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

CANADIAN

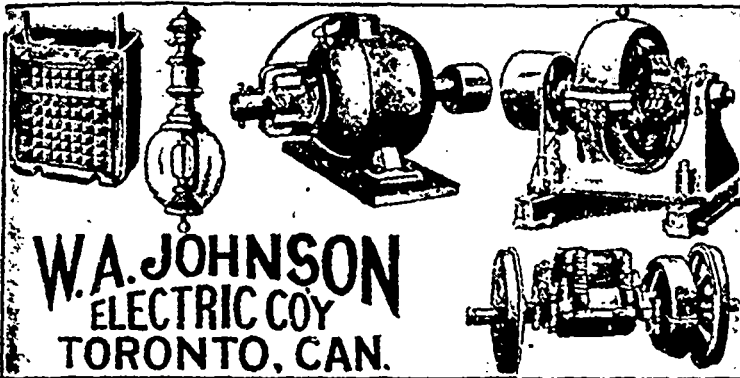
ELECTRICAL NEWS

STEAM AND ENGINEERING JOURNAL


OLD SERIES, VOL. XV.—No. 6.
NEW SERIES, VOL. VIII.—No. 7.

JULY, 1898


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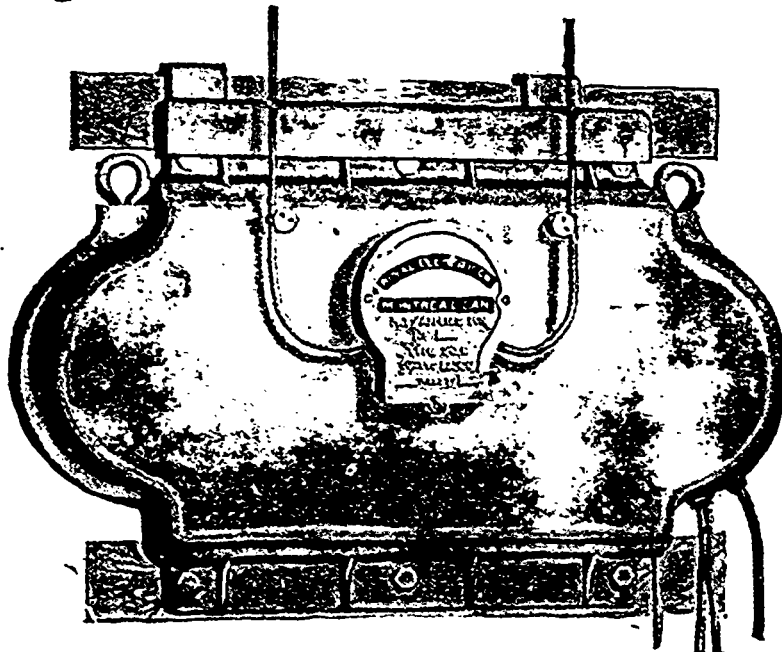
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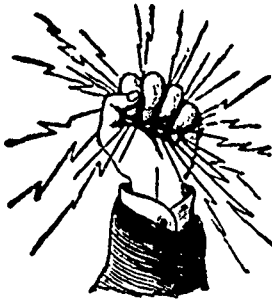
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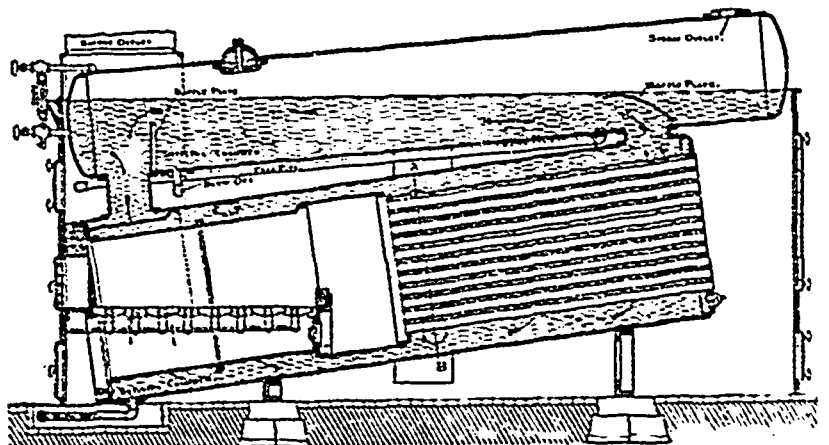
