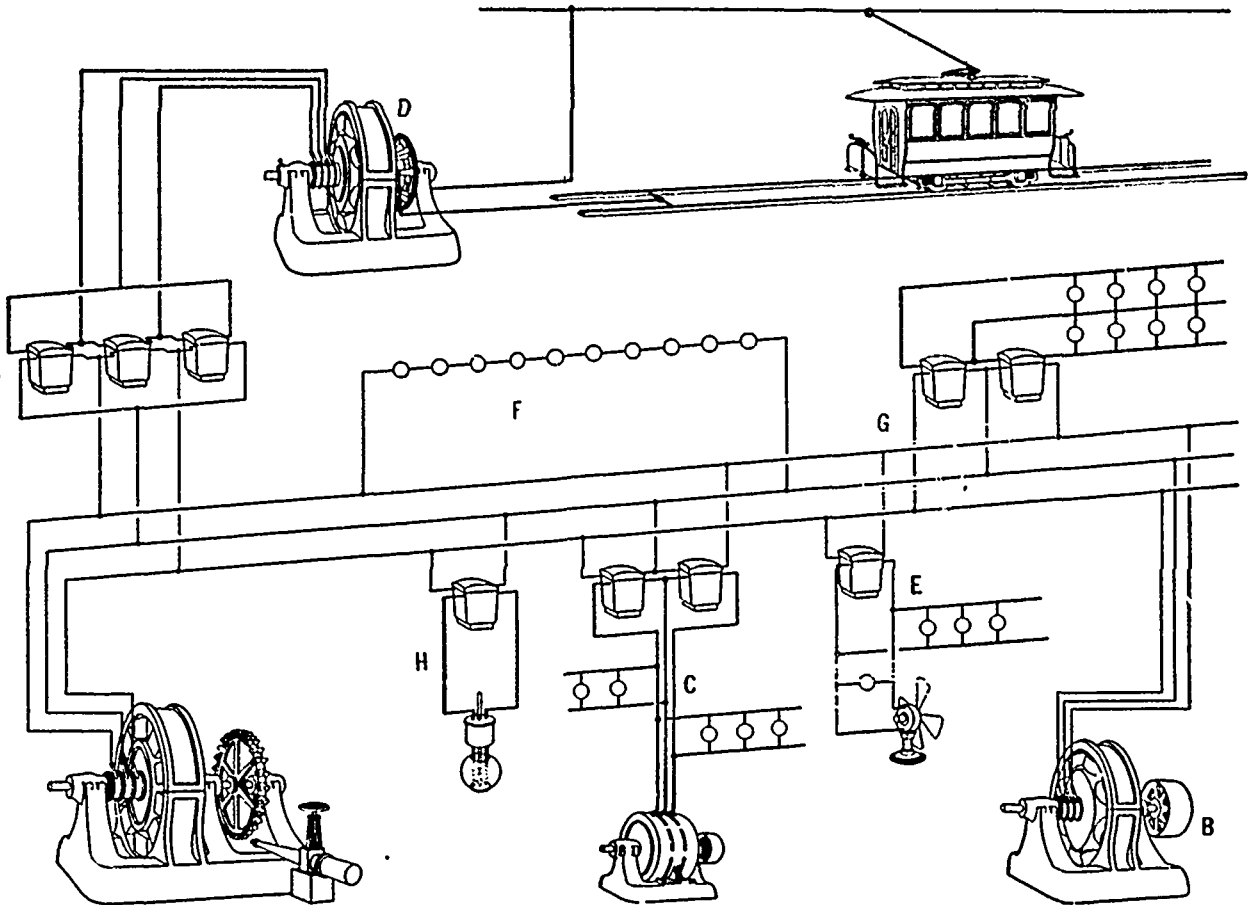
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St. Hyacinthe Electric Light Co.	-	St. Hyacinthe, Que.	-	500 " 4 1/2 mile "
Department of Railways and Canals	-	Soulanges Canal	-	700 " 14 " "
Trenton Electric Co.	-	Trenton, Ont.	-	400 " 12 " "
Lunenburg Gas Co.	-	Lunenburg, N.S.	-	150 " 9 " "
J. R. Scott & Co.	-	Napanee, Ont.	-	150 " 8 " "
J. R. Booth, Esq.	-	Ottawa, Ont.	-	500 " 4 " "
Auburn Power Co.	-	Peterboro', Ont.	-	400 " 2 1/2 " "
Hanover Electric Light and Power Co.	-	Hanover, Ont.	-	100 " 8 " "
Durham Electric Co.	-	Durham, Ont.	-	100 " 4 " "
Light, Heat and Power Co.	-	Lindsay, Ont.	-	600 " 14 " "
B. C. Electric Railways Co.	-	Vancouver, B.C.	-	1,600 " 12 1/2 " "
West Kootenay Power Co.	-	Rossland, B.C.	-	4,000 " 39 " "

