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

**CANADIAN**  
**ELECTRICAL NEWS**  
**ENGINEERING JOURNAL**

OLD SERIES, VOL. XV—No. 3.  
NEW SERIES, VOL. X.—No. 9.

SEPTEMBER, 1900

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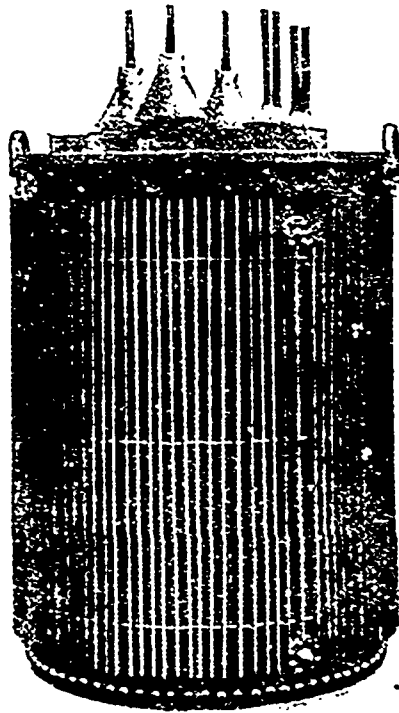
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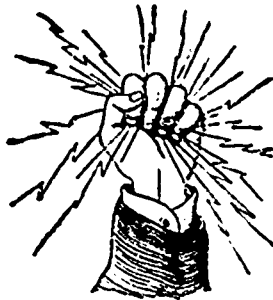
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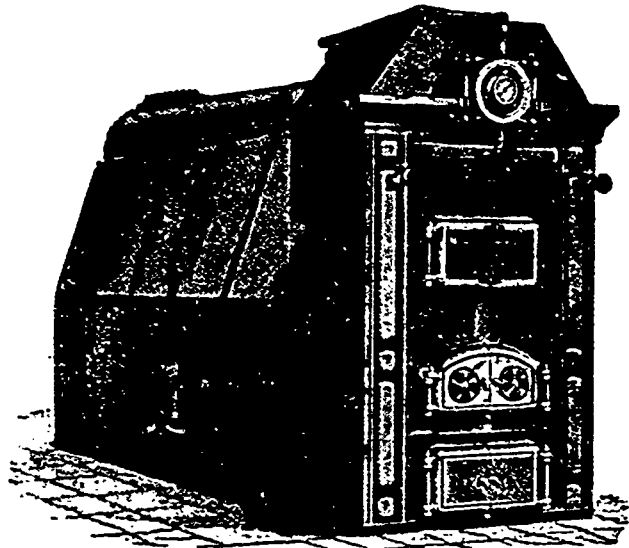
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CANADIAN ELECTRICAL NEWS

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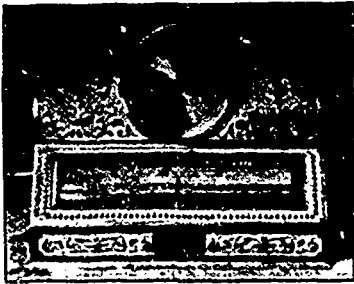
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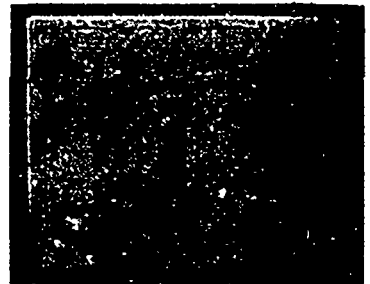
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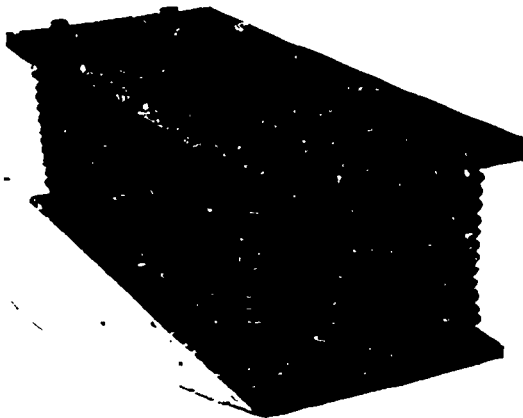
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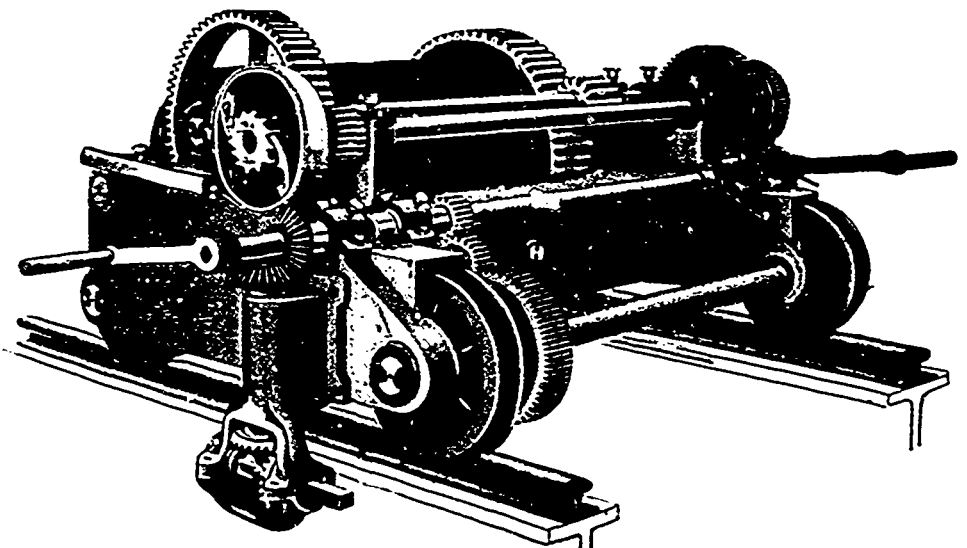
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## PERSONAL.

Mr. J. H. Walker, of Kincardine, has been appointed engineer at the pumping station at Berlin, Ont.

Tenders are invited up to September 10th for lighting the streets of Millbrook, Ont., with incandescent or arc lamps. Particulars may be obtained from Mr. Turner, village clerk.

Mr. W. D. V. Eaul, local manager of the Bell Telephone Company at Brockville, Ont., was recently married to Miss Moody, of Terrebonne, Quebec.

Mr. J. W. Marr, late chief engineer for the Metropolitan Railway Company, has been engaged as traveller for the Steam Specialty Company, of Toronto.

It is said that Mr. Wilfrid Phillips, manager of the Niagara Falls Park and River Railway, has been offered the management of the Winnipeg street railway system, and that he is likely to accept it.

Mr. W. G. Eddington, of Toronto, has been appointed superintendent of the electric light plant owned by the town of Weston, Ont. This plant is meeting with considerable success, and a large number of houses and street lights have been installed. The NEWS wishes Mr. Eddington success in his new position.

In our September issue it was stated that Mr. R. R. Wiley, E.E., had recently joined the staff of the Packard Electric Co., of St. Catharines, as meter expert. By a typographical error in the item, it appeared that Mr. Duncan, of the Siemens-Halske Company, was also associated with the Packard Company. The statement intended to have been made was that Mr. Wiley had been associated with Mr. Scheeffler, of the Diamond Meter Company, and Mr. Duncan, the well known meter inventor now attached to the staff of the Siemens-Halske Company. Mr. Wiley will have charge of the meter department of the Packard Electric Company.

Mr. J. Ames, superintendent of construction in the long distance department of the Bell Telephone Company, is at present engaged on the construction of the Minnedosa and Neepawa branch. The long distance lines now reach from Winnipeg to Portage la Prairie, Brandon, Neepawa, etc.

## SPARKS.

The village council of Morrisburg, Ont., have invited tenders for the installation of an electric lighting and power plant. The plant will be operated by water power.

The Kootenay Electric Supply & Construction Company, of Kaslo, B.C., have installed an electric light plant in a new steamer for the Kootenay River and Navigation Company.

The town of Napanee, Ont., is about to install an electric fire alarm system, for which tenders close September 15th. John Carson is chairman of the Fire, Water, and Light Committee.

It is understood that the Galt, Preston and Hespeler electric railway has passed into the control of the Hamilton Electric Light & Cataract Power Company, and that extensions to the road will be made.

The Hinton Electric Company, of Victoria, B.C., recently secured a contract to supply the Le Roi mine at Rossland, B.C., with a hoist and other apparatus, the cost of which will be about \$20,000.

The corporation of Niagara Falls, Ont., have decided to purchase another transformer, so that additional power may be furnished for operating the works of the Ontario Silver Company.

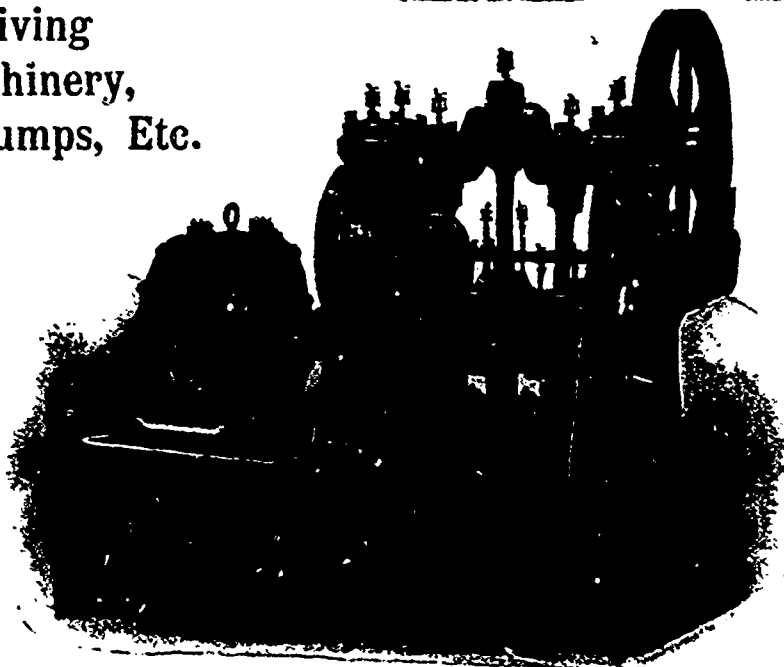
Mr. P. R. Colpitt, city electrician, of Halifax, N.S., has submitted to the town authorities of Charlottetown, P.E.I., an estimate of the cost of installing an electric light plant. His figure is \$15,387.50, exclusive of power house and foundations for engine and generators, which would bring the cost up to \$20,000 for a complete plant. A special committee has been appointed to report further on the matter.

The annual meeting of the Parry Sound Electric Light Company, of Parry Sound, Ont., was held a fortnight ago, at which a most satisfactory report was presented. The report stated that the plant is to be doubled, and steam power adopted. An annual dividend of 8 per cent. was declared, and the following directors elected: President, E. J. Vincent; Vice-President, Sheriff Armstrong; Secretary-Treasurer, J. W. Easton. Directors—E. J. Vincent, Sheriff Armstrong, Capt. Macfarlane, J. F. Moseley, W. B. W. Armstrong, E. Pirie, and Judge McCurry.

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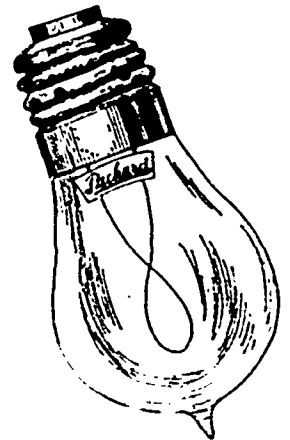
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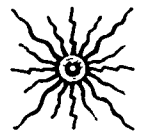
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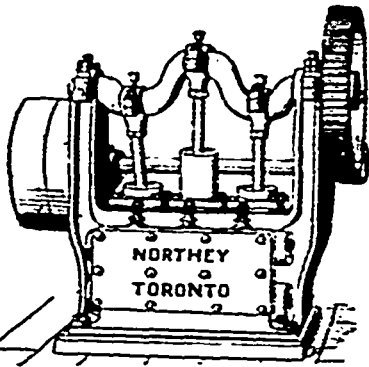
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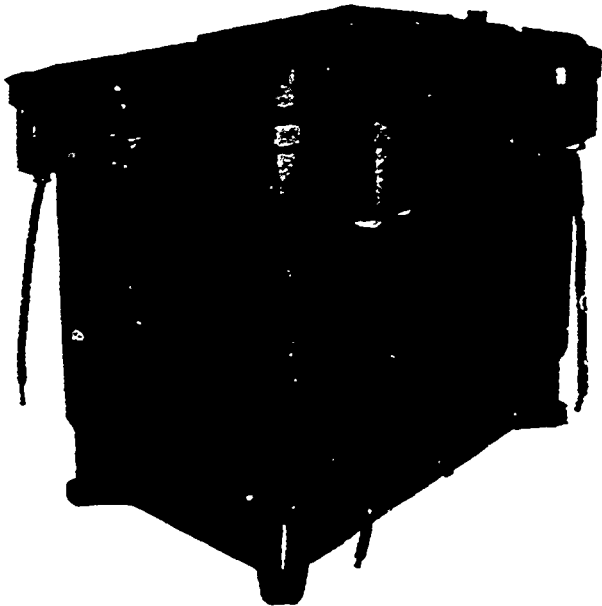


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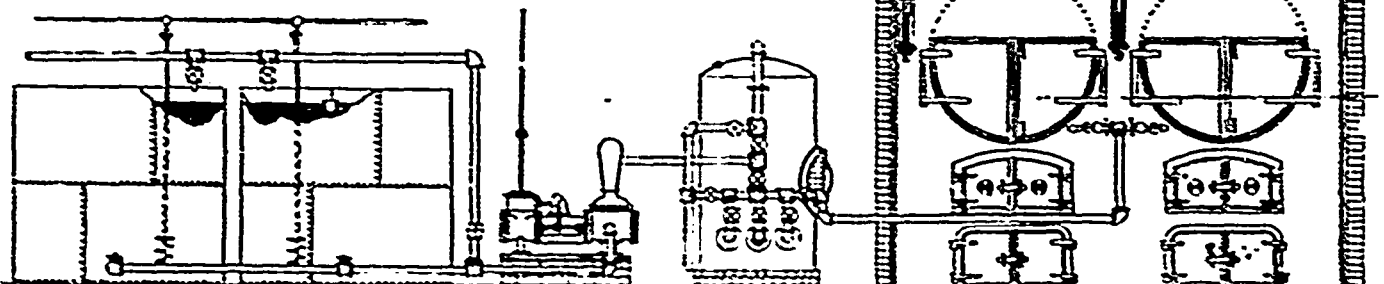
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CANADIAN  
**ELECTRICAL NEWS**  
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VOL. X.

SEPTEMBER, 1900

No. 9.

**MR. D. E. BLAIR.**

THOSE who attended the recent convention of the Canadian Electrical Association will recognize in the accompanying portrait the features of Mr. D. E. Blair, B. Sc., the author of that interesting paper pertaining to the operation of the electric railway in the city of Quebec. Although only twenty-three years of age, Mr. Blair is well versed on the subject of electric railway operation. He graduated from the High School in the year 1893, when he entered the Science Department of McGill University, graduating with the degree of Bachelor of Science in the spring of 1897. In August of that year he was engaged as assistant electrician for the Quebec District Railway Company, and in the following year became chief electrician. In the fall of 1898 this company was amalgamated with the Quebec, Montmorency & Charlevoix Railway Company and the Montmorency Power Company under the name of the Quebec Railway, Light & Power Company, and since that time Mr. Blair has acted in the capacity of chief electrician of the railway division of the amalgamated interests. His paper, read before the Canadian Electrical Association, and which appears in this issue, is one of exceptional value, and was much appreciated by the members.



MR. D. E. BLAIR.

**CHAMBLY POWER FOR MONTREAL STREET RAILWAY.**

THE Montreal Street Railway Company have entered into a contract with the Chambly Power Company under which the latter agrees to supply the former with 5,000 h.p. continuous current, day and night, every day in the week, for twenty-three years, at \$25 per h.p. per annum. The arrangement is no doubt in the interest of the street railway company, as it saves a large outlay for additional plant, in the shape of engines, boilers, machinery, buildings, etc., their present power plant being fully loaded. Again, it is good for the Chambly Company, who run by water power, use large units, and are really in need of a load, more especially if the contemplated new dam is gone on with.

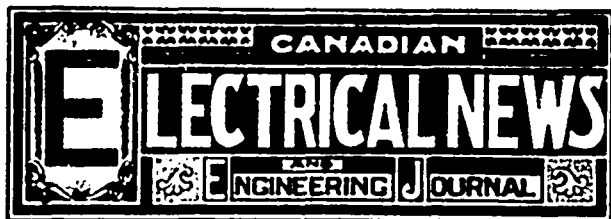
There was opposition to the contract by some of the directors of the Street Railway Company, but, luckily, the manager, Mr. Wanklyn, is a practical man, thor-

oughly up in the business, and he managed to get a proper view of things taken, and the scheme was ratified.

The contract aggregates, in twenty-three years, \$2,875,000. At the meeting of the Street Railway Company, Mr. Wanklyn explained that at the present time the Montreal Street Railway was laboring under the disadvantage of not having any reserve of power. It would cost the company at least \$650,000 to build the necessary reserve steam plant, and he considered the contract before the shareholders the most advantageous arrangement which they were able to make. On a winter's day at present the railway needed nearly 1,000 horse power, and he expected that in two years' time they would require another 5,000 horse power from the Shawinigan or any other company which could furnish it to the best advantage. Mr. Boas stated that the Shawinigan Company would put the power in at from \$20 to \$22 per horse power per year. To this Senator Forget remarked that as a director of the Shawinigan Company he was in a position to say that they were not ready to supply power. In answer to some questions, Mr. Wanklyn explained that it would take about 7,100 horse power alternating current at Chambly

to deliver 5,000 continuous current to Montreal. The relative cost of the alternating and continuous currents is \$25 to \$32 per horse power. The Royal Electric Company had been contracted with to supply 500 horse power alternating current, as a temporary relief, for \$35 per horse power, which was equivalent to \$42 continuous current. Mr. James Ross, the vice-president of the company, thought the Street Railway Company was making an excellent bargain. He had visited different western cities, had seen all the latest improvements in electrical power, had gone over the works of the Niagara Company, which is getting \$35 and \$36 per horse for its power, and he had come to the conclusion that the Street Railway Company was making the best bargain possible.

The Wm. Sutton Compound Company, of Queen street east, Toronto, had an attractive display of engineers' supplies in the machinery hall at the Toronto Exhibition. They included boiler compound, lubricating oil, cotton waste, pipe covering, asbestos goods, etc. The company report a steadily increasing trade in these lines.



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H. F. KEESOR, Manager Electric Light Co., Lindsay, Ont.

W. H. BROWN, Manager Royal Electric Company, Montreal.

JOHN YULE, Manager Goelph Light & Power Co., Goelph, Ont.

F. W. SIMMONS, Superintendent Kingston Light, Heat & Power Co., Kingston.

W. J. CAMP, C. P. R. Telegraph Co., Montreal, Que.

EDWARD SLADE, Manager Jacques Cartier Water Power Co., Quebec, Que.

### MARITIME ELECTRICAL ASSOCIATION.

President, F. A. HUNTRESS, Man. Halifax Elec. Tramway Co., Halifax, N. S.  
Vice-President, F. R. COLPITT, City Electrician,  
Secretary-Treasurer, F. A. HAMILTON, E. E.

#### Canadian Electrical Association.

The annual convention of the Association held in Kingston at the close of last month was, perhaps, quite as successful, all things considered, as could have been anticipated. The change in place and date of the meeting made necessary by the Ottawa fire, the absence of some of the members on vacation, and the necessary attendance of others at the Toronto Exhibition, were important factors militating against a good attendance and a successful meeting. Keeping in mind these drawbacks the attendance was satisfactory. The papers were of a high order, but in some instances evoked less discussion than their merits entitled them to. The late date at which the manuscripts reached the committee made it impossible to have the papers printed and distributed to the members in advance of the meeting. To this was largely due the lack of discussion, especially on some of the more highly technical papers. Authors would do well to remember that if their papers are to receive proper attention at these conventions they must be completed sufficiently in advance of the meetings to permit of their being carefully read and digested by the members. Seeing that an important object of most of the papers presented at meetings of this kind is to provoke discussion, and that the points brought out by the discussion are in many instances quite as valuable as those contained in the paper itself, every effort should be made to ensure as full discussion as possible by the members of the papers which may be presented at future conventions. To this end it is incumbent upon the Association to allow ample time for the preparation of

papers, and upon those who may undertake their preparation to complete their task at least a month in advance of the meeting at which they are to be presented.

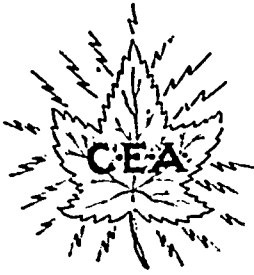
In the President's address and the reports of the various committees there is to be found evidence of useful work accomplished by the Association in the past, as well as a determination to broaden to the greatest possible extent the scope of its influence in the future for the development and protection of electrical interests in Canada. Special emphasis should be placed upon the value of its work in securing the legislation contained in the Conmee Bill, under which the interests of electric lighting companies in their relation to the municipalities are safeguarded. This measure has already proved of inestimable value to several companies whose property has, thanks to its provisions, recently been taken over by the municipalities at a fair valuation. Had this measure not been placed on the statute books, largely through the efforts of the Legislation Committee of the Canadian Electrical Association, these and all other private lighting companies would have been completely at the mercy of the municipalities. In view of what it has done for them, the Association has the strongest possible claim to the friendship and support of electric lighting companies in Ontario. All such companies should show their appreciation by becoming identified with the Association and its work. Mention was made at the Kingston convention that the Electric Light Association of the United States had recently sent out letters to lighting companies in Canada soliciting them to become members of that organization. Apart from the fact that membership in the National Association costs \$25 per year, while in the Canadian Association the cost is only the nominal fee of \$3 per year, the Canadian organization can benefit the electric lighting companies of Canada in many directions—notably as regards legislation, municipal, provincial or federal—to a much greater degree than could an alien society. An important concession was obtained last year by the Association from the Inland Revenue department of the Dominion government by which in future the charge for reinspection of detective meters will be only fifty cents.

There is ample scope in these and other directions for useful effort by the Association in behalf of the electrical interests—not to speak of the benefits accruing from the reading and discussion of valuable papers such as are presented at the annual conventions. This year a new departure was made by inviting manufacturers and dealers in electrical and kindred supplies to send exhibits to the convention, necessary space, current and labor for the purpose being provided without charge by the city council and local electric companies of Kingston. Doubtless this will prove to be an interesting feature of future conventions.

Too much cannot be said in praise of the cordial hospitality extended by the Mayor and Corporation, the local electrical companies and the citizens of Kingston to the members of the Association in attendance at the convention. The decision to hold next year's convention at Ottawa and the re-election of the President and other executive officers will no doubt meet with the approval of the entire membership. Steps are to be taken to materially increase, during the coming year, the already large membership of the Association, and to push vigorously forward all departments of its work.

# CANADIAN ELECTRICAL ASSOCIATION

## PROCEEDINGS OF THE TENTH CONVENTION



THE Tenth Annual Convention of the Canadian Electrical Association was held in the City Hall, Kingston, Ont., on Wednesday, Thursday and Friday, August 29th, 30th and 31st. The first session opened at 10 a.m., the president of the Association, Mr. A. A. Dion, of Ottawa, being in the chair.

The following members were in attendance :

W. H. Warrington, A. M. Wickens, T. F. Dryden, J. A. Kammerer, A. C. McDonald, J. J. Wright, H. Gearing, A. B. Smith, J. Raymond, E. B. Biggar, C. H. Mortimer, Toronto; F. H. Leonard, jr., W. J. Plews, W. B. Powell, Wm. H. Browne, P. G. Gossler, H. O. Edwards, A. L. Mudge, N. C. Ross, Cecil Dautre, Wm. H. Winter, F. Wilson Fairman, K. B. Thornton, A. G. Grier, R. M. Wilson, Geo. H. Olney, L. A. Herdt, Thomas Rogers, D. Sleeth, Ed. Brown, J. P. Thomson, R. E. T. Pringle, R. S. Kelsch, A. C. McDonald, Montreal; A. A. Dion, W. G. Bradley, Wm. Ahearn, jr., J. M. Leamy, W. S. Hodgins, D. R. Street, Ottawa; H. R. Leyden, Gordon J. Henderson, F. W. Martin, Wm. A. Turbayne, Hamilton; A. A. Folger, E. Moore, Geo. H. Dickson, J. Halliday, F. Simmons, E. Ashley, R. White, R. Boyd, jr., H. C. Nickle, I. H. Breck, Thomas Donnelly, Kingston; A. L. Briethaupt, J. E. Bilger, Berlin, Ont.; W. W. Williams, Geo. Shand, Sarnia, Ont.; B. F. Reesor, Lindsay, Ont.; J. F. H. Wyse, Brantford, Ont.; E. E. Cary, George A. Powell, St. Catharines, Ont.; J. W. Purcell, Walkerville, Ont.; John Yule, Guelph, Ont.; A. Sangster, Sherbrooke, Que.; D. E. Blair, Edward Slade, Quebec, Que.; L. A. Somers, Halifax, N.S.; P. H. Houer and Geo. M. de Ginther, New York.

The President called the convention to order and stated that the first item on the programme was the address of welcome from the Mayor and Aldermen of the city of Kingston. He said: I have much pleasure in introducing the mayor and some of the members of the city council who have been kind enough to come and greet us this morning.

Mayor J. A. Minnes, on rising to speak, was greeted with applause, and said: Mr. President and Gentlemen of the Canadian Electrical Association: It gives me, on behalf of my colleagues of the city council and the citizens of Kingston generally, the greatest of pleasure to extend to you a most cordial and hearty welcome to this good old historic city. Let me assure you, we appreciate the honor you have done this city and done us in holding this convention here. I trust your deliberations may be productive of very much good to your Association, that your visit may be a very pleasant one, and that you will be able to carry away with you a very pleasant recollection of your stay in Kingston. Referring more especially to the object of your gathering, let me say that, in my mind, it is fraught with the greatest possible interest to the welfare of mankind. There is no subject of more vital importance or of greater moment than the study of that subtle and silent force with which your labors are connected. Of the abstruse quality of that power, what it is, whence it comes and whither it goes, I will not attempt to speak, but let me congratulate you, Mr. President and Gentlemen, on the splendid strides and rapid advancement electricity has made, more especially in its application to the good of humanity. This may truly be said to be a progressive age, that the object of all our energy is to make the powers of nature, seen and unseen, minister to the wants of man, his progress,

welfare and happiness. In the industrial application of the electrical current we have reached a position never before dreamed of by any previous generation. It is an important factor in our transportation, it moves the great wheels of commerce, it gives the traveller the light, and affords light, heat and comfort to all men. In the Roentgen ray the unseen parts of the body are brought to view, thereby proving a valuable adjunct to medical sciences. In fact, in the whole complex system of modern civilization it proves an important factor. I congratulate you that your labors are in such a field. I trust that through your deliberations benefits heretofore undiscovered may be brought forth, and I trust that your convention in Kingston may prove of very much good to your Association and to mankind in general. I extend to you the freedom of the city. Accept it from my hands, and I trust your stay will be a most pleasant one. (Applause.)

Ald. Donnelly, in following the Mayor, said: As a member of the City Council, I desire to supplement the remarks of our Mayor in regard to the kind invitation that he has given to you this morning. We cannot offer you any of the very great advantages that you will find in the larger cities in Canada, but we point with a great deal of pride to the historical record of Kingston and to the physical advantages which you see on every hand. Kingston is beautifully situated. You will find it of great interest to visit our educational institutions, to notice the great harbor that we have here, boating facilities, the works that the Militia Department in the old days have erected here for the defence of the city, and we trust you will find enough interest in the city to warrant your coming back here in the near future. At any rate, we will endeavor to do our best to make it as pleasant for you as we possibly can. As the Mayor has very truly said, yours is a very noble vocation indeed. To harness and control the powers of electricity is something that must be of great interest to mankind; and you in your deliberations and advice one with the other will be able greatly to assist along the lines of this work. I can assure you that anyone who notices what vast strides electricity has made in the last few years cannot help but be amazed when they notice it. Why, it is only the other day, looking at some of the reports of the United States, I noticed that at the present time the electrical plants of the United States somewhat over 3000 plants represent a value of three hundred millions of dollars. That is a wonderful record, indeed, when we take into consideration that it has only arisen in the past few years, you might say. As one of the Council of the city, I will do all that I can to make your visit a pleasant one. The Mayor has told us that your labors have been of great advantage to mankind. You have, it seems to me, in a greater degree than any other body of men carried out the scriptural injunction which we find very early in the bible, when the Lord said "Let there be light, and there was light." (Applause). I hope and trust that your deliberations will be of great benefit to yourselves and to mankind, and I know they cannot help but result in all that is beneficial to electrical interests on this continent.

The President: I have much pleasure in calling upon the President of the Board of Trade to address a few words to you.

Mr. E. J. B. Pense: Mr. President, I can assure you, on behalf of the mercantile interests of Kingston, that we heartily endorse the welcome addressed to you by the Mayor and by Ald. Donnelly. I have read somewhere (I think it was in a patent medicine advertisement) that "electricity is life." We have not

fully realized it in the city of Kingston yet, because we have not got an electric light on every corner, but we hope next year to make some attempt at a municipal lighting system; at least, they are all talking that way. I may say, electricity has not been a very strong point in the city of Kingston, but there are points about the old city, and we who have fought for a number of years to get it the recognition it deserves, are very proud indeed to have your convention here, that the people of Ontario may say that the city is a little better than it looks. You will find in the city of Kingston, a city of 20,000 people, greater charities than is found in any other city of its size on the continent of America. You will also see fine churches. We are not given many gifts by rich men, but we have a great university and it is going to be much greater; instead of being Queen's College it is going to be Queen's University in all that a university implies. In three or four years I hope to see three or four stone buildings upon the campus of Queen's University, and among those buildings I am assured by Principal Grant will be one for the full equipment of an electrical plant. Our mining school, which has struggled along for a few years, is doing the best practical mining work on the continent of America, with the exception of the Michigan school, and they receive a straight grant of \$45,000 a year. We are now equipping a laboratory which will be the best by far odds in practical mining in the whole Dominion of Canada; and I may say to you that it recognizes the generosity with which science is looked upon by all classes and all countries, that nearly every machine in that mining laboratory is a gift from manufacturers, and chiefly from the United States. I can assure you, gentlemen, that although the mercantile interests of Kingston are not very strong, they have the reputation, as you know, of being solid, and that Kingston, while it is not large, is honest to the core, and the merchants of Kingston will reach towards you the glad hand and hope that you will go away from Kingston not only having had a pleasant time, but with a better opinion of its social and business qualities. (Applause).

The President: Mr. Mayor and Gentlemen of the city of Kingston: It is not my purpose to detain you here to listen to a speech of mine, but I desire on behalf of the Canadian Electrical Association to tender to you our very warm thanks for the kindness which you have shown us this morning. We are indebted to you, gentlemen, for coming here to greet us, and for the very kind words of welcome which you have uttered. We are indebted to you in a special manner because I know of no city where the previous conventions of this Association have been held where the municipality has taken such pains to show their hospitality. You have given us the use of your beautiful municipal building, and through your kindness we are enjoying the comforts of this well appointed place. You have done more, sir, you have provided for us an excursion to which we look forward with pleasurable anticipations, and we cannot say too much to express the gratitude which we ought to feel for all you have done for us. When I look upon these beautiful buildings I think it is a privilege to be here. When I look upon the beautiful portraits of the past mayors which adorn the walls of the hall upstairs, when I look upon you, sir, I think it is a privilege for me to occupy this chair, if only for a few moments. We accept with very much pleasure the freedom of the city which you have offered us. We will be very happy to have you attend the sittings of this convention right along. I think by this afternoon the attendance will be very much larger, and you may hear something that will be interesting and profitable to you. The next item on the programme this morning is the reading of the President's address. It seems to be an established custom in this Association that the President should read an annual address. Were it not so I would not inflict upon you this formality, but profiting by the experience I have gained during my year of office, I have put together here a couple of suggestions which will be taken up later by the Association, and thus this address may result in some benefit to the Association.

## PRESIDENT'S ADDRESS.

To the Members of the Canadian Electrical Association:

GENTLEMEN:—I extend to you a hearty welcome to this our tenth annual convention. I have looked forward with feelings of keen pleasure to this meeting, where it would be my privilege to greet many old friends, make new ones, and celebrate with them the tenth anniversary of our Association.

Each successive convention increases my faith in the value of our Society from the standpoint of our various business interests as well as that of education—and I trust that this meeting will be as fruitful of good results as any of the preceding nine.

I had cherished the hope of meeting you in my own city of Ottawa, but it had been ordained otherwise. The disastrous conflagration of April 26th which reduced to ashes a large portion of our Capital, rendering thousands homeless and destitute, and destroyed the greater part of the various electrical plants of the city, made it practically impossible to hold the convention as pre-arranged, and a postponement became necessary at first, and later, to my regret, a change of place.

Let me say here that the value of the friendships formed in this Association was exemplified in a touching manner by the many expressions of sympathy, the prompt and generous offers of assistance received from many of my fellow members.

A formal invitation having been received from the good city of Kingston to hold our 1900 meeting here, the executive committee unanimously decided to accept the proffered hospitality. When you consider the good things provided for our entertainment by the mayor and citizens of this city, and the completeness of the arrangements made by the local committee under the guidance of Mr. F. Simmons, you will agree with me that we have made no mistake in coming here, and that the thanks of this association are due to those who so zealously labored for our comfort and pleasure.

It is a source of gratification to me that our membership continues to increase notwithstanding that a considerable number of members drop out of the association every year. We should put forth our best efforts to prevent, if possible, these annual lapses, and we should not rest satisfied until every electrical operating, manufacturing and supply company firm or individual is represented on the membership roll.

In this consideration I would submit to your earnest consideration whether it would not be well to introduce in our constitution a feature of company membership such as carried out by the National Electric Light Association of the United States in addition to the individual memberships, which could remain open to those who wished to avail themselves of them.

This might be a means of interesting in our work many companies who now take no part in it, although they all receive practical benefit from our labors.

You will be pleased to see by the report of the Secretary-Treasurer that our finances are in a sound and prosperous condition. The revenue up to May 31st last was about \$130 in excess of that of the preceding year, and the cash on hand for the same date was about \$330, or more than double the amount on hand on the corresponding date last year. You will observe that this is due largely to the low cost, to the association, of the convention of 1899 as compared with that of 1898.

You will have submitted to you the reports of the various standing committees, and you will realize that all the work of the association is not done at the annual convention. Much has been done during recess and some important results have been obtained.

Those members who have freely given of their time and purse on committee work are entitled to the fullest expression of our appreciation and gratitude. The achievements of the legislative committee during the past year have been of incalculable value to the members of this association. Through the untiring, timely and well directed efforts of this committee the "Conmee Bill," which was in danger of being ruinously amended, was reaffirmed by the Legislature of Ontario, so that this law now bids fair to remain permanently on the Statute books of the province.

This is as it should be. No doubt a careful consideration of this measure has convinced our legislators of the justice of its principles and the wisdom of its provisions. The committee should be continued for the purpose of watching any legislation unjust to electrical interests which may be introduced in our legislatures, and I trust that such calls upon the companies interested which may be required to meet the necessary expenses will be promptly and cheerfully met.

Let me say to those who contributed to the expenses of this committee during past years, that they have received good and full value for their money. The work has been done efficiently and economically.

The report of the committee on meter inspection will show that it also has gained something for electric lighting companies in the reduction of certain inspection fees.

Other committee will report progress.

With regard to the committee on standardization of accounts, I would commend this work to your serious consideration.

If companies could agree on some general plan of distributing operating expenses and would furnish their figures to some committee of this association, it would be possible to circulate among the members comparative statements of expenses, omitting names and amounts and giving percentages only, which would enable managers to test the economy of their management and apply the pruning knife where necessary. If all companies would agree to make their annual reports of revenue and expenses on the same basis, especially as regards interest, depreciation and charges of that nature, and publish their statements, it would be possible to ascertain the true percentage of net profits in each case, and this would tend to remove from the minds of municipal legislators the impression often prevailing that there are enor-

mous profits in public services such as electric lighting. In this way the ardor of advocates of municipal ownership might be tempered. At any rate it would have an educational value for the ratepayers.

The above considerations were suggested to me by a discussion on this subject which I had the privilege of hearing at the recent convention of the N. E. L. Association, who appointed a strong committee to deal with this question.