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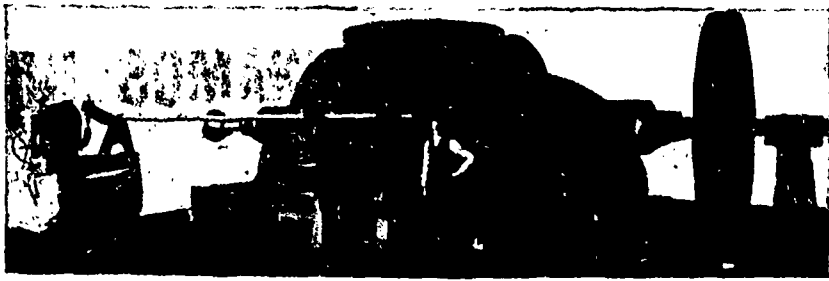
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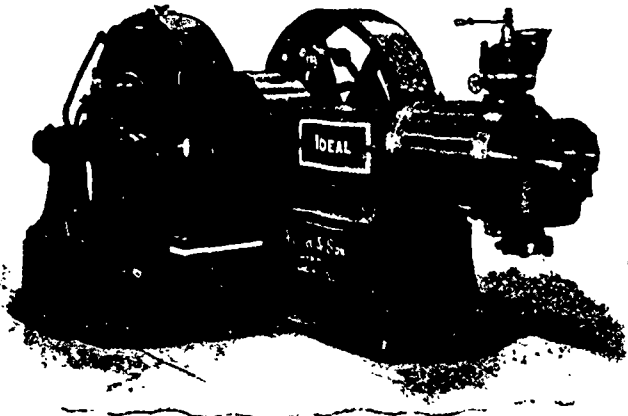
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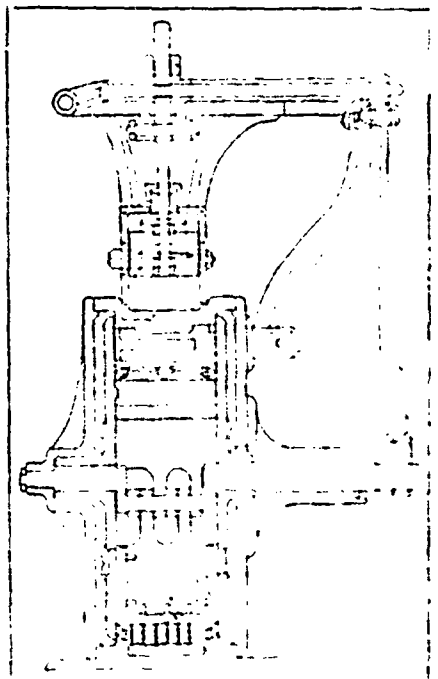
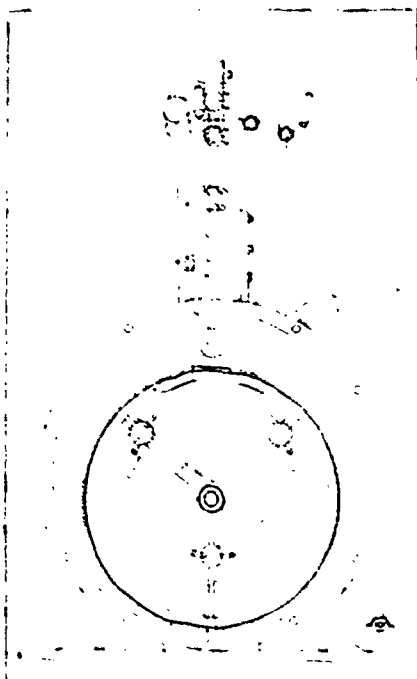
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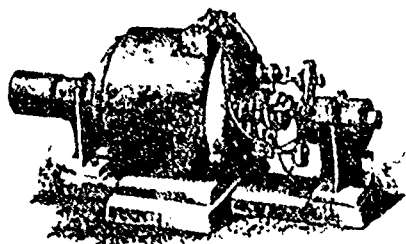