FOR INFORMATION ADDRESS NEAREST DISTRICT OFFICE

The town of Shelburne, Ont., will probably purchase the electric light plant from the present proprietors.

Mr. James S. Craig has been appointed city electrician for Toronto, as successor to the late Donald Gibson.

The engine for running the electric plant for the Toronto city hall has been ordered from the Robb Engineering Co., Amherst, N.S.

The electric light plant owned by the town of Kamloops, B.C., has been found inadequate, and steps will likely be taken to in-

crease it by two boilers of 150 h.p. each, an engine, pump, heater and dynamo. It is probable that an engineer will be engaged to report on the plant before the council takes any action.

At the annual meeting of the New Brunswick Telephone Co., held at Fredericton, N.B., on June 14th, it was decided to put in a double metallic circuit between St. John and Fredericton, and extend the trunk line from Fredericton to Chatham and along the north shore. A. A. Stackton, Charles Fawcett, Joseph Black, A. G. Blair, F. P. Thompson and W. T. Whitehead were elected directors.

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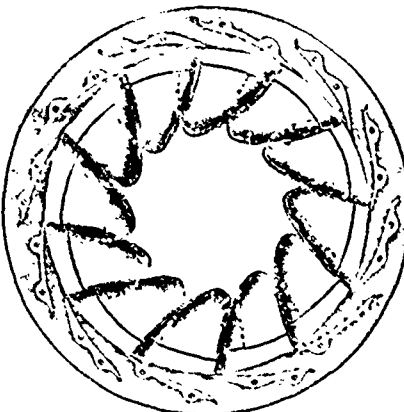
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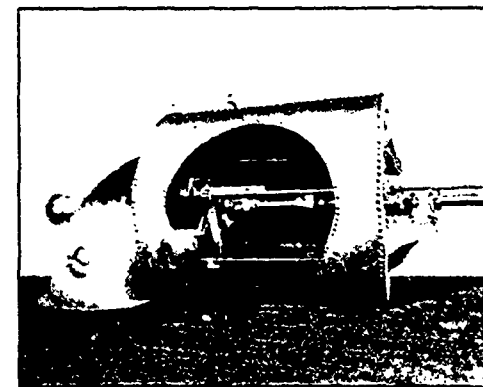
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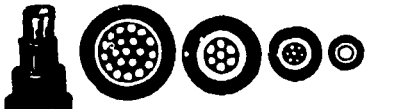
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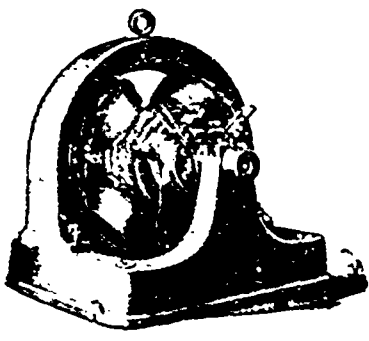
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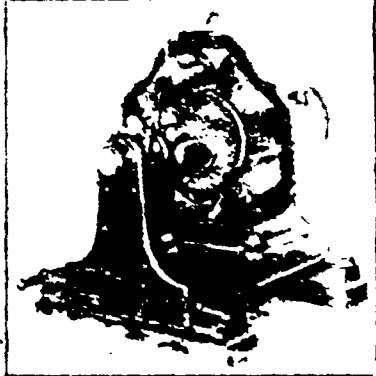
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