Letters have recently been received by electric light companies in Canada from the National Electric Light Association of the United States, urging such companies to join that association, (whose membership fee is \$25 per year), in view of the important work being done by it for the benefit of electric light companies.

While that association, which has several Canadian companies on its membership roll, is to be commended for the work it is doing, I must remind Canadian electric light companies that their first duty is to the Canadian Electrical Association, whose work is of more immediate value to them, and which is in greater need of their co-operation and support.

The committee on papers is to be commended for the high character of the papers to be read and discussed at this meeting, and I desire to tender to the distinguished writers, who have given us so freely of their precious time, the thanks of the association. The range of subjects is such as to, I trust, please every member.

It is a matter for congratulation that the electrical industries in Canada generally continue to enjoy a reasonable amount of prosperity.

The past year has been marked by extraordinary activity and progress. Many new and extensive electrical works have been carried out, and everywhere there has been evidenced the greatest confidence in the future success of electrical undertakings. Water powers have been developed and utilized, and electric power transmitted to long distances. Large works and factories hitherto operated by steam have adopted the electric motor in large units. Some steam railways have been converted into trolley lines. Electric railways have been extended far out of cities, equipped with heavier rails, better rolling stock, larger generators, and more powerful motors, and higher speeds have prevailed.

Electric light and power stations have been enlarged and remodelled. In this particular field there has been a decided tendency to install generators of one kind only, and to supply all services therefrom, hence the increasing use of A. C. polyphase motors of the "induction" or "synchronous" type and A. C. arc lamps of the enclosed arc variety, either "series" or "constant potential."

The use of electricity in mining has also received considerable development, and its application to the manufacture of calcium carbide is beginning to assume large proportions. The large number of small central station installations testifies to the increasing popularity of electric lighting and power. New isolated plants, some of them very considerable, were also very numerous. As a central station man I regret this, but I suppose the manufacturer is happy.

In the telegraph and telephone fields the past year has witnessed important extensions and improvements to existing systems.

Among the many important works of the year the following may be mentioned:

The great water power and electrical developments at Shawinigan Falls and other places on the river St. Maurice, Que.

The Jacques Cartier Water and Power Company, transmitting energy from the falls of the Jacques Cartier river to the city of Quebec for general light and power distribution.

The Canadian Electric Light and Power Company's transmission from the Chaudiere Falls on the river of that name to the town of Levis, Que., for general distribution, with possible future extension to the city of Quebec, opposite, through submarine cables.

The Lunenburg Gas Company, transmitting 100 horse power 8 miles for distribution in Lunenburg, N.S.

The 14 mile transmission of the Lindsay Light, Heat and Power Company, into Lindsay, Ont., recently inaugurated.

Extensions of the Metropolitan Railway, of Toronto, to Newmarket, 30 miles distant. Extensions of the Ottawa electric railway to Britannia on the bay and to the Dominion rifle ranges.

The conversion of the steam railway from Quebec to St. Anne de Beaupre, some 30 miles.

The adoption by the Montreal Street Railway Company of electric power from Chambly, Que.

The installation of several thousand horse power of induction motors by the Dominion Cotton Company for their mills in Montreal, and by other factories in the same place.

The installation by the E. B. Eddy Company, of Hull, Que., of 1500 or more horse power of induction motors, and the building of a power house by Conroy Bros., at Deschênes, Que., five miles away, to supply the power at 10,000 volts.

The 500 horse power plant of the Soulanges canal used for operating the lock gates and for lighting the canal.

The 2,700 horse power generating water power plant of the Bronsons Company at Ottawa, supplying energy for the manufacture of calcium carbide to the Ottawa Carbide Company.

The extension of the government telegraph system in the Yukon district, 600 miles, and along the north shore of the lower St. Lawrence river, for 300 miles down to Labrador.

The substitution of storage batteries and dynamos for chemical batteries in the plants of the G. N. W. and C. P. R. telegraph companies at several places.

The complete renewal of the Bell Telephone Company's plant at Ottawa, introducing the "central energy" system. The complete reconstruction of their lines there and in other places, and the extension of their long distance system in all directions.

To this list, made mostly from memory, many other important works and undertakings could be added.

The pleasing features of all these undertakings, from an engineering point of view, is the generally scientific design and modern character of the apparatus and works.

I thank you for the confidence you reposed in me when you raised me to the presidency of this Association. I have conscientiously tried to further your interests during the year, and I am indebted to other officers and members of the Executive Committee for the assistance they rendered me at all times. I desire to make special mention of our secretary-treasurer, who was ever cheerful and willing to do everything I asked him to do, although I know I exacted much of him at times. The relations between the members of the executive have been very pleasant and harmonious, and I trust the same harmony and good feeling will characterize the proceedings of the convention, and that when you return to your homes you will, each one of you, bear away the most pleasant memories of the 10th convention of the C. E. A., the good city of Kingston and its citizens. I wish you all continued prosperity and success in your various spheres.

Mr. C. H. Mortimer read his report as Secretary-Treasurer, which was as follows:

#### SECRETARY-TREASURER'S REPORT.

The membership of the Association has somewhat increased during the year, notwithstanding the removal of a number of names of members who resigned, and of others who changed their place of residence without notifying the Secretary. It perhaps cannot be expected that the membership should increase in the same ratio as in the past, yet there is still large room for expansion if all who should be interested in the work of the Association would connect themselves with it. For example, there are many electric lighting companies who co-operated in the work of the Legislation Committee, but are not yet represented on the membership of the Association. If possible, means should be found to enroll them and obtain their active co-operation in the various departments of the Association's work.

In several of my previous reports I have referred to the refusal of some members to pay accounts of past due fees, on the ground that they joined the Association for one year only. I am still confronted with this difficulty. Under present circumstances it is difficult to know who can be safely counted as members, or what amount of the outstanding fees can be regarded as collectable. I would suggest that the form of application for membership be changed, so as to provide that persons who may join the Association shall assume liability for payment of fees until their resignations have been tendered and accepted.

The number of members at present on the roll is as follows: Active, 213; Associate, 31; total, 244; a gain of 3 since last report.

Three meetings of the Executive Committee were held during the year, viz., on September 14th, 1899, February 10th and July 26th, 1900.

At the first of these, held at the Russell House, Ottawa, Mr. J. Gordon Henderson, Secretary of the Local Entertainment Committee in connection with the Hamilton convention, reported that the account for expenses incurred by the local committee, after having been audited by Messrs. Black and Leyden, had been paid, the balance above \$100 contributed by the Association having been obtained by voluntary subscriptions.

The Secretary Treasurer reported funds on hand to the amount of \$271.00. Accounts for printing and engraving, in connection with the last convention, amounting to \$46.90, were ordered to be paid. The work of the various special committees was discussed, and the Secretary directed to write the chairman of these committees requesting them to call meetings at an early date to consider and prosecute their work. The Secretary was also instructed to request the members of the Association to suggest topics for papers for this convention.

At the second meeting, held at the Russell House, Ottawa, on February 10th, a number of letters were read from members suggesting topics for papers. The Secretary was directed to acknowledge receipt of a letter from Mr. E. Mascart, inviting the Association to send a representative to the International Electrical Congress of 1900 at Paris. Messrs. Street, Gossler, Higman, Cary and the Secretary were appointed a Committee on Papers for this convention. To this committee were referred the suggestions received from members regarding suitable topics. It was decided that Mr. Wallbank be invited to submit a paper on "Meter Inspection," and Messrs. Keely and Higman to prepare a public demonstration of Wireless Telegraphy. The Secretary was directed to send accounts to members in arrears for fees, giving them notice of draft if the amount should not be paid within ten days. A large local committee was appointed to make all necessary arrangements for the convention, and the sum of \$150 was voted for the use of this committee. It was resolved that the annual convention be held at Ottawa on the 27th, 28th, and 29th of June, 1900.

Owing to the disastrous fire which occurred in Ottawa shortly after this executive meeting, it was found necessary to postpone the convention until September, which was done with the unanimous consent of the Executive Committee, and the members notified accordingly. Subsequently a cordial invitation was received from the Mayor and citizens of Kingston to hold the convention in that city, which invitation was accepted by the Executive Committee at a meeting held in Toronto on July 26th last, with the approval of the President and other members resident in Ottawa. The 29th, 30th and 31st of August were selected as the dates for the convention. The President and Mr. A. B. Smith were appointed a committee to assist in making the local arrangements. One hundred dollars was voted to-



wards the expenses of the local committee. The Secretary was directed to notify manufacturers and dealers in electrical supplies that free accommodation would be provided during the convention for exhibits, also labor and current free for installing and operating same. The Secretary was authorized to procure the services of a stenographer to report the proceedings of the convention. Five persons were elected to active membership in the Association, and several resignations accepted. In the case of members in arrears for fees the Secretary was directed to notify them that their resignations could not be accepted until all indebtedness to the Association is liquidated.

Following is a statement of the receipts and disbursements :

FINANCIAL REPORT FROM JUNE 1ST, 1899, TO 31ST MAY, 1900.

RECEIPTS.	
Cash in bank June 1st, 1899	\$137.76
Cash on hand June 1st, 1899	17.85
194 Active Members' fees at \$3.00	582.00
21 Associate Members' fees at \$2.00	42.00
50 copies Convention report	5.00
Exchange on Cheque	.25
	<u>\$799.64</u>

DISBURSEMENTS.	
Expenses of Convention :	
Grant to Local Committee	\$100.00
Geo. Angus, Stenographer	26.00
C. R. Lane (Assistant to Secretary)	3.00
Electrical News, printing account	96.90
Express Order	.25
Express charges	.60
	<u>\$226.75</u>

Grant to Secretary	\$125.00
Secretary's travelling expenses to Ottawa attending Executive meetings	31.00
Postage	35.61
Exchange on cheques and drafts	13.38
Express charges	.59
Telephone messages and telegrams	2.85
Stationery and printing	16.50
	<u>\$451.68</u>

	<u>\$333.18</u>
Balance in bank May 31st, 1900	\$339.83
Balance on hand May 31st, 1900	11.20
	<u>\$351.03</u>

Unpaid accounts	17.85
	<u>\$333.18</u>

RECEIPTS.	
Money on hand June 1st, 1900	\$11.20
Money in bank June 1st, 1900	339.83
25 Active Members' fees at \$3.00	75.00
4 Associate Members' fees at \$2	8.00
Envelopes used by Legislation Committee	1.00
	<u>\$435.03</u>

DISBURSEMENTS.	
Convention buttons	\$6.25
Telegrams	1.83
Postage	15.00
Exchange on drafts	.90
Ribbon for badges	1.11
Stationery	.60
Money on hand, August 27th, 1900	17.01
Money in bank, August 27th, 1900	392.53
	<u>\$435.03</u>

The President: As the consideration of reports is put down for to-morrow morning, it may be laid on the table until then. According to custom, I will appoint Mr. A. B. Smith and Mr. B. F. Reesor to audit the Secretary-Treasurer's report. The next item is the reports of standing committees. We had a Committee on Statistics which was appointed two years ago, and continued last year. The Secretary will read you the report.

The Secretary read the report of the Committee on Statistics, as follows :

REPORT OF COMMITTEE ON STATISTICS.

MR. C. H. MOKIMER, Secretary C. E. A.

DEAR SIR, I have your favor, also one from our respected President in reference to my work as Chairman of the Statistical Committee of the C. E. A., and am very sorry to say that, while I have gathered a lot of interesting information and data, I have not been able to put it properly together or tabulate it in such shape that it will be of much value to the Association. I have been too busy to pay any attention to the matter beyond trying hard to do a little from time to time, and in that manner hoped to have had a fairly good report, but my trip to Winnipeg coming in within the last four weeks, completely destroyed any chance of my getting a report ready. I must ask the indulgence of the Association, and can only plead that the days are not long enough and not many enough to get through my business engagements, let alone any additional work. I must therefore ask that you kindly relieve me of the Chairmanship of this Committee and appoint somebody who will be able to give it more time and attention. I have considerable data which I would be glad to hand over to whomever you may

designate. I trust you will have a very successful meeting and hope to be able to be with you one day at least

Yours very truly,

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

The Secretary read the report of the Committee on Meter Inspection, as follows :

REPORT OF COMMITTEE ON METER INSPECTION.

To the Canadian Electrical Association :

GENTLEMEN,—Your Committee on Meter Inspection beg to report that they have since the last meeting of this Association interviewed the officers of the Electrical Inspection Branch of the Inland Revenue Department, with a view of ascertaining if the working of the Inspection Act could not be made easier to the electric light companies, and less expensive.

We have very much pleasure in reporting that we obtained a concession in the matter of inspection fees, viz: That whenever a meter requires inspection before the expiration of the five years covered by the last regular inspection, it shall be certified by the department for a fee of 50 cents only instead of the regular fee.

This, while it affects a saving to the companies, is also an evidence of the desire of the department to meet the electrical companies half way, and make the operation of the Act as little irksome as possible. I am,

Yours very truly,

A. A. DION, Chairman.

Mr. J. J. Wright read the report of the Committee on Legislation, which was as follows :

REPORT OF COMMITTEE ON LEGISLATION.

It was considered last year, at the time when the Conmee Act became law, that while there was not much danger of the fundamental principle of the bill being abrogated, that amendments would be brought forward from time to time which would, hile intended to apply to special cases, interfere with the general working of the Act. These expectations were more than realized, for not only were amendments proposed in several ways, but a separate bill was introduced by Mr. Graham purporting to amend the Conmee Act in one or two particulars, but in reality repealing the Act and re-enacting an ingeniously worded measure that would have utterly destroyed the usefulness of the Act as originally passed by the Legislature of 1899.

It became necessary then for your Committee to take active measures to meet this threatened attack. In the meantime, in the expectation that some work would have to be done and expense incurred, a request was made to the various electric lighting companies interested for financial assistance, and a draft made upon the basis of the former subscriptions paid in. A sum amounting to about \$400 was realized by this means, which was thought would be sufficient for the purpose, but the sweeping nature of the so-called amendments and the postponement of action, from time to time, by the parliamentary committee having the matter in hand, necessitated a much larger outlay. As the work of council retained by your Committee, as well as the efforts of individual members, held forth promise of ultimate success, it was deemed inadvisable for the sake of saving additional expenditure to jeopardise the success of work already accomplished. It was thought that the benefits accruing to the companies interested would be ample justification for this, and that in view of the important work accomplished we could reasonably look forward to increased assistance to enable all liabilities to be fully met.

The total disbursements on this account have been :

For legal services	\$765.00
For telegrams, postage, stationary, printing, exchange, etc.	62.78

Making a total of..... \$827.78

To meet this there has been subscribed, during the year, the amount of \$719.25, which, with \$75.67 on hand from last year, makes a total of \$794.92. This deducted from the total expenses leaves a deficit yet to be made up of \$32.86.

While as a result of this effort the principles of the Conmee Act has become more firmly established than ever, it is altogether likely that further efforts will be made to amend or nullify it at future sessions of the legislature. Although this opposition will become less and less serious as time progresses, it will be necessary for this Association, as representing the industry of electric lighting and the distribution of power, to prepare to repel and neutralize these repeated attacks.

Your Committee has thought that some action should be taken to consolidate in a greater degree the interests involved, that special effort should be made to have every electric lighting company in the province identified with the Association. A number of companies who have benefitted to a marked degree by the work done by this Committee have not contributed in any way to the expenses incurred. If every company who are interested would assume a fair share of the burden, it would merely be a nominal one, and provision in a proper manner would be made to meet these periodical attacks upon their interests. Your Committee would recommend that the Association take some action looking to the consolidation of these interests and to a proper method of again making provision to meet attacks upon this legislation.

The number of companies and individuals who have subscribed towards the fund this year is 76; last year the number was 51. The names of the contributors are as follows :

Mattawa Electric Co.; Jos. Knox, Stayner; Paris Electric Co.;



Trenton Electric Co.; Parry Sound Electric Co.; North Bay Electric Co.; Tisonburg Electric Co.; Rat Portage Electric Co.; Woodstock Electric Co.; Robertson, Rowland & Co., Walkerton; H. Gruetzner, Hanover; Aylmer Electric Co.; Wingham Electric Co.; Bowmanville Electric Co.; W. Moore & Sons, Meaford; Shelburne Electric Co.; Toronto Electric Light Co.; John Phillip, Grand Valley; Madill Bros., Lakefield; Owen Sound Electric & Illuminating Co.; Napanee Electric Co.; Seaforth Electric Co.; Peterboro Electric Co.; Kingsville Electric Co.; Lindsay Light, Heat & Power Co.; Arnprior Electric Co.; Galt Gas Co.; Stratford Electric Co.; Stormont Electric Co., Cornwall; Watford Electric Co.; Leamington Electric Co.; Pembroke Electric Co.; St. Catharines Electric Co.; William Smider, Waterloo; People's Electric Co., Windsor; St. Thomas Electric Co.; Gananoque Electric Co.; Welland Electric Co.; Port Hope Electric Co.; Sarnia Electric Co.; Smith's Falls Electric Co.; Uxbridge Electric Co.; Ottawa Electric Co.; L. H. Reesor, St. Marys; Strathroy Electric Co., W. A. Mackay, Renfrew; A. A. Wright, Renfrew; Cataract Power Co., Hamilton; Howes & Leighton, Harrison, Ont.; Simcoe Gas & Water Co.; Cobourg Electric Co.; Norwood Electric Co.; Carleton Place Electric Co.; Brantford Electric & Operating Co.; Alliston Electric Co.; London Electric Co.; Kingston Electric Co.; Gravenhurst Electric Co.; Hamilton & Prout, Forest; Dunnville Electric Co.; Guelph Electric Co.; Midland Electric Co.; Berlin Gas Co.; Markdale Electric Co.; Almonte Electric Co.; Georgetown Electric Co.; Ingersoll Electric Co.; Dundas Electric Co.; D. A. McIntyre, Paisley; R. P. Bearman, Chesley; Clinton Electric Co.; Kilmer, Crawford & McIntyre, Durham; Petrolia Electric Co.; I. J. Gould, Uxbridge; Wallaceburg Electric Co.; Warton Electric Co.

Your committee is glad to be able to state that the legislation obtained and protected through its efforts has been of the most vital importance to several companies during the year, in preventing what might be termed the absolute confiscation or destruction of their property. At the same time, the measure is eminently fair to the municipalities and protects their interests equally with those of the companies concerned.

Your committee have to express their acknowledgement to those gentlemen who actively assisted them, at considerable sacrifice of time and at their own expense, in defending the rights of the companies before the Legislature.

J. J. WRIGHT,  
Chairman Committee on Legislation.

The President: There was a Committee appointed to confer with the Underwriters, a continuation of the Committee of the preceding year; Mr. Gossler is the chairman of that Committee.

Mr. P. G. Gossler: Your Committee appointed at the last convention, consisting of Mr. Sangster, Mr. Dion, Alderman Sadler and myself, met on the 15th January last in the Windsor Hotel, Montreal, with a view of discussing and considering a by-law which it is proposed to incorporate in the building by-laws of Montreal, known as the Montreal Building By-law of 1899. Section 168 of this by-law proposed that all electric installations within the city of Montreal should be inspected and a certificate of inspection, to the effect that the installation is in accordance with the Board of Fire Underwriters' rules, should be issued before such connection was made. Alderman Sadler had taken up this proposed by-law in detail, and after due consideration of the matter, especially in view of there being nothing definite stated in the proposed by-law as to who should stand the expense of this inspection department, it was not thought advisable for your committee to take the matter up in a formal manner. However, as the Secretary of the Board of Fire Underwriters, Mr. Hadrill, expressed last year that he was in hopes that municipalities would pass such by-laws throughout the Dominion that would make the enforcement of the Fire Underwriters' rules part of the building laws, and that the expense of such enforcement or compliance with the law would be stood by the municipalities; it would seem that this by-law was intended to be the first step in that direction, and, after considering the matter at the Windsor Hotel, as I stated before, it was not thought advisable to take the matter up until such time as this by-law was presented for enactment before the city of Montreal. The Committee really has taken no definite steps except to familiarize itself with the proposed legislation, and having Alderman Sadler keep his eye on the by-law as it progresses. There has really been no progress made towards having a definite bureau of inspection established in the Province of Quebec or throughout the Dominion, and at the suggestion of the meeting it was resolved to let the established systems of inspection as then existing remain without being interfered with. I further wish to say that the minutes of that meeting to

discuss that by-law in detail, and also a copy of the proposed by-law, will be incorporated in my report to the Association.

The President: There was a committee appointed last year at Hamilton to deal with the proposed "Standardization of Accounts," as suggested in a paper read before that convention. We have a report from Mr. D. R. Street.

The Secretary read the report, as follows:

REPORT OF COMMITTEE ON STANDARDIZATION OF ACCOUNTS.

To the President of the Canadian Electrical Association:

Sir,—As there is apparently an idea on the part of the executive of the Association that I am chairman of the committee "to formulate a standard system of accounting for our central stations in Canada." I take the liberty of reporting that at a meeting of this committee held in the Royal Hotel, Hamilton, on the 30th of June, 1899, at which Mr. Hart, Mr. Wright and myself were present, Mr. Hart was unanimously chosen as chairman of the committee, this being out of deference to him as the author of a very excellent paper on accounting read at the last convention, from which the present committee is the issue.

As Mr. Hart, the chairman, I understand, is in the Lower Provinces, and may possibly not be at this convention, and as it is impossible for me to be there on the first day, I take the liberty of stating that the committee has done some work, though not much. However, a start has been made and a certain amount of correspondence has been done and data collected, forms have been received from Mr. T. E. Oakley, of Fort William; we have Mr. Hart's paper read at last convention, also a communication from the Librarian of McGill College saying that a copy of the report of the National Electric Light Association proceedings held in Montreal some eight years ago, and which contains an excellent paper on accounting, is at the disposal of the committee at the College, but unfortunately cannot be removed. We also had a very good paper upon the same lines that this committee is working, from Mr. Colquhoun, submitted at the last meeting of the National Electric Light Association.

Please bear in mind that should Mr. Hart be present, as he possibly may, he will, of course, have his own report as chairman, and I would respectfully request that this letter to yourself should in that case not be used.

Yours truly,  
D. R. STREET.

The President: There was a proposal to establish a standard for arc lamps which could be embodied in contracts to take the place of the old standard of 2,000 or 1,200 c.p., which led to many disputes; it was taken up at the last meeting and discussed to some extent and a Committee appointed to make some suggestion at the next convention. Mr. Higman, of Ottawa, was chairman, and Mr. Gossler was a member of that Committee. As Mr. Higman is not here and has sent no report, perhaps Mr. Gossler could make a verbal report of what has been done by that Committee during the year.

Mr. P. G. Gossler: Mr. President, after consideration of the matter and the remarks that were made at the last convention, it was thought that it would be premature to decide on any definite standard at the present time for illumination of arc lamps. There are so many possibilities of inaccuracies being introduced in the rating of street lights on a basis of c.p. that such a rating has almost been entirely superseded by the watt basis, that is, the watts consumed per lamp, and at the present time the same energy in different types of lamp gives a very decided difference of illumination; it was thought best to not even make any suggestions towards a definite standard until such time as there was more universal accord on the subject of exactly what energy should be used in lamps, or what illumination could be expected from different classes of lamps. As you all know, there is a very great diversity of opinion on the subject.

Mr. J. Yule: Wasn't there a resolution carried?

Mr. Gossler: Not being chairman of the Committee, I am really not familiar with the details. There may have been a resolution. You were present, were you not, Mr. Yule?

Mr. Yule: Yes.

Mr. Gossler: You were a member of that Committee.

Mr. Yule: My recollection is there was a resolution.

The President: My recollection is we passed a resolution in order to narrow down the discussion, which had been of a very rambling character. A resolution was passed to bring the discussion within a certain channel, but that resolution was to the effect that the rating should be on a wattage basis, and there were

some other things besides that which were to serve as a basis for discussion at a future meeting, but that other meeting not having been held, I don't know that it would be wise to present the conclusions of that first meeting as a report. It was only preliminary, and it may have been all undone at a subsequent meeting. I agree with Mr. Gossler that it would not be safe to express ourselves on this point which is now engaging the attention of more important bodies elsewhere; we might let them speak first. Possibly to-morrow, when the consideration of these reports comes up, we might decide to continue the committee and see what they can do next year.

Mr. Gossler: In connection with Mr. Yule's suggestion of a resolution having been passed relating to the wattage to be used per lamp, I may say that there may be the same wattage in the arc and yet have altogether a different illumination. Of course, it depends upon the character and size of the arc.

Mr. Yule: You were asked to report on that.

Mr. Gossler: If I was I certainly have overlooked it. I have not gone into it with a view of making a report. I could possibly talk for an hour and a half on the subject of arc lamps, but I didn't know I was to make a report.

Mr. Yule: I mean to a subsequent meeting of the Committee, not to this convention. It is understood this Committee has no power whatever; they simply make a recommendation to the government department.

The President: The next order is the appointing of the Nominating Committee. The duties of this Committee are to suggest names for the various standing committees for the coming year and for the officers to be elected on the 31st. I will appoint on this committee Messrs. E. E. Cary, P. G. Gossler, J. J. Wright, J. Yule and J. F. H. Wyse. If these gentlemen will get together between this and to-morrow, they can take as a basis for the committees last year's list; the same committees will very likely be continued, and suggest who should compose them, as well as the officers for next year. This is intended as a guide and a help to the convention. It is not binding by any means, and other nominations can be made when the time comes.

The President: I think if there is any general business to be brought before the convention, we should hear it now, because the author of the first paper on the list is not here yet, and the time at our disposal this morning is short.

Mr. J. J. Wright: On the other hand, there are others who have some business to bring before the convention, thinking it will come after the reading of the papers.

The President: I would like to have a little larger audience for the reading of the papers, and I think we will have it this afternoon.

Mr. J. J. Wright: I would suggest that an adjournment would be in order now until the afternoon session.

The President: I am sorry to see such an old member as Mr. Wright talk about wasting time in this way. However, if that is your wish, all right.

Mr. Wright: If there is any business to come before the convention which members wish to bring up now, I am quite agreeable.

Mr. J. F. H. Wyse: I understand there is a motion to adjourn. I second the motion.

Mr. Gossler: As a further suggestion, I know that on the next train from Montreal there will be at least ten or fifteen members, and it will be hardly fair to them to proceed. However, it may not be fair to us for them to stay behind. But a postponement for an hour or two hours will probably not be out of the way.

The President: It is moved by Mr. J. J. Wright, seconded by Mr. J. F. H. Wyse, that this meeting adjourn until 2.15 this afternoon.

On a vote having been taken, the motion was declared carried.

#### AFTERNOON SESSION.

At 2.45 p.m. the President called the convention to order.

The President: The first order is general business; if there is nothing in the way of general business, we will pass on to the reading of papers. The first paper is by Mr. Camp, C.P.R. Telegraph Company, Montreal. I have a telegram from Mr. Camp stating that he will arrive at 4.30 this afternoon, and asking us to postpone the reading of his paper. The next is a paper by Prof. Owens. I have a letter here stating that Prof. Owens has been called away to Maryland on account of the death of his sister. Prof. Owens did not send in his paper. The next is a paper by Mr. F. H. Leonard, of Montreal. Mr. Leonard is in the city, but is not here just now, and as it is getting late, Prof. Herdt has consented to read his paper now. The paper is on "Conditions Affecting the Wave Form of Alternators."

Prof. L. A. Herdt, McGill University, Montreal, read his paper. (See page 171).

The President: You have heard the able paper by Prof. Herdt. As he has stated, the subject is of great importance, especially now when alternating current generators are being used to such an extent that all services, not only incandescent lighting, but arc lighting and motors, are furnished from alternating current generators. To those of us who have been accustomed to look upon the sine curve as approximately correct in dealing with alternating current phenomena, the results shown here are somewhat startling. This paper is open for discussion, gentlemen. I regret the fact that the papers could not have been placed in the hands of the members some time before the opening of the convention, because papers of that nature require some study. It was our purpose that there should be opportunity for studying them. I must say, however, that although the Committee on Papers have used their utmost endeavors to get the papers printed in time, they have failed. Could we hear from Mr. Leonard on this subject?

Mr. Leonard: Well, no, I am hardly prepared to say anything on Prof. Herdt's paper. I didn't come into the room until the paper was half through, and I would like to study it a little further before taking up any discussion on it.

The President: Perhaps we had better postpone the discussion on this paper until to-morrow. Are there any gentlemen here who would like to discuss this paper?

Mr. Gossler: I would like to ask Prof. Herdt a question for the purpose of getting information. Not having read the paper, I am not very familiar with its contents. Plate 3 shows different curves of electro-motive force and different power factors there, and I notice that the maximum electro-motive force of each curve comes within possible 15 degrees of either side of the 90 degree line. You have shown here electrical degrees from zero to 180, and the maximum electro-motive force on all those curves is within 15 degrees either way of 90 degrees. You have your maximum electro-motive force practically on a straight line.

Prof. Herdt: Yes.

Mr. Gossler: I was under the impression that frequently the demagnetizing effect distorted the magnetic field so as to throw the maximum E.M.F. further than 15 degrees one way or the other.

Prof. Herdt:—The ordinates of the curves at load have been plotted 60 volts below that of the preceding ones, for clearness. At full load, 100 per cent. power factor, the electro-motive force is shown to be shifted about ten degrees in the direction of rotation; however, as the power factor is decreased, this is gradually reduced until we find that with a power factor of 55 per cent., the electro-motive force wave is nearly back in the original position of the no load wave.

Mr. Gossler:—It is an individual characteristic of the machine. I should say that was a very good machine.

Prof. Herdt:—It is a very good machine. If you like to consider that later, Mr. Gossler, we can do so.

Mr. Gossler: I just wanted to get that information.

The President:—Is there any further discussion? If not, we will go on with Mr. Leonard's paper, and we will give you an opportunity to take Prof. Herdt's paper

up again to-morrow. I have much pleasure in calling upon Mr. F. H. Leonard, of Montreal, to read his paper entitled "Power Factor as Affecting Operation and Investment, with Special Reference to Induction Motors and Enclosed Arc Lamps."

Mr. F. H. Leonard read his paper. (See page 173).

The President: Gentlemen, I think I may state that this is one of the best papers we have had submitted to this Association. It deals with matters that as central station managers some of us have to consider very seriously, and I wish you would give it a very full discussion. It contains a great deal of interesting matter, from the standpoint of theory as well as that of practice, and I hope it will receive due consideration. It is now open for discussion.

Mr. E. E. Cary: Mr. President, don't you think it is somewhat necessary to allow the members to digest these papers over night. There are a number of modest individuals here, and their digestion is a little out of order, and it is only in the morning they are prepared to tear the papers to pieces. I would offer the suggestion that we read another paper and then discuss the three of them in the morning.

The President: I am quite agreeable to that, but if there are any members here who have anything to say on the papers now, or wish to ask for information, I think we might hear them.

Prof. Herdt: I would like to say a word in regard to one paragraph here at the top of page 5: "If this leading phase displacement can be made equal to the lagging phase displacement of other devices, a power factor of unity would result, as suggested by an eminent engineer, though in practice, during a period covering the whole history of this branch of the art, I have never met such a condition, nor have any of my friends in the profession, many of whom have had extensive experience with synchronous and induction motors separately and both together on the same circuit." In regard to that point, is it not so that the difficulty in obtaining unity power factor is due to the difference existing between the wave form of the generating and receiving machinery? Still in most cases it seems that with a proper adjustment of field excitation the power factor may be made to reach very close to unity.

Mr. Leonard: On that subject I can state at the end of an experience extending over several years in manufacture and experiments leading up to the manufacture of a single phase, self starting synchronous motor, I have concluded, as I intimated in the paper, that over-excitation cannot be carried too far. If a synchronous motor is over-excited beyond a certain limit, it begins to make the circuit unstable and there immediately results a very vigorous pumping and flickering of the lights which makes the thing utterly impracticable on a commercial circuit. Theoretically it may be otherwise, but in practice there are mechanical and electrical difficulties which enter into the question that, so far as I have been able to learn, put the thing out of the question entirely. I would like very much to meet somebody that has ever had the experience of obtaining the power factor of unity on motor work. I have talked on the subject frequently with many of my friends who are quite prominent in the profession, and who have had excellent opportunities to investigate this matter, but up to now I fail to find anybody who has secured this wonderful, or what seems to me wonderful, result. It is theoretically all right and should be obtained, but in practice it seems to be out of the question.

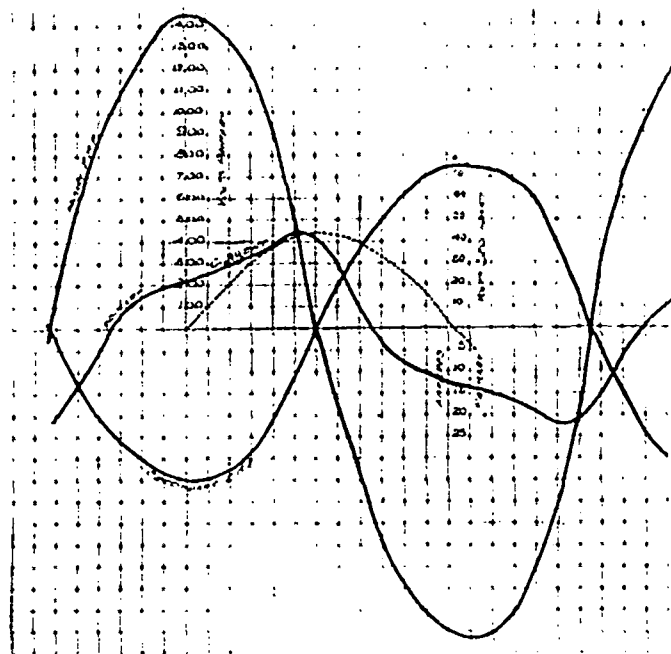
Mr. Gossler: In regard to the matter of unity power factor, does not Mr. Leonard mean to say that the power factor of unity is rather an unstable quantity under commercial conditions, and not that it cannot be procured, for I know unity power factor can be obtained, but there has been difficulty experienced in maintaining unity power factor under commercial conditions. It is a well known theoretical fact that unity power factor can be obtained, but there has been experienced considerable difficulty in maintaining unity power factor on account of the unstable conditions existing at the time. I have not had an opportunity of reading this paper before it was presented, and as it is going to be discussed

to-morrow, I desire to bring up a few points for information, and which I should like to hear discussed in the morning. I notice that after a discussion of the characteristics of the synchronous and induction motors, that the statement is made that the preference is altogether in favor of a well designed induction motor. Now, while the usefulness of the induction motor is without question, there are also certain conditions which make the synchronous motor almost indispensable to a large operating system. When under the control of the central station the synchronous motor is one of the most valuable adjuncts to a general supply system. This is well illustrated under practical conditions in the Buffalo arc light system, where the power factor on the general system is maintained, I understand, under their conditions at about .97 or .98. I do not think there is any claim that induction motors operate at a power factor of .97 or .98, or that they can be made to better the power factor system so as to maintain it under normal conditions anywhere in the neighborhood of .97 or .98. It therefore seems that the impression which I have obtained from Mr. Leonard's paper that the preference is to be altogether in favor of a well designed induction motor over the synchronous motor, is wrong. I know of several large installations that are at present being designed where it is proposed to install synchronous motors. In another part of Mr. Leonard's paper he has compared the action of the induction motor to a transformer, stating that, being complete in itself, the regulation was automatic. The impression which I have gained from this statement is that there is no regulation of the generator required to overcome increases or decreases of the load on induction motors. The operation of induction motors shows that regulation of the generators is necessary to compensate for changes in load on the motors. We know that throwing a load on an empty transformer increases the power factor of the general system, and consequently permits of better regulation, for the reason that it brings the current more nearly in phase with the electro-motive force, but certainly regulation of the generator is required to compensate for any increase of load on the transformer, even if the load introduced does bring the current more nearly in phase with the electro-motive force; consequently the impression given in this paper that an induction motor causes an automatic regulation of the system, and no change of field excitation is required, is incorrect. Mr. Leonard further states that the best load for a synchronous motor is one of a steady character. This same statement applies to induction motors, engines, water wheels, or any motor. Mr. Leonard has stated that as high a power factor of an induction motor under full load conditions has been obtained as .94, but there are very few conditions, especially when there are a great many of them, which allow of motors being operated continuously at full load. There has been reference made to an operating plant where in one installation there are about 3,000 h. p. in motors, ranging from fan motors to motors of 500 h. p., and that recent measurements showed the power factor of the circuits supplying this installation to be about .90. I think I know what plant Mr. Leonard has reference to, because I operate it. I may say we found that under certain conditions we had on our transmission lines supplying our entire system at our power house a power factor on a commercial load of about .94; the load consisting of a general lighting and power business, several large motors being of the synchronous type; we found that by removing about 25 per cent. of the synchronous motor capacity, and placing additional induction motors on the system, the power factor was reduced from .94 to .87, thereby reducing the full load unity power factor capacity of the generator from about 88 to 75 per cent. In stating that it is necessary to have synchronous motors started by means of external starting apparatus I presume the self-starting synchronous motors have been overlooked. However, the latter absorb a large amount of starting current, frequently several times the full load current. I also know of a number of induction motors in commercial use that require several times the full load current for starting. I think the Association is certainly very much indebted

to Mr Leonard for that paper, because it is on a subject that is pretty close to us all. I think we all regret that we have not had a chance to make a pretty close study of it before it was presented. There is one more note I have marked in reading it over. Mr. Leonard, I see further on, recognizes there is some use for synchronous motors. He says: "In some notable cases where central stations are using power transmitted from a distance, induction or synchronous motors have been coupled direct to D.C. arc dynamos; this would be the ideal place to use a synchronous motor immediately under control of the central station if the induction motor load occurred at the same time, but unfortunately they occur at different periods." The maximum demand on a central station supplying light and power is at the time when the lighting of offices and stores and the day power business overlaps the evening lighting load. In Montreal this overlapping of day load and evening load occurs during seven months out of the year, also, at the same time the arc lights are operating, so that the power required to operate them is in demand at the time of this overlapping; consequently any synchronous motors used to operate arc machines could, during seven months of the year, be used to better the power factor on the general system, in consequence of which there would be available more generator capacity than if the arc lights were operated by means of motors having a lower power factor than that obtainable with synchronous motors.