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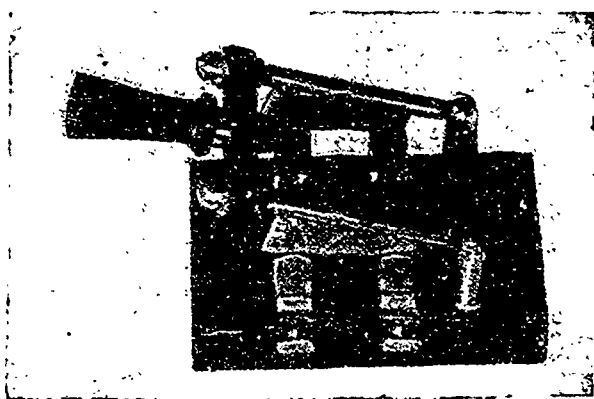
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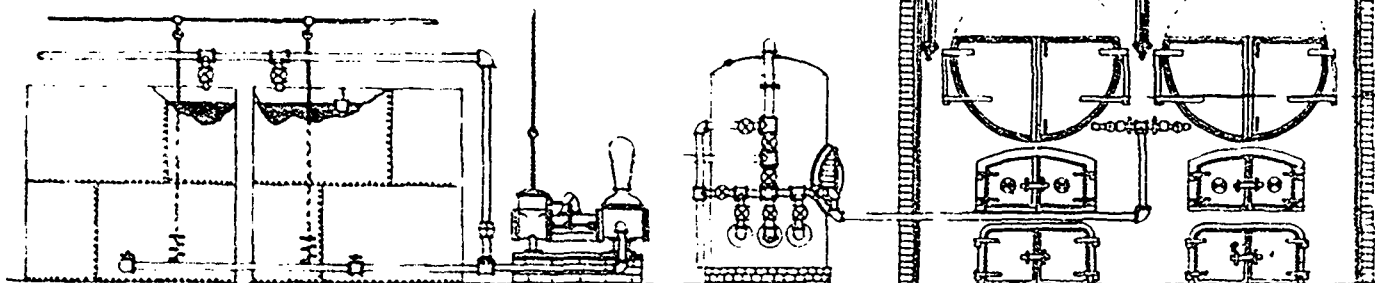
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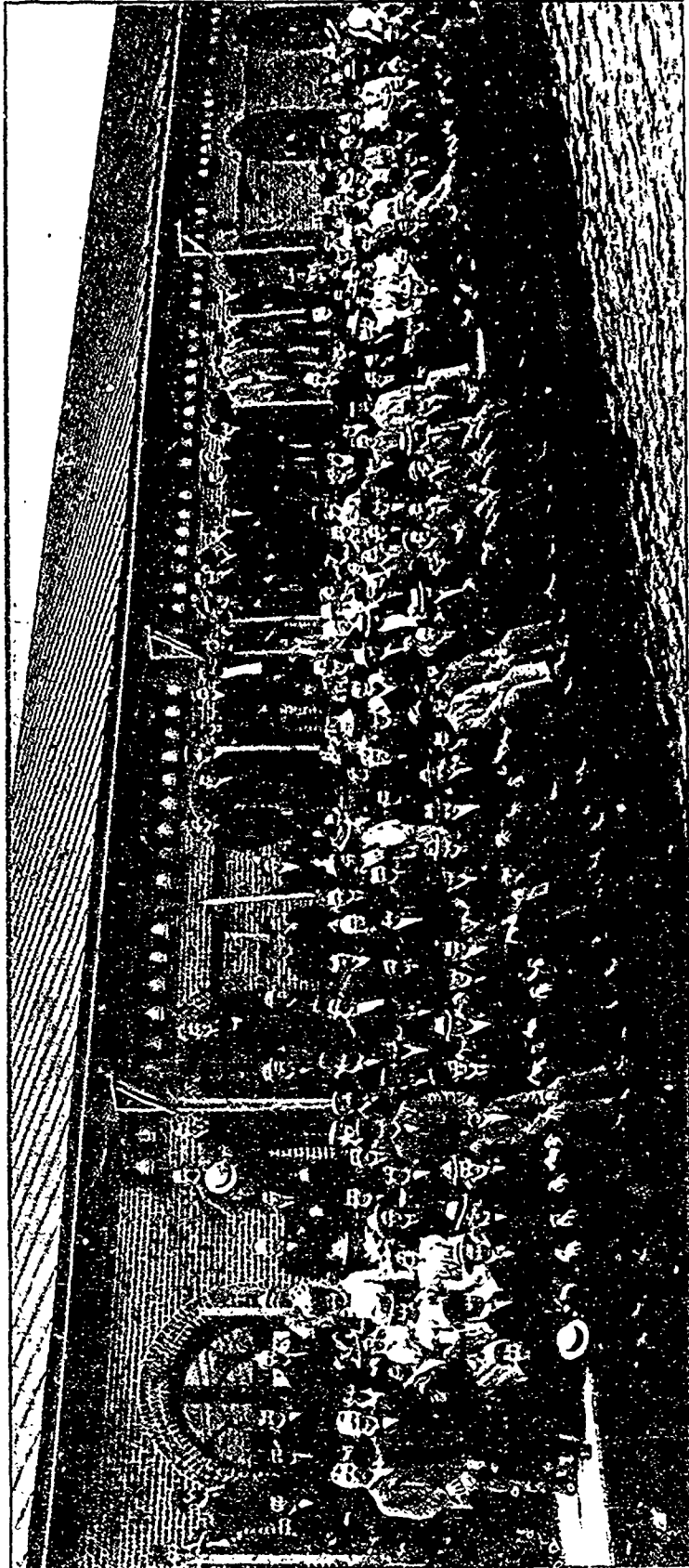
ROOM 311 TEMPLE BUILDING,
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CANADIAN
ELECTRICAL NEWS
AND
STEAM ENGINEERING JOURNAL.