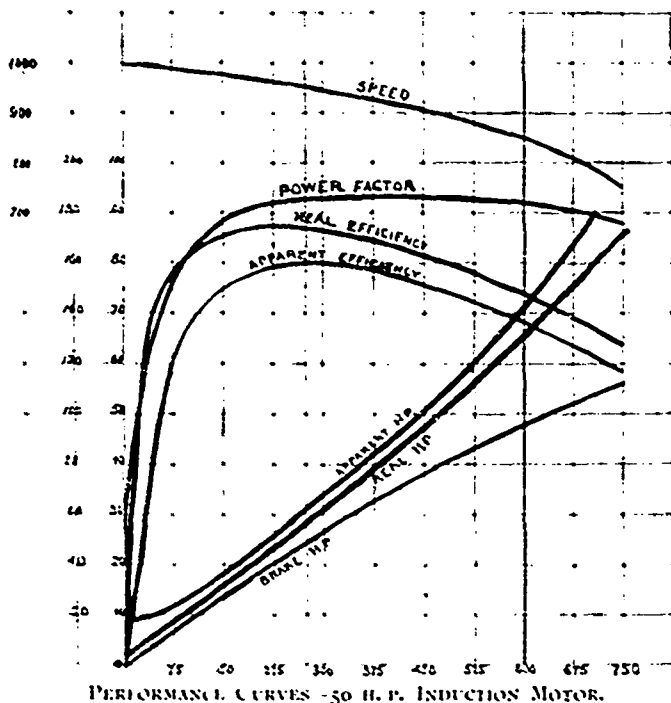
Mr. Leonard: I don't think I differ so very much from Mr. Gossler on a good many of the points. I called attention particularly in my paper to the fact that there are places in which a synchronous motor can be used to great advantage in overcoming line drop. If you could distribute synchronous motors at certain centres of distribution where your drop is heaviest and your variation in load the greatest, and you have an attendant there in charge who is under control of the central station, as I say in the paper, it would certainly serve as a very valuable adjunct to the central station management. You would reduce the amount of copper and you would require less attention at your switchboard, although that would have to be made up by the attention of the man at the motor, while under those conditions it would be necessary to have the syn-

Gossler mentions was one where we took the two synchronous motors (we only had two on) off our line, and in place we put in all of the small induction motors, many of which were running under load. A small induction motor does not give as good a power factor usually as a large one, they improve slightly as the



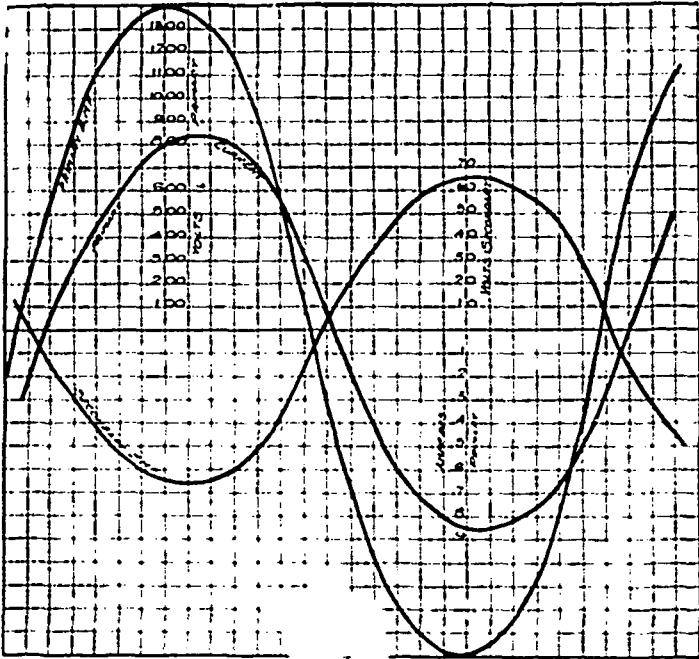
TRANSFORMER CURVES—OPEN SECONDARY.

size increases, but a small induction motor with a light load, it is recognized, has a lower power factor; and as I say in my paper, the regulation of the line may be improved by the use of the induction motor. I think that experience will bear that out. We have at full load a very high power factor. I have a diagram here which I have taken and I will put it up. This is the line we have been considering; that is the power factor. This, I may say is taken in actual practice from a moderate sized induction motor; it has a capacity of 50 h.p. This is the full load line here. Now, you see the power factor starts at about 20. The observations are not very accurate on these starting loads; here we start with a power factor of about 20 at practically no load. It almost instantly reaches 40, and then up to 60, and then rises gradually as the load increases, this line crossing under here and going over this point up to 93, almost 94, with even that small-sized motor, where the generator conditions and so forth are right. What I was trying to maintain was that the regulation of the line is assisted—not altogether compensated for, I might say—but assisted by the use of induction motors rather than synchronous motors. At full load we have a power factor of .93, and we will say at 25 per cent. overload we have got very nearly .94; all over this range the power factor is very nearly uniform. I call attention in the paper to the fact that the induction motor should be selected particularly with regard to the amount of work it has to do, so as to obtain the best conditions of power factor. That is, if you have a load of 10 h.p. for five minutes out of the day, and 7 h.p. for the other nine hours and 55 minutes, you should buy, not a 10 h.p. motor to take care of that 5 minutes, but a 7 or 7½ h.p. motor so as to obtain the best conditions. You can stand an overload of 25 per cent.; your power factor is really improved by that load; all over this range your motor is running at good power factor; if there is any slight increase or overload the motor is safe if it is properly designed, as it should be designed under those conditions. If you throw a load off from an induction motor you immediately reduce the power factor. Mr. Gossler said the power factor will vary the electro-motive force something like the square of the variation in the power factor. Under those conditions you have thrown off your load, your generator has lost part of its load; the natural tendency of any generator with fixed excitation would be to increase its



chronous motor large enough in capacity so as to take care of the work it has to do as a motor, and besides that have capacity for furnishing leading currents to overcome the lagging currents produced by other inductive devices. With regard to power factor, Mr. Gossler in his remarks made a little slip; he said that the induction motors made the power factor higher. I think he meant the reverse. The case that Mr.

electro-motive force; it would immediately, if you throw off a certain amount of load, build up and increase the electro-motive force. With an induction motor having its load thrown off, it brings the power factor down into this part of the curve (refers to diagram), and in doing so it demagnetizes the field of your current generator and prevents the increase of the field and lowers the electro-motive force slightly and compensates, in a measure, for the change of load. I don't mean to maintain that that will compensate automatically for every change. You cannot do away with your switch-board attendant entirely, but I merely wish to call attention to the fact that it assists



TRANSFORMER CURVES—FULL LOAD.

in the regulation; whereas in a synchronous motor, if a load is thrown suddenly off, your voltage immediately rises. You have introduced leading currents, you increase your field strength by the armature reaction, it raises the electro-motive force immediately and will cause trouble with incandescent lights if your attendant is not very sharp with his work. If there are any other points I would be very glad to take them up to-morrow morning. I will give a chance for somebody else to say a word now.

The President: Are there any other members who wish to speak on this? There is a point mentioned by Mr. Leonard at the top of page 5 where he states that a leading current may be produced in a synchronous motor to compensate for the lagging current due to other devices. He says, it has been stated by an eminent engineer, and it has been stated by a number of authorities, and it is a question which central station managers who are operating alternating current motors want to know all about. I may say it has been stated to me by eminent engineers of manufacturing companies, that while this was theoretically so, it was, as stated by Mr. Leonard, almost impossible to realize in practice. Now, this is the point we want to know about. It has been held by people who are interested in having synchronous motors used that this is a valuable feature of the synchronous motor, that you can use it to off-set the lagging currents due to other motors or other devices on your circuits. Others state that it is impossible to obtain these results in practice, except under conditions which have to be so nice that you do not get them as a general rule, and if anybody can give us more light on this particular point to-morrow we will be very glad to have it. If there is no further discussion to-day we will allow the paper to lie on the table for further discussion to-morrow, and we will pass on to the paper on "Some Experiments with Rotary Convertors," by Messrs. A. G. Grier and J. C. Hyde.

Mr. Grier read the paper. (See page 175).

The President: The auditors whom I appointed this morning have completed their work of auditing the accounts of the Secretary-Treasurer and have certified them to be correct in every particular. If there is any general business to bring before the meeting this would be a good opportunity, a better chance now than to-morrow. If there is nothing I would ask someone to move an adjournment.

Mr. J. J. Wright moved, seconded by Mr. P. G. Gossler, that this meeting adjourn until to-morrow morning at 10 o'clock. Carried.

## SECOND DAY.

At 10.30 a.m. the President called the convention to order and said: The first item is the consideration of the President's address. The reason for this order of the day is that there are some suggestions in the President's address which may be taken up by the Association. As you know, there are still a number of electric companies in Canada that are not represented in this Association, and it has always been the aim of the Executive Committee to bring these in, if possible. I will read you the suggestion which is made in the address in connection with that: "It is a source of gratification to me that our membership continues to increase notwithstanding that a considerable number of members drop out of the Association every year. We should put forth our best efforts to prevent, if possible, these annual lapses, and we should not rest satisfied until every electrical operating, manufacturing and supply company, firm or individual is represented on the membership roll. In this connection I would submit for your earnest consideration whether it would not be well to introduce in our constitution a feature of company membership such as carried out by the National Electric Light Association of the U.S. in addition to the individual memberships, which could remain open to those who wished to avail themselves of them." I thought it would be well to get an expression of opinion from the convention as to that feature. Can we hear from Mr. J. J. Wright on that subject? It is a matter we may not be able to dispose of now, but it would be well to talk it over. You know that the National Electric Light Association is composed of companies; the companies pay \$25 a year and send their representatives. It was thought that where the companies do not send the same members every year, that company membership would be, perhaps, a means of getting the companies interested.

Mr. J. J. Wright:—As I understand it, there are a number of companies represented in our association already.

The President: As companies?

Mr. Wright: As companies, I think.

The President: No. Their officers are members individually. We have no such thing as company membership.

Mr. Wright:—That would be an amendment of the constitution, and would require notice for one session. I am willing to introduce a resolution to that effect, giving notice of an amendment of that kind, and leave it to be discussed at the next convention. We cannot take any action on that except to propose it.

The President: I thought if we could get an expression of opinion from the convention, the executive committee for the coming year would know what to do.

Mr. Wright: That would blend itself with another matter which will probably come up later, and that is with regard to identifying the electric companies with the Association in the matter of looking after legislation and so forth. If the electric light companies are to become interested in the Association as companies, of course the Association would be in a very much stronger position to take hold of matters connected with legislation; and the present haphazard method of making provision for legislation by raising subscriptions and so forth would be very much simplified. We have no means now except by making a draft on the various companies as occasions arise; we have done that al-



ready three times practically, and it is a question, of course, how far it is proper for that method to continue, and that is a matter which I think will have to be taken up by the legislative committee and executive committee, probably jointly, during the coming year, to see whether an organization of that kind could not be completed. Your suggestion, perhaps, that the companies should become interested, might be right in line with that idea.

Mr. H. R. Leyden: It seems to me that is exactly the line in which this association has been developing for the last couple of years. This association is not what you would call an association of electrical engineers; its principal object and its principal work has been the benefit of the companies. The men who come here to this association are usually sent here by the companies and their expenses paid by the companies. As Mr. Wright says, one of the principal objects of the thing is for the enacting of such legislation as will protect the companies, and it is the companies that have been paying for the expense of such legislation, and it seems to me we have been gradually working away from the idea of an electrical engineers' society and becoming an association for the benefit of electrical interests; and it seems from that point of view it should be the companies who are represented and not the individuals.

The President: There is this difference between our society and the American association, that while a company sends a representative here and pays his expenses, if that company wishes to send another representative next year he has to get a membership, while if the company held the membership and paid a higher fee than the individual subscription, that company would be free to send any representative or any number of representatives. Of course, when it comes to voting, the voting will have to be limited, but any number of representatives might be present at the convention from one company.

Mr. Gossler: I don't like to see the idea encouraged suggested by Mr. Leyden that we are working away from an engineering body; the matter of legislation and commercial operation of our plants can be managed by purely business men and business associations; I would very much rather encourage this as being more of an engineering society for the advancement of engineering and commercial operation. I think your suggestion of having the company membership is a very excellent one, as it will bring the association to address the companies rather than their individual representatives; that is, the association has had its support from the companies, and it has gotten that support from individual efforts rather than making a direct appeal to the companies. I think the suggestion as put forth by the President should be put in formal shape, perhaps by resolution put before the association, which will allow it to become a part of the constitution of the association.

Mr. E. E. Cary: I think Mr. Gossler's suggestion is a very good idea, but one point that appeals to me is this, I think both the commercial interests and the scientific interests can work harmoniously. Our meetings in the hall, the same as in our neighboring Association on the other side, would generally be devoted to the scientific side of our work; naturally, the other side gives more or less entertainment when we are not in the hall for discussion. The papers will be more scientific than commercial, of necessity. In addition to this I would like to say a few words regarding the matter of exhibits. This is the first year that any of us have been privileged to exhibit under the auspices of the Association. There is a peculiar meaning in that to me. The manufacturer or jobber gets the agency from any foreign country of any special apparatus which have been developed and brought out during the year, it may have been described in the journals, but very few of the central station managers, perhaps, have been privileged to see the latest developments—the large exhibits such as the Electric Light Association have on the other side bring together all the latest developments of the year; it is not to sell, at the time; in fact, the manufacturer or jobber who respects himself would severely reprimand any representative who tried to really do business, but it is

to our interests to have the criticism of central station managers upon anything we bring out, because no matter how carefully we may test any apparatus, I never saw a piece of apparatus placed on the market that central station managers could not tear to pieces and improve. They have conditions which we cannot always duplicate in our testing rooms, notwithstanding our best efforts to do so; consequently, we get their suggestions, and they see the results of our efforts. You may say, that is purely for commercial reasons. We are all after the money, there is no doubt about that, but unless you have the best and most economical apparatus you cannot make as much money during the year following the convention as if you had it. And I think any manufacturer, if he appreciated that element the way it is appreciated in the old country and in the United States, would make an effort to show anything of recent development, and the means he has devised to help you in your operating expenses. I think both sides, the strictly scientific and the commercial elements, will not conflict, but will harmonize, because our papers will be scientific, and between our sessions we can view the exhibits, and the more working exhibits we have I think the better everyone will be pleased. I feel very strongly on this matter, for I was interested for some twelve years on the other side, but as you all know we have not been privileged to do anything here before. The time has been extremely short this year. We are not as busy as our competitors, so we had more time to devote to it. But another year, if it is thoroughly understood, you will find all the manufacturers here exhibiting. I had to work nights, gentlemen; I worked overtime. We have not much upstairs, but we manufacture bunting and ice cream and so forth at St. Catharines, and that is what we are showing. Another year we will show you some apparatus. (Applause).

Mr. Yule: Of course, I represent purely the commercial side of the electric light business. As it is, there is a good deal in what Mr. Wright says, that company membership would interfere somewhat with another proposition we have to bring forward. There is one thing about company membership in getting a fee sufficient to meet our expenses, and that is, you cannot get the same amount of fees from a small company that you can from a larger company. Some of them are not able to pay a very large fee, and some of them are able and willing to pay it. The conditions on the other side are very much different from what they are here, and we have to modify our plans. This question will come up again, I understand, in the legislation report. I would move that the recommendation of the President be sent on to the Executive Committee for consideration.

Mr. Cary: Couldn't that be on a sliding scale according to capitalization—so much for each thousand capitalization, then nobody would feel injured at paying too much.

Mr. B. F. Reesor: Doesn't that mean that a company could have a company membership or not, just as they pleased?

The President: Yes, that was my idea; it would be optional.

Mr. Reesor: The small company would send the same man every year; the large company would pay a \$25 fee and send two or three men, and change around occasionally.

Mr. H. O. Edwards: There would be a larger fee entitling them to a larger number of delegates; the larger company would want to send more delegates than the smaller company; the smaller company might have a smaller fee, entitling them to one, two or three delegates, and the larger company more.

Mr. Reesor: How would that be when it comes to voting? The large company have three or four votes and the small company one?

The President: I think in the National Association each company has one vote.

Mr. Cary: They are privileged to send any number of representatives, but only one official representative.

Mr. Leyden: It seems to me we are confusing two things, the fee that the company would pay for membership, and the amount that a company should con-

tribute towards the expense of the Association. I don't see that you can charge one company more than another for membership fee in any association. We should, it seems to me, have a fee which is reasonable and charge all the companies the same fee, and when we want to take up a collection to raise money for legislative purposes it will have to be done outside of that, and the larger companies necessarily will be expected to pay more than the smaller companies. I don't see how you could have a sliding scale for membership fees.

Mr. C. Doutré : There are companies who, at the present day, have two or three delegates whom, I presume, are individual members. It is going to be pretty hard to decide upon any equitable fee for company representation. There are companies who invariably send three or four delegates, and other companies will only send one, and those companies who send one will object to paying any company fee which would be considered equitable, because you could not put the fee down at any \$3 or \$5 basis; they would overcome that by sending simply individual members. I think there is nothing to be gained by introducing a company membership fee, because those companies who object would simply send individual members, and those companies who have five or six parties they wished to send would pay the fee, which would be a nominal one, and the Association would lose by it.

Mr. Cary : I think there is one point Mr. Doutré has omitted. No company would be privileged to exhibit at the convention unless they were members of the Association as a company. If we bring that up to the proper level, any company that has any respect for itself at all will pay \$25 for the privilege of exhibiting.

Mr. Gossler : As I understand your suggestion, the matter of company membership is simply to augment the membership of this Association; it would in no wise eliminate individual membership.

The President : It is suggested as a possible means of reaching and interesting companies who now have no individual membership. It is moved by Mr. Yule that this matter be referred to the Executive Committee.

Mr. A. B. Smith : I second that.

The President : The Executive Committee would report to the next convention. It might be in the form of an amendment to the constitution.

Mr. Reesor : That would put it off for two years. You could put it in as a notice of motion.

The President : If we are agreed as to what we want we can put it in as a notice of motion, but I hardly think we have reached that point to know exactly what we want.

Mr. Gossler : There must be some means of putting that before the Association so that it will not take two years to act.

The President : I think we could put a notice of motion in general terms and we could arrange the details to suit ourselves.

Mr. Reesor : Put it in as a notice of motion and the Executive Committee in the meantime can deliberate and report at the next meeting.

The President : Article 10 of the constitution says : "Permission to introduce any notice of amendment or amendments to this constitution must be granted by a majority of two-thirds of the active members present. Permission being granted, notice may be given and the proposed amendment moved at any subsequent sitting. After discussion the amendment must be submitted to a committee of five, named by the chairman." There is only one motion before the chair, that by Mr. Yule, seconded by Mr. Smith, that this matter be referred to the Executive Committee.

Mr. Cary : Would Mr. Yule be willing to withdraw that and make the motion that the chair should appoint a committee. We are a little hazy, I think, on the constitution. What is your wish in the matter?

Mr. Yule : I don't understand what you want.

Mr. Cary : To follow the constitution. The president says if he appoints a committee of five they can report to-morrow; that won't postpone it for even a year.

Mr. Yule : I will withdraw my motion.

Mr. Reesor : The way I understand it you will have to take a two-thirds vote of the meeting to allow the constitution to be amended.

The President : Yes, there must be a two-thirds vote of the members present to grant permission to introduce the amendment. When the amendment is introduced I refer it to a committee of five.

Mr. Yule : I will take the original motion, that it be referred to the Executive Committee, and that they be asked to report at the next convention.

Mr. Wright : I would vote against any amendment to the constitution at this session; it would not be advisable.

The President : I don't think myself it would be well to be too hasty about this, and probably if we could amend the constitution at the next convention it would be quite early enough. Will your motion stand then, Mr. Yule?

Mr. Yule : Yes. My motion is that the recommendation in the President's address be sent on to the Executive Committee, and if approved of by them they report a scheme to the next convention.

The President : You have heard the motion, are you ready for the question?

Mr. Gossler : I personally object to any proceeding that would require two years to make it effective. If we are going to get any benefit out of it, two years is too long.

The President : I think it can be done in one year.

Mr. Gossler : When is it going to be? There will have to be ten members to form a quorum.

The President : Mr. Yule's motion is that the Executive Committee consider this question during the year and report some scheme at the next convention.

Mr. Leyden : I don't believe we fully realize the extent of this change that is going to be brought about by carrying this motion at the present time, there are two kinds of societies, one of electrical engineers, the other a commercial society for the benefit of electric companies. At the present time we are in the happy position of being on both sides of the fence; we have members interested personally and the companies interested personally. If you change that, if you make that a company representation, it is going to mean quite a vital change in this association, and I think it should be thoroughly considered by the members of the association before it is carried. The electrical men in the Dominion of Canada are none too many, and none too many of them are interested in the association to run the risk of any of them dropping out because their companies take the responsibility from them.

Mr. Cary : By referring it to the executive we have fulfilled Mr. Leyden's idea.

The President : I think so. I take Mr. Leyden's remarks to be in the line of the proposition by Mr. Yule.

The motion was then put and carried.

Mr. Wright : I understand your interpretation of the constitution is that it can be amended at the next meeting.

The President : There is no question in my mind on that article, it can be amended at the next meeting.

Mr. Wright : I always had the impression that it could not be amended at one session.

The President : We will have to refer this to the solicitor of the legislation committee. The report of the secretary-treasurer, which was read yesterday, as to the finances of the association, is before you if you have any remarks to make.

Mr. Reesor : I would move, seconded by Mr. Smith, that we adopt the report. Carried.

Mr. Reesor : I wanted to say something about the application for membership form. The way the form reads now is that a person joining the association joins for one year. I think when they join they should be considered as members until they send in their resignation. I think it should be made so that when I once join I am constituted a member, and I should be called on to pay my fees every year until I give notice of withdrawal.

The President : I don't think it is necessary to pass any resolution, but when the secretary gets new application forms, he should have that corrected. We will record it

in the proceedings that the secretary is instructed to do that.

Mr. Gossler: I wish to give notice of motion that at the next convention I will make a resolution whereby companies can be admitted to membership to this association, if the executive committee think it wise, or if the association think it wise, at the next convention. The object of that is that we can introduce company membership at the next meeting of the convention, rather than two years hence, if it is thought advisable. I think that this notice is necessary according to the constitution.

The President: I don't think it is, but I am quite willing to take the notice of motion in case there is any doubt. It requires a two-thirds vote of this meeting to give permission for this notice of motion to be recorded. Are you willing that we should receive this notice of motion? It is subject to the report of the Executive, of course. This is a precautionary measure to save time in case we want to make an amendment next year.

Mr. Gossler: The idea of that is that if it is decided at the next convention by the Executive that it would be desirable to admit companies to membership, we can take immediate action. It is not in any way to antagonize the action of the Association or of the Executive Committee, but it permits of more prompt action.

The President: Are you willing that we should receive this notice of motion?

Carried by two-thirds vote.

The President: The report of the Committee on Statistics is before you, gentlemen. For those who have not heard this report I may say that the report was to this effect, that considerable data had been collected, but no definite action had been taken by the committee during the year. What is your pleasure regarding this report?

Mr. Yule: I move, seconded by Mr. J. J. Wright, that the report of the Committee on Statistics be received. Carried.

The President: The report of the Committee on Meter Inspection is before you. This report is to the effect that during the year the committee has interviewed the officials of the Inland Revenue Department and obtained from them a concession regarding inspection fees to the effect that whenever a meter is inspected within the five years' period, namely, before the five years dating from the regular inspection are expired, 50 cents only will be charged instead of the regular fee.

Mr. Reesor: For any size of meter?

The President: Yes. You have the meter inspected and that inspection is good for five years. If after two years the meter requires readjustment and you have to break the seal and get it re-certified, you pay 50 cents fee instead of paying the full fee. This is in effect now.

Mr. E. Slade: Has any effort ever been made to abolish that fee altogether?

The President: No very determined effort has been made, because I think it would have been useless. I think anyone who has come in contact with the officers of the Department will know it is a useless undertaking. I don't say it could not be done in time, but at the present moment I don't think it would be possible.

Mr. W. Williams: I would move that the thanks of this Association be tendered the Meter Inspection Committee for their successful efforts so far, and that they try and do better, and endeavor to get that inspection fee blotted out altogether.

Mr. Sangster: I would second that. Carried.

The President: The next is the report of the Legislation Committee which was read yesterday.

Mr. Wright: There is only one matter in connection with that report that I think calls for special remark, and that is the suggestion that some method should be adopted to raise the funds in a more systematic manner, a more equitable manner, to meet the expenses of that committee. The electric light companies throughout the province of Ontario have benefitted very largely from the labors of that committee and from the expenditure that has been made, and they have responded,

taking them altogether, in a first class manner to the demands that have been made on them for the expenses. But it seems to me a hand-to-mouth method of raising the funds to have to suddenly make a draft and say, here, you are expected to pay so much, without any explanation or any particular arrangement as to the proper method of collection. The report simply suggested that some method should be adopted by which these subscriptions could be brought in in a more systematic manner. That appears to be the only point. It has been suggested that the various companies should be organized perhaps something after the manner of the suggestion in the President's address, so that they will become, as it were, almost stockholders in this thing, and if all contributed, a very small amount from each would possibly suffice. If any arrangement of that kind could be made it would materially lighten the labors of the committee, and especially those of the Secretary-Treasurer, on whom the onus falls of making these drafts and collecting the subscriptions.

The President: This is a very important question. I had hoped the Legislation Committee would have had some scheme ready to submit to this meeting, because they are the ones who know, from their experience, how this thing is to be handled best. It is difficult for a member outside, who has had no experience on the Legislation Committee, to suggest a proper scheme.

Mr. Williams: 'Wouldn't it be possible to bring in the gas companies in this legislative business? I think they are interested just as much as we are. Of course, a great many of our companies are controlling both; but I am sure this last spring the gas companies were as deeply interested as electrical companies in certain legislation which might have been put through the local house, and I am sure that a number of the gas companies could be brought in and would willingly contribute their share, according to their capitalization or ability, towards permanently looking after legislation.

Mr. Yule: Two years ago, in my report on legislation, I suggested some scheme of this kind being adopted. My idea was that the thing should be sent on to the Legislative Committee and to the Executive, and, if they could so arrange it, that a canvasser could be engaged to visit all the companies and get them to sign an agreement to contribute a specific amount for five years. I think the work this committee has done is worth a great deal of money to the companies of Ontario; it has saved lighting companies hundreds of thousands within the last six months to those who would not have got a dollar if this Conmee bill had not been on the statute book. It is quite apparent that legislation in the Ontario House has need of careful attention; if it is not attended to we will have trouble, and will get back where we were, and will not get out of there any more. There should be a strong effort made to get a system that will protect us and protect us well. I would move that this question be sent jointly to the Legislative Committee and the Executive Committee to develop a scheme along those lines, to get a canvasser or solicitor to visit all the companies and get them to sign an arrangement for five years to contribute a specific amount to relieve ourselves and relieve them of a good deal of worry and annoyance, and make the committee and their services more efficient.

The President: You wish to authorize the committee to do this?

Mr. Yule: The Legislative Committee would not like to take any action of that kind without the concurrence of the Executive Committee. I am throwing out that suggestion for the members to express their views on. Of course, this thing applies only to Ontario. In Quebec, fortunately, they do not have the anarchists and socialists that we have up here to bother and put the knife into them.

Mr. Reesor: In connection with that, you would have to talk ways and means if the two committees join and promulgate a scheme of some kind. I think it would be perfectly right to get a man to go around and get the companies to become members of the Association at the same time; but it costs money to send that canvasser around, and these committees



would have to have some ways and means at their disposal to send a man around, unless they were only going to report to the convention next year.

Mr. Cary: Question.

The President: The motion by Mr. Yule is to the effect that the executive committee and the legislative committee jointly consider this question, and be authorized, if they deem proper, to send an agent around the country to the different companies, to get them, if possible, to sign an agreement to contribute a fixed sum each year for five years, for legislation purposes. Is that your idea, Mr. Yule?

Mr. Yule: Yes. I don't know about sending a representative around, but let them consider some plan.

The President: Not necessarily that, but I understood you to say that, and as Mr. Reesor says, that is a matter of expense, and we must consider that feature of it.

Mr. Yule: I talked this thing over with Mr. Mortimer some time ago, and he says he will be sending a man around working in the interests of his journal. Probably we might get him to attend to it.

The President: I will make your motion simply to refer the matter to the two committees jointly without any instructions, and they will do what they deem best.

Mr. Yule: Yes.

The President: We cannot tie their hands very well.

Mr. Yule: No.

The President: We will take the motion this way, that the matter of raising money for legislation purposes be left to the executive and legislative committees jointly, with power to adopt whatever means they may deem proper. This motion is seconded by Mr. Williams. Are you ready for the question?

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

The President: The next is the report of the Committee appointed to confer with the Underwriters. As this is a special committee, it will be necessary in adopting this report, to state whether you wish this committee continued or not.

Mr. Yule: I think the chairman of that committee expressed a desire that the committee be continued.

Mr. Gossler: Yes; it would be advisable to have a committee; not necessarily the same committee.

The President: The personnel, of course, could be changed.

Mr. Gossler moved, seconded by Mr. Smith, that the report of the committee to confer with the Underwriters be adopted, and that the committee be continued for another year. Carried.

The President: The next is the report of the Committee on Standardization of Accounts. This committee reported they had collected considerable data, and had had correspondence from different sources, and were still at work. I think we will have to adopt the report and continue the committee. Will anyone move that?

Mr. Wright: If the committee is still at work I would move they be continued, of course.

The President: They were at work up to the time of the convention; their work is not finished; they had no report ready.

Mr. J. J. Wright moved, seconded by Mr. Briethaupt, that the report be adopted and the committee continued. Carried.

Mr. Leyden: They promise a report for the next convention?

The President: I don't know who will compose that committee for the next year. If the same men continue I suppose they will.

Mr. Leyden: I understood the proposition was to continue the same men.

The President: To continue the same committee. The naming of the members will come later.

The President: The last committee is also a special committee for the purpose of defining some standard for arc lamps. This committee report progress, but their work is also unfinished. Shall this report be adopted?

Mr. Leyden: Excuse me; that committee was to report on a standard for arc lighting, as I understood.

At the last convention we had a discussion, and there were several motions offered to define what is meant by a 2,000 c.p. arc lamp, and some of the motions were exactly according to the wording of the American Institute of Electrical Engineers, and the London Board of Trade, and all the authority that was necessary to give the thing a standard value, namely, that an arc lamp which should consume 450 watts to the arc should be considered as defining a 2,000 c.p. arc. I think it is all nonsense for us to continue in this way, if we are going to do business let us do business.

The President: If you had heard the report which was given yesterday you would have seen the reason the committee did not bring in a report. They did not give a final report. Their reason was this, that as there are so many different kinds of arc lamps now being brought out, it was difficult to make a cast iron wattage rating that could be accepted; and that as this question was in the hands of larger bodies, and engineering societies were still dealing with it, it would be premature for this society to express itself. That was the sense of their report. Does Mr. Gossler move that this report be adopted?

Mr. Gossler: I move the adoption of the report.

The President: Do you wish the committee continued?

Mr. Gossler: I don't know as it will do any harm, and it may be a great deal of benefit.

Mr. Gossler moved, seconded by Mr. Simmons, that the report be adopted and the committee continued. Carried.

The President: I will now call upon the Nominating Committee, appointed at yesterday's session, to report.

Mr. Mortimer: I have been asked to read this report. It is as follows:

For President: A. A. Dion, of Ottawa.

1st Vice-President: E. E. Cary, St. Catharines.

2nd Vice-President: P. G. Gossler, Montreal.

Secretary-Treasurer: C. H. Mortimer, Toronto.

Executive Committee: First five—A. B. Smith, O. Higman, D. R. Street, J. J. Wright, B. F. Reesor. Second five—F. W. Simmons, A. Sangster, John Yule, Edward Slade, H. R. Leyden, Wm. Williams (Sarnia), J. F. H. Wyse.

Committee on Statistics: J. F. H. Wyse, J. A. Kammerer, A. A. Wright.

Committee on Legislation: R. O. McCullough, J. J. Wright, B. F. Reesor, C. B. Hunt, John Yule, H. R. Leyden, A. A. Dion, W. H. Breithaupt. (With power to add to their numbers.)

Committee to Confer with Underwriters: P. G. Gossler, Edward Slade, A. A. Dion, Alderman Sadler, A. Sangster.

Committee on Arc Lamp Rating: O. Higman, P. G. Gossler, Fred Thompson, John Yule, J. F. H. Wyse.

Committee on Meters: (Same committee continued).

Committee on Standardization of Accounts: (Same committee continued), Mr. Hart, chairman.

The first name on each case to be chairman of the committee.

The President: You have heard this report. You understand thoroughly that this is merely a suggestion on the part of the committee; it is done for the purpose of guiding the members and helping them in their choice; it is not binding on any member of the Association. Other nominations for any of the offices or committees are quite in order. The election of officers and the executive committee will be taken up to-morrow, but the other committees will be selected now. The selection of the Nominating Committee of a Committee on Statistics is Mr. J. F. H. Wyse, Brantford, Mr. J. A. Kammerer, Toronto, and Mr. A. A. Wright, Renfrew. Are there any other nominations for this committee?

Mr. J. J. Wright: I think in the case of this committee it is not open to change.

The President: It was my impression that the chairman had the nominating of the committee, but Article 18 of the Constitution says: "The president shall nominate a committee of three to strike the standing committees for the following year and define their

respective duties, the report of the committee being considered at a subsequent sitting to its introduction." That would mean to-morrow. This is an article of the constitution that has been ignored in the past. I think the President has appointed the committees on the recommendation of the Striking Committee, but to be on the safe side I would rather have the convention confirm the nomination. Is it your pleasure that the Committee on Statistics be as recommended by the Nominating Committee? Carried.

The President: The next is the Committee on Legislation. R.O. McCullough, J. J. Wright, B. F. Reesor, C.B. Hunt, John Yule, H.R. Leyden, A.A. Dion, W.H. Breithaupt, with power to add to their number. Does this meet with your approval? Carried.

The President: The next is the Committee to confer with Underwriters. The committee recommend Messrs. P. G. Gossler, Edward Slade (Quebec), A. A. Dion, Ald. Sadler and A. Sangster. Carried.

The President: The next is the Committee on Arc Lamp Rating. The committee recommend Messrs. O. Higman, P. G. Gossler, Fred Thomson, John Yule and J. F. H. Wyse. Carried.

The President: The next is the Committee on Meters. The same committee as last year is recommended: Messrs. A. A. Dion, E. E. Cary and J. J. Wright. Carried.

The President: The next is the Committee on Standardization of Accounts. The same committee as last year is recommended: Messrs. D. R. Street, P. H. Hart and A.A. Wright (Renfrew.)

The President: Mr. Hart has taken no action at all, and he has not been heard from for a number of months; I don't know where he is.

Mr. Gossler: He is down in the Lower Provinces.

Mr. Street: Although I was named first on that committee, Mr. Hart was chosen chairman at a subsequent meeting, on account of the paper he contributed to the association last year. I might say that the committee arose from the discussion on his paper and the appointment from that, and out of deference Mr. Hart was appointed chairman, and if he is going to continue a member of the association and a member of that committee, I, for one, would like to see him still chairman, although I see my name is mentioned first.