Vol. VIII.

JULY, 1898

No. 7.



MEMBERS AND VISITORS, CANADIAN ELECTRICAL ASSOCIATION CONVENTION, MONTREAL, JUNE, 1898.

From photograph taken at Chambly

MR. W. H. BROWNE

The Canadian Electrical Association is to be congratulated upon having chosen Mr. W. H. Browne as its chief executive officer. Since his connection with the Association Mr. Browne has been recognized as one of its strongest pillars. Of his desire and ability to wisely direct the affairs and promote the interests of the Association there can be no question. His energy, earnestness and thorough business methods, as exemplified in the management of the Royal Electric Company, are sufficient guarantee on this point. In this he will be given valuable assistance by the two vice-presidents, Messrs. H. P. Dwight and A. A. Dion.

Mr. Browne was born in the year 1849, at Troy, N. Y. While engaged in the foundry and general hardware manufacturing business in the city of New York, he perceived the possibilities in the electrical field. Besides investing in other electrical industries, he became interested in and was one of the organizers of the electric railway at Richmond, Virginia, which was the first electric railway in the United States, the construction of which was commenced in 1888. He continued as manager of this road until 1891, and in addition had the



MR. W. H. BROWNE,
President Canadian Electrical Association.

management of the United Electric Light and Power Company, perhaps the largest concern of the kind existing at that time, which afterwards absorbed the United States Illuminating Company and the Brush Illuminating Company. In January, 1895, Mr. Browne accepted the management of the Royal Electric Company.

CONVENTION ECHOES.

Mr. Kammerer's pretty little Anglo-American flags were very much in evidence.

What's the matter with the new president and vice-presidents? Oh! they're all right.

Parlez vous Francais? If not, we may conclude that you are among the few who didn't attend the convention.

Mr. E. I. Jenking is not only a clever stenographer, but also an excellent singer and an altogether jolly good fellow.

Mr. F. A. Wunder, of New York, eastern manager for the Fort Wayne Electric Corporation, took in the convention. He was accompanied by Mrs. Wunder.

Three cheers and a tiger for the members of the Reception Committee—Jolly good fellows every one—when shall we see their like again? "Hip! hip!" etc.

The excellent work done in behalf of the Association by Mr. Yule during his two years' term as president is recognized and held in highest appreciation by the officers and members.

Mr. Samuel Chase, of New York, representing the Western Electric Co., of Chicago, is well known to the electrical fraternity in Canada, and consequently was right at home with the boys at Montreal.

Mr. R. E. T. Pringle's handsome electrical display on St. James street was highly commended, as was also that of the Lachine Rapids Hydraulic and Land Co., corner of Craig street and Victoria avenue.

The absence from the banquet of Mr. C. F. Sise, president of the Bell Telephone Co., was much regretted. Mr. Sise is at present a victim of rheumatism, and therefore subject to the commands of his physician.

Conspicuous among the dispensers of hospitality throughout the

convention was Mr. L. B. McFarlane, of the Bell Telephone Company, who constantly exerted himself for the success of the meeting and the pleasure of the visitors.

The sight of the genial manager of the Toronto Electric Light Co., wearing on his breast the combined flags of Britain and United States, was accepted by the members as indisputable evidence of the genuineness of the entente cordiale which is said to have recently been established between these nations.

It is to be hoped that Mr. Wm. Thompson, the indefatigable chairman of the Committee on Arrangements, has found time



MR. H. P. DWIGHT,
First Vice-President Canadian Electrical Association.

since the convention to enjoy the sleep which was so conspicuously absent a feature of his existence during convention week. Mr. Thompson has made a reputation for himself as a "hustler."

In addition to a number of interesting samples of electric cables, Mr. John Carroll, of the Eugene Phillips Electrical Works, presented to his friends a handsome souvenir of the convention in the form of an attractively covered folder, containing excellent portraits of Admiral Dewey and other prominent American commanders.

The Canadian General Electric Co., Limited, of Toronto and Peterboro', presented the delegates to the convention with a handsome and serviceable souvenir, in the shape of a paper weight made in miniature to represent a small induction motor. This



MR. A. A. DION,
Second Vice-President Canadian Electrical Association.

little souvenir was much admired and highly appreciated by all who received one.