The President: The recommendation of the Nominating Committee is that the first name mentioned on each committee will be the name of the chairman.

Mr. J. J. Wright: That is according to the constitution; it is just as well to have the constitution defined. I think we are practically unanimous in accepting these committees. Article 19 says: "The first person named on any committee shall act as chairman until the committee is called together, when they will elect their own chairman."

Mr. Reesor: That should be that the first name on the committee should be the convener.

Mr. J. J. Wright: If you take the article before that, and take that word "strike," it must mean to elect, not to nominate. It is a very ambiguous term. The considering of it would mean the announcing. If it is thought well to introduce any amendments to the constitution at the next convention, I would move that some of these articles be amended in a certain degree to make them plainer.

The President: There are several amendments required. Mr. Street requests that the order of the names be changed on this committee, and that Mr. Hart's name be placed first. Are you willing to alter your report in that way? He wishes to have Mr. Hart continue as chairman because he was chairman last year and took the initiative in that.

Mr. Wright: I suppose the committee would have to be called together again to do that.

The President: It occurred to me that Mr. Hart took no action for some time, and he might not in the coming year. That would leave only two names. It might be advisable to add another name.

Mr. Street: I think it would be very wise.

Mr. Wright: Would you suggest a name?

Mr. Street: No, I don't think I can.

Mr. Smith: I would suggest Mr. Higman, of Ottawa

The President: I think some gentleman who has to do with central station accounts should be put on that committee.

Mr. Gossler: I think the matter as brought out by Mr. Wright is a matter that should be decided now, as the precedent that is being established here by the action of the executive placing before the association the committees for approval is, if I am not incorrect, contrary to custom. The constitution has been interpreted here to convey that the executive should receive the nominations for the committees, and then present them to the association. I think in all legislative bodies or all organizations that this is one of the privileges of the executive. Now the precedent has been established in this association for the executive to place those committees before the association for its approval. It seems to me that is contrary to precedent and custom, and I think we had better decide now whether we want to interpret the constitution to mean that of our own association and go contrary to custom, or stick literally to the constitution.

The President: It is very difficult to interpret this article, and for that reason I thought I would keep on the safe side by getting the approval of the meeting.

Mr. Wright: But you establish a precedent which might be inconvenient at some future time.

The President: The article says they shall "strike"; if you take that to mean they shall "elect," what is the use of considering their report at a subsequent meeting?

Mr. Wright: That is probably antagonistic to the other word.

Mr. Yuie: I think the meeting would have power to amend the committee's report in any event.

Mr. Gossler: I don't think so, unless there was an illegal appointment. Is it not customary for the executive to have the power of appointing committees in organizations such as this?

Mr. Wright: That certainly is the custom; it is thoroughly well safeguarded, and the very fact that the President may nominate a committee of three clearly shows that. Now, of course, he is given the initiative in the first place; he can select three men whom he thinks will nominate and strike the committees rightly in the interests of the association; then there is the further safeguard that three good members of the Association would not in all probability strike committees that are not in the interests of the Association. The President takes the initiative; the three men then strike the committees, so there is a safeguard there between the executive and the three members of the committee; at the same time it does not leave it open to be all torn to pieces by the association generally.

The President: Article 21 says Todd's Parliamentary Practice shall govern.

Mr. Reesor: As far as I understand the parliamentary practice, I think the select committee strikes the standing committees; the standing committees are then reported to the full body and usually they are adopted, but it is not imperative; the whole council can tear them to pieces or add to them. I think the select committee have the nominating of them, and it is the usual practice, but not imperative, to adopt them.

Mr. Gossler: I understand a motion could be introduced whereby the committee could be increased in numbers.

The President: So far there has been no amendment. The committee have been accepted just as they are. But I have asked the Nominating Committee to amend their report themselves by adding a name to the Committee on Standardization of Accounts. If they consent to do that all right. In any case, no objection has been taken to any of those committees.

Mr. Wright: That is not the question, it is simply to define the article in the constitution to avoid any further trouble. According to article 15 of the constitution we are empowered to amend this constitution at this session, so I will give notice of motion, with the consent of two-thirds of the members present, that this word "consider" in Article 15 shall be changed to "announce." This, of course, will be considered at tomorrow's session.

The President: Do you consent to receive this notice of motion? I think we might leave this matter of amendments until our next sittings, to allow the members to become familiar with the articles.

Mr. Wright: If we do that it prevents any amendment being made at this session. It is really unimportant, as far as that goes; there is nothing hinges on it now, but at the next convention there might be something very important come up. If it is thought more advisable a small committee might be appointed to revise the whole constitution and report at the next convention.

The President: I think so. I have had occasion to refer to this constitution during the year, and I think it is very incomplete.

Mr. Williams: I don't think the amendment, with the present constitution, would be got through this session any way; it requires, after permission being granted, after discussing, that the amendment be submitted to a committee of five named by the chairman; the report of the committee cannot be considered on the same day on which it is introduced. If you take your notice now you can't do anything till to-morrow; to-morrow you would refer it to a committee which could not report.

The President: It would be necessary for the committee to report this afternoon, and we could not take it up till to-morrow.

Mr. Breithaupt: I would move that the chair appoint a committee of three to look into this matter and report at the next meeting, if possible, on to-morrow morning.

The President: If they report to-morrow morning we cannot consider it at this session.

Mr. Wright: Would you refer the matter to the Executive Committee to bring in a recommendation at the next convention?

Mr. Breithaupt: The only reason why I mentioned three is because the executive is rather large, and three would be better able to get together and do the business. I am willing to change it to the executive if Mr. Wright thinks so.

Mr. Wright: It is a question for the majority of the members.

The President: Unless it is reported upon to this convention this afternoon, we cannot consider that at this convention.

Mr. Breithaupt: It that is not the proper interpretation, we might have a motion that it be left to the next session, and the change then be adopted. I would move that.

The President: It is moved by Mr. Breithaupt, seconded by Mr. J. J. Wright, that the Executive Committee be requested to suggest necessary amendments to the constitution at the next convention of the Association. Carried.

The President: The next order of business is the reading of papers.

Mr. Smith: Before that, I would like to move that the usual grant be given to our secretary as last year.

Mr. Leyden: I second the motion.

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

The President: I would call on Mr. Camp to read his paper on "The Use of the Dynamo and Storage Battery in Telegraph Offices." (See page 170).

Mr. Camp: Before reading the paper I would like to call your attention to an error made in fig. 2 of my paper; it was a mistake on my own part. You will find by one of the circles designating dynamos on the left hand side, it is marked "negative 350 volts"; this should read "positive"; the next one should read "negative 350 volts." The four circles should be lettered m, n, o, p, commencing on the left hand side. It is necessary, in order to understand the inspection of the diagram.

The President: You will agree with me that this is a very excellent paper on the subject. It has always been a difficult matter to get papers on telegraph subjects. This time we have secured a valuable one, and the subject is fully and well treated. The telegraph business, while comparatively an old branch of the electric

science, is, as we may see by the descriptions given by Mr. Camp, by no means at a standstill, but developing rapidly as the other lines of electrical application. The paper is open for discussion.

Mr. Camp: I would like to hear some expression from Mr. Smith on this subject. I certainly expected to have his experience; he has probably been more largely concerned in working dynamos as applied to telegraphing than I have. It is only in the present year that we have installed our own plant in Toronto. I think he could give a good deal more information on the subject than I have.

Mr. Smith: Mr. Camp's paper does not admit of much discussion; he has covered the ground so thoroughly and so concisely that there is nothing left to be said. As an historical paper, we are very glad to have it for the Association. We have nothing of its kind in our papers, and having this from Mr. Camp, who is so well qualified to write, we are glad indeed to have it. In speaking of our experience with dynamos and motor generators for telegraph work, I have a very vivid recollection of the first machine made; I think it was in 1882 it was brought out, and I think Mr. Wright had a good deal to do with it, and when the machine was first connected up, we stood by in fear and in trembling wondering what it was going to do, and finally the thing seemed to go off allright, and out of that developed the two large motor generator plants we now have in use in Toronto and Montreal. Subsequent development and improvement in the storage battery developed the fact that they are superior to the motor generator for most classes of work, and would to-day be adopted, I think, in all the larger places. I would move a vote of thanks to Mr. Camp for his paper.

Mr. Wyse: I second that.

The President: I have much pleasure, Mr. Camp, in tendering the thanks of the Association to you for your valuable paper. Yesterday we had a paper on power factor on which there was a little discussion, and the further discussion of it was adjourned until to-day. I would like to hear from any members on this subject. I think it is a very excellent paper which should be discussed.

Mr. Gosler: I suggest that you call on Mr. Leyden for an expression of opinion. He has had considerable experience in the use of induction motors, alternating current arc lamps, and synchronous motors, and is, I am sure, very well qualified to speak on the subject.

The President: We should be pleased to hear from Mr. Leyden, I am sure.

Mr. Leyden: I have not had an opportunity to read over this paper of Mr. Leonard's with any care, and anything that I can say would just be a sort of general expression of what my opinions might be, and I don't know whether they would be covered by Mr. Leonard's paper or not. The only thing I can say is this, that the keeping of your power factor, particularly at certain hours of the day, as high as possible, is of very great importance to the operation of your station, especially where you are supplying incandescent lights from the same generators as you are the motors and arc lights. It becomes a question that you have to figure on, on almost every installation of motors and lights and everything you put in, to find out and anticipate as nearly as possible what its effect will be on your whole service. On the other hand, the question of putting in induction motors and alternating arc lamps on your circuits has so many manifest advantages that you can afford to put up with some of the disadvantages in order to obtain the cheapness and reliability of operation that you certainly do secure by these means. On our plant we are changing all our arc lighting service over from direct current to series alternating current for our street lighting. So far, we have changed about half of it to series alternating current enclosed arcs. The power factor of that we find varies to a very considerable extent, according to the number of lamps we put on our circuit, but as far as the reliability of our service or economy of operation is concerned, it is all that we anticipated when we adopted that method. As compared with the series open arcs which we had

before, it certainly saves a very considerable percentage in the amount of power it takes in your lighting service; it also saves you a very considerable expense in the operation of your circuits; by that I mean both the expense of trimming, the expense of carbons and the expense of maintenance of the arc lamps. The series alternating arc lamps that are on the market to-day are quite simple and reliable in operation and cheaply repaired. We have had perhaps six months' experience with series enclosed arc lamps. While, of course, you necessarily have your troubles in any electric plant, you have nothing at all serious. The effect of this power factor and of these alternating arc lamps on the rest of your service amounts to about this, we have made a number of tests on our arc lighting circuits, and we found that our power factor will vary according to the number of lamps that we connect on that circuit. If we get all the arc lamps on that the circuit will possibly carry, we get a power factor of about .85, and it drops down very rapidly as you take arc lamps off your circuit. We run a pressure of 2,400 volts; on that we should be able to burn, theoretically, some 33 arc lamps, series enclosed; if we got the full 33 on, I think we would have a power factor of somewhere about .90 or .91, but we find that the circuits won't work well when we put the full number on, and we get more satisfactory operation by cutting it down to about 30; that has also the effect of reducing your power factor down to about .85. So it is a question you have to consider on both sides, whether you can put up with the annoyance of this power factor in order to save the expense of operation of your plant. I think the expense which you do save and the economy which you gain, and the simplicity of your system, certainly overbalances any evil effect of this low power factor, especially when you take into consideration that at certain times of the day when this power factor annoys you most, by having some synchronous motors on your line you can to a large extent over-balance it. Synchronous motors in large sizes I consider to be a very valuable, very handy, and convenient piece of apparatus to have on your circuits. This is especially true for motors which you must have in your own premises and under your own care, where you can regulate and operate them to the best advantage, or in places where you have some control over them through the attendant who operates them. On the other hand, my idea of small motor work is that the induction motor is much simpler; and while it has a low power factor in a great many cases, particularly on partial loads, still it is a commercial problem, and you have to balance one advantage against the other; and generally speaking, the result of our experience is this, that in large motors, and particularly where you have steady loads, I should employ synchronous motors; where you have distributed power in a factory where you want to divide it up into small units, the manifest mechanical advantages of the induction motors predispose me in their favor. I am talking in this general way because I have not read Mr. Leonard's paper with sufficient care to take it up in any detail.

The President: Might I ask a question or two. Apart from the lowering of the power factor induced by the use of alternating arc lamps, are they a disturbing element on your circuit to any extent, assuming you are running incandescent lights off the same generator?

Mr. Leyden: No, I should not say that they are. We cannot notice any effect of these arc lamps on our service in general, any more than, well, not as much as you would by starting a motor up to drive a lot of arc machines; that is, we throw one arc light circuit on after the other at the time of starting; the effect on our service of that is less noticeable than would be the effect of starting up a large motor to drive a lot of arc machines, and the attendant at our power house has to be watching his business, and gradually raise his field current on his generators in order to compensate this. By careful attention on the part of the switchboard attendant, he can put those arc lights on so that there is no serious interference with our incandescent lighting. I presume if we throw all those arc lamps, say 500

series alternating arc lamps, on at once, it would produce quite a very marked disturbance, but we don't notice it in our present system.

The President: Another thing I wished to ask is whether, in the case of synchronous motors used on your circuits, or more especially in your station within your control, whether you can regulate them day in and day out, as a general thing, so as to counteract drop, whether that is a practical quality of the motor that you can do that regularly.

Mr. Leyden: I should say that would depend to a very great extent upon the character of the load on your synchronous motor. If you have a rapidly fluctuating load, I have found the only way is to set your field current so high that it cannot be pulled out of step by any of the sudden jerks that come upon it, and let it run at that. If your load is steady all the time, you undoubtedly can operate that synchronous motor to very great advantage to the rest of your service. At the time that your power factor is low, and you set the field current on high, it will compensate for a great deal of the lagging current on your other service; and I should say that in most cases where you have synchronous motors the loads are steady, and under those conditions you can operate a synchronous motor so that it is of very marked benefit on the rest of your service.

The President: Have you anything further to say on the subject, Mr. Gossler?

Mr. Gossler: I don't know that I have anything further to say on the subject; it is pretty broad, and a subject that could be talked on for a very long time, but I don't think I will say anything on it now.

The President: How about Mr. Leonard?

Mr. Leonard: I have very little more to say. In what I said yesterday in my paper, and the discussion we had yesterday afternoon, I think I have expressed myself pretty fully. But it has certainly pleased me very much to hear from Mr. Leyden, as it brings a class of information to central station managers which is just exactly what we are looking for; particularly those that are either in the power business at the present time or contemplate going into it; and I wish the discussion could have been a little broader. I was very much interested in what Mr. Leyden said about arc lamps; it is a matter which I have not personally had a great deal of experience with, but I think it is one of the branches in connection with alternating stations which is certainly going to be a matter of a good deal of importance. They are trying to simplify our stations to the utmost, and we may some day realize the ideal of a single type of generator, as I said in my paper, with interchangeable parts, and one type of reserve apparatus—everything in shape so that an accident is not going to cripple the whole system. Besides these advantages, there is the advantage of the reduction in expense of operation. I think the arc lights can be operated at very much less cost in connection with a large alternating current generator, as compared with the necessarily small direct current machines. I don't know, Mr. Leyden, what system of compensation you are using. Is it the choke coil type of apparatus?

Mr. Leyden: Yes, the choke coil.

Mr. Leonard: I think I have nothing further to say.

Mr. Sangster: I may say one year ago about this time we adopted the series alternating enclosed arc lamps in our station; we didn't put in very many of them, about 90, I think, at that time, and we found them very satisfactory indeed. We purchased them from the General Electric Company, and we are using the transformer. We can put on 12 or 15 lights on the line and it does not seem to affect it in the least. We sometimes have to do that. We have two lines, 45 on one, and 47 on the other, using about 80 volts each, and we find it very satisfactory, both as to expense and care of the lamps and the general maintenance and cost, generally running one week on half a carbon; one carbon does two weeks. And we find it an advantage in every possible way. As far as the

power is concerned, I really think it does not seem to take any more power than we were using on the straight current before, and I think that station managers should look into this a little more. Of course, there is no doubt they are improving on the lamps every day.

Mr. Leyden: There is an interesting part of this alternating arc lamp business that does not pertain exactly to the subject of this paper, but I think it would be of interest to the members of the Association. There seems to be considerable talk, and there has been for a number of years, amongst the electrical fraternity, about the inefficiency of an alternating arc lamp as a light-giving device; that is, a great many prominent electrical engineers and scientists tell us that you don't get as much light out of the alternating arc light with the same consumption of watts as you do out of the direct current. However that may be, I have become thoroughly convinced that for the same number of watts consumed in an alternating enclosed arc lamp, having a proper reflector above it, that you get a more satisfactory street illumination than you do out of the old-fashioned open arc lamp, direct current. We have had them in Hamilton burning since last Christmas, and we have not had one complaint about the amount of light or the quality of it; on the other hand, we have had a great many people compliment us on the greater satisfaction of illumination that we have. We find this, that while the light apparently directly underneath the lamp is not as bright as with the old open arc, yet it is even and no shadows; it is evenly distributed around underneath the lamp, and up and down the streets you will find a more even distribution of light, and after you get off, say beyond 100 feet, there is apparently more light on the street than there is with the old arc lamp; so that the difference, particularly in the amount of light, is not noticed; that is, there is no dissatisfaction with the amount of light by putting in these series enclosed arc lamps. There is another advantage which is quite marked, that is, that you can hang them low down, close to the street, and in that way increase the apparent illumination on the street without having any blinding effect on the people looking directly at them. The source of light is apparently so much larger that you can look right at the lamp without being blinded, and people can drive under the lamps and see where they are driving, which is not the case with the old arc lamp. I mention that as a point which is often brought up against the use of these lamps.

The President: I would like to hear what has been Mr. Sangster's experience on that—whether there has been any complaint by the people as to the difference in the light.

Mr. Sangster: I would say that the remarks Mr. Leyden has made would apply, that it is the same with our city. We can lower the lamps and the light is diffused much more than with the open arc lamps. They like it much better. We get the light more direct with the open arc, but the enclosed type seems to diffuse the light much better and people are generally much more pleased with the lights since we put them up, and every day we hear expressions as to how nice it is to what it used to be, and yet we had a very good light before in our open arcs.

The President: Do you have choke coils on in the station?

Mr. Leyden: Yes, we have them in our station.

The President: That means a good deal of wiring many circuits.

Mr. Leyden: We had our circuits divided up practically in the same way as before, so that it didn't mean much difference to us.

Mr. Leonard: I was going to ask Mr. Leyden what his opinion was of operating arc lamp circuits with the transformers or choke coils distributed around on different parts of the circuit, as to whether there is any indication in his experience that such an arrangement would be objectionable in any way? Can the transformers, in other words, be relied upon to perform the work laid out for them without any attention whatever?

Mr. Leyden: We don't use the transformer method

in our service, so I am not prepared to speak, but in a number of places I have visited where they do use that method, they have them distributed in that way; instead of having the transformers right in the station they are put out in vaults around in different sections of the city, and then they have an arc light inspector whose business it is to go there and start them up and look after the lights while they are burning, and if anything goes wrong it is his business to return to this vault and see what has happened. In my own experience I don't know whether it is advisable or not.

Mr. Sangster: We have not had any trouble with the transformers in the station; we have just two lines running out from them, a line from each transformer, and they are supposed to carry 50 lights, and as I say, it is very satisfactory; 12 or 15 lights put on we do not seem to notice—it seems to pick up so quickly.

Mr. Reesor: I would move that a hearty vote of thanks be extended to Mr. Leonard for his very able and useful paper. I think it is one of the best papers we have had read at our conventions yet. (Carried.)

The President: I have very much pleasure in tendering to you, Mr. Leonard, the thanks of this Association. The paper is not only a very good one, but the discussion which it has provoked has proved most interesting. As you said a while ago, that is the kind of information that central station men want at the present time, and therefore what has been said to-day has been of value, I am sure, to the members of the Association.

On motion of Mr. Reesor, the convention adjourned to meet at 2:15 o'clock p.m.

#### AFTERNOON SESSION.

The President, in the chair, called the convention to order at 2.30 o'clock, p.m.

The President: The next order of business is the paper by Mr. Blair, of the Quebec Railway and Lighting Company, of Quebec, on a railway subject.

Mr. W. H. Browne: I would ask leave to move to amend the regular order of business and substitute therefor the election of officers. I understand that the Nominating Committee have their ticket prepared to offer, and action can be taken upon it very readily and we can dispose of that part of our business. I ask for a seconder.

Mr. Ross: I second the motion.

Mr. J. J. Wright: Would it be competent to change the order of business to that extent? The day is set apart in the programme, and it has been the usual custom to elect the officers on the morning of the last day. Any member of the Association who is unable to be present now, and could be present to-morrow, might reasonably take exception to altering an important part of the proceedings in that way. Not that I think it will make the slightest difference to the election, but simply as a matter of procedure.

Mr. Browne: I made my motion with full knowledge of the fact that that order of business was down for to-morrow. I did not understand that our order of business was the matter of a day. I thought it was competent for us to move for the amendment of the order at any time, and, believing the matter of nominations is practically all settled except the formal act, I thought it would save that much time.

Mr. Leyden: The object of this motion, I believe, is to arrange matters so that we can finish up our convention this afternoon, instead of carrying it over until to-morrow morning. We have only a small amount of business to transact, and one paper, I believe, to read, and if we could get through this afternoon there is no use carrying it over until to-morrow.

Mr. Wright: I think there is not the slightest doubt but that the business of the convention could be well and satisfactorily arranged this afternoon, but the city of Kingston have invited us here, and have entertained us most hospitably, and I think it would be very derogatory to them, and would appear to me to be a slighting of their reception, if we come here with the intention of holding a three days' convention and at the end of the second day we turn the whole thing up and go home.



Mr. Browne: I had better perhaps express myself more clearly concerning my motion. I did not know it was necessary to explain why I wished to change the order of procedure. I understand there are several members here who would like to adjourn this afternoon in order that they may still further enjoy the hospitality given by the city of Kingston, and then resume business to-morrow morning, and it was with a view of giving effect to that that I made my motion for the election of officers now.

The President: The holding of the election of officers now, to be followed by an adjournment until to-morrow morning, would practically close the convention.

Mr. Browne: There is another paper to be read.

The President: I know, but the attendance would be small; I am afraid there would be a general exodus of the members.

Mr. Wright: If there is any special reason for adjourning this afternoon, if they wish to take up something else this afternoon, it would be quite in order to adjourn this session of the convention till to-morrow morning, and take up the business then, but I think it would be considered a very impolite act to close the convention to-day and go away. I do not mean to say it would make the slightest difference financially or in any other way to the city of Kingston, but when people have done their best for us and given us a good time, I do not think it is exactly the thing to pick up our traps and leave.

The President: I may say, in justice to the citizens of Kingston, that they have offered us a visit to the penitentiary to-morrow afternoon, and asked us to attend the military tattoo given by the military band to-morrow evening.

Mr. Browne: The main purpose for making the motion for the election of officers by me to-day, is that I am told it will be practically unanimous. There will be left then for to-morrow simply the matter of reading the paper and the discussion of it, without any interference with it whatever, and the great desire of the majority this afternoon is to adjourn and take a visit on the river again.

The President: If there are no further remarks we will take the sense of the meeting.

Mr. Leyden: That being the case, I would most strenuously object to holding the election this afternoon. They have been scheduled in the programme you have sent out to be held to-morrow, and it has always been the usage of this Association that we should hold our election on the last day. I do not see any use of bringing them on now if you are going to continue the convention to-morrow morning.

The President: The motion is to take up the election of officers. Do you move an amendment? It is a question on which I feel rather embarrassed, because, while the convention can order me to do whatever they like by a majority vote, I feel that I have a contract to fulfil here and a programme to follow, and whatever is decided, I would like to be decided by a very large majority, if not a unanimous one; in fact, I would rather have it unanimous and then we could share the responsibility together. I do not believe, though, that there are any members who are not here to-day that will be here to-morrow morning, so that it will really make no difference. Are you ready for the question, gentlemen? We will now put Mr. Browne's motion that we should change the order of procedure, and take up the election of officers now.

The vote being taken, the President declared the motion carried by a majority of two.

Mr. Leyden: I move, seconded by Mr. Wright, that we adjourn until to-morrow morning.

The President: This motion cannot be discussed.

The President put the motion, and, on a vote having been taken, declared the motion carried, seventeen voting for and ten voting against the motion.

At 2:45 the convention adjourned until Friday morning at 10 o'clock a.m.

At 3 o'clock p.m. the members of the Association and their friends left on the steamer New York for a trip amongst the Thousand Islands, proceeding as far as Alexandria Bay. A unique feature of the return trip was the assembling of the members, at the call of the president, in the dining room of the steamer at 7 o'clock p.m., at which time Mr. Blair read his paper entitled "A Railway Subject, Giving Several Curves Showing up the Average Power During a Day, and Maximum and Minimum Requirements for Power Called for on the Quebec System." (See page 179.) The reading of the paper was greeted with applause.

Mr. Wyse: How long has the road been operated?

Mr. Blair: Three years. The heaviest wire on any commutator is three eighths of an inch.

Mr. Wyse: Is your traffic heavy as well as your grades?

Mr. Blair: On those grades it is, the heaviest grades carry the heaviest traffic in town. There has not been a commutator flash on back on the road for eighteen months. The water and slush in the spring time have never given us any trouble, it is the hard snow in the winter. \$16,300 is the total cost chargeable to snow. I may say in our company we have no depreciation account, everything goes in to maintenance account.

Mr. Wickens: Depreciation and cost of repairs go in together.

Mr. Blair: They go in together.

Mr. Browne: That is, you keep the road up to the standard?

Mr. Blair: Yes, up to the standard for railways.

Mr. Wyse: Do you actually have to cart the snow away?

Mr. Blair: In some cases we have to actually cart it away to some convenient place for the time being, and then the next day take it away permanently.

Mr. Wyse: Then you have to cart it twice?

Mr. Blair: In almost every case we have to cart it twice. In some cases, without exaggeration, there are four feet of snow above the top of the car; that, of course, has got to be shovelled out. A car will run into these drifts. Anybody who knows Quebec will know the point I refer to, Chateau Frontenac.

Mr. Wyse: Where do the foot passengers go?

Mr. Blair: They have to come in along the car tracks.

Mr. Gosler: You pay the tenants fifteen cents per lineal foot for the removal of the snow how often?

Mr. Blair: Once a year.

Mr. Wickens: What is the length of your day?

Mr. Blair: Eighteen hours.

Mr. Wyse: The power supply is water power, is it not?

Mr. Blair: Yes.

Mr. Wyse: What do you use the rotary converter for?

Mr. Blair: For the railway at St. Anne-de-Beaupre, five hundred volts are fed into the wire. I may say there are eighteen stops made in twenty-one miles. We have as many trains on now as we can put on in that section. They will, in all probability, have another line laid in the near future.

Mr. Edwards: What kind of brushes do you use?

Mr. Blair: We use the Valley Whiting.

Mr. Wyse: What pressure do you put on each brush?

Mr. Blair: That depends on which car it is. We keep the hill cars and level running cars separate on our road.

Mr. Wickens: You run the same car over the hill as on the level?

Mr. Blair: Yes, but we are drawing more current than on the level.

The President: I want to say, gentlemen, in justice to Mr. Blair, that he advised the committee on papers a very short time ago that his paper was not written, and owing to pressure of work he was not able to write it, and the chairman of the committee on papers consulted me and we concluded that as we had decided to have a paper on a railway subject, and as it was too late to ask anyone else to write it, he should insist that Mr. Blair should write this paper. This seemed to be a little cold-blooded, but the interests of the association required it, and we were firm, and to our great satisfaction Mr. Blair replied that he would write it. That is not more than a couple of weeks ago, and this work has been done since, and we are certainly very much indebted to Mr. Blair.

Mr. Wyse: You must have a good method of keeping records.

Mr. Blair: We keep records of everything.

Mr. Wyse: You keep the records by numbers?

Mr. Blair: By numbers of the car and so forth. The men who do the work keep the records during the month, and I take the whole of them and enter them in my own book once a month.

The President: That shows the value of keeping records.

Mr. Browne: It shows the value of systematic attention and records. I certainly think the thanks of the association are cordially due to Mr. Blair, and I move that a vote of thanks be passed to him.

The President put the motion, which, on a vote having been taken, was declared carried, and the thanks of the association tendered to Mr. Blair.

#### THE BANQUET.

The large dining hall of the Hotel Frontenac was none too large to accommodate the members of the Association and invited guests who assembled on the evening of August 30th to participate in the annual Association banquet. Mr. A. A. Dion, the President, presided, and gracefully discharged the duties of toast-master.

After the singing of the National Anthem in response to the toast to Her Majesty the Queen, the United States Vice-Consul, Mr. Twitchell, was asked to respond on behalf of the President of the United States, which he did in an able and interesting manner. Mr. Wm. H. Browne, in a pleasing speech, replied on behalf of "Our Association." Excellent speeches were delivered by Mayor Munne and Alderman Donnelly on behalf of the "Corporation of Kingston." The names of Messrs. Simmons, Neekle, and ex-Alderman Belun were associated with the toast to "Our Guests." The toast to the "Allied Interests" drew eloquent replies from Messrs. M. H. Folger and E. E. Cary. Mr. Pense, editor of the Kingston Whig and President of the Board of Trade, responded for the Press, and Mr. Shannon, city clerk, formerly editor of the Kingston News, for the Ladies. Alderman Donnelly favored the company with a recitation, Alderman Craig contributed a song, the local military band and the Italian orchestra, engaged by Mr. Cary, each contributed a number of pleasing selections.

#### THIRD DAY.

At 10:30 o'clock a.m. the convention resumed.

The President: The first thing on our programme this morning, to carry out the resolution passed yesterday, is the election of officers. The Nominating Committee have reported yesterday suggestions as to the election, and I wish to repeat that suggestions made by the Nominating Committee are in no way binding on any of the members, but nominations can be made and received for any of the offices or the committee. The first office is that of President, and the Nominating Committee have recommended your humble servant (Carried.) For First Vice-President the Nominating Committee suggest the name of Mr. E. E. Cary, St. Catharines. (Carried.) For Second Vice-President, the committee recommend Mr. P. G. Gosler, Montreal. (Carried.) For Secretary Treasurer they recommend Mr. C. H. Mortimer, Toronto. (Carried.) With regard to the Executive Committee, as you know, five of the old members are to be re-elected, after which five more members are elected. Of the old Executive Committee the Nominating Committee wish the following to be retained: Messrs. A. B. Smith, O. Higman, D. R. Street, J. J. Wright, B. F. Reesor. Carried. Now there are five other members of the Executive who may be chosen from any members of the Association. The committee suggest Messrs. F. Simmons, A. Sangster, John Yule, Ed. Slade, H. R. Leyden, W. Williams, and J. F. H. Wyse. There are more names suggested than we require; we only want five names to complete the list. I presume from this that the Nominating Committee wish us to make a choice from these names.

Mr. Ross: I nominate Mr. Camp, of the C. P. R. Telegraph Co., Montreal.

The President: I would ask Mr. Purcell and Mr. Reesor to please act as scrutineers. Are there any other nominations for the committee before we close it? Those going out on last year's Executive are Messrs. Carol, Black, Sangster, Wyse and Browne. Mr. Sangster and Mr. Wyse are proposed in this list.

Mr. Wyse: Would it be in order for me to nominate anybody else? If so, I would like to nominate Mr. Browne.

The President: I have no objection. I want to give the fullest freedom possible.

Mr. Wyse: Then please add the name of Mr. W. H. Browne.

Mr. Cary: I hope it will not be improper to call to your mind a short speech that was made at the banquet by Mr. Simmons. Some of you may not recollect it, but those of us who have endeavored to do a little here before the convention in Kingston realized that we could not get help for love or money, could not get plumbers, decorators, or anybody. Mr. Simmons took off his coat and worked like a day laborer. We wanted him to use his wits, but he had to use his hands. I feel that, if you all know the value of his services, you will only be too happy to put him on the Executive. And, in addition to that, he lives near Ottawa for the next year.

The President: While the ballots are being counted, we might improve the occasion by taking up the selection of a place of meeting.

Mr. Wyse: I would suggest that Ottawa be the place for the next meeting, and the approximate date as soon after the adjournment of parliament there as possible.

Mr. Leonard: I second that.

The President: Do you wish to have the date in the motion or leave that separately? There might be some discussion as to the best date.

Mr. Wyse: Keep that separate.

The President put the motion that the convention be held in the city of Ottawa next year, which, on a vote having been taken, was declared carried.

The President: I wish to say this, that I am very much pleased indeed that the convention should be in Ottawa. I didn't make you any formal invitation or press you to come to Ottawa simply because I thought that, having done so once and not being able to carry out the programme, we should not stand in the way of any other place which would like to get the convention or which was entitled to it. I wished, while we were desirous of having it in Ottawa, that the suggestion should come from outside, as it did. That was my reason for not extending to you an invitation. But let it be understood that we are very happy to have you come to Ottawa, and we will do our best to entertain you and give you a good convention. As to the date, Ottawa is peculiarly situated in that way. The sessions of parliament bring many to the city, and it taxes the hotel accommodation to the utmost, and during the last few years the sessions have extended far into the summer. Parliament adjourns late in June and sometimes well into July; for that reason the old favorite date, about the end of June, could not hold in Ottawa. I don't think it would be safe to select any date previous to the 15th of July. I think any time from the 15th of July on would be acceptable to us in Ottawa. It would be a matter of which would be the most convenient date for the members to get away. We might hear some expressions of opinion on that point.

Mr. J. J. Wright: I would move that the matter be referred to the Executive Committee, having in view what you say.

Mr. Kammerer: I second the motion.

The President: I would like to see the Executive Committee tied up as to the time when they must decide, so that there will be no possibility of leaving it till the last month. The date should be published months before.

Mr. Wyse: The constitution provides that the date should be approximately fixed now.

Mr. Wright: I think "approximately" would mean as near after the prorogation of the House as possible. I think that was understood.

The President: That is a question. It might be desirable to wait and have it later.

Mr. Wright: It would not be earlier than the end of June, that is the usual time we should have the convention, and it should not extend later than the middle of July. The present time is a most inopportune time to hold a convention in my opinion, but, of course, force of circumstances compelled us; but any time up to about the middle of July would be a suitable time.

The President: There is nothing in the constitution about the approximate date.

Mr. Street: Article 19 gives it.

The President: The only motion before the chair is that by Mr. Wright, seconded by Mr. Kammerer, that the fixing of the date be left to the Executive Committee. (Carried.) If there is any general business we might go on with that.

Mr. Yule: I would like to put before the meeting this resolution:  
Resolved that the hearty thanks of the Canadian Electrical Association be extended to the Mayor, corporation, and citizens of Kingston, the president of the Board of Trade, Kingston, the Kingston Street Railway Co., the Kingston Electric Light Co., the local committee, composed of Messrs. J. W. Simmons, Breck and Nickle, and the warden and officials of the Kingston penitentiary, for the hospitable and courteous treatment accorded to the members of the Association, and to the gentlemen of the press for their full and correct reports.

Mr. Yule: I think I am voicing the sentiments of the members when I say that Kingston is an ideal place for a meeting of this kind. They have the facilities, and they apparently have the heart to entertain, and they have done it most excellently. I do not know that we have ever visited a place in which we have received more general recognition and more kind and courteous treatment. I have much pleasure in moving the resolution.

Mr. Kammerer: I have much pleasure in seconding the motion.

The President: I presume the motion is carried. The election results in a tie. I may say that Messrs. Simmons, Browne, Camp and Yule are elected. There is a tie between Mr. Leyden and Mr. Slade. You will kindly vote again on Mr. Leyden and Mr. Slade.

Mr. Kammerer: While the ballot is being prepared for this I would ask that you request Mr. Yule to retire for a few moments.

The President: Mr. Yule, will you kindly retire?

Mr. Yule having retired, it was moved by Mr. W. H. Browne, Montreal, seconded by Mr. J. J. Wright, Toronto, and resolved, that more than a year having elapsed since the inauguration of the legislation pro-

cured by the Legislative Committee for this association under the guidance and leadership of our past president, Mr. John Yule, this Association, recognizing the great advantage and element of justice that has been brought to the operating companies of Ontario by this legislation, feel it incumbent upon the Association as such to record in its minutes the hearty appreciation which it entertains for the original and continued work of Mr. Yule on behalf of such legislation, and that a copy of this resolution properly engrossed be prepared and sent to Mr. Yule, with the hearty compliments of this Association, at an early date as possible.

On Mr. Yule's return the president put the motion, which, on a vote having been taken, was declared carried unanimously amid applause.