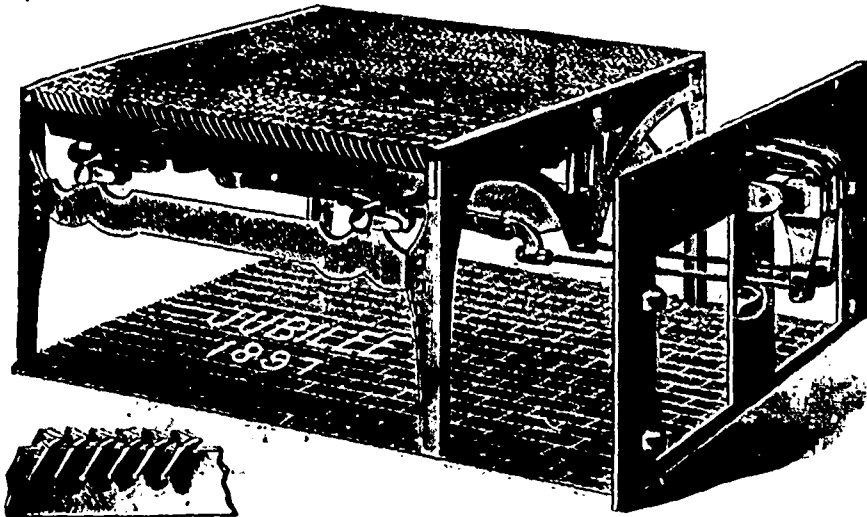
Some of the Montreal ladies were extremely thoughtful and kind to the wives and lady friends of non-resident members. It has been suggested that at future conventions, the pleasure of visiting ladies could be greatly enhanced by the appointment of a local committee of ladies, under whose direction points of interest might be visited during the progress of the business sessions.

Mr. H. O. Fisk, of Peterboro', took in the convention city, but not the convention. The why and wherefore of his absence from the convention hall and the good fellowship of his brethren in the Association was the subject of many conjectures. We now feel at liberty to state that Mr. Fisk was compelled to choose between electrical technicalities and the society of his young and pretty

bride, and he very wisely chose the latter. The members of the Canadian Electrical Association will join us in wishing the young couple a long and prosperous matrimonial voyage.

The wife of a well known member, who took in all the visits of inspection and asked the why and wherefore of everything she saw, has expressed her intention to prepare a series of lectures on electricity from a woman's standpoint. This preliminary announcement is made in order that the proposed departure may not prove too great a shock to the lady's husband and friends.

Mr. W. H. Browne, manager of the Royal Electric Company, and his excellent staff, placed themselves unreservedly at the disposal of the officers and members throughout the convention.



THE JUBILEE SHAKING GRATE.

It is needless to say to those who know them that they are a bright and cheery lot of good fellows, who do not count any effort too great that is calculated to increase the comfort and happiness of their friends.

Many of the members were glad to find Mr. R. G. Black, son of Mr. Geo. Black, of Hamilton, in charge of the Chambly Manufacturing Company's plant. Mr. Black, in addition to excellent natural ability, is a graduate of the School of Practical Science, Toronto, and has had a valuable experience in the factory of the Westinghouse Electric Manufacturing Co., at Pittsburg, Pa. Therefore in his present position he will no doubt prove to be the right man in the right place.

THE JUBILEE SHAKING GRATE.

We take pleasure in calling the attention of our readers to the merits of the Jubilee shaking grate. People who are interested in steam power and heating plants have been giving much attention to the cost of fuel used to generate steam, hot water or hot air, as the case may be. It has taken but little observation, when once put to the scrutiny of skillful engineers, to see that the old-fashioned way of burning coal on stationary bars, using hoes, slash bars, scrapers, hooks, slicing bars and other such fire tools to rid the ash and clean the fire did not prove an economical way of burning coal. This conclusion, settled by the observant engineer and fireman, opened the field for some appliance to take the place of the stationary bar.

It will be observed by the illustrations presented that the Jubilee Grate Bar Co. appear to have embodied the essential points required in the construction of a shaking grate. The bars stand erect upon the rockers, presenting a perfectly smooth and level surface to the fire. When shaking, the bars have an up and down movement which thoroughly sifts the ash from the coal, allowing the air free access to properly oxidize the carbon. It is claimed for these grates that they evaporate from 10 to 20 more water per pound of coal, using slack or screening, and with natural draft, than can be evaporated when using select, lump or best steam coal on a stationary bar. Below is a summary of the prominent features which distinguish the Jubilee shaking grate:

It gives the greatest percentage of air space of any grate in the world, thereby insuring the most perfect combustion: $\frac{3}{8}$ air space gives 57 per cent. air; $1-2$ air space gives 70 per cent. air; $\frac{1}{2}$ air space gives 78 per cent. air.

It has 50 per cent. more under-draft than any shaking or stationary bar made.

The angle sections which protrude above the body of the bar, and form the top or surface of the grate, are set at such an angle

that the air is carried in its natural line of flow without a break in its current, under and behind the coal.

Owing to the angular shape of the sections they gather the air in and over the top of the bar, thereby distributing the air evenly under the coal, besides keeping the bar cool.