Mr. Yule: It gives me very great pleasure to hear your expressions so clearly set forth in your resolution. I give you my hearty thanks for keeping in mind the work that has been done by the Legislative Committee. You all know what has been done. Some three years ago we were attacked in Guelph by an attempt to pass a by-law to practically wipe us out. The by-law was defeated. I may say to my mind then it was the greatest injustice to an enterprise of a very problematical character. No one knew they would ever receive a return on the investment when they took the chance, and then as soon as the corporation came to think that you were receiving a dividend on your investment, they wanted to practically confiscate the property. I didn't go into this matter entirely for the sake of the companies in Ontario. I had principally in view my own company in Guelph, and there is no one more pleased than I am that we were as successful as we were, and I was very happy to support the Legislative Committee. The companies responded not only cordially and handsomely with funds, but they came down to Toronto when called on for assistance, and rendered very efficient aid. We have not only succeeded in getting the legislation, but we succeeded in convincing the members of the Legislative Committee that our position is right, and they were doing us no more than justice; during the last session they confirmed that position by giving us a further trial to work out the Connee Bill. Three companies during the last two or three months have received the benefits of that bill to the extent of hundreds of thousands of dollars, and there are more to come. If I were to give a word of warning to the companies throughout the province, I would say they had better not be too aggressive in their dealings with corporations. Meet the corporations as soon as any advance is made, and fairly and squarely deal with them as they would deal with any other item of business. It appears to me this movement is going to grow; it will grow for a time, and then I think it will die out after they have had a little experience. I noticed an item in the Kingston paper referring to one place where they have had a municipal plant for a number of years with which they were going to make money and do wonders, and when they got in their last tax bill they found about three or four mills over and above paying for their light to help pay for the electric plant and maintenance, and the way they did was they passed a by-law to raise funds to put in their plant, and they seemed to be under the impression that that was the end of the matter. They don't realize that the life of an electric plant is anywhere from six to twelve years; these debentures probably run for twenty years instead of ten years, and they had to pass another batch of debentures to rebuild and reconstruct, and possibly extend, and before the 20 years are up, if I am not mistaken in my judgment, they will have three lots of debentures going. Companies do not have that advantage, they have to pay as they go; they have to provide for depreciation, for extensions, and they have to provide to put in modern improvements as electrical machinery is developed. I thank you heartily for your kind recognition of my assistance to the electrical companies of Ontario.

Mr. J. J. Wright: In the meantime, while the meeting is waiting for the result of the ballot, I would like to move, seconded by Mr. Reesor, that it be resolved that the hearty appreciation and thanks of this Association be extended to the gentlemen who have prepared the papers presented at the meetings of this convention; and that the secretary forward a copy of this resolution to the parties indicated. Carried.

The President: I have to announce that Mr. Edward Slade is elected. Therefore the Executive Committee is as follows: Messrs. A. B. Smith, O. Higgins, D. R. Street, J. J. Wright, R. F. Reesor, F. W. Simmons, W. H. Browne, J. W. Camp, John Yule, and Edward Slade.

The President: As there seems to be no business before the chair, I want to take up your attention for a minute or two to tell you how extremely gratifying it has been to me to see such a large attendance at this particular convention. You are aware of what the circumstances were and how difficult it was, and how improbable it was, that the attendance would be large. At least, that was my impression; and it has been a very agreeable surprise to find that notwithstanding all these things, we have had a fair assembly and a successful convention. The papers have been good, and altogether I think that we cannot feel that we have lost so very much by postponing the convention to so late a date as we did. I came here with the determination to step out of office. I was exceedingly thankful for the confidence that had been reposed in me, and I was quite satisfied to put in the year, and then make room for someone else. It was only through the earnest solicitation, I may say, of friends that I consented to be re-elected. I rather think as a general rule, it is better for an Association of this kind to change its officers a little oftener than two years. To those who are entitled to the positions, and care to take them, it is rather a long time to wait two years between each election, and I don't approve of two year terms as a general rule; and that was one reason why I did not wish re-election, but so many things were said to make it desirable that I should accept this year that I finally consented to do so, and the convention being in Ottawa next year, was a special inducement. I will endeavor, during the year, to look after your interests and to organize a convention in Ottawa which shall be as successful as any which has been held heretofore. I trust I may receive the assistance of each and every one of you if I should have to call on you. (Applause.)

Mr. W. H. Browne: Brethren, there being no further business before this convention, and in view of the fact that the grand hospitality of this city has robbed a great many of us of our ordinary amount of repose, I rise to suggest and move a motion of adjournment of this convention until our meeting at Ottawa next year.

Mr. J. J. Wright: I second the motion.

On a vote having been taken the motion was declared carried, and the convention adjourned at 11:45 a.m., to meet in Ottawa in 1901.

**THE USE OF THE DYNAMO AND STORAGE BATTERY IN TELEGRAPH OFFICES.**

By W J Camp, Superintendent C P R. Telegraphs.

Previous to 1871, acid batteries of various kinds were used for main telegraph circuits, and the Daniel form of blue-stone battery for the locals, or sounder circuits. Between 1870 and 1874, what is known as the "gravity battery" was brought into general use. This battery is a modification of the Daniel cell, but the sulphate of zinc and sulphate of copper solutions are kept separate by the difference in their specific gravity instead of by means of a porous cup. This form of battery is very constant and requires but little attention as compared with the acid. To obtain the best results, not more than two or three wires should be worked from each bank, although frequently ten or more are thrown on one bank of battery. When this is the case the results are unsatisfactory, particularly during wet weather, and when wires of different lengths are combined together. A separate bank is required for each duplex or quadruplex set, and also a local battery for each sounder circuit. It is true that, as each cell gives out about one volt E.M.F., the exact power required for each multiple circuit or local can be very accurately adjusted by adding to, or taking off from the number of cells; and on this account, a great many chief operators raised objections to dynamo currents. However, even this advantage has been compensated for.

While the change from acid to gravity batteries effected a great economy in maintenance, and improvement in the working of the telegraph wires, a much greater stride has been made by the introduction of the dynamo and storage battery in telegraphic work. I will deal first with main lines, and then with local, or sounder and transmitter circuits.

About 1880 dynamos were introduced by the Western Union Telegraph Co. at New York for supplying current to the single working wires. The means for doing this are comparatively simple. Two dynamos are used, each of a voltage high enough for the longest wires; the positive pole of one and the negative pole of the other dynamo are earthed, and the opposite poles connected to two buss wires. The various single working wires are connected to these buss wires, according to the polarity required, through an artificial resistance for each wire. The Western Union in the United States, and both companies in Canada use incandescent electric lamps for these resistances. The Postal Co. in the United States uses German silver wire wound on tin tubes, so designed that, should any heating take place, it is counteracted by a current of cold air which passes through the tube. Additional resistances were inserted on the shorter wires to make all lines approximately of the same electrical length. These resistances were usually of fine German silver wire wound on the handle of a wedge which was inserted with the instrument wedge in the spring-jack of the switch. It has been found much more satisfactory, however, to have several dynamos giving different voltages, and the use of the resistance wedges abandoned.

The next step was to apply dynamo power to duplex wires. For many years back the polar duplex has been used all over America. When using the gravity battery the transmitter (pole changer) was arranged to reverse the poles of a bank of battery from earth to line and vice-versa. This pole-changer required very accurate adjustment in order to reduce the time of reversals to a minimum; the least break in the circuit, or short-circuiting of the battery, being liable to affect the signals at either or both terminals of the line.

For dynamo power the earth connection is omitted in the pole-changer; the armature is connected to the line circuit, the front contact to the negative buss wire, the back contact to the positive, and resistances of 600 or more ohms inserted ahead of each buss wire to prevent arcing at the contacts of the pole-changer.

Then came the application of the system to quadruplex circuits. Great difficulties had to be overcome to effect this. Two entirely different systems are in general use, one by the Western Union and Great North Western Telegraph companies and the other by the Postal Telegraph Co. The Canadian Pacific Co. uses the W. U. system at Toronto and Montreal and the Postal system at other points.

A few general remarks with reference to the duplex and quadruplex as worked with gravity batteries may be of interest at this point to those who have not read up the subject.

Duplex is a system by which two operators can transmit simultaneously in opposite directions. This is attained by winding the receiving relays with two coils of wire in opposite directions, one winding being connected to the line, and the other to a set of resistance coils and condensers which are so adjusted that the electrical length and static capacity are the same as the real line. The home power divides equally, half passing around the core in one direction to the real line, and half in the opposite direction to the artificial line; the result being that the core is not magnetized by it, and is not susceptible to any change in the home power. As the power coming over the line from the distant station only passes through one of the coils, and there is none coming in from the artificial line to counteract it, the core is affected by any change in power at the distant station. The receiver is a polarized relay whose armature closes the sounder when moved in one direction, and opens it when moved in the other. The transmitter is an instrument worked by an ordinary telegraph key and local circuit. It is so arranged that, when the key is depressed the negative pole is connected to the line, and positive when the key is opened.

Quadruplex is a system by which two operators can transmit one way simultaneously with two operators transmitting in the opposite direction, i. e., four messages can be sent simultaneously on one wire, two in each direction. The arrangement by

which two operators transmit in the same direction may be briefly described thus:

A transmits by reversing the polarity to line the same as in duplex, and C receives by means of a polarized relay. B transmits by increasing and decreasing the same power which A is reversing; D receives from him by means of a neutral relay which responds to power of any direction if it is strong enough. The retractile spring of the armature is adjusted so that the weaker power does not move the armature, but when the full power is on the spring is overcome. By double winding both receivers at each end as explained for the duplex, we obtain "two circuits in the opposite direction."

In order to obtain satisfactory work all resistances must be maintained at their relative length. When using gravity battery transmitter "B" simply adds more cells to "A's" battery, or takes them off when closing or opening his key. A resistance coil to compensate for the internal resistance of the extra battery is automatically cut out, or inserted, thus maintaining the total electrical length of the line from earth to earth.

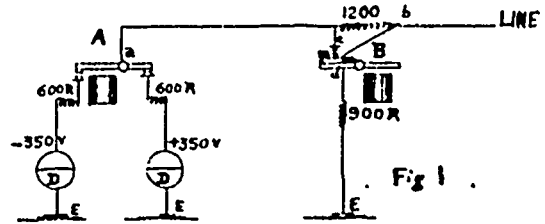


Fig. 1.

The W. U. system of transmission is shown in Fig. 1. The resistance from A to earth through the dynamo circuits is 600 ohms no matter which position transmitter A is in. When transmitter B is closed the resistance from b to earth is 600 ohms because the 1200 ohm coil is shunted out by contacts c and the leak of 900 ohms is disconnected at d. The full power of either the negative or positive dynamo goes to line through one of the internal resistances of 600 ohms. When the transmitter B is opened the 1200 ohm coil is inserted between b and c making the total resistance between b and earth via the dynamo of 1800 ohms. There is also another route to earth, through the leak of 900 ohms. The joint resistance of these two routes is 600 ohms, as found by the formula  $\frac{A \times B}{A + B}$  or  $\frac{(1200 + 600) \times 900}{1200 + 600 + 900} = 600$  thus maintaining the same resistance between b and earth for all changes.

The amount of power passing b to line is however reduced to  $\frac{1}{2}$  when transmitter B is open, first, on account of the added resistance of 1200 ohms, and second, on account of the leak of 900 ohms. In other words when transmitter B is closed the power passing to line is three times as much as when B is open.

By changing the added resistance to 1800 and the leak to 800 ohms the difference is then as 4 to 1 and the internal resistance still maintained at 600 ohms.

The principle of the Postal system of quadruplex transmission is shown in Fig. 2. For the purpose of explanation, transmitter A is shown as two separate instruments worked simultaneously

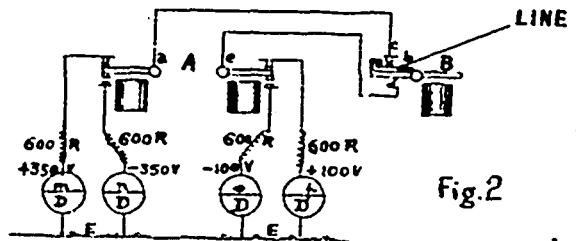


Fig. 2.

by one key. The one on the left gives 350 volts to the line and the one on the right 100 volts. Opening of the key connects either m or p to line according to the position of transmitter B; closing of key connects either n or o; or opening A gives positive pole and closing gives negative. Closing transmitter B connects line through b, c, a, to dynamos m or n (350 volts) according to the position of transmitter A; opening transmitter B connects line through b, d, e, with dynamos o or p (100 volts). Thus B transmits by increasing or decreasing the power sent out by A. As the resistances in each of the four leads to the dynamos are the same (600 to 1000 ohms) the internal resistance from b to earth is constant.

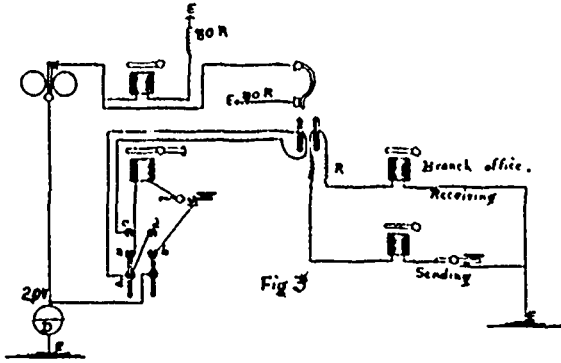
It is hardly within the scope of this paper to compare one system with the other. It is sufficient to state that either system has certain advantages and both give excellent results. The receiving instruments are the same as for gravity battery.

The dynamos are made of sufficient voltage for the longest quadruplex circuit from the office. When the same machines are used on comparatively short circuits a resistance coil of 1000, or more, ohms is inserted between b and the receivers.

We now come to the locals. For ordinary sounder circuits a very simple plan is to use a dynamo of 6 volts and connect all sounders in multiple. The sounders are wound to 20 ohms resistance; but in nearly every office where dynamos are used there are also quadruplex or duplex sets, and it is often necessary to connect these as repeaters. There are a number of systems, but I will only describe the one in use by the C. P. R. This is, I think, the most simple yet designed. It is shown in Fig. 3. Each half quadruplex or half repeater is shown as a



duplex set. All sounders and transmitters are wound to 20 ohms and, by resistance coils, each local circuit is brought up to 100 ohms. The dynamo gives from 20 to 25 volts. The former is found to be sufficient. The figure shows the instruments in a normal position, except that the transmitter wedge should be inserted in the spring jack. Starting from the dynamo the receiving circuit passes through the relay contacts, 20 ohm sounder, 80



ohm coil, earth to dynamo, the leg through jack being open at c. The sending circuit is from dynamo through switch b, key, 20 ohm transmitter, switch a, d, wedge, back contact of jack, 80 ohm coil, earth to dynamo.

To work as repeaters the wedges of the two sets are exchanged, that of No. 1 set, being inserted in No. 2 jack and No. 2 wedge in No. 1 jack; the table switches a and b on each set are reversed.

The circuit then is, earth, dynamo, relay contacts, 20 ohm sounder, 80 ohm coil, earth; also from relay contact to top of jack, front of wedge of No. 2 set, c, a, transmitter, key, b, d, back of wedge, coil and earth. The circuits from No. 2 set are the same. Any break in contacts of relay opens its sounder and also the transmitter of the other set. Thus signals received from the line on No. 1 set are automatically retransmitted over the line connected to No. 2 set, and vice versa.

To extend the locals of a duplex to a branch office, the loop wedge is inserted in the spring jack on top of the transmitter wedge; switch a. is turned up; switch b down. Circuits are then as follows: Receiving side, dynamo, relay, sounder, coil, earth; with leg from relay contacts to top of jack, front of wedge, coil, line, branch receiver and earth. The resistance coil is adjusted so as to make the circuit from wedge to branch earth total 100 ohms including branch sounder.

Sending side, dynamo, b, key, transmitter, a, c, front of transmitter wedge, back of loop wedge, coil, line, branch sounder, key and earth. The resistance from wedge to distant earth is 80 ohms including sounder. On this circuit the resistance of the transmitter is added making a total of 100 ohms.

Sometimes the dynamos are operated from a common shaft driven by an electric motor or other power, but the plan most generally adopted is to use motor generators, each machine working independently. In order to be reasonably certain of a continuous supply of power, spare leads are run to different power stations, and spare machines are also kept in readiness, so that not more than a minute or so is lost at any time.

In cities where continuous power cannot be obtained from at least two different stations, storage batteries are now largely used. Generally speaking, the wiring of a telegraph office, from the discharge leads of a storage battery to the instruments, etc., is the same as for dynamos, but extra switches have to be used for connecting the various banks of battery with the charging or discharging circuits. Various devices are used, but as I consider the C.P.R. system the most flexible, I will describe it only.

At Vancouver the Winnipeg street railway power is transformed by two motor generators; one reducing the power to seven volts of twenty amperes capacity for charging local batteries; and the other to 130 volts, 5 amperes, for main batteries. In Ottawa a 250 volt power is reduced to seven volts for the locals and the mains are charged direct without reduction. In St. John the 112 volt lighting circuit is used. The locals are in two banks, of two cells each, of chloride accumulator, type E 9, one bank being charged while the other is discharging. There is no dead resistance inserted in the local circuits, as is the case where dynamos are used, extra cells providing the necessary power when quadruplexes or duplexes are extended to branch offices.

The switch for the main batteries consists of a series of spring-jacks and wedges, so designed that the jack is open, and a wedge cannot be inserted when reversed. The cells (which are C3 type of accumulator) are arranged in banks of 40 or more as needed to meet the requirements of the office, and of a voltage sufficiently below the charging circuit. The negative pole is connected to the top of a wedge and positive to bottom. The wedges are all interchangeable. As many banks as required can be charged simultaneously.

In Canada, the C. P. R. has storage battery plants at Vancouver, Winnipeg, Ottawa and St. John, and dynamos at Toronto. The new Telegraph building in Montreal will also be equipped with dynamos. At present power in the latter place is obtained from the dynamo plant of the G. N. W. Tel. Co. I understand that the W. U. and G. N. W. Co's have storage plants at St. John, Quebec, London and Ottawa, and dynamos at Toronto and Montreal.

The adoption of either dynamos or storage battery for power on telegraph lines has very materially improved the working of

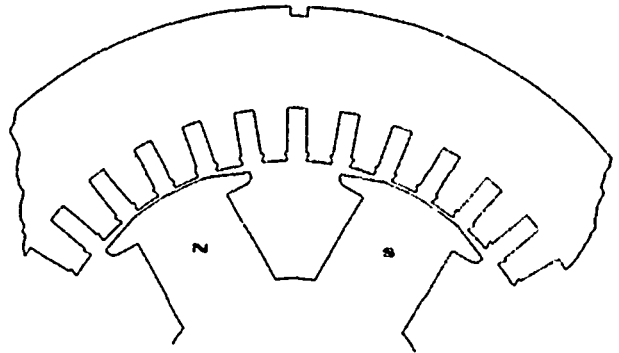
the lines, and at the same time effects a great economy. One or the other will gradually replace gravity batteries for all main lines; and the time may come when even the locals at wayside stations will be worked by storage battery cells which will be charged at some central point and sent out by train.

**CONDITIONS AFFECTING THE WAVE FORM OF ALTERNATORS.**

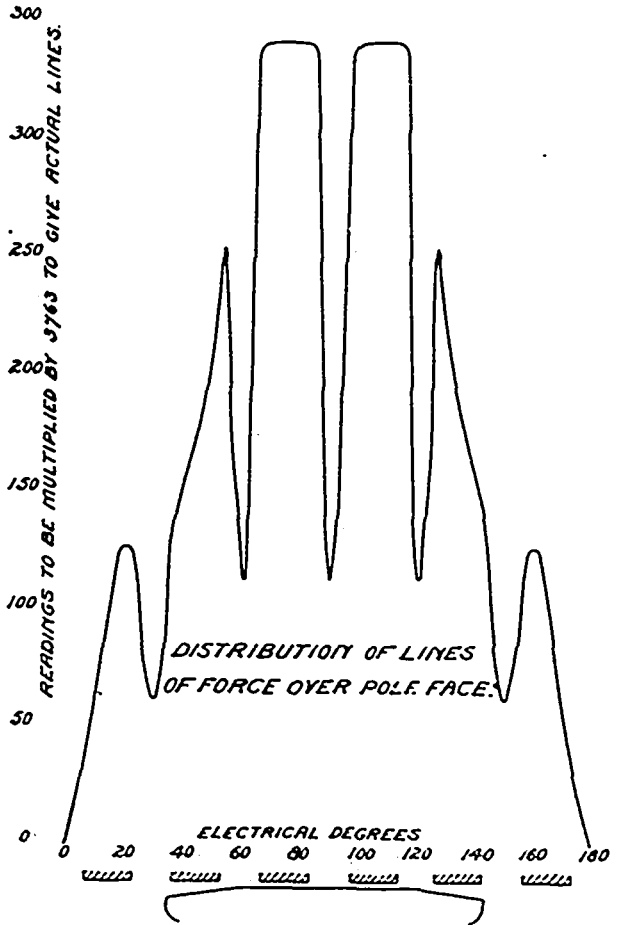
By L. A. HERDT AND E. M. ARCHIBALD.

In what is given below it is not intended to consider the question of wave form as affecting successful distribution, but rather the extent to which the e.m.f. wave of certain machines may change under not unusual commercial conditions.

In alternator specification, along with regulation, heating and



other clauses, it is often argued that a clause relating to wave form should be included, but as comparatively little is known of the extent to which the wave form of modern alternators change with amount and character of load—to say nothing of the effect of such changes on the operation of the receiving machinery—it seems advisable that more information be accumulated before



**PLATE I**

FIG. 2.

very rigid wave form requirements are inserted. However, with a view of throwing more light on the subject, a series of experiments were undertaken in the electrical engineering laboratories of McGill University during the past winter and though not complete, certain results already obtained may be of interest.

For the purpose in hand a number of different types of alternators were available, some with a concentrated armature winding, and some with distributed windings of the revolving arma-

ture, revolving field and inductor types. The e.m.f. waves were obtained from each at different field excitations, different armature currents and different power factors, lagging and leading. The distribution of induction in the air gaps under different conditions was also obtained by means of small test coils suitably placed. As illustrating the general effect of lagging and leading armature currents in relation to type of machine upon induction distribution and consequent wave form, the results obtained upon a revolving field distributed winding alternator, part of the magnetic circuit of which is shown in Fig. 1, Plate 1, and upon

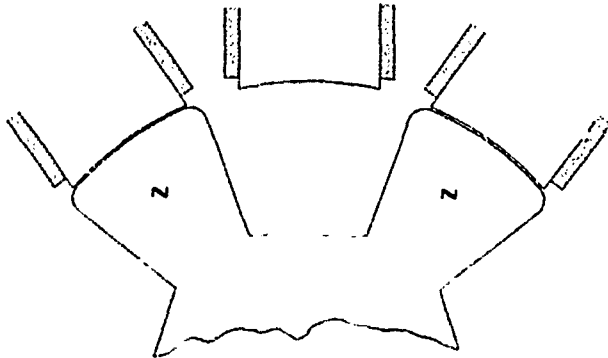


PLATE 2.

an inductor type machine with a concentrated winding and poorly shaped inductor lug, shown in Plate II, may be cited.

In Fig. 2, Plate 1, is seen the distribution of induction in the air gap of the first machine for the particular position of the field pole shown. As might have been expected, the larger part of the induction enters the armature through the teeth, but about one-third, in the case of those teeth immediately opposite the pole, passes into the armature by way of the slot due to the practical saturation of these teeth. The no load e.m.f. wave of each coil of the distributed winding may be constructed from the no load induction distribution curve by the method of tangents and for

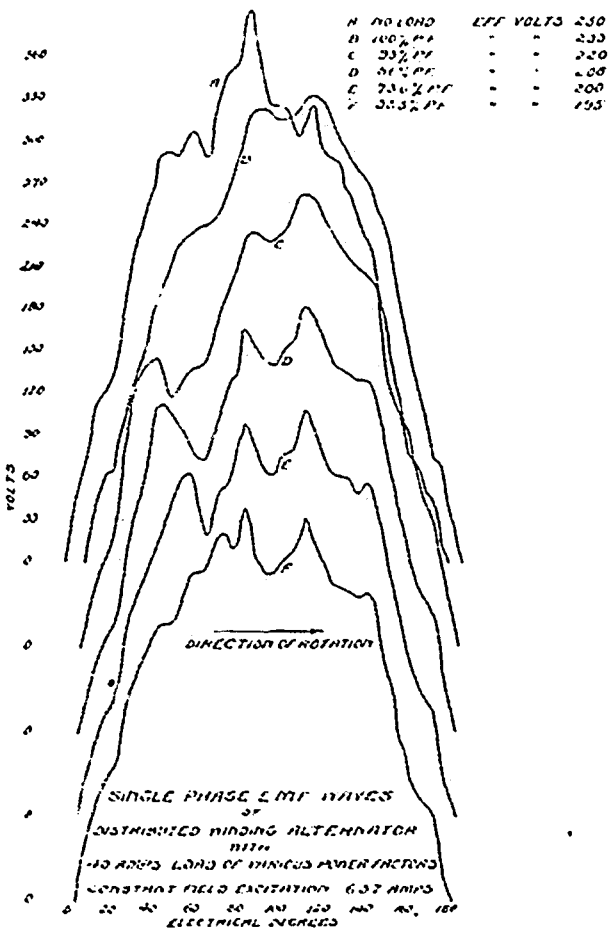


PLATE 3.

any group of coils by taking the algebraic sum of the instantaneous e.m.f.s. of the individual coils. This has been done and the results found to check quite well with experimental values.

Plate 3 gives a series of e.m.f. waves for this machine connected as a single phase alternator at no load and full current load of different power factors, lagging current; the field excitation being kept constant.

Plate 4 shows the e.m.f. waves of the same machine connected as a quarter phase generator under similar conditions. It is to be noted that while the wave form and terminal volts both change a marked degree with power factor, the change is not nearly

so great as in the case of the second machine having a concentrated winding and comparatively weak field.

With a concentrated winding the conditions are different, the

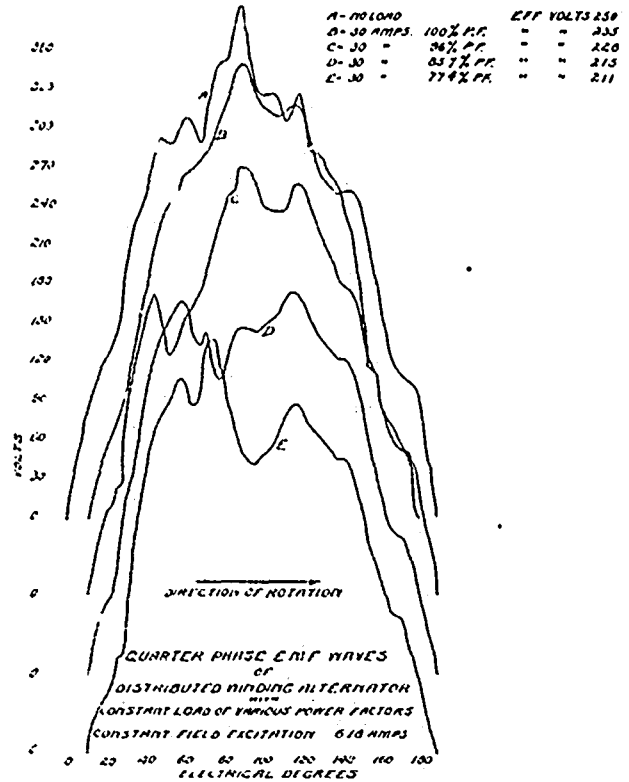


PLATE 4.

wave form not being a function of the angular displacement of the armature coils.

In Plate 5 is given the no load induction distribution in machine

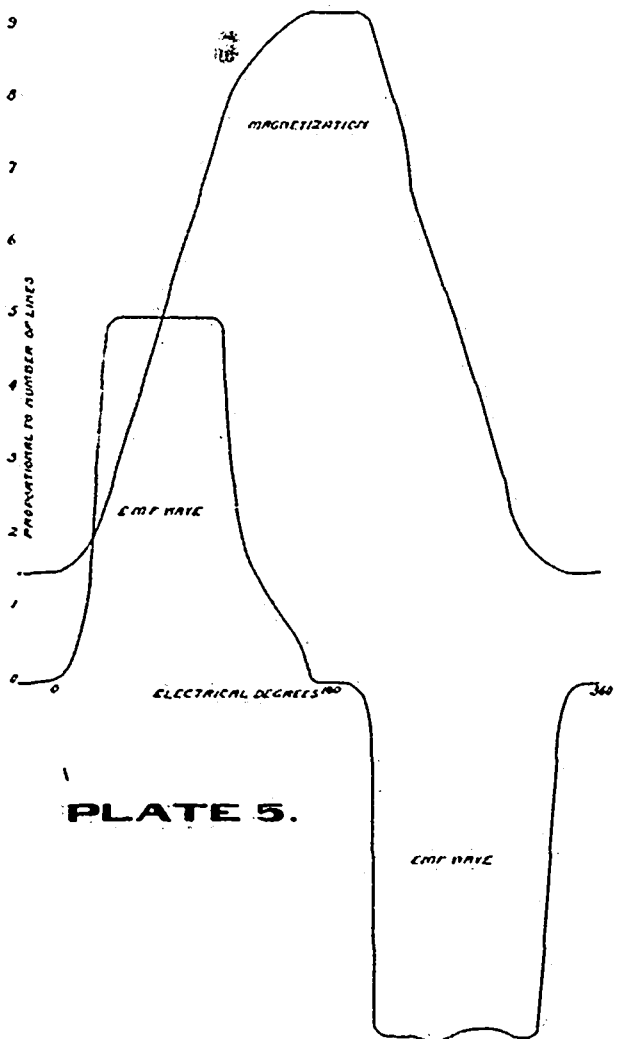


PLATE 5.

No. 2 at normal field excitation. It is to be noted that, due to poor design, the armature induction at minimum points is a considerable fraction of its minimum value, which would not be the

case in rightly proportioned machines of this type. With this machine also the no load wave form was readily predetermined from the curve of induction distribution and found to agree with the experimental values.

In Plate 6 is shown the no load and load E.M.F. waves at different power factors. The change of wave form with character

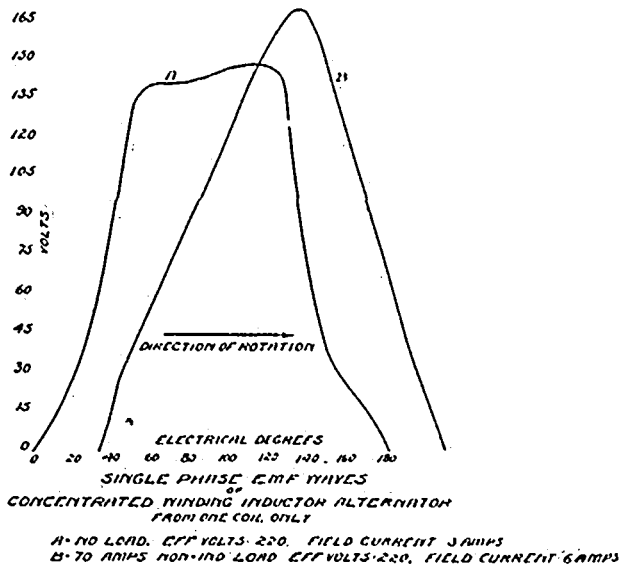


PLATE 6.

of load is, to say the least, startling, especially to those who have been accustomed to regard the sine wave assumption as to alternating E.M.F.s. sufficiently near for practical purposes. The effect upon the operation of synchronous and induction machinery designed for sinusoidal E.M.F.s. of such waves as shown can be pretty well anticipated. Several synchronous motors were in turn operated from a generator whose wave form was made to

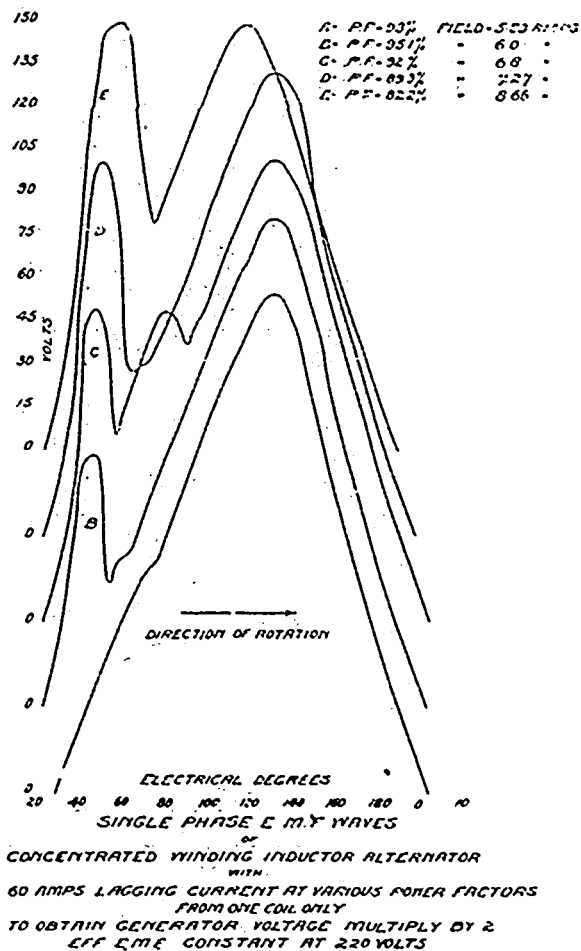


PLATE 7.

vary by changing the character of an auxiliary load. In every case, as might be expected, the energy absorbed and the idle current to the motor increased with dissimilarity of wave. Also the tendency to fall out of step with slight provocation was very marked when the wave shapes were greatly different, but as above indicated, such experiments are not yet complete. It is hoped,

however, that enough has been said to induce a discussion of this certainly important subject, particularly from the standpoint of the purchaser and operator of alternating current apparatus.

We desire to acknowledge our indebtedness to Prof. R. B. Owens for the suggestion of the work carried out and for valuable assistance.

POWER FACTOR AS AFFECTING OPERATION AND INVESTMENT, WITH SPECIAL REFERENCE TO INDUCTION MOTORS AND ENCLOSED ARC LAMPS.

By F. H. LAMOND, JR.

POWER factor is the ratio of the true watts, to the apparent volt amperes in an alternating current conductor, circuit or device (Houston). In a direct current circuit the energy is calculated by multiplying the volts by the amperes, and the result is the true energy in the circuit in watts, but in alternating current circuits this does not follow, as the electromotive force wave is out of phase with the current wave in every case except when the load is purely non-inductive, as with a load consisting of incandescent lamps only. When arc lamps or induction motors are used, there is always a lagging phase displacement of the current, and when synchronous motors are used, there is also a phase displacement of the current which may be either leading or lagging behind the electromotive force wave, and both conditions may occur, in the case of the generator being driven by a steam engine, twice in each revolution.

With water power, a steam turbine or other prime mover where the angular velocity can be maintained practically uniform and where speed variations affecting the generator take place gradually in a period covering several revolutions of the generator, much better results can be obtained with synchronous motors, always of course presuming that the motor is designed to, and does in practice, give the same electromotive force wave as that produced in the generator, which for reasons which have been at length discussed by many able authors should be a sine curve.

Power factor is comparatively a new term to the central station manager, and in fact, was hardly ever heard of before the introduction of the A.C. motor, though some central station superintendents had noticed that there was considerable current flowing in their primary circuits when all their transformers were running with open secondary circuit, and that this current did not take the energy from the steam engines corresponding with the volt ampere readings. To express this condition the terms false currents or wattless currents were used.

The transformer when very lightly loaded or when running with open secondary takes much more apparent energy from the circuit than the real energy, because of the lag or phase displacement of the current wave. This displacement, however, grows constantly less as the load is increased, until the E.M.F. and current waves nearly coincide. To illustrate this graphically, the two diagrams of E.M.F. and current waves in a transformer in open circuit and under full load show that the instantaneous values of the product of volts and amperes must be less than the apparent watts, and must be multiplied by the power factor to represent the true energy. As will be noted, the maximum E.M.F. occurs before the current has reached its maximum point.

Referring to the full load curve it will be seen that current and E.M.F. curves have nearly reached conditions where they increase and decrease together. The nearer this condition is approached, the nearer the power factor approaches unity or 100% power factor. As an induction motor is practically the same as a transformer with one of its elements in motion, its action with regard to power factor may be traced in the same manner, as explained in connection with a transformer.

The primary circuit furnishing the magnetizing current or field and also the work current by induction to the secondary, which when running light generates a counter E.M.F. so high that only enough current is taken in the secondary to overcome the friction of the bearings. As load is added the speed is slightly reduced, the slip resulting in lowering the counter E.M.F. until enough current is allowed to flow to do the added work. A very slight reduction in speed is sufficient to reduce the counter E.M.F. of the secondary of the motor varying not to exceed 5% in speed from light to full load and usually not over 2% over the working range of load usually met with.

These motors are self starting from the A.C. lines, and with suitable starting devices take about full load current for a few seconds in coming up to speed light, or a little more than full current in bringing up to speed their normal load, a somewhat longer time being occupied in reaching full speed, depending on the inertia and friction characteristics of the work.

If you will consider the counter E.M.F. of the motor secondary as the equivalent of resistance of the transformer secondary the similarity of action will be more striking.

The synchronous motor differs from the induction motor from the fact that it does not make its own field, which is usually excited from a separate source of direct current, and it is not usually capable of starting itself even without load, but must be brought up to synchronous speed by means outside of itself. A small induction motor is generally supplied for the purpose, which is disconnected after the synchronous motor has been brought up to speed.

The load is then applied gradually with a friction clutch coupling, friction pulley or equivalent device. Once in step, the synchronous motor cannot vary in speed, except the generator driving it changes speed, any more than though the two were positively coupled or mechanically geared together, except by overload much beyond the capacity of the motor, which breaks it out of step as though the gear were broken, and having fallen below speed even for a fraction of a second, it cannot recover, but will stall, in the meantime absorbing excessive current unless the circuit is immediately opened. The load must then be thrown off and the motor started again as at first.

The fact that the synchronous motor has a separately excited field is an advantage under certain conditions as pointed out in my paper before the National Electric Light Association at the New York meeting in '95. By increasing the field excitation sufficiently in a synchronous motor the apparent paradox of a counter E.M.F. higher than the line of impressed E.M.F. is produced by the motor sufficient to raise the E.M.

F. of the line, overcoming all drop, and even altering the pressure at the generator itself at the same time introducing leading currents having a condenser effect on the line which may be made to balance out the lagging currents produced by induction motors, arc lamps, &c. If this leading phase displacement can be made equal to the lagging phase displacement of other devices, a power factor of unity would result, as suggested by an eminent engineer, though in practice, during a period covering the whole history of this branch of the art, I have never met such a condition, nor have any of my friends in the profession, many of whom have had extensive experience with synchronous and induction motors separately and both together on the same circuits.

An over excited synchronous motor in the right place, with a load not subject to sudden variations and in charge of an attendant in communication with and controlled by the central station chief, is a convenient means of overcoming line drop and poor power factor. Over-excitation should not be carried too far, as it will result in pumping or flickering the lights. I have a vivid recollection of a case in which a 2½ h. p. self starting synchronous motor, which I designed, pumped the whole circuit on a 300 k. w. alternator.

Under a steady load and careful adjustment of the field excitation, a large synchronous motor supplied with current from a well-designed generator driven by water power or steam turbine, a power factor at full load of .94 or a fraction better may be obtained, though the same motor furnished with current from the same generator driven by a slow speed reciprocating engine, would hardly attain a power factor of .90 at full load, as the fly wheel moment of the motor would make it difficult to follow the changes in angular velocity of the generator, the tendency to break out of step resulting in surges of current, as before intimated.

Generators directly connected to slow speed reciprocating engines, in my opinion, are not suited for operating synchronous motors or rotary converters unless extreme care is taken in designing the fly wheel so as to obtain the minimum change of angular velocity per revolution. A much larger percentage of speed variation taking place more gradually, is less disastrous to the attainment of high power factor.

The best load for a synchronous motor is one of uniformly steady character with no sudden changes in the work it has to do.

Throwing the load off suddenly calls for instantaneous adjustment of field excitation in order to prevent sudden rise of E. M. F. which in a large motor would affect the whole line, and even change the voltage of the generator, having a disastrous effect on incandescent lamps that may happen to be in circuit. Suddenly adding a load to a synchronous motor has the reverse result and adjustment of the fields become immediately imperative to prevent heavy drop in E. M. F. A single synchronous motor subject to sudden load variations may easily defeat any attempt at good regulation on the part of the central station management.

These objectionable features are minimized, though never wholly overcome by designing both generators and motor for exceptional regulation using a distributed armature winding with a large number of slots per pole, per phase. The old style armature with windings concentrated into a single slot per pole, per phase, are unsuited on account of their high armature reaction for this class of work.

The induction motor being complete in itself, requiring no exciter starting motor or clutches, and furthermore, being automatic in its regulation without any special appliances, free from commutators or brushes, is simplicity itself, its essential features consisting of a stationary primary and a rotating secondary in large sizes when well designed, has a power factor at full load of .94 or better, regulates well under sudden fluctuations of load without reflecting seriously on the line and generator, but in fact actually tending to assist the regulation of the line. A load thrown suddenly onto an induction motor immediately increases its power factor and helps the regulation of the generator supplying this sudden demand for current. As the power factor of the induction motor is low at light load, it follows that a sudden reduction of the load at once lowers the power factor of the motor, calling for lagging currents in the line, replacing by inductive drop the ohmic drop of the work current of the moment before the armature reactions in the generator tending to demagnetize its field and prevent increased E. M. F. which would otherwise result when load is thrown off.

For varying loads and for operating incandescent lamps in connection with a power circuit, under the ordinary commercial conditions, the preference is altogether in favor of a well designed induction motor. With a secondary consisting of copper bars secured to short circulating rings at both ends, insulation is never troublesome, and in fact may be omitted entirely. It rotates without electrical contacts or connections inside the stationary primary element which can be safely insulated for all ordinary voltages, and in the larger sizes connecting the two thousand volts pressure directly to the motor terminals. In the small sizes it is of course advisable to use transformers to reduce the pressure to 500 volts or less where subject to careless handling. Having once become familiar with them, you would never think of using direct current motors with their troublesome commutators and brushes and expensive repair accounts.

Intelligent selection of the size of an induction motor for the work it has to do, has a very important influence on the power factor of the line and should not run with an average load much below its rated capacity. It is much better to select the motor which, being loaded to its rated capacity, or nearly so, operates with a high power factor and can be overloaded for short intervals to the extent of 25% of its capacity without doing any harm, as there are no delicate parts to this type of machine, nor any moving insulated wires, they will stand a much higher temperature without deterioration than the equivalent direct current motor.

Induction motors are also designed for variable speed, many now being used for crane work, and other uses calling for variable speed and torque, but in this class of work they are hardly equal to the direct current series motor, and unless very expensively designed, operate with low efficiency and power factor, though where non-inductive resistance is used for control, the power factor may be improved at the expense of efficiency.

Arc lamps have been until recently operated from direct current series dynamos, though the first important arc lamp installation used in the city of London, England, the Joblacof candles as they were called, were operated by alternating current dynamos.

Several years ago the direct current incandescent companies realized the advantage of being able to supply arc lamps from their incandescent circuits and adopted the D. C. incandescent open arcs. These were soon followed by the enclosed arcs, which operating at a higher voltage admitted of individual control without excessive waste in the large resistance required with the open arcs. Besides this, a great saving was realized in the amount of carbon burned, the inner globes preventing access of oxygen which rapidly disintegrates and causes the carbons to waste away. By no means the least saving which followed was the reduced labor, one man easily trimming six times as many enclosed arcs as he could of the open arcs, as they required attention once in several days instead of daily trimming.

From the D. C. enclosed arc it was but a step to the A. C. enclosed arc with resistance in series, or with Auto-transformers or choke coils on commercial A. C. incandescent circuits.

It was found, however, that the A. C. arcs operated to reduce the power factor of lines with which they were connected, depending on the regulating device used in connection with them, it being practically impossible to obtain a satisfactory light without some regulating arrangement, though sometimes sufficient choking effect is produced by the feed regulating magnets. All such regulating arrangements reduce the power factor, except the resistance method, but the resistance while improving the power factor wastes true energy and reduces the efficiency, while the inductive regulators only increase the apparent energy or wattless currents.

The advantage of operating arc and incandescent lamps from the same dynamo simplifies the central station equipment and admits of the use of a single type of dynamo for all purposes of higher efficiency, interchangeable parts, one type of reserve apparatus, and easier switch board control.

Some of the best inventive talent on the continent has recently been employed upon devices to enable the central station management to rid themselves of the D. C. series arc dynamos, which at best occupy much floor space for their output and have a maximum efficiency of 75 to 80%, as against an efficiency of 90 to 97% in large modern A. C. dynamos which occupy the minimum floor space per unit of output at much lower first cost.

For A. C. street lighting with lamps in series, one device has followed another till we now have an almost bewildering variety, each device having its superior points, making the choice more difficult.

The constant current transformer operating a string of arcs is almost perfectly automatic provided the load is not too much reduced and can be tapped onto any part of the line to economize wire, the device itself being located in a small substation which may consist of an underground vault, as inspection and adjustment is not frequently necessary. This arrangement has a very fair power factor at full load, but the power factor is low when partly loaded.

A device operating on the choke oil principle has all the advantages named in connection with the first arrangement. The amount of choking effect is regulated by the number of lights which is desired to compensate for. If a small percentage of regulation is required, a small regulator at low first cost is sufficient, and at full load the power factor is high, the inductive effect depending almost entirely upon the lamps themselves.

Another arrangement has been designed on the principle of the constant potential transformer with loops taken out to automatically vary the voltage as lamps are turned off or on. The power factor is good and rather better at light load than the others, but such a regulator should be kept in the central station, or in a substation when it has the advantage of an intelligent attendant.

Besides devices of the above types, individual transformers may be used, but their high first cost and the fact that each lamp must be turned on and off individually instead of in groups as with the previously mentioned apparatus, makes their use impractical for street lighting except under special circumstances.

In some notable cases where central stations are using power transmitted from a distance, induction or synchronous motors have been coupled direct to D. C. arc dynamos; this would be the ideal place to use a synchronous motor immediately under control of the central station if the induction motor load occurred at the same time, but unfortunately they occur at different periods and we can see no reason for using the synchronous motor, as the induction motor is self starting and requires no separate excitation.

In any case the motor driven arc dynamos are out of the question except where the frequency is too low for satisfactory arc lighting. Arc lamps are very unsatisfactory on 25 cycles and their effect at least unpleasant unless the frequency is in excess of 35 or 40 cycles.

With a mixed lighting and motor load there should be no difficulty in getting a line power factor of .90, and with load consisting mainly of motors .80 to .85. I have in mind a case where about 3000 h. p. in motors ranging from fan motors to motors of 500 h. p. are used, and recently measurements showed a power factor of about .90, the percentage of incandescent lamps on the circuit being almost negligible.

A power factor of .50 at full load would be disastrous to the regulation of the old style single phase dynamos; no amount of excitation would enable them to hold the voltage on the line. Though many will no doubt recollect seeing at the World's Fair at Chicago in 1893, the then monster two phase dynamos, which were but two large alternators with armature mechanically coupled together so as to give the proper phase displacement to the two independent circuits.

Some of our Canadian water power stations who have not yet installed polyphase apparatus having two single phase alter-

nators, might adopt this method of obtaining two phase currents to start a power circuit. With ample water power, the added expense for a day circuit would not amount to much, probably little more than the cost of an additional attendant, which would easily be covered by a contract for furnishing power to some manufacturing establishment, or perhaps pumping water for the city and neighboring villages. The power business once started would grow rapidly and become an important source of revenue. Few realize the extent to which the power business is destined to grow.

The old style alternator will stand a moderate amount of motor load mixed with lighting load, but when the motor load becomes a large percentage of the total load, the old dynamos which perhaps were admirably adapted for supplying incandescent lights will no longer be suitable.

The growth of the motor business has called for radical changes in the design of alternators. Machines which on short circuit would give double full load current were the rule, and this was even urged as a distinct advantage in such an emergency.

For motor work, the inherent regulation indicated by a short circuit current of at least three or four times full load current is demanded, and a change of excitation with full load current and .80 p. f. not exceeding 15 or 20%, and capacity for 25% more than normal full load current for six hours without dangerous heating, or 50% more than full load current for one hour, which means a very superior dynamo: this state of perfection having been reached through gradual evolutions resulting from the difficulty of maintaining regulation with motor loads and lagging currents, which tend to demagnetize the fields and lower the voltage.

The lagging currents call for increased capacity in the dynamo line and transformers which supply current to the phase displacing devices, though the power is not increased beyond the small amount necessary to supply the I. R. losses in the copper.

This calls for increased investment to cover the first cost of the improved dynamo transformer and added copper, though notwithstanding the advance in raw materials, the very superior dynamos of to-day cost no more than the dynamos of a few years ago, and not so much per k. w. as we were obliged to pay ten years ago for the old single phase dynamos.

In all classes of business it is poor policy to attempt to save on the first cost of a plant by buying machinery which is out of date. This is particularly the case in making an investment in electrical apparatus, the design of which has been undergoing such active gymnastics in the past ten years. We must look well into the future and anticipate the growth of the power business, which already bids fair to outstrip the lighting, and get only the best apparatus well up to date in every particular. The apparatus made by the leading electrical manufacturers on intelligent specifications more nearly approaches perfection than any other power translating device, notwithstanding the comparative youth of the art. What engine or water wheel builder would for a moment consider a specification calling for 96% efficiency? Yet electrical manufacturers for the larger sizes of dynamos will guarantee even better than such efficiencies.

With these high attainments it is hard to conceive of any material improvement in electrical apparatus, and we shall probably see little more of the changes once so frequent where entire plants were consigned to the scrap heap because it was cheaper to buy new than to continue even for a short time the operation of the old, the difference being sufficient to turn the balance between success or failure of the enterprise.

Already the process of standardization of things electrical has set in, and we may look for changes in the future, tending to a reduction to well recognized standards in construction of apparatus and central station practice rather than to startling improvements in design.

Power factor, which at one time was the great bug-a-boo of the electric central station, is now being rationally met and provided for in the equipment of power houses as a necessary evil and one of the incidental expenses of a new branch of the business, which adds materially to the income of the plant, and enables the hard working manager and superintendent to please his stockholders with increased dividends.

**SOME EXPERIMENTS WITH ROTARY CONVERTERS.**

By A. G. Grier, B.Sc., and J. C. Hyde, B.Sc.

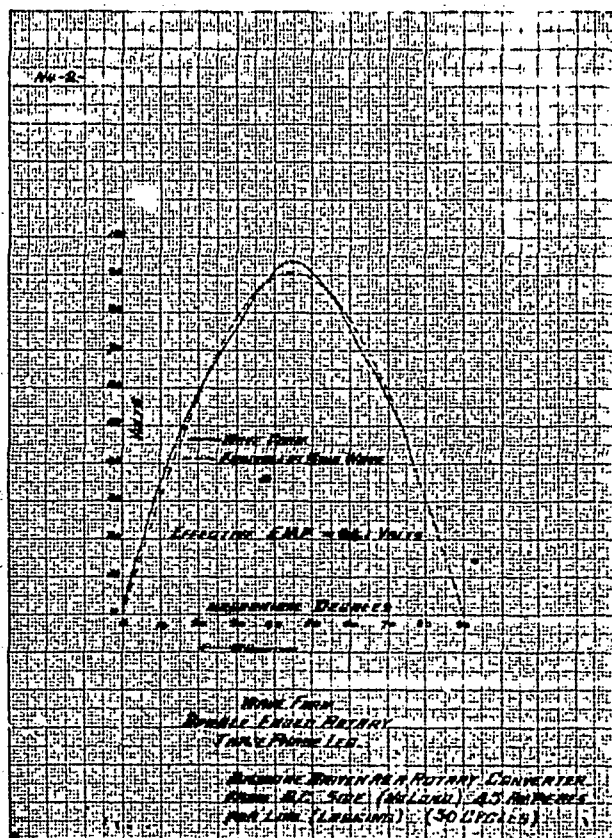
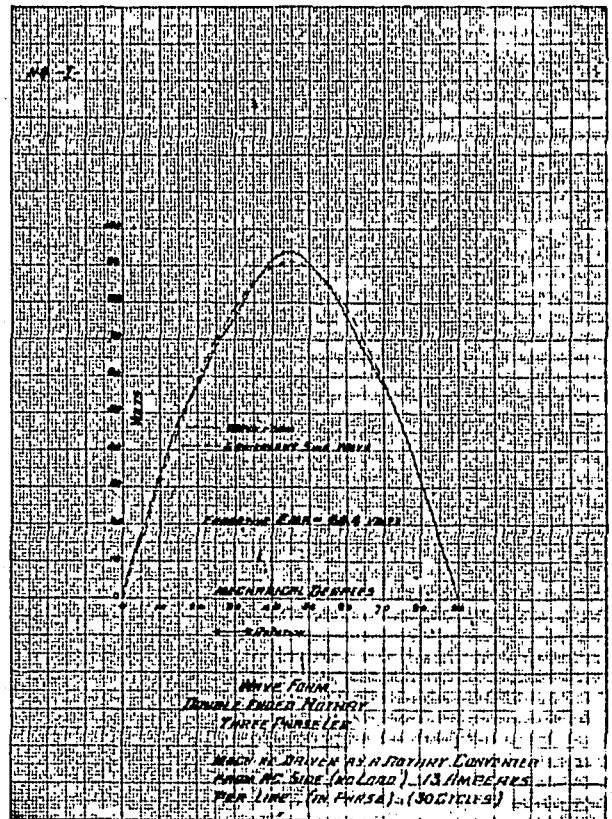
In the last few years Rotary Converters have gradually come to the front and at present are an important factor in some of the most modern and best equipped transforming stations. They form the connecting link between alternating and continuous currents in the simplest and most efficient way.

The following experiments were carried out during the past session in the electrical engineering laboratories of McGill University.

**WAVE FORMS ON A ROTARY CONVERTER UNDER DIFFERENT CONDITIONS OF LOAD.**

The wave forms shown as per curves were taken under different conditions on two rotaries. They show that armature reactions are very small and the 2 phase wave form approaches very near a sine wave, practically holding it under all conditions of load. The first four wave forms were taken on a double ended rotary, or in other words, one with two separate and exactly similar windings on the one armature body, each winding having its own commutator and collector rings. It was thus possible to run the machine as a rotary converter from one winding and get the induced volts from the other winding. The first curve is for an inphase running light current of 13 amperes, the second curve is for a 45 ampere lagging running light current, and the third a 45 ampere leading running light current and the fourth a 61 am-

per inphase load current. From these curves the effect of armature reactions on the wave form is hardly noticeable. Curves Nos. 5, 6 and 7 were taken on the second machine, the greatest distortion of the wave being when the machine was mechanically run as a continuous current generator. In taking the wave-



forms the voltage to be measured was made to charge a condenser which was then discharged through a Weston volt meter by means of a suitable disc placed on the end of the shaft.

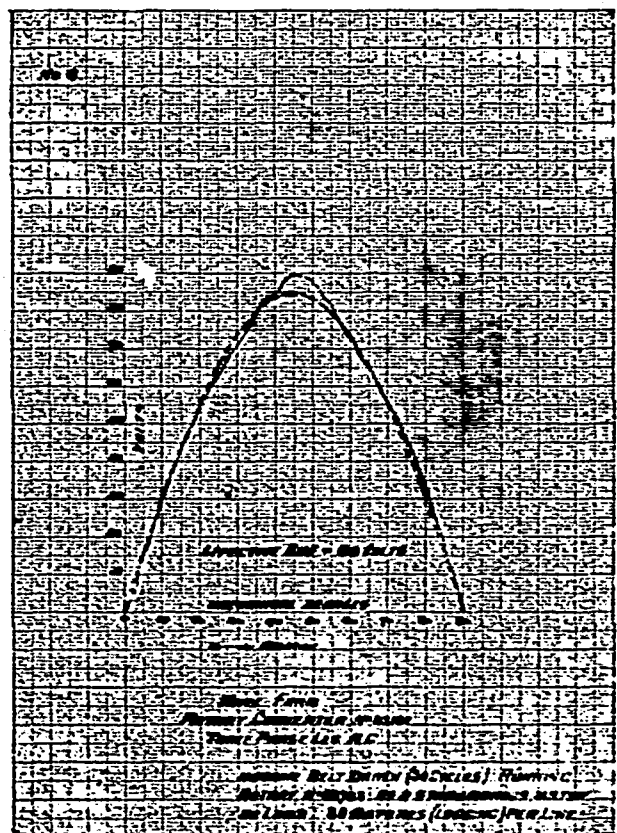
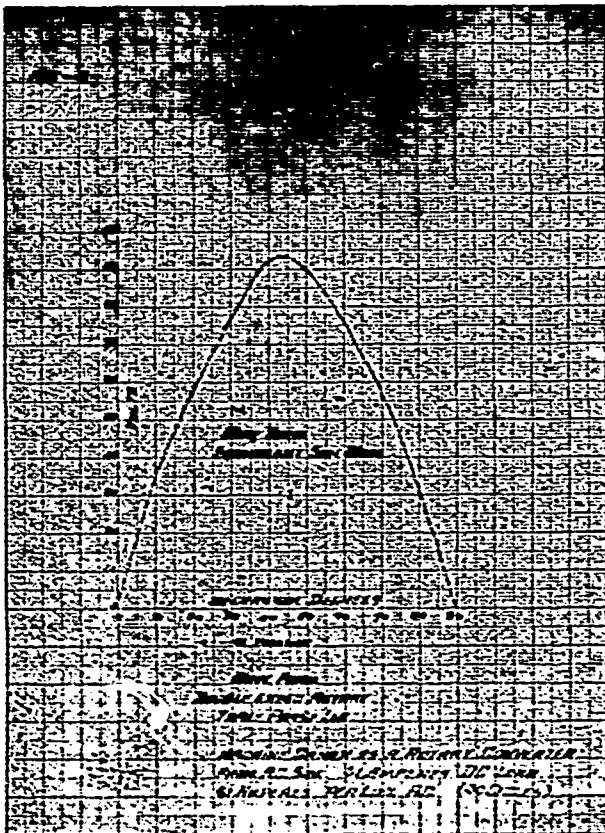
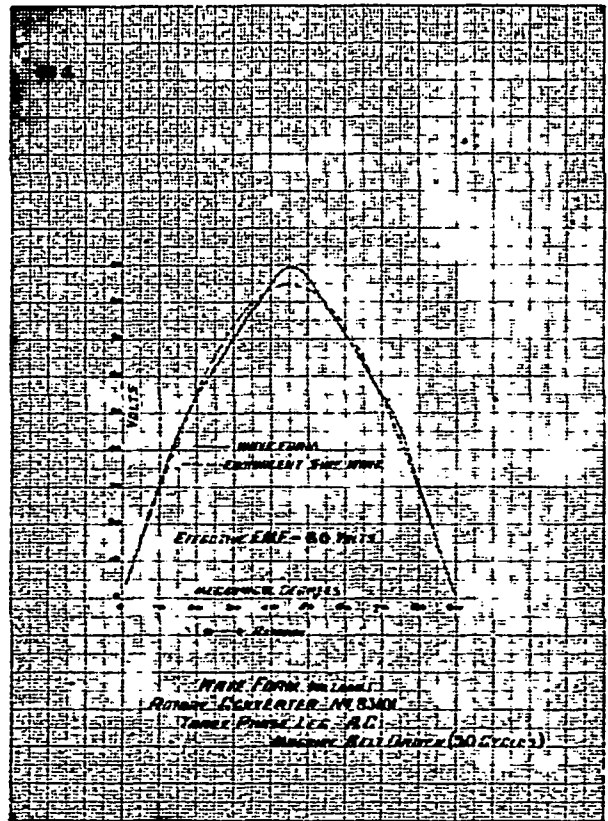
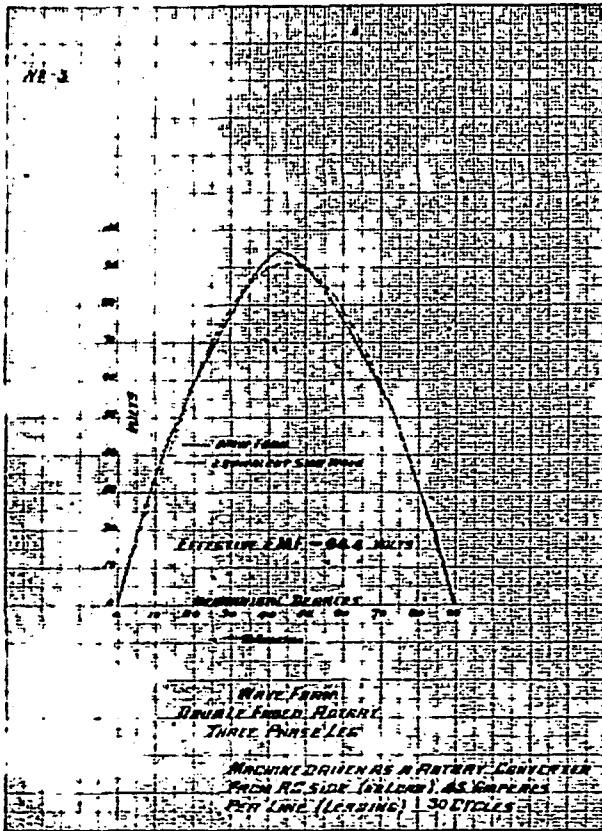
**COMPOUNDING A ROTARY CONVERTER BY MEANS OF IMPEDANCE COILS IN THE LINE.**

THE D. C. voltage of a rotary converter depends on the impressed A. C. voltage, so that as the D. C. load comes on to keep up the D. C. volts some means must be used to raise the impressed A. C. volts. There are two general ways of accomplishing this, viz., by using induction regulators or having impedance coils in



the lines which, accompanied with a change in field strength of the rotary, will raise or lower the voltage as required. In some cases where a wide variation is required both ways are used. The action of the reactance coils may be made entirely self-regulating by having compound turns on the rotary. At no load a good lagging current should be used, gradually working up to an inphase current at about three-quarter load and a leading current beyond this. The diagram (No.8) shows an A. C. generator belt

of 68' was started with, ending up with a lag of 12'. The terminal voltage of the generator was kept constant at 85 throughout, the volts impressed on the rotary at start were 61.5 and rose to 70 at finish. Another way of seeing the effect of the compound turns on the power factor of the line, is to run the rotary no load (reactance coils in the line), separately excite the compound turns, noting the current in them and the circulating A. C. current between the machines. This was done and the results were plotted



driven feeding a rotary converter with compound turns. This machine when run as a D. C. generator was slightly over-compounded. The machines were used as three phases. The D. C. regulation of the rotary converter at different loads was first taken without reactance coils in the lines, the impressed A. C. E. M. F. being kept constant throughout. After this three similar reactance coils were placed one in each line (machines delta connected) and the regulation again taken. In this case a lag

as per curve (No. 10 and 11). The D. C. regulations with and without the reactance coils in the line are also shown. (No. 9.) The frequency throughout was kept constant at 30 cycles. The following example is typical of the last experiment: Given a transmission line in which the receiver volts are to increase uniformly with load, 2880 volts at no load and 3160 volts at full load. The energy component of the current at full load being 52 amperes, at three-quarter load the current is to be inphase with

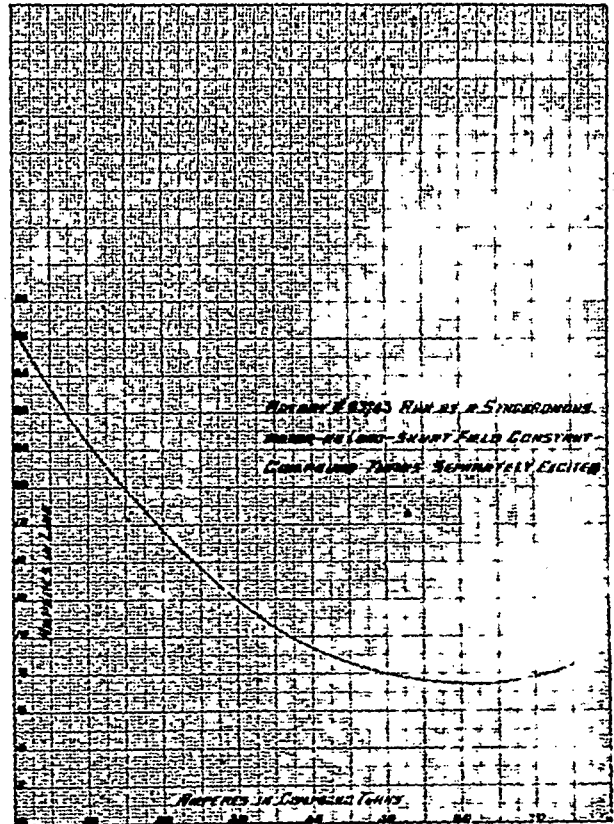
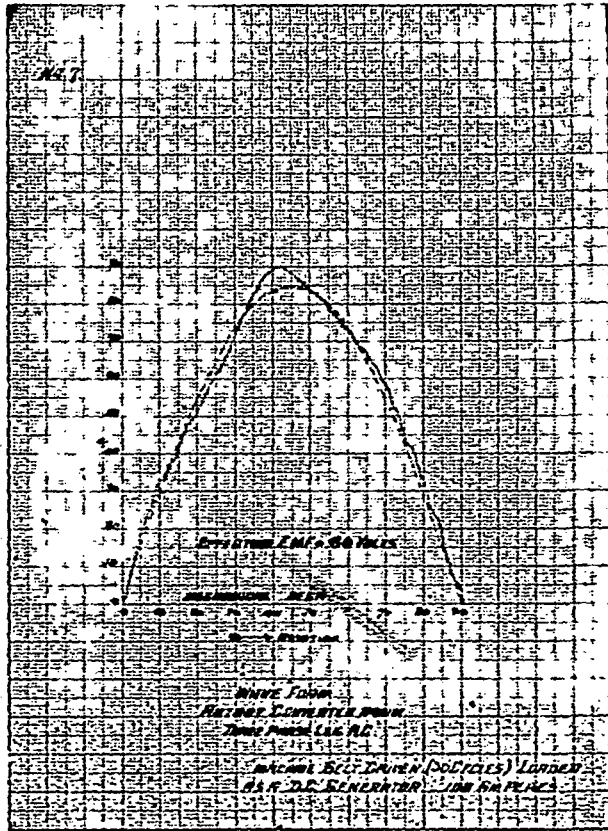
the E.M.F. at the receiver end. The line impedance is  $Z = 8 - 30j$ . What must be the (constant) generator voltage, the current in the line and the power factor at the receiver circuit?

- Let  $i$  = the energy component of the current
  - "  $i_1$  = wattless
  - "  $I$  = total current =  $i + ji_1$
  - "  $E_g$  = Gen. voltage.
  - "  $E_r$  = Receiver voltage.
- Then  $E_g = E_r + IZ = E_r + (i + ji_1)(r - jx)$  or  
 $E_g = E_r + i(r + x) + j(i_1(x - r))$

From this formula everything may be calculated, since the gen

means of cutting the fuses out of circuit at the start should also be provided.

Since single phase rotaries are not self-starting, and the alternating and continuous currents do not neutralize one another, it is more advisable to use synchronous motors and continuous current generators. It is now the general practice to magnetically

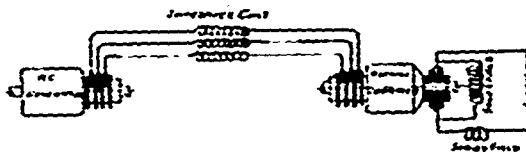


No. 10.

erator voltage (terminal) is to remain constant at all loads. The numerical results are as follows :-

	Generator Voltage = 1102				
	No load	1/4 load	1/2 load	3/4 load	Full load
Volts line	2580	2950	3020	3090	3160
Energy current	0	13.00	26.00	39.00	52.00
Wattless current	23.75	17.50	10.01	0	12.88
Total current	23.75	22.05	27.92	39.00	53.60
Power factor	0	59.0	93.2	100.0	97.0
Lag of current	90.	54.	21.	0.	14.

Polyphase rotaries are self-starting from the A. C. side, and may be thrown direct on the line. They will pull two or three times full load current at the start, but will come up into complete synchronism, which may be indicated by a phase lamp or by the

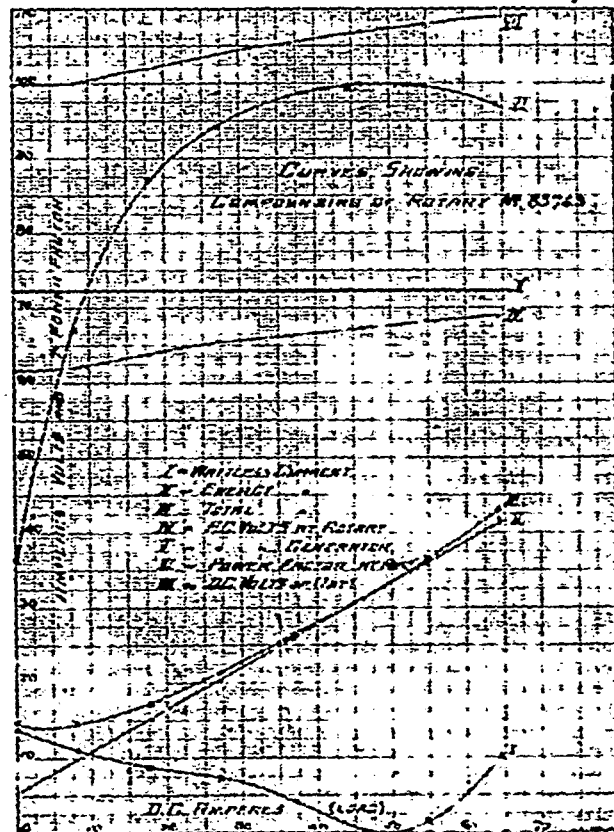


No. 8.

field switch. One of the rotaries used had solid pole tips, and came into synchronism when thrown on the line, but another rotary with laminated pole tips would not, and required to be brought up to speed (from the D.C. side) and thrown on the line by the aid of phase lamps.

It was found that the first rotary would not come up into complete synchronism if the field switch was closed at the start, but would come up to about half speed and remain there. On opening the field switch, however, it would immediately run up.

As there are dangerous voltages induced in the fields (when left open) in starting in this manner, it is advisable to have the field circuit open in two or more places, as otherwise it would put too great a strain on the field insulation. The machines, when started up in this manner operate as hysteresis motors, hence the reason of leaving the field switch open. The D. C. polarity also depends on which pole the rotary synchronizes under, and therefore all D.C. meters should be out of circuit until the D. C. polarity is tested. Impedance coils may be used for starting in this manner so as not to affect the line voltage too much. Some



No. 11.

connect rotaries on their A.C. side when they are required to run in parallel from the same line. This allows of their being connected in series on their secondary side without causing the short circuit which would otherwise occur. It also does away with the circulating current, which otherwise occurs when they are connected in parallel on the primary and secondary sides, rendering the D. C. readings valueless.

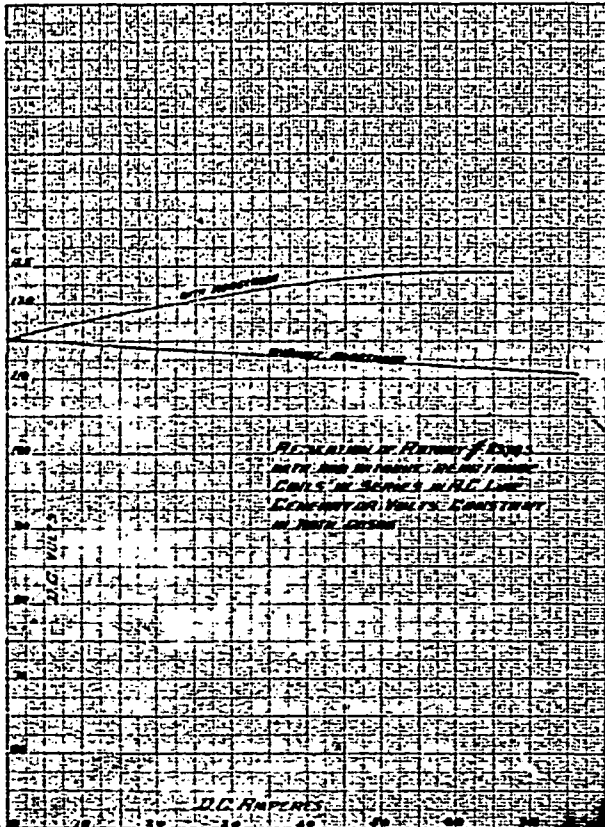
ROTARIES IN STREET RAILWAY WORK.

In street railways it is very often necessary to cover very large districts. This means very large feeders to keep the drop of potential within limits. This requires a large outlay for copper and installing, neither is it very efficient.

The easiest way to overcome this is to have one main generating station and several substations. In this station would be placed alternating current generators, and the power should be transmitted to the substations, where there would be placed synchronous motors driving continuous current generators or rotary converters.

As rotaries allow of a simpler means of converting alternating current into continuous current, also being more efficient and allowing of better potential control, they are now nearly always installed for railway work.