It presents a perfectly level surface while at rest.

Owing to the perpendicular movement of the bars when shaking, the grate surface is cleaned equally without opening fire doors and without loss of fuel.

The Jubilee grate shakes from wall to wall, and has no stationary centre or side bars upon which the ashes and clinkers can collect.

The bars stand erect upon the rockers and are held in place by a projection on the end of the bars, which move in guides on end frames, which are well down below the fire, and by having nothing to interfere with expansion makes it impossible to twist or bend the bars.

The bars are held down to rockers by gravity hooks, doing away with the inconvenience of split pins and such methods.

It has a most unique and effective lock to hold the bars level.

It is easily adapted to any furnace.

It can be changed from one sized air space to another without removing anything but the bars.

These grates are manufactured and sold by the Jubilee Grate Bar Co., of Toronto, Limited, West Market street, Toronto; the Goldie & McCulloch Co.,

Limited, Galt, Ont., and the Laurie Engine Works, Montreal, Quebec.

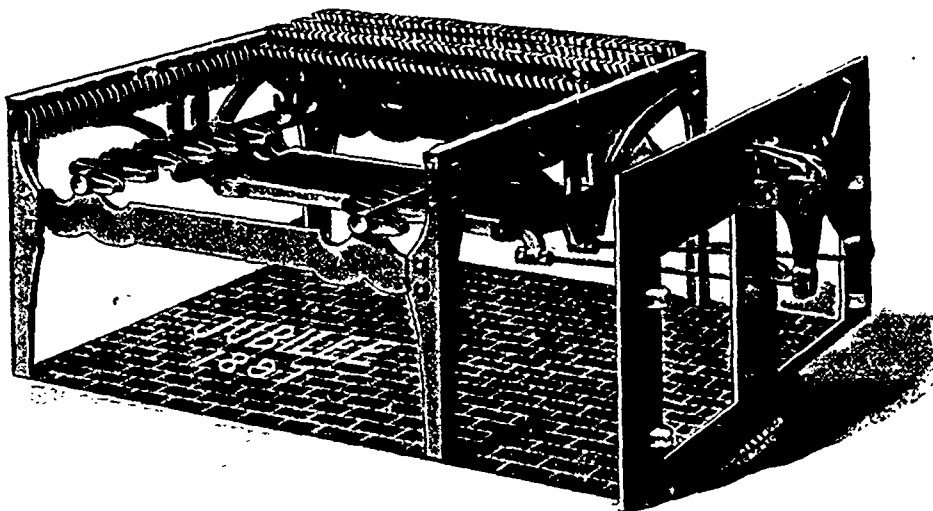
PERSONAL.

Mr. A. Bingham, manager of the Bell Telephone Co., has resigned, and has accepted the position of manager of the St. Thomas electric railway.

Mr. E. Round, of the Peterborough Light & Power Company, was a recent visitor at the office of the *ELECTRICAL NEWS*. Mr. Round has been connected with the above company for fourteen years.

Mr. I. H. Breck, electrician, of Kingston, Ont., is receiving the congratulations of his friends upon the occasion of his recent marriage to Miss McLeod. Mr. Breck is a son of the president of the Kingston Electric Railway Company.

Before leaving to assume his new position with Messrs. Dick, Kerr & Company, of London, England, Mr. F. C. Armstrong, late

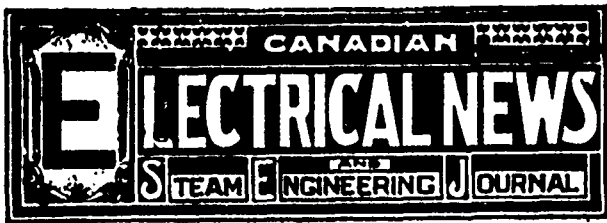


THE JUBILEE SHAKING GRATE, WITH SOME OF THE BARS REMOVED.

of the Canadian General Electric Company, was tendered a farewell dinner at the Board of Trade restaurant in Toronto.

McCurdy & Co., Antigonish, N. S., are enlarging their electric light plant, and have a contract to light the streets of the town. A 60 h.p. engine and boiler has been ordered from the Robb Engineering Co.

An effort is being made to form a company in London, Ont., in opposition to the Bell Telephone Co. It is stated that Messrs. Walter & Evans, of Detroit, and J. Minihinnick, F. B. Leys, T. Smallman, and others, of London, are interested, and that the charge for instruments will be \$18 for house service and \$25 for office service per annum.



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

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H. R. LEYDEN, Manager Cataract Power Co., Hamilton.

GEO. BLACK, G. N. W. Telegraph Co., Hamilton.