On account of D.C. potential being directly proportional to the A.C. potential, it is necessary to have some means of controlling this in a long transmission line which has considerable resistance and self induction. As railway load fluctuates a great deal, it



No. 9.

would be difficult to keep the potential constant at the terminals of the converter, especially as the current in the line may remain the same and still the conditions of load at the other end might vary a great deal. Take the case where current is leading or lagging; a watt meter in circuit might read the same watts, but in the first case the potential at generator should be lowered and in the latter should be increased. It is therefore necessary to be able to regulate the potential at converter. This can be done by changing field excitation of rotary; that is, changing phase relation of current and therefore increasing or decreasing the potential at the converter, as shown by the previous experiment.

Now, as a converter is a synchronous motor on its A.C. side, we will have same E.M.F. acting as in a synchronous motor.

- 1st. The impressed E.M.F. at terminals.
- 2nd. The counter E.M.F. of converter.
- 3rd. The E.M.F. consumed by impedance.

The impressed E.M.F. depends on generator E.M.F. The counter E.M.F. is proportional to field excitation, and as its speed is constant, this counter E.M.F. is independent of load on the machine. The E.M.F. of impedance changes with load, and is proportional to load. The following diagrams (No. 12, 13 and 14) will show how generator voltage has to be varied to keep constant voltage at receiving end when phase relation of current is varied.

I.—When current is in phase with E.M.F.; that is, a non-inductive receiver current.

II.—When current lags behind E.M.F.

III.—When current leads E.M.F.

- IR = ohmic drop.
- IX = reactive drop.
- IZ = impedance drop.
- OI = total current.
- OE = voltage at machine.
- OE<sub>0</sub> = generator voltage.

As these diagrams are drawn to scale, we can see how generator voltage varies with load to keep receiver voltage constant.

For accurate results the analytical method should be employed rather than the preceding method. The analytical method is as follows:

- e<sub>0</sub> = generator voltage.
  - e = receiver voltage.
  - i = energy current.
  - i<sub>1</sub> = wattless current.
  - I = total current = (i + j i<sub>1</sub>).
  - Z = impedance of line and generator = r - j x
- Now e<sub>0</sub> = e + I Z (vector sum).  
 = e + (r - j x) (i + j i<sub>1</sub>).  
 = e + i r + i<sub>1</sub> x - j (i x - i<sub>1</sub> r)  
 = e + i r + i<sub>1</sub> x + (i x - i<sub>1</sub> r)² - I

At non inductive load i<sub>1</sub> = 0.

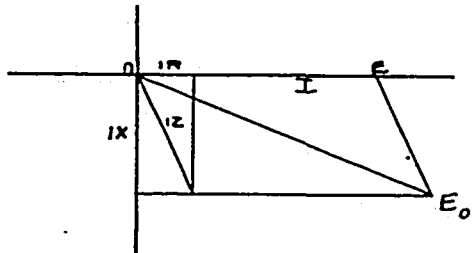
Then e<sub>0</sub>² = (e + i r)² + i² x² — II.

At no load i = 0 very nearly compared with i<sub>1</sub>.

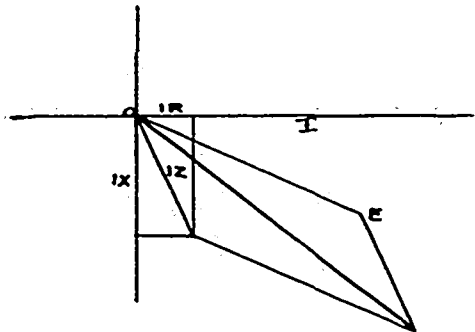
e<sub>0</sub>² = (e + i<sub>1</sub> x)² + i<sub>1</sub>² r² — III.

Now, as a converter can be made to take lagging or leading currents, the receiver E M F can be varied at will.

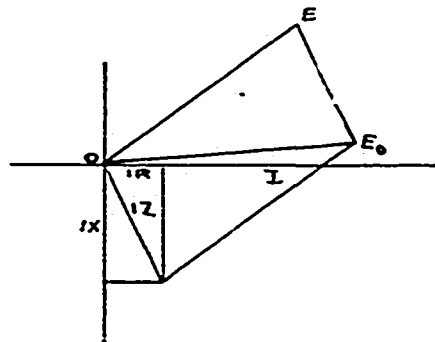
Having decided at what point you wish to run non-inductively,



No. 12.



No. 13.



No. 14.

it is necessary to calculate the running light current and to adjust the shunt and series field for same. From II and III the running light current may be obtained.

e<sub>0</sub>² = (e + i r)² + i² x² — II.

e<sub>0</sub>² = (e + i<sub>1</sub> x)² + i<sub>1</sub>² r² — III.

Therefore (e + i r)² + i² x² = (e + i<sub>1</sub> x)² + i<sub>1</sub>² r².

i<sub>1</sub> = - (e x) / Z² + √( (e² x²) / Z² + i² + (z c i r) / Z² )

If e = 1 and if it is to be non-inductive at full load, let I = 1

i<sub>1</sub> = - (x) / Z² + √( (x²) / Z² + 1 + (z r) / Z² ) — V.

If non-inductive at 1/2 load

i<sub>1</sub> = (x) / Z² + √( (x²) / Z² + .56 + (z r) / Z² ) — VI.

From these equations we can get the running light current. The following would be the currents running light where converter would run non-inductively at full load Z = .1 - .4j.

r	x	Z²	i <sub>1</sub> % of full load current.
.10	.40	.17	.42
.20	.40	.20	.64
.30	.40	.25	.84

Converter to run non-inductively at 1/2 load.

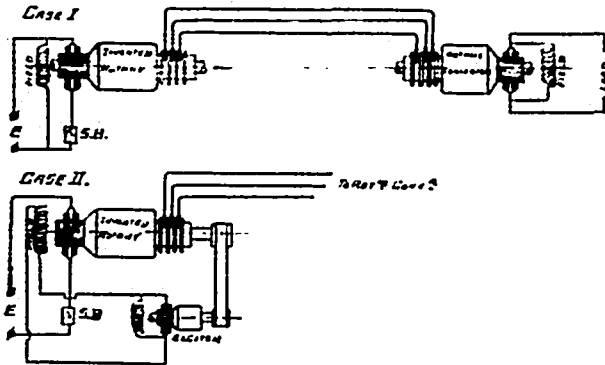
r	x	Z²	i <sub>1</sub> % of full load current.
.10	.40	.17	.31
.20	.40	.20	.45
.30	.40	.25	.63



From these results we see the effect of the energy loss on running light current. It is also evident the more the energy loss the higher should the generator voltage be relative to the converter voltage. It also shows that it is better to run the converters non-inductively at  $\frac{1}{2}$  load, as before stated.

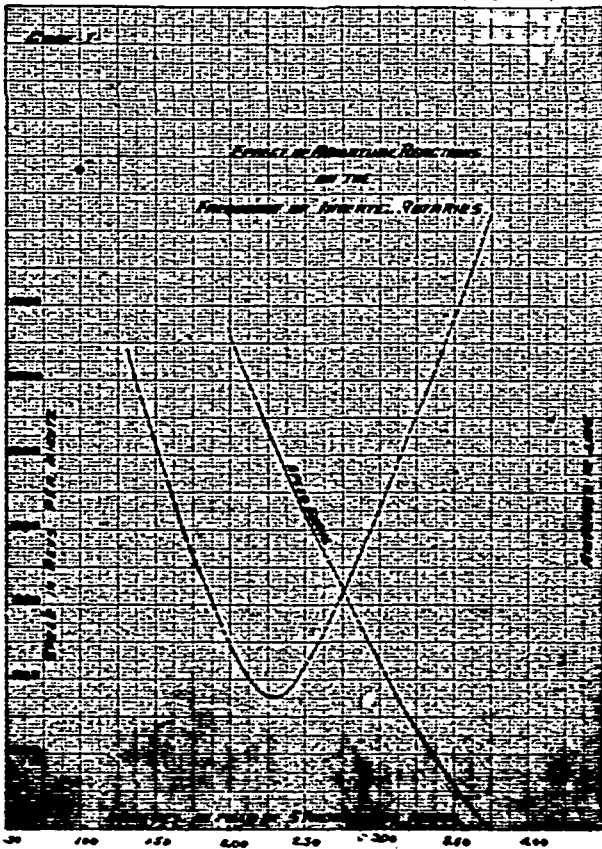
INVERTED ROTARIES.

In some cases rotary converters are used to change continuous currents into alternating currents, or as inverted rotaries. Trouble arises immediately when the power factor of the line changes to any extent as it is accompanied by a change in the frequency of the machines. The reason of this is very readily seen. A continuous current shunt motor will speed up and down according as its field is weakened or strengthened, and for the



No. 15.

same variation in field strength at light loads its speed will change more than at full load. As an inverted rotary is nothing more or less than a D. C. motor running light, a very small change of field strength is accompanied by a large variation in speed. The effect of lagging and leading currents on an inverted rotary is to speed it up and down. One way of getting over this difficulty is to strengthen the field of the inverted rotary, as lagging currents come on or weaken it for leading currents. An ingenious and automatic way of meeting this difficulty was devised and put into practice by Mr. B.G. Lamme, which is as follows:



The inverted rotary is made to drive its own exciter which may be placed on the end of the shaft or belt driven from it. (No. 15.)

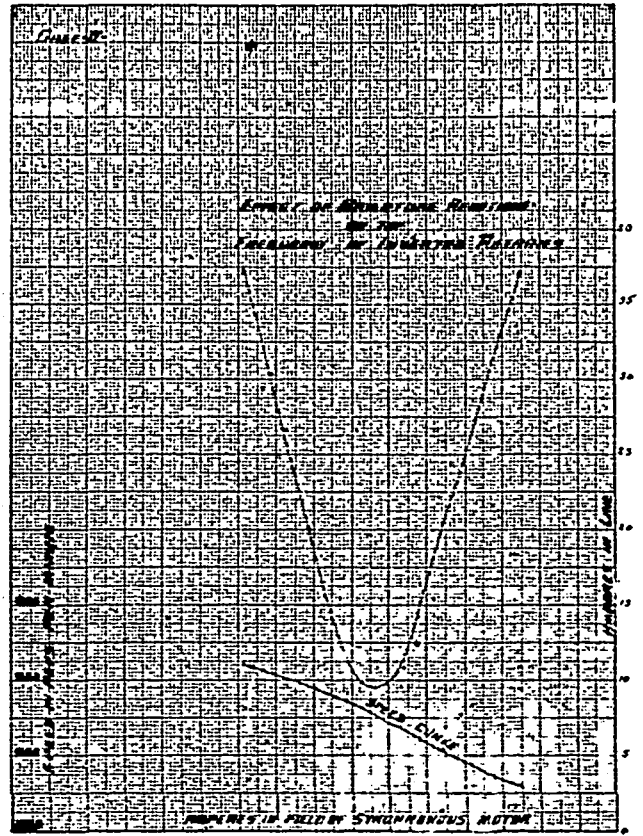
The exciter should be worked low on its magnetization curve so that a small variation of speed is accompanied by a large variation of voltage. Supposing that there was a lagging current on the lines the speed would rise, but the speed rising would strengthen the field, and if the one tendency were made to counteract the other a constant speed would be obtained. The following are the results of experiments carried out to show these effects. The exciter not being a specially designed one did not keep the speed absolutely constant, but its effect is clearly seen.

In case I and II the voltage impressed on the armature of the inverted rotary was kept constant throughout and in case I the

field current was also kept constant, thus any variation in speed would be due to armature reactions.

To get a large variation of power factor the field current of the rotary converter was varied and speeds as well as circulating currents were taken and plotted with field currents of the rotary converter as abscissae.

The effect of the exciter in case II is very readily seen, as for the same variation of field current in case No. I the speed changed from 900 to 1036 revs. per min. and in case II the change was from 892 to 926. If the inverted rotary were equipped with a compensating exciter similar to the one patented by



Mr. Rice, of the General Electric Co., then theoretically the frequency would be constant.

Another way which might be used is to automatically vary the field by having a Siemens epicyclic train, one wheel connected to the rotary, another to a constant speed motor, and the third connected to the field rheostat.

As regards to their practical operation inverted rotaries are now being used to advantage in transmitting continuous current power (from large D. C. power stations) long distances.

CONDITION OF OPERATION OF STREET CARS IN THE CITY OF QUEBEC.

By D. E. BLAIR, B.Sc., Chief Electrician Q.R.L. & P. Co.

Of all financial undertakings, none perhaps depend more upon the nature of local conditions than does the successful development of a city street railway system, and for this reason it may be of interest to the members of this Association to have before them a more or less general description of the difficulties encountered and overcome by those responsible for the development of the Quebec Street Railway.

Quebec, as a city, has many distinctive features that are not to be found in any other city in America, and the stranger within its fortified walls is very soon struck with the unique fashions, methods and temperament of the quiet people who make up what may be called the native population, numbering about 75,000, and of which about 65,000 are French-speaking.

When the construction of the road was first contemplated by those responsible for the promotion and fulfilment of the scheme, there existed certain unpromising conditions which tended to arouse the doubts of many as to the feasibility and possible financial success of the enterprise. Of these I might mention a few at random. Business, in general, is carried on in a very quiet and matter of fact way, and an observant critic does not notice the hustle and bustle so common in most modern cities of this continent.

The salary of the clerk and the wages of the laborer are moderate, and the average individual very seldom seems inclined to do any more than he is paid for.

The natural result of this state of affairs is that the electric street car was not likely to be looked upon as a valuable and indispensable time-rover, as well as a welcome convenience, but rather as a luxury to be enjoyed by those who could afford it.

The manufacturing interests of the city are limited, and further development along this line is hindered by the somewhat strict conservatism of capital. Further, the average laborer or even expert workman is the proud possessor of a large family, several

of whom are perhaps engaged in the same work as himself, and he finds it convenient and economical to live near his work, as rent in the manufacturing districts very reasonable.

The city is very compact and densely populated, being furthermore divided into certain sections which are practically self-contained municipalities. Public entertainments and social functions were very little appreciated or patronized, and the principal streets seemed almost deserted after 9 p.m.

Although these conditions may have no direct bearing on the practical expenses of construction and operation, they were certainly not in favor of the credit side of the prospective railway company's cash book.

The more formidable objections, however, were of a practical nature. Five years ago, and even less, it was considered impossible that anything that looked like a street car could ever climb the steep, narrow and winding thoroughfares that lead from the water's edge to the highest points of the solid mass of rock upon which the city is built. Besides this, the heavy snowfalls, coupled with the narrowness of the streets, were likely to be a great hindrance to the service, but in spite of everything the completion of the road was finally rushed through, and it has now been proved that the limiting conditions of the street railway operation were not overstepped in the bold undertaking which has given the people of Quebec a reliable and efficient means of transportation. The city has improved wonderfully since the inauguration of the road, and promises to become, before long, as wide-awake and progressive a centre as any in the country. Even theatrical entertainments have become more or less popular and everything seems to be moving at a faster pace than heretofore.

On the 1st November, 1896, was commenced the laying of the rails through the main streets of the city, and on the 1st July, 1897, the road was open to traffic.

Specifications of track were as follows:—72 lb. 6" steel T rails in 30 ft. lengths by Cammell & Sons, England. Standard gauge laying on 7" ties at 28" centres.

Each joint to be double rounded by two 00 solid copper wires in Eclipse copper bonding caps by Ohio Brass Co., these to be tinned and ends of wires riveted on outside of rail. Double cross hands to be placed at every 5th joint 150 feet.

#### OVERHEAD CONSTRUCTION.

Tubular poles 28 ft. long, weighing 700 lbs., and spaced 90 ft. apart, are used throughout. Insulation is of "Dirigo" type and trolley wire No. 00 hard-drawn. Span wires of standard galvanized steel wires 7/8" in diameter. Lightning arresters of Wurts' non-arcing type. All construction is elegant and of a substantial nature. Altogether there are 10 miles of span wire construction and 2½ miles bracket.

**CAR SHEDS.**—Of these there are two, one in Upper Town 210 x 120 ft., having 14 tracks and 7 doors, where all cars in service are laid up at night. The other is in Lower Town and is used for storage purposes only. The capacity of the working car shed is 52 cars, and here all repairs are done. There are seven floored pits communicating with the machine and blacksmith shops underneath. It has been found cheaper to manufacture most of the repair parts than to purchase them from supply dealers.

**PAVING.**—At this time all streets, without exception, were covered with a generous laying of macadam. Within the last two years, however, a great improvement has been made in this respect on nearly all the streets through which the lines run. All macadam was removed to a depth of about 12 inches, leaving the ties completely exposed, and these were then filled in with concrete to within about 2" of the top of the rail. The facing of the new pavement throughout the city now consists of Scoria blocks between and 8" beyond the rails, while the remaining strip of roadway is filled either with asphalt, asphalt brick or scoria blocks, according to the grade of the street.

In Upper Town, the residential district of the better class of people, the streets were nearly all wide enough to permit of a double track, but even here it was found necessary to run through certain sections on single track.

Lower Town, the business section of the city, is a semi-circular strip of varying width and of a practically level ground which is surrounded on the outer edge by water, and lying beneath the cliffs which mark the boundary of Upper Town. Here the lines are all single track with the exception of one section, where two parallel streets converge into one wide street ½ mile in length. The main street which runs through the entire length of this section is about 2½ miles long and is so extremely narrow in places that there is hardly room for an ordinary vehicle to squeeze past on either side of a car, on the single track in the centre of the street.

The return line is run through a maze of narrow and unsymmetrical side streets which seem to run in almost any direction until they form a junction at an oblique angle with one of the largest arteries, thereby losing their identity.

On one section of the line, one mile in length, there are no less than eleven curves of from 35 to 40 feet radius at intersections of about 90 degrees, one of which requires a reverse curve of 30 feet radius.

On all these streets the inner rail is placed within two feet of one sidewalk in order to leave room for single vehicles to pass a car on the other side.

The Upper and Lower town lines are connected by two cross town lines which ascend obliquely along the face of the cliff. One of these, the Green Line, runs through the public thoroughfare which, though very steep, is yet feasible. The actual length of this line is 3440 feet, and the difference of level between junctions is 172 feet, which is equivalent to an average grade of 5%. The total length is made up of sections of 200 ft. 12½%,

100 ft. of 10%, and 600 ft. of 9.5% grades, the rest of the line being nearly level. All these grades have sharp curves in their lengths, but the most difficult to operate is the first. This one begins to rise at a gradient of 11½%, and terminates at 14.15%, these being a 40 ft. rad. curve at the top, of which one half is on the heaviest part of the grade.

The second cross-town line runs for a certain distance down Palace Hill at an average grade of 11% and then turns off the public street at an angle of 80° on to a steel trestle which runs parallel with the face of the cliff at a gradient of 7.5% for 800 ft. The total length of this line is 1300 ft., with average gradient of 6.85% and a maximum of 12%, difference of level being 89 ft. One disadvantage in the operation of this line is, that when a car leaves the trestle to take the 11% grade it is running at half speed and must be accelerated on grade. This means a very heavy drag on the motors for the first 50 ft. of the climb.

**CAR SERVICE.**—The Upper Town service consists of a double belt line, 3½ miles in circumference, with from 4 to 7 cars running in each direction on a 4 minute headway in summer and 5 minutes during the winter. Schedule speed on all lines is approximately 8 miles per hour, except for a few short stretches of level; the total length of this belt is layed on streets having a gradient of from 4% to 8%.

In Lower Town there is but a single belt line, both branches of which are intersected by the cross-town lines. Cars running west are for most of their run within one block of those running east. Here also cars are run on a 4 minute headway and the service requires from 8 to 10 cars. Free transfers are issued from one belt to the other over the cross-town lines. These are run separately in winter, but two sides of a double rectangular belt line in summer. Both tracks are single and crossings are made at turnouts.

Strict regulations govern the operation of cars on grades and sharp curves. On some of the grades stop-boards are placed top and bottom and the motorman cannot proceed until signalled by the conductor. Speed down grade must not exceed 4 miles per hour. As a result of these precautions, runaway cars are very rare, and have never yet been attended by any serious consequences.

The average number of cars in regular service during the summer months is about 35, and in winter about 30.

**BRAKES.**—In every city of grades, such as Quebec, the system of braking should be of special interest, yet hand brakes are used throughout, the effective leverage being 100 to 1.

The brake shoes in use are of very soft cast iron, and it has been found that the retarding force due to the application of this shoe is much more evenly supplied and that the co-efficient of friction is higher under all conditions than it is when hard cast iron is used. This is especially the case in frosty or snowy weather.

New shoes weigh 19½ lbs. and wear down to 4½ lbs. Average life is 6150 miles, or 410 miles to the lb. of wear.

**WHEELS.**—All wheels used are of ordinary chilled cast iron 33" diam., weighing 425 lbs. each and mounted on 4" steel axle. Of these removed from cars during the first three years of operation there is not a great proportion of "flats," as will be noticed from the accompanying table.

Wheels removed.....	125 pairs	
Of these Worn out.....	94 "	75.2%
" Flats.....	23 "	18.4%
Broken Flanges.....	8 "	6.4%

Average life, 24,800 car miles.

Maximum " 49,000 " " (reached by 10 pairs).

**CAR EQUIPMENT.**—The car equipment consists of: Thirty-five 28 feet double vestibule closed cars, weight fully equipped 14,500 lbs., seating capacity 30; 24 double and open cars, weight 16,500 lbs., seating capacity 50; 6 double ended snow sweepers; 2 double ended wing plows; 1 street sprinkler; 1 "converted" horse car.

**ELECTRICAL EQUIPMENT.**—The electrical equipment is standard throughout on all rolling stock and is of Westinghouse manufacture. It consists of 124 No. 12 A-30 horse power motors; 124 No. 28 A controllers; 62 sets controlling resistance.

All closed cars are fully equipped and in service during 12 months of the year, and the extra equipment required for sweepers and snow plows during the winter are borrowed from the open cars.

The sweeper and plow equipments are necessarily very much overloaded at times, and it will be of interest to some here present to know how they have stood the hard usage.

**OVERLOADS ON MOTORS.**—An overload of 100% for several minutes at a time has often been carried by these during heavy snow storms, and a sweeper will sometimes burn five or six No. 13 B & S copper wire fuses, or in other words draw from 200 to 250 amp. at 520 volts before it can get past a difficult spot. This extremely hard usage does not seem to have any very bad effects beyond a temporary softening of the armature insulation and sometimes the loss of a certain amount of solder from the commutator connections, and the management are proud to say that they have not had a single armature burned out since the road has been in operation, in fact the only trouble they have ever had with an armature is that in two cases the insulation was scraped off the wires by rubbing against the pole pieces in consequence of a defective bearing. This is not a bad record considering that there were 124 of them in use. There has never yet been a commutator lost, or even has it been necessary to repair one, apart from resoldering a few melted connections, and the heaviest wear on any diameter up to date is ¾ inches, and the average wear taken from the first 28 closed cars in operation is 22 inches on the diameter after having made an average run of 71,800 miles. There has not been a commutator "flashed" or "bucked" in the past 18 months, and this perhaps is largely due to the excellent

quality of brush used, as well as to the constant care that they receive.

**CARE OF MOTORS.**—It has always been the practice to send an armature to the lathe at the first sign of a "buck," and it has been found that this is absolutely the only way to prevent a re-occurrence of the trouble.

A sharp eye is kept on the brushes to see that they do not wear down too far or become gripped in their holders, and commutators are cleaned and sandpapered about once a week with No. 0 sandpaper, although it is quite common for a commutator to keep a nice chocolate glaze for over a month without being touched.

The commutator is the most delicate and troublesome part of any electric equipment, and there are two or three more points which ought to be strongly recommended in its care:

1st—To send it to the lathe before it has worn down too far. Just as soon as a slight shoulder is formed at each side of the wearing surface, the brush is lifted by the end play of the armature and unnecessary and expensive sparking is the result. Further, the copper segments are rarely of a uniform boldness throughout, and the least inequality of wear soon develops into a low spot on the commutator.

2nd—It is very important that the brush springs be set at the proper tension, and it is easy to make a rough comparative test of this statement with no other tools than a pair of calipers or steel tape line and an angler's spring balance. It will be found that too light is just as serious a defect as too heavy a tension, if not more so. In one case excessive wear is due to sparking and probable "flashing," and in the other to actual friction.

3rd—See that brush-holders are accurately aligned so as to divide the current equally between the two circuits of the armature. If the brushes are but the thickness of one segment out of place, one is liable to be notified of the fact at the first heavy overload on the motor. Of course a great deal depends upon the quality of brush used, and cost price of this article should not be considered.

The brush used here averages a life of 12,600 car miles and costs 15c. a piece, which is more than most brushes of this size on the market, but let any one just make a simple calculation to see how many times the difference in the price of the brush goes into the saving effect by prolonging the life of a commutator several years.

The cost of renewing one commutator would keep a 50 car equipment in brushes for two years.

(I have now to apologize for having perhaps tired you with detail, but I feel that a great deal more could be said on this subject if time and courtesy permitted.)

Some trouble has been experienced during the snow storms of winter by the grounding of field coils, but means have been found to effectually prevent this in future. I might here mention that during 12 hours of a cold dry snow storm, when light particles of snow are flying about, 2 or 3 gallons of water are sometimes collected in the bottom of the motor casings. Water and slush in the spring time have given no trouble.

A word about controllers. Aside from the burning out of a couple of magnetic blow-out coils, there have never been any repairs made on any of the 124 controllers in service beyond the renewing of the sparking tips of the drum, which is done about once in two years at cost of about 50c. a controller.

Here again are the results attained by vigorous inspection and careful cleaning each night.

Apart from the nightly inspection it is the practice of the road to thoroughly overhaul every car once in every six weeks. This work is done in day time. Bearings and armatures are examined, brush springs set, brake rigging adjusted, and journal boxes examined and renewed if necessary.

As a result of this routine work, which costs but little, it is seldom that the service has to suffer the annoyance and blockage of traffic caused by a disabled car on the road. It can be safely said that there are not more than 2 or 3 cars ever pulled out of service for any reason whatever from early spring to late in the fall. In winter the number is somewhat greater.

#### CURRENT CONSUMPTION OF CARS ON GRADES.

The current required to get a loaded car up the steepest grades on a good summer rail, is practically constant and well within the overload capacity of the car motors. The maximum amount usually drawn from the line at 520 to 540 volts under such conditions is rarely above 125 amperes, and that for a short time only. The average current is from 60 to 80 amperes per car.

Just as soon as the appearance of snow or ice on the rail has to be considered, the ascent becomes a more serious question. Wheels begin to skid and the car loses momentum, then sand is applied, and the sudden overload on the motors as the wheels take a grip is often beyond the capacity of the heaviest fuse wire it is safe to use on the car equipments, viz., 14 B & S. This wire will carry 180 amperes for several minutes in winter time and 200 amp. for about 10 seconds, and this will give a rough idea of the power required. The rated capacity of the motors is 50 amp., so that when running on the parallel connection the rated load per car would be 100 amp. In other words, every equipment on the road has frequently to stand each day an overload of from 50 to 120 per cent. These figures, however, are yet too low for the current consumed at times by the driving motors on the sweepers. On these there has been frequently measured an overload lasting an appreciable time of 180% to 200%. Apart from these sudden maxima, the average load distributed between the two motors sometimes averages 150 amp. for hours at a time, including several short periods of comparative rest. Some, I know, will say that it is extremely bad practice to strain an equipment to such an extent but, without denying the charge, it may be said that these sweepers have cleaned over 6,000 miles of track every

year for the last three years, and the only mishap which occurred to any one of them during the third year of their operation was the grounding of one field coil, this too in spite of the fact that they were on one occasion running for 106 hours continuously, each one wearing out 3 or 4 sets of brooms during that time. On several occasions they were running continuously for two or three days, except for an occasional stop of an hour to renew the brooms.

Curve No. 2 shows the average power required by each car in service during each month of the year. These curves are calculated from the readings of an integrating wattmeter in the central station.

The total cost of maintenance of electric equipment per car mile per year is 17c.

**EFFICIENCY OF MOTORMEN.** The car service calls for a working staff of 70 conductors and as many motormen. All motormen before being accepted on the road must go through a period of training averaging from three weeks to a month. Part of this time is spent on the road in the company of a good regular motorman, and at least a week is spent in the car sheds, where the novice acts as helper at nominal wages. He is then examined as to his knowledge of the road, car equipment and regulations. Very little technical knowledge is required beyond a thorough understanding of the different parts of the equipment. As a result of this discrimination against the blockhead and the fool, it is a marked fact that on every car in service, "the man behind the gun" knows his business and uses his brains to the advantage of the company.

**SNOW AND ICE.**—The greatest difficulty encountered by the Railway Company in its efforts to provide a regular and efficient car service during the winter months, is the clearing away of the snow from the tracks. It is not so much that the snowfall is somewhat heavier than in Montreal and Ottawa districts, as that the extremely narrow strips of roadway either one side of the track or the other, soon become piled up with snow to such an extent that all snow removed by a passing sweeper immediately slides back on to the rails and blocks the passage of the following car.

Another serious disadvantage is that all cars in the city have to run over some sections of single track. This fact requires, of course, that cars shall make regular crossings at certain points, and if one car should be late for—or worse still, not reach—its crossing point, several of the following pairs of cars which cross at the same point will be stalled there until the tangle is straightened out. A delay of this sort is disastrous in many ways, because the leading car, when it gets away, has sometimes to plough its way through a heavy accumulation of snow until it is, possibly, extricated from its sorry plight by a passing sweeper, which has to be signalled and shunted past the waiting cars before it can be of any service. Matters are soon straightened out, but then that sweeper should have been somewhere else and there is more trouble ahead. Just as long as all cars make their proper crossings, no matter if they be a few minutes behind scheduled time, everything works smoothly, and after that, complications seem to increase in geometrical progression.

It is the practice to send out the "wing plows" as soon as a certain amount of snow has fallen, and these follow the sweepers around the whole length of the track, at regular intervals, pushing the snow piles back as far as six feet from the rail where it is possible, although there are miles of track to be kept open where there is less than that distance between the rail and the actual buildings, to say nothing of the sundry poles and sidewalks that necessarily intervene.

As the day wears on and the snow still continues to fall, the swing of the plows is limited to two feet and possibly to one foot, after which it is a hard struggle to keep everything moving through the rectangular channel four to five feet deep which has been formed by the wing plows in their endeavors to clear the right of way.

There are several bad spots at which it is absolutely necessary to keep gangs of snow shovellers at work as soon as the storm reaches any more than even moderate proportions.

It has further been necessary on two or three occasions to pull all cars out of service in order to give the tireless sweepers a chance to keep the road open, but only once in 1898 and once in 1899 has the service been entirely blocked, and that for one day only.

Nearly all cars in service now carry side brooms or flangers about three feet in length, which are set obliquely across the rails about one foot ahead of the front wheels. These consist of cast frame, into which are fastened a number of cuttings from the sweeper brooms about ten inches in length. They cost very little and have proved of invaluable service in keeping the rails clear of snow during the hourly or half-hourly intervals between passing sweepers; in fact, the car service very often depends entirely upon these to get through a light snowstorm, a couple of sweepers being sent out, after it is all over, in order to clean up.

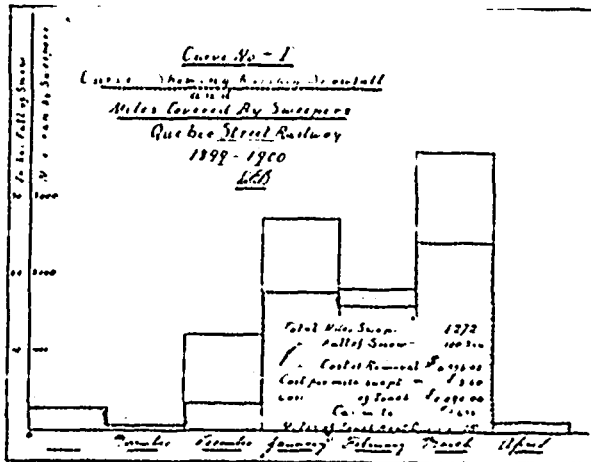
These long brooms have another great advantage over a narrow steel wire brush in that they keep the snow and ice at each side of the rails at an easy slope toward the bottom, instead of cutting a deep rectangular trough which remains filled with snow after the sweeper brooms have gone over the track.

Since adopting these brooms on the road, a marked decrease in the power consumed by the rolling stock during storms is noticed, and a great saving has been effected in the quantity of tannin used by the sweepers for each mile of sweeping. This results from the fact that when the transverse section of the winter road bed is properly graded the sweeper brooms need not be let down so far in order to clear all snow from the rail, thus saving a great deal of breakage.

The average snowfall in Quebec for the last three years has

been as follows: 1897-98, 104.6 inches; 1898-99, 120.6 inches; 1899-00, 100.3 inches.

Curve No. 1 shows the proportion of last year's total fall during each month, also the number of miles covered by the sweepers during each month of the same year. Further data relative to cost of removal will be found beneath. These include all cost of



sweeping, stovelling and carting away of snow, as well as the interest, depreciation and maintenance of the necessary equipment.

With reference to the removal of snow, the city by-laws enact "that proprietors or occupants shall remove the snow and ice from their roofs and from the streets, from the street line to the centre of the street, and keep the same within two inches of the pavement."

The by-law granting a franchise to the Quebec Railway, Light & Power Co. enacts "that the company shall remove the snow from their tracks and two feet on either side thereof." As the Company could not see their way to carry out this regulation without having trouble with the proprietors or tenants, they every year make an arrangement with the tenants on that side of the street on which the Company throw their snow, to remove the same, paying them at the rate of 10 cents per lineal foot of their frontage, except in places where the snow is known to accumulate, where they pay at the rate of 15 cents per lineal foot. Consequently, all the Company have to do is to throw the snow off their tracks, leaving the proprietors to remove the same along with their own. With this arrangement the proprietors seem very well satisfied.

One can better appreciate the relative magnitude of the snow expenses when told that \$1.54 has to be deducted from the daily gross earnings of every car in service during the year in order to make up the amount.

**HEATERS.**—All closed cars in service are heated electrically during six months of the year, the heaters being divided into 4 sections, two on each side of car, each pair being separately controlled. The current consumed by each pair is 49 amp., and it therefore requires 9.8 amp. at 520 volts, 5.1 k.w., to heat a car during four months of the year when both sides are in use, but during the months of November and April one side is quite sufficient to maintain a comfortable temperature within the thin shell which composes the car body.

Taking the average time of service of car at 18 hours per day, and the actual cost of the extra current required at 65c. per k.w. hr., the cost of heating one car is as follows:—

$$5.1 \times .65 = 3.31 \text{ cts. per hour}$$

$$58 \text{ " " " day}$$

$$150 \times 58 = \$87.00 \text{ " " year.}$$

This is equivalent to .204 cents per car mile, and the maxim taught is, "don't use electric heaters in a cold climate unless you have the advantages of an unlimited water-power and station capacity." The interest on first cost, depreciation and maintenance of the heating equipment would not add more than 2 or 3% to the figures.

The electric railway, as well as nearly all lights and motors in Quebec, are operated through a sub-station within the city, from a power house situated at the Falls of Montmorency. The power house is 150 ft. long and 50 ft. wide, and contains the following equipment: 3-600 k.w. 2 phase 66 eye 5,500 volt S.K.C. alternators; 1-750 k.w. 2 phase 66 eye 5,500 volt S.K.C. alternators; 1-600 k.w. double current 275-500 volt Westinghouse generator; 2-30 k.w. bipolar exciters.

All the larger machines are direct connected to 52 in. water wheels of 1000 h.p. capacity each, and operating at a speed of 286 revolutions per minute. They were built by the Stillwell Birce and Smith Valve Co., of Dayton, Ohio.

The power is transmitted to the city over 16 wires, carried on two separate pole lines. Each machine is fed into a separate circuit at Montmorency, but may be connected in parallel at the sub-station in the city. The sub-station consists of a substantial stone building containing the following machines: 2-600 k.w. 2 phase S.K.C. synchronous motors, taking current at 5000 volts direct connected to 2-500 k.w. 550 volt G. E. railway generators, 2-200 k.w. 2 phase 5000 volt synchronous motors direct connected to 4-125 light multi-circuit Brush arc machines.

Besides these are the direct connected starting motors required for the motor-generators, 2 exciters driven by induction motors, and all necessary transformers and switchboards for distributing the current to its various uses.

**RAILWAY SWITCHBOARDS.** The railway switchboard contains—besides switches, circuit-breakers, volt and ampere meters and field resistance—1 Thomson integrating watt-meter, 2 Bristol recording ammeters, and 1 Bristol recording volt-meter.

From the daily readings of the first has been prepared curve No. 2, which shows the current consumed by the railway cars during each month of the year. It will be noticed how much more power is required during the winter than in summer, in spite of the fact that fewer cars are in service, and the car miles run by each are fewer than in summer. It will also be seen that, during the month of February, each car consumes an average of 24 h.p. during a whole day's run.