F. E. CARY, Manager Packard Electric Co., St. Catharines, Ont.

Articles Omitted. THE space required in this issue for a report of the proceedings of the convention of the Canadian Electrical Association renders it imperative that several articles previously arranged for be held over until our August issue. Among these are the last of Mr. Thompson's series of articles on "Corrosive and Scale Forming Agents in Boiler Feed Waters," and the conclusion of Mr. R. A. Ross' paper on "Electrical Power Transmissions."

THE recent convention in Montreal of the Canadian Electrical Association was, without doubt, the most successful yet held. The arrangements were complete in every respect, the attendance large and representative, and the proceedings unusually interesting. At a meeting of the Executive Committee held prior to the convention, over sixty new members were elected. The Association is now in a prosperous condition, and continued growth is assured. Lack of space prevents a more extended reference to the convention proceedings.

ASSESSMENT OF POLES, RAILS AND WIRES. ELECTRICAL companies will await with much interest the decision of the Privy Council in England with regard to the validity of the assessment imposed on the rails, poles and wires of the Toronto Railway Company, inasmuch as the result will affect not only street railway companies, but also gas, electric light, telephone and telegraph companies. In the city of Toronto alone, an assessment on the various companies of more than two million dollars is involved, which would give a yearly

revenue of at least \$34,000. The question has been before the Ontario courts for four years, but the decisions already given provide little ground on which to forecast the final result. The Supreme Court decided that the gas mains of the Consumers' Gas Company are liable to assessment; Judge McDougall held that the rails, poles and wires of the Toronto Railway Company are also liable to assessment. Judges McGibbon and Dartnell ruled that the above equipment of the Toronto Railway Company is exempt from taxation, but the Court of Appeal for Ontario has reversed this decision, and it is from this last decision, which is final until overruled by the Privy Council, that the appeal is now being taken. The question which the Privy Council must decide is whether or not the equipment, such as rails, poles, wires, mains, etc., of a company, is real or personal property. If real property such equipment is assessable; if personal property it is exempt from taxation, the Assessment Act of Ontario providing that the personal property of a company which invests the whole or the principal part of its means in gas works, waterworks, railways, and such like, shall be exempt from assessment. There are many debatable points in connection with the case, and no prediction as to the outcome can safely be ventured.

Cost of Power for Generating Electricity.

IN a paper read before the National Electric Light Association, Mr. W. McLea Walbank, of Montreal, gives some calculations as to the cost of producing power from the Lachine Rapids for the generation of electricity. His estimate includes the cost of developing the power and delivering it on the bus-bars at the sub-station, in which the cost of step-down transformers and the drop or loss in power from the rapids to the station must be taken into consideration. Of a total installation of 72 wheels, 48 are already in place. About \$1,000,000 has been spent in hydraulic development, which will furnish 20,000 horse power, but until a market is found for the total power, some 5,000 horse power will have to be charged with the expense of hydraulic development of the total 20,000 horse power. Therefore Mr. Walbank, in his paper, gives, first, the cost per kilowatt per year for the portion of the plant at present installed, and, second, the cost when the whole water power development will be in operation. In the first instance the cost of water rights, hydraulic machinery, etc., is \$957,200, and the power delivered at sub-station, allowing for loss, 3,600 kilowatts, which is equivalent to \$263.83 per kilowatt, capital cost. This, at six per cent., would be equivalent to \$15.95 per k.w. The depreciation on \$300,000, representing the cost of that portion of the plant subject to depreciation, at 5 per cent., would be \$4.17 per k.w., and the operating expenses, including repairs, insurance, etc., \$2.85 per k.w., giving a total cost on a twenty-four hour day basis of \$22.97 per year per kilowatt. Taking the completed plant, with 72 wheels installed, the cost is given as \$1,113,273. The power developed, after deducting losses, will be 13,500 kilowatt at the bus-bars, equivalent to \$82.46 per h.p. capital cost, which, at six per cent., represents \$4.95 per kilowatt annually. Allowing \$1.68 per k.w. for depreciation and \$1.51 for operating expenses, the total cost per annum will be \$9.14 per kilowatt. Attention is directed to the fact that the operating and depreciation expenses per kilowatt will be very much reduced when the entire hydraulic equipment is put into operation. It is stated that Nova Scotia coal, costing \$3.50 per ton, is used.

CANADIAN ELECTRICAL ASSOCIATION

PROCEEDINGS OF THE EIGHTH ANNUAL CONVENTION

The Eighth Annual Convention of the Canadian Electrical Association was held, pursuant to announcement, at the Windsor Hotel, Montreal, on Tuesday, Wednesday and Thursday, June 28th, 29th and 30th.

The first session opened at 10 a. m., with the President, Mr. John Yule, in the chair.