The maximum overload capacity which the station is ever called upon to furnish the railway, is about 900 k.w., and a yearly average is about 350 k.w.

The peak of the summer load very rarely reaches 550 k.w. and is easily handled by one generator, although a 10 or 15% increase over this load would be very liable to pull the synchronous driving motor out of step, if of long duration.

Time has unfortunately not permitted the preparation of any accurate curves to tell the story of the station's output, but one may form an idea of the average fluctuations by an examination of the recording ammeter charts on exhibition.

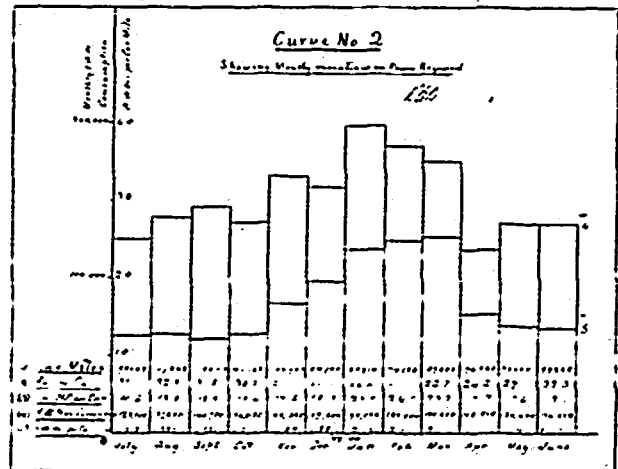
Before closing this very hurriedly prepared paper, it may perhaps be in order to make a few remarks relative to the conversion of the old Q. M. & C. Railway to an electric suburban line. This excellent road-bed now serves to carry a fast service of electric cars, interspersed with steam trains, which handle the heavy traffic between Quebec and the Shrine of St. Anne de Beaupre.

A trolley wire is suspended at a height of 22 ft. above the rail by stranded steel span wires hung from wooden poles, and the rails have been connected with single bonds of No. 00 wire for a distance of 26 miles. A copper cable of 300,000 C.M. area runs parallel with trolley wire for most of its length and is connected to the trolley every quarter mile.

This cable is fed at a pressure of 560 volts at 3 points, at Quebec, at Montmorency, 7 miles away, and at St. Annes, 21 miles away from the city, all power of course being generated at Montmorency and transmitted for ends of line at a high alternating tension.

Cars used are 50 ft. over all, mounted on Taylor trucks and each equipped with 4 Westinghouse 38 B motors geared to a speed of 45 miles an hour.

On account of the many stops to be made in the length of the line (18), a schedule time of 21 miles in 60 minutes has been adopted.



This is quite satisfactory and fast enough, because the line is a very busy one in two ways. The number of passengers carried is beyond the highest hopes of the management, and it would be impossible to run any more trains over a single track and on train orders than are operated at present. There is every prospect of a second track being laid in the near future. The idea of running steam and electric cars is a novel one in this country, but is highly successful in every respect.

**SPARKS.**

The St. John's Electric Company, of St. Johns, Nfld., has sold out to K. G. Reid.

The ratepayers of Nelson, B. C., have sanctioned an expenditure of \$15,000 for an electric light plant.

A committee has been appointed by the town council of Stellarton, N. S., to obtain information as to the cost of an electric light plant to be controlled by the town.

J. S. Dennis, a lineman for over fifty years in the employ of the G. N.W. Telegraph Company, was killed in Ottawa recently by the breaking of a pole on which he was working.

The town council of Newmarket, Ont., will ask the Lieutenant-Governor-in-council to authorize an expenditure of \$10,000 to increase the electric light plant. If granted, the necessity of submitting a by-law to the ratepayers will be removed.

"Polyphase Electric Currents and Alternating Current Motors," by Silvanus P. Thompson, B.Sc., B.A., F.R.S.: This work is of considerable value to the electrical fraternity, as it treats of polyphase currents and alternating current motors and their application to various services in a most exhaustive and thorough manner. The book consists of 508 pages, divided into 20 chapters, and contains 358 illustrations, 24 of them in color, and eight folding plates. There are reviewed such interesting subjects as: Combination of polyphase circuits and economy of copper; structure of polyphase motors; polyphase electric railways; properties of rotating magnetic fields; etc. It is the second edition, and bound in cloth, retails at \$5. The publishers are Messrs. Spon & Chamberlain, 12 Cortland Street, New York.

CONVENTION NOTES.

Mr. E. E. Cary's graphophone entertainments were well attended and much appreciated.

The Association did a fitting thing by recognizing the services of ex-president Yule in connection with the work of the Legislative Committee.

Mr. J. J. Wright, Mrs. Wright, the Misses Wright, and Mr. and Mrs. A. B. Smith went down to the convention in Mr. Wright's yacht, "The Electra."

The evening excursion among the Thousand Islands on board the steamer "America," equipped with a powerful searchlight, was most enjoyable.

During the convention the home of Mr. Fred. Simmons, electrician, Princess street, was decorated especially with variegated colored incandescent lights.

Mr. Higman, of Ottawa, one of the stand-by's of the Association, was among the absentees at this year's convention, having been on a visit to the Pacific coast.

Many regrets were expressed at the absence of Prof. Owen, who was prevented, by the death of his sister, from attending the convention and presenting his promised paper.

The unavoidable absence of Mr. A. A. Wright, of Renfrew, and Mr. Geo. Black, of Hamilton, two veteran and useful members of the Association, was the subject of regret.

The weather was a trifle too warm for comfort, and induced a disposition to give the social features preference over business. A cooler month should be chosen for the meeting at Ottawa next year.

The kindness of Chief Hughes in conducting members through the penitentiary and explaining to them the prison regulations, and other interesting features of this institution, was much appreciated.

Everybody voted Mr. Fred. Simmons a "hustler" in behalf of the success of the convention, and withal a jolly good fellow. He was ably seconded by Mr. Nickle, manager of the Kingston street railway.

Mr. Geo. M. DeGinther, representing the Holophane Glass Co., of New York, Mr. Philip H. Hover, of the New York Insulated Wire Co., and Mr. William C. Hubbard, of the Manhattan General Construction Co., of New York, were among the American visitors to the convention.

Mr. Burns, representing Messrs. Munderloh & Co., of Montreal distributed as a souvenir of the convention an attractive and useful pocket match box, having celluloid sides and nickel ends, bearing on one side the Canadian flag and on the other the name of the company and the device "Our lamps are matches—have a light." The company will be pleased on request to send one of these souvenirs to any member of the Canadian Electrical Association who could not attend the convention.

The Packard Electric Company had a magnificent exhibit in the large hall immediately above the council chamber where the sessions of the convention were held. Mr. Cary, the manager, is an adept at arranging exhibits of this kind, having gained his experience in connection with the National Electric Light Association conventions in the United States. The exhibit was most complete and artistic, and attracted much attention and praise. An Italian orchestra formed a pleasing accompaniment. We propose to more fully describe, and perhaps illustrate, this exhibit in a succeeding issue, being debarred from doing so in this number by lack of space.

The platform decoration and exhibition at the city hall—the work of Mr. I. H. Breck, of Kingston, was unique in design and most attractive. On either side of the neatly carpeted stair-way at the top step were two white square pillars. At the base in golden letters were the words "Fiat Lux" (let there be light). Engraved on the left pillar were the well known names of "Volta" and "Franklin," while to the right appeared those of "Edison" and "Tesla." Surmounting the pillars was an archway made of galvanized iron letters two feet high, and attached to which the word "Welcome" brilliantly illuminated with 72 incandescent lights, blazed forth. Under the archway the typical emblem, a huge naturally tinted maple leaf, was lighted up with the letters "C.E.A." (Canadian Electrical Association) in red, white, and blue lights. Stretching to the right and left were green colored decorations and lights. Each side of the platform was handsomely furnished and carpeted, and lighted with handsome hanging and bracket lamps of the Packard firm, St. Catharines. All at the convention commented on the beauty and originality of design of the display, and citizens were loud in their praise of the exhibit, claiming it to be the best yet seen in Kingston.

Evidence has recently been taken in the matter of arbitration for the purchase by the city of Winnipeg of the lighting plant now operated by the Winnipeg Street Railway Company. M. J. A. Kammerer, of Toronto, was one of the experts examined.

The exhibitors of electrical apparatus at the Toronto Exhibition just closed were the Royal Electric Company, of Montreal; The Electrical Construction Company, of London, and Jones & Moore, of Toronto. The Royal Company had their usual attractive display, consisting of S. K. C. dynamos, direct current and alternating motors, transformers, arc and incandescent lamps, switchboard apparatus, etc. The Electrical Construction Company exhibited their well-known type of dynamo and several motors. The Goldie McCulloch Company, of Galt, exhibited their Ideal and Wheelock engines, also a number of gas and gasoline engines, which attracted more than ordinary attention.

PUBLICATIONS.

We have received, through the kindness of Mr. Frank M. Baker, a copy of the report on tests of street car brakes, as conducted last year by the New York Railroad Commission. After making most exhaustive tests, the Board of Commissioners gave the first place to the Electric Selector and Signal Company, second to the Peckham Motor, Truck and Wheel Company, third to the Sterling Supply and Manufacturing Company, and fourth to the G. P. Magann Air Brake Company.

"Modern Electric Railway Motors," by George T. Hanchett, S.B. This work is a discussion of current practice in electric railway motor construction, maintenance and repair, and is so written as to be easily understood by anyone who has had a thorough grounding in Ohm's law. It consists of upwards of 200 pages, abundantly illustrated, and treats of the various designs of motors in a most able manner. The publishers are the Street Railway Publishing Company, of New York.

The General Engineering Company, of Toronto, have just issued their fifth catalogue of the Jones Underfeed Mechanical Stoker, and have succeeded in producing a work worthy of special mention. In it the Jones stoker, improved and perfected, is fully described and illustrated, and strong arguments advanced in favor of the underfeed principle of firing. It also contains numerous statistics of tests, as well as testimonials from persons who have used the Jones stoker in Canada and the United States. The General Engineering Company of Ontario, who control this stoker for the Dominion, is now under the able management of Mr. J. J. Ashworth.

SPARKS.

The Brandon Electric Light Company, Brandon, Man., have been granted authority to increase their capital from \$50,000 to \$125,000.

The Canadian Electric Light Company, of Quebec, are arranging to sell power to a pulp company to be established at the Chaudiere Falls.

A motion has been introduced in the town council of Rat Portage, Ont., to enter into arbitration with a view to the purchase of the electric plant of the Citizens Electric Light Company.

At a recent meeting of the city council at St. John, N.B., it was decided to engage an expert to report on the cost of installing and operating a civic electric plant for lighting the streets of the city.

A company has been formed in Ottawa to take over the Conroy electric plant at Dechenes, Que. The capital is placed at \$300,000. The power house at Dechenes was built from designs of Wm. Kennedy, C.E., of Montreal, the electrical apparatus being of the Canadian General Company's manufacture.

A school has been established by the United States government at Fort Monroe, Va., for the purpose of instructing regulars in the application of electrical machinery used in the army. The rules, published by the Secretary of War, provide that applicants must be under 25 years of age, unmarried, qualified as a gunner, a student of a correspondence school, or the owner of electrical books, and no applicant will be recommended unless he has sought for a year or more to become practically familiar with one or more classes of electric machinery or with some portion of the elementary literature on electricity.

MOONLIGHT SCHEDULE FOR SEPTEMBER.

Day of Month.	Light.	Extinguish.	No. of Hours.
	H.M.	H.M.	H.M.
1....	P.M. 9.10	A.M. 4.30	7.20
2....	" 10.00	" 4.30	6.30
3....	" 11.00	" 4.30	5.30
4....	A.M. 12.10	" 4.30	4.20
5....	" 1.10	" 4.30	3.20
6....	No Light.	No Light.	....
7....	No Light.	No Light.	....
9....	No Light.	No Light.	....
10....	No Light.	No Light.	....
11....	P.M. 6.40	P.M. 8.40	2.00
12....	" 6.40	" 9.20	2.40
13....	" 6.40	" 10.00	3.20
14....	" 6.40	" 11.00	4.20
15....	" 6.40	" 11.50	5.10
16....	" 9.40	A.M. 0.50	6.10
17....	" 6.40	" 1.50	7.10
18....	" 6.30	" 2.50	8.20
19....	" 6.30	" 4.00	9.30
20....	" 6.30	" 4.50	10.20
21....	" 6.30	" 4.50	10.20
22....	" 6.30	" 4.50	10.20
23....	" 7.20	" 4.50	10.30
24....	" 6.20	" 4.50	10.30
25....	" 6.20	" 4.50	10.30
26....	" 6.20	" 4.50	10.30
27....	" 6.20	" 4.50	10.30
28....	" 7.00	" 5.00	100.0
29....	" 8.00	" 5.00	9.00
30....	" 8.50	" 5.00	8.10
31....			

Total.....186.20



# ENGINEERING and MECHANICS

## CANADIAN ASSOCIATION OF STATIONARY ENGINEERS.

### ELEVENTH ANNUAL CONVENTION.

The Canadian Association of Stationary Engineers opened its eleventh annual convention in Engineer's Hall, 61 Victoria street, Toronto, on Tuesday, August 28th, at 11 a.m. Mr. James Huggett, president of Toronto No. 1, extended a few words of greeting to the delegates, after which the executive president, Mr. R.C. Pettigrew, of Hamilton, took the chair.

The following executive officers and delegates were in attendance: R. C. Pettigrew, Hamilton, president; G.C. Mooring, Toronto, vice-president; A.M. Wickens, Toronto, secretary; Chas. Moseley, Toronto, treasurer; W. Oelschlager, Berlin, conductor; W. Bear, Dresden, doorkeeper. Delegates J. Huggett, A. Storer, H. E. Terry, W.J. Webb, N.V. Kuhlman, Toronto No. 1; G. W. Dawson, Hamilton No. 2; A. Ames, Brantford No. 4; R. W. Greene, Guelph No. 6; W. Steeper, Dresden No. 8; W. Oelschlager, Berlin No. 9; W. F. Chapman, Brockville No. 15; J. Uttley, Waterloo No. 17; J. M. Dixon and J.T. Smart, Toronto No. 18.

Visitors during the convention included E. J. Philip, J. J. Main, J. W. Marr, W.G. Blackgrove, John Fox, W. Johnson, Geo. Bradley, W. D. Bly, Martin Mose, R. McCauley, P. Jaffray, Alf. Butcher, S. Thomson, Fred Hamner, Wm. Bourne, W. D. Irwin, and James Bannon, of Toronto No. 1, and T. Graham (president), P. Trowern, H. McMartin, Jos. Hughes, J. Hamilton, W.T. Bateman and J. Richardson, of Toronto No. 18.

The first business of the convention was the appointment of the following committees:

Committee on Credentials—J. G. Bain, C. Moseley, J. Uttley. Committee on Finance—Jos. Smart, H. E. Terry, G. W. Dawson. Committee on Mileage—A. Storer, W.J. Webb, W. Steeper. Good of the Order—J. M. Dixon, W. F. Chapman, J. Huggett, A. Ames, W. Bear and W. Oelschlager.

The president then read his opening address, as follows:

#### PRESIDENT'S ADDRESS.

Brethren,—It is with pleasure that I welcome you to our eleventh annual convention. You have been selected from the different Associations throughout the Dominion to legislate and enact laws for the welfare of the Canadian Association of Stationary Engineers. Before proceeding further, kindly permit me to thank you for the honor you conferred upon me in electing me unanimously to the office of president at our last convention. I can assure you that I appreciate the honor very highly, and while I have endeavored to fill the position in a fitting manner, I fear my efforts were not as successful as could be wished for.

The number of very important questions coming before this convention should receive your earnest and careful attention and deliberation.

The matter of plebiscite vote on bi-annual conventions will be brought up for debate.

The report of the committee re bill for legislation is one we should consider well, as this will be the most important matter before us. I trust the committee will have this in detail, as each delegate will have to report to his own association, and it is essential that we keep right on and not give up until we have been successful in having the bill put through in every detail. I may say that within the last two months I have had three men who operate threshing engines inquire of me about certificates, and as to the method of how to go about to get them. This should be very encouraging, as it indicates that even in the rural sections engineers are considering the necessity of qualifying themselves for certificates.

You will see by the secretary's report that we are gaining ground. The old Association has been revised, and charters for new Association have been signed.

At your last convention I must say you made an excellent choice in your selection of a secretary in electing past-president Wickens to the office. In connection with the duties of this office a great amount of work is entailed, and Bro. Wickens has succeeded in keeping in touch with every officer of the executive, as well as each subordinate association.

The lesson papers which were in circulation last winter had the effect of bringing every member to think, and although some are

old and scholarly men, there is yet something to learn and to teach. This feature in connection with our Association should be continued every winter, and even should some of the papers and lessons be repeated, there are always young men coming into the Association to whom such lessons would be a material help, as well as having the effect of perfecting ourselves in the different subjects taken up.

Yours fraternally,

ROBT. C. PETTIGREW,  
President C.A.S.E.

On motion of Mr. Terry, seconded by Mr. Huggett, the president's address was received and referred to the committee on Good of the Order.

The committee on Credentials presented their report and were discharged. The minutes of the last meeting were read by the secretary and adopted.

#### SECRETARY'S REPORT.

Mr. Wickens, Secretary, submitted his report, which showed a membership of 239. It stated that a new association had been formed at Vancouver, B. C., and there was a good prospect of one at Sarnia. Ten associations had lapsed. Monthly papers, as ordered by the convention, were issued for five months, and had been of much benefit to the members. The legislative business for the year was strongly pushed by the joint committee of the Canadian and Ontario associations, and hopes are entertained of securing the desired legislation at the next session of the House. It was recommended to the convention that the actions of the Legislative Committee of the Brotherhood of Locomotive Engineers, in reference to the legislation asked for by the C.A.S.E., be referred to a special committee, with instructions to endeavor to remove the opposition now being put forth by that body. The membership of the Association was shown to be as follows: Toronto No. 1, 124; Hamilton No. 2, 31; Brantford No. 4, 5; Dresden No. 8, 7; Berlin No. 9, 13; Brockville No. 15, 12; Waterloo No. 17, 11; Toronto No. 18, 38; Vancouver No. 19, 16; Calgary No. 1, 9 members—making a total of 266 members, a net gain (after deducting Montreal No. 1) of 27 members for the year.

The secretary's report was referred to the committee on Good of the Order. The report of the Treasurer, Mr. Moseley, showed a cash balance on hand of \$202.18. Referred to the Auditing and Finance Committee.

Mr. Terry gave notice of motion that section 1, article 12. of the constitution, be amended by striking out the word "annual," and substituting "biennial," therefor. He also moved, seconded by Mr. Ames, that the present convention be concluded in two days. Carried.

Mr. Dixon gave notice of motion that in future the annual date of meeting be left in the hands of the executive committee, August, of course, being the month for such conventions. Referred to the Good of the Order Committee.

Adjournment was then made until 2.30 p.m. in the afternoon, when business was resumed. The reports of the committees on Mileage, Auditing and Finance were presented and adopted. The report of the committee on Good of the Order was read by Mr. Dixon, as follows:

#### REPORT OF COMMITTEE ON GOOD OF THE ORDER.

Clause 1.—Resolved, That the president's address was of a hopeful and congratulatory character, showing also a careful consideration of the manifold questions affecting the Association's interests.

Clause 2.—Resolved, That the executive secretary's report was complete in the details necessary for our development as an Association.

Clause 3.—Resolved, That C.A.S.E. membership, while not showing a great increase, had been held together firmly, largely by the individual efforts of the executive secretary. We wish to impress upon the members as a society that there are numbers of men in our profession who are eligible candidates for our society, who might be reached by making a united effort to secure them as members. We recommend further, that deputations be appointed from time to time to address mass meetings of engineers

called for that end by the executive, who should be instructed to provide delegates and funds for such purposes.

Clause 4.—Resolved, That the Association, during its efforts to secure legislation at the last session of the House, was materially hindered by the opposition of a sister society, which issued a written protest unfavorable to our interests, and while we do not propose to deal with them in the spirit of retaliation, we are of the opinion that they must be laboring under an erroneous opinion to attempt to prevent us from obtaining legislation which would be of universal advantage. We desire to endorse our executive secretary's suggestion that a special committee be appointed to correspond with this sister organization with a view to enlightening them, and ultimately having this opposition removed, and their support obtained.

Clause 5.—Resolved, That the executive be instructed to issue



MR. G. C. MOORING, President.

a strongly worded circular prior to each half-yearly return made by secretaries of primary branches urging the necessity of making such returns punctually.

Clause 6.—Resolved, That the issue of the lesson papers be continued, as apart from their educational value they keep the members in touch with each other, and such cohesive value should not be overlooked. It is also recommended that the papers be mailed to secretaries of the primary branches for distribution.

Clause 7.—Resolved, That the month of August will in future be the month in which the annual convention is held, and we are of the opinion that the fixing of the day or days of the month to hold same shall be left to the decision of the executive.

Clause 8.—Resolved, That the changing of the convention from an annual to a bi-annual session would be detrimental to the growth of our society. The reasons are respectfully submitted: First, that the organization will be in the course of time very wide in its influence. Second, that the yearly interchange of ideas is a great help. Third, that the bi-annual meeting would mean a lack of interest that would imperil the life of the association.

Clause 9.—Resolved, That the papers be issued to manufacturers and owners of steam plants, such papers to deal with questions, for example, as "Economy in Fuel," "General Saving Effected by the Supervision of a Competent Engineer," etc. We recommend that such papers be gotten up plainly and simply, and in such a general manner that they will impress not only the engineer, but the employer through whose hands they pass. We also recommend a grant of \$50 to be used in this way.

Clause 10.—Resolved, That a continued effort be made, both by the Association and its individual members, to secure such legislation as would be in the best interests of not only the Association, but the public at large.

The above report was taken up clause by clause. Clauses 1 and 2 were adopted without discussion. Clause 3 resulted in considerable discussion, some of the members questioning the wisdom of the recommendation to send delegates to assist in organizing branch associations, inasmuch as a large expense might be incurred, but it was finally adopted upon the understanding that the member living nearest to the town or city should be sent. Clauses 4 and 5 were adopted as presented. Clause 6 brought up the question whether instruction papers should be mailed to the secretaries of the subordinate associations, or whether they should be mailed to each member direct. Mr. Wickens said that in order to place the papers in the hands of the members, it seemed necessary to send them direct. Mr. Huggett said that outside members complained of not getting their papers. Consideration of this clause was deferred until the following morning, and at 4 p.m. the

delegates became the guests of the City Council Reception Committee and enjoyed a drive around the city, also visiting the refrigerating plant of the O'Keefe Brewing Company.

In the evening, a public meeting was held in the hall of Toronto No. 18, at which there was a large attendance. An address of welcome was delivered by Mr. T. Graham, president of Toronto No. 18. A paper on "Boiler Construction" was read by Mr. P. Trowern, engineer at the Toronto asylum. Considerable discussion followed, Mr. E. J. Philip taking exception in a friendly manner to some of the arguments advanced by Mr. Trowern. Mr. Wickens also spoke. A vote of thanks was tendered to Mr. Trowern for his paper.

An interesting paper on "Chimney Construction" was presented by Mr. E. J. Philip, chief engineer for the T. Eaton Company. Mr. Philip has just completed the construction for this company, of a chimney 186 feet in height, with 7-inch flues, and having a total weight of 1,400 tons. It is 16 feet diameter at bottom, and 9 feet 3 inches at top. The base is six feet of concrete. The paper will be published next month.

#### SECOND DAY.

Upon resuming business, the discussion on clause 6 of the report of Committee on Good of the Order was continued. Mr. Dixon was in favor of assessing a general tax on the members for the sending out of instruction papers. It was finally decided to continue the sending of papers to the subordinate lodges as heretofore. Clause 7 was adopted without amendment. Clause 8 aroused a lively discussion on the question of annual or biennial conventions. A motion by Mr. Terry, seconded by Mr. Webb, that the clause be struck out, was lost. Mr. Terry spoke very strongly in favor of a convention every two years, contending that the money thus saved could be expended to better advantage for educational purposes. Mr. Moseley suggested doing away with the annual banquet, which would reduce the expenses and encourage small associations to hold the annual convention in their towns. The



MR. CHAS. MOSELEY, Vice-President.

clause in favor of annual conventions was finally carried by a good majority. Clause 9 recommended the sending of engineering papers to steam users. Mr. Moseley moved, seconded by Mr. Terry, that the clause be struck out. Lost. Mr. Mooring moved an amendment that the sum of \$50 be voted for the purpose, to be used in conjunction with a grant from the Ontario Association. Carried. Clause 10 was adopted, and on motion of Mr. Dixon, seconded by Mr. Ames, the report of the committee, as amended, was adopted.

On motion of Mr. Moseley, Messrs. Dixon, Wickens, Huggett, Webb, Mooring, Dawson, and the mover were appointed a committee on legislation. The convention then adjourned to visit the plants of the

Toronto Street Railway Company and the Toronto Electric Light Company.

A committee was appointed to interview the Canadian Manufacturers' Association, to explain that the C.A.S.E. is an educational body, and that the legislation which is asked for is for the purpose of inducing users of steam power to employ properly qualified engineers.

At 3 p.m. the election of officers was proceeded with, the result being as follows: President, G. C. Mooring, Toronto; vice-president, Chas. Moseley, Toronto; Secretary, A. M. Wickens, Toronto; treasurer, Wm. Oelschlager, Berlin; conductor, Geo. Dawson, Hamilton; doorkeeper, John M. Dixon, Toronto. Votes of thanks were tendered to the scrutineers, Messrs. Trowern, Chapman, and Amber, and the installation of officers was then proceeded with.

It was decided to hold the next convention in the city of Brantford.

The usual grant was made to the secretary.

The retiring president, Mr. Pettigrew, was made the recipient of a past master's jewel. Votes of thanks were then tendered to the city council, the retiring officers, and the mechanical press.

On motion of Mr. Pettigrew, the secretary was instructed to send a letter of greeting to the Canadian Electrical Association in session at Kingston.

#### THE BANQUET.

The annual banquet was held at Webb's parlors on the evening of the 29th ultimo, Mr. Huggett, president Toronto No. 1, officiating as chairman. After welcoming the guests, the secretary read letters of regret from Mr. Carscallen, M.P.P., Hamilton; J. F. Ellis, president Canadian Manufacturers' Association; J. R. Barber, M. P., Georgetown; F. R. Latchford, M.P.P.; the Mayor, Ald. Loudon, and others. After the edibles had been disposed of, the toast list received attention. "The Queen" was duly honored. With the toast "Ontario, the Garden of Canada" was coupled the name of Thomas Crawford, M.P.P. He said he recognized the C.A.S.E. as a good society, and had had the

pleasure at one time to introduce a bill for the engineers, which, however, did not pass the House. Last year Mr. Carscallen had introduced a similar bill, and he thought results should be attained within a year or two. The legislation asked for was important. From the number of lives depending on the competency of the engineer, it became imperative that legislation should provide that he should be qualified for the position in which he was placed. To the toast "Toronto, the Queen City," Ald. Urquhart and Graham responded. Both recognized the usefulness of the C. A. S. E., and were in sympathy with their movement towards securing legislation. Messrs. Mooring and Moseley responded to "The Executive Council." The latter dwelt on the necessity of educating steam users to employ only competent engineers. In Toronto, he said, thirty-eight boilers were under the sidewalk, and it was absolutely necessary that they should be in charge of competent men. He knew of old boilers that had been taken out of second-hand shops and bricked up, but were totally unsafe. Mr. E. J. Philip was also asked to respond. He said that many thought that the object of the proposed legislation was to make the Association a closed corporation to advance wages, but this was entirely wrong. The public would be the principal gainers, and steam users would be benefitted by having their plants operated more economically. To the toast "Our Guests" Messrs. Steeper, Oelschlager and Pettigrew responded. The latter pointed out that the Association was not an enemy to the manufacturer. He hoped that other corporations would soon follow the example of Hamilton city council and employ only engineers holding certificates. "Our Rights and Wrongs" brought responses from Messrs. Wickens, Dixon and Main. Mr. Dixon made a most eloquent and humorous speech, which was heartily applauded. Toronto No. 1 was then toasted, and proceedings ended by singing "God Save the Queen." During the evening Blea's orchestra rendered a first-class programme of selections, and there were songs by Messrs. W. J. Lawrence, D. C. McGregor, H. B. Short and E. Piggott.

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**SPARKS.**

Mr. Hartley Gisborne, E.E., has resigned his position with the Crow's Nest Pass Coal Company, to accept a more lucrative appointment on Vancouver Island.

Mr. A. Harrington, of Shallow Lake, recently passed the examination of the Ontario Association of Engineers, and is now taking a course with the International Correspondence Schools, of Scranton, Pa.

The Vernon & Nelson Telephone Company has just secured a contract from the Miner-Graves Smelter people for the construction of a 30-mile metallic circuit private telephone system between Greenwood and Grand Forks, B.C.

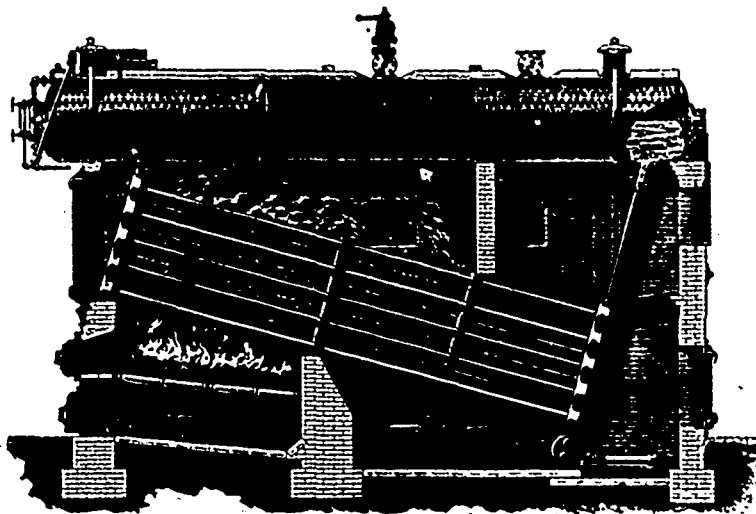
Mr. W. T. Steward, E. E., of Toronto, has just finished, on behalf of the town of Oshawa, in arranging an amicable settle-

ment with the present electric lighting company of that place, for a renewal of the contract for lighting for a term of five years.

W. Moore & Sons, of Meaford, have just installed a Thomson light alternator, in addition to the 500 light alternator and 35 light arc machine which have been in operation up to the present time. They expect to still further increase their plant in the near future by the addition of a large power plant, in order to meet the wants of the increased demand in their town.

The prices of scholarship in the International Correspondence Schools, Scranton, Pa., will be increased on October first. Before that date new students will have the benefit of the lower prices, in force at the time of enrolling. Even at the new prices, the scholarships are remarkably low, and the terms of payment are liberal. Payment may be made in either \$2, \$3 or \$5 installments, or a discount will be given to students paying in advance.

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## SPARKS.

Mr. W. H. Birchard has made an offer to the Royal Electric Company to purchase the electric light plant at Aurora, Ont.

The town council of Thessalon, Ont., have adopted a motion to consider the advisability of installing a civic electric light plant.

The city of Halifax, N.S., is looking into the question of street lighting. The Halifax Electric Tramway Company have agreed to make a new contract to supply 236 arc lamps at \$65 per lamp per annum, and a number of 50 c.p. Bernstein lamps for lighting the city building at \$21 per lamp per annum.

The arbitration to fix the value of the electric light plant of the Pembroke Electric Light Company, which the town of Pembroke desires to purchase, is in progress as we go to press. The arbitrators are Judge Mosgrove, of Ottawa, for the town, Judge Valin, of North Bay, for the company, and these two have agreed upon Judge Senkler, of Perth, as the third arbitrator. The Pembroke Electric Light Company have engaged as experts Mr. David Starr, E.E., of Montreal, and Mr. J.J. Ashworth, manager of the General Engineering Company, of Toronto, while the interests of the town are in the hands of Mr. Roderick J. Parke, E.E., of Toronto, and Robt. A. Ross, E.E., of Montreal.

Ambitious mechanics who desire to obtain better positions and higher wages should investigate the many advantages afforded by the correspondence method of instruction in the theory of the trades and engineering professions. Without leaving home, or losing time from work, the student pursues a thorough course of study under the direction of able instructors,

who are always ready and willing to assist him. Instruction papers, prepared especially for teaching by mail, are furnished free. These papers, written in clear and concise language, as free as possible from technicalities, are much superior to ordinary text-books on the subjects of which they treat. In addition, special information regarding any difficulties in their studies is furnished students without extra charge. It should be the ambition of every man to advance in his trade or profession. A mechanic with practical experience supplemented by theoretical education can command a better position than a man without such an education. The result of long experience in teaching by mail shows that no other method so fully meets the requirements of men who have but little time for study.

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**SPARKS.**

It has been rumored that the Ottawa Electric Railway Company contemplate extending their line from Rockcliffe Range to Besserer Grove.

At a recent meeting of the city council of Picton, Ont., the question of installing a municipal electric light plant was given some consideration.

The Selkirk Electric Railway Company have met with considerable success in securing franchise privileges from the various municipalities along the route of their proposed road from Winnipeg to Selkirk. The overhead trolley system is to be adopted.

The ELECTRICAL NEWS acknowledges receipt of an invitation to be present at the twenty-second annual Rhode Island Clam Dinner tendered to the electrical fraternity by Mr. Eugene F. Phillips, manager of the American Electrical Works, of Providence, R. I. The event takes place on the 13th inst.

The corporation of East Toronto is making satisfactory progress with the installation of its municipal electric light plant. The contract for electrical apparatus has been awarded to the Canadian General Electric Company, and tenders invited for the erection of power house. Mr. H. F. Strickland is consulting engineer.

Among the exhibitors in the machinery hall at the Toronto Exhibition was the Steam Specialty Company, of 43 Welling-

ton street east, Toronto. This company are sole agents in Canada for the Bundy steam specialties, including traps, separators, feed water heaters, etc. The Bundy return steam trap attracted considerable attention. By its use the condensed water from all apparatus using live or exhaust steam is returned to the boiler, thus affecting a saving in fuel. The Steam Specialty Company are also agents for the Manzel automatic oil pump. They are now represented on the road by Mr. J. W. Marr, late chief engineer for the Metropolitan Railway Company.

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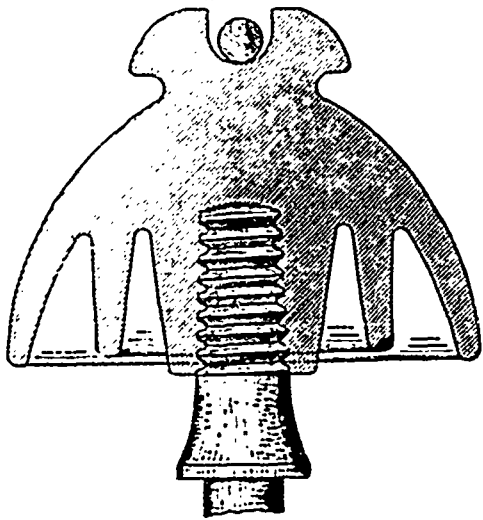
SPARKS.

The corporation of St. Louis, Que., is being sued by the Citizens' Light & Power Company, of Montreal, for \$3,325 for electric light supplies.

The Calgary Water Power Company, of Calgary, N.W.T., have offered to supply the city with 35 1,200 c.p. arc lights for street lighting at \$65 each per annum, on a five year contract.

They also agree to erect new poles, and to install new enclosed arc lamps.

The village council of Huntingdon, Que., have accepted the tender of Boyd & Company to operate electric light and water-works systems. The company agree to install a dynamo of a capacity of 1,000 16 c.p. lamps, and to have the works in operation by January, 1901.



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Scientific American, Oct. 14, 1899.

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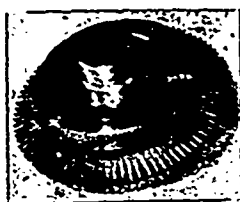
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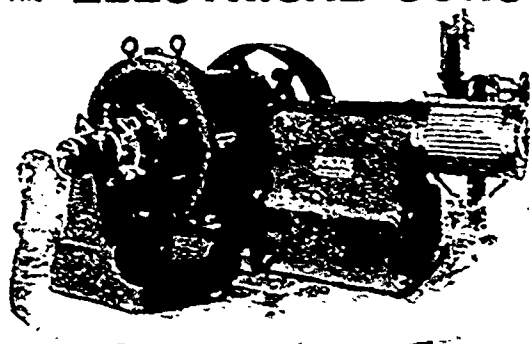
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