There were present the following members :

L. B. McFarlane, John J. York, H. O. Edwards, F. W. Fairman, John Shaw, Wm. B. Shaw, John Carroll, P. H. Hart, N. W. McLaren, Fred Thompson, E. Craig, C. H. Wright, Geo. W. Sadler, R. S. Kelsch, W. E. Gower, George A. Childs, James A. Baylis, Moses Rubenstein, N. C. Ross, D. S. Barton, Wm. T. Bonner, Wm. H. Browne, J. E. Scott, M. P. Cochrane, Louis A. Herdt, P. G. Gossler, I. D. W. Magie, H. J. Fuller, Thomas Rodger, D. W. McLaren, P. H. Davidson, George E. Matthews, Alex. Barrie, E. Carter, W. B. Powell, H. H. Henshaw, R. E. T. Pringle, A. W. Staveley, H. G. McLaren, W. F. McLaren, W. McLea Wallbank, J. A. Burns, R. Dobie, L. A. Howland, E. A. Wallberg, F. H. Leonard, jr., W. J. Plews, J. W. Pitcher, D. Sleeth, Montreal, Que.; W. A. Johnston, Wm. McCaffrey, E. B. Biggar, A. M. Wickens, A. B. Smith, J. J. Wright, J. W. Campbell, Walker G. Anderson, E. D. McCormack, Joseph Wright, J. K. Johnstone, J. J. Ashworth, C. H. Mortimer, J. A. Kammerer, Toronto, Ont.; A. A. Dion, W. G. Bradley, Wm. Ahearn, jr., C. Thompson, E. J. O'Reilly, James Johnston, R. Anderson, Ottawa, Ont.; F. W. Martin, George Black, John P. Riggsby, Gordon J. Henderson, Hamilton, Ont.; Charles B. Hunt, C. E. A. Carr, London, Ont.; B. F. Reesor, Thomas Sadler, D. McGibben, P. Morgan, Lindsay, Ont.; E. E. Ctry, D. H. Henderson, G. A. Powell, St. Catharines, Ont.; W. R. Leet, E. A. Wright, Danville, Que.; J. J. Mahoney, Samuel A. Chase, W. K. McLaughlin, F. A. Wunder, New York, N. Y.; John Yule, Guelph, Ont.; William Thompson, Montreal West, Que.; J. W. Purcell, Walkerville, Ont.; Geo. D. Ellis, Barrie, Ont.; A. A. Wright, Renfrew, Ont.; H. A. Moore, Trenton, Ont.; W. F. Simmons, Kingston, Ont.; A. L. Breithaupt, Berlin, Ont.; V. B. Coleman, Port Hope, Ont.; E. J. Kyle, Merrickville, Ont.; J. F. H. Wyse, Brantford, Ont.; Andrew Sangster, Sherbrooke, Que.; Alfred Stearns, Brussels, Ont.; W. A. Penn, Buffalo, N. Y.; J. A. Hunter, Vancouver, B. C.; Stephen Noxon, Ingersoll, Ont.; P. Bowler, New Westminster, B. C.; George W. Thompson, Belleville, Ont.; S. E. Fletcher, St. Johns, Que.; H. R. Caruthers, Millbrook, Ont.

The Secretary-Treasurer read the minutes of the last annual meeting of the Association, held at Niagara Falls, June 2nd, 3rd and 4th, 1897, which were approved.

His Worship, Mayor Prefontaine, of Montreal, was then introduced to the President and the Association, and made the following address :

Mr. President and Gentlemen:—In the name of the citizens of Montreal, I heartily welcome you to our fair city. The Association to which you belong is one of the most important Associations of the century. The science which you study is one which can be called the science of the 19th century, although immense progress and discoveries had been made previous to then.

It is not necessary for me to enlarge more upon the question, as I hope that I will have the pleasure of meeting you at the banquet, but this morning, let me only repeat again that we are glad to see you here amongst the citizens of Montreal.

I know the work you will do will bear fruit as regards the prosperity of the science which you study.

I, therefore, as chief magistrate of the city of Montreal, declare the eighth annual convention of the Canadian Electrical Association to be open, and I trust your stay will be pleasant, and hope that you will be favored with fairer weather than you were this morning, as otherwise you will obtain a poor opinion of our climate.

I hope the stay that you will make in the city of Montreal will be both useful and enjoyable.

The President: We are all very much pleased to see His Worship here, and I call on Mr. Wright, of Renfrew, to thank him for his kindly address.

Mr. A. A. Wright: I am very sorry for two things one is that I was not born a French-Canadian, in order that I might have all the eloquence which, you know, is supposed to flow in the veins of those good people; and another thing for which I am sorry is that I was not born in Ireland, in order that I might have lived near the "blarney stone." I may say that I have made full arrangements that when I come to be born again, all

these little difficulties will be overcome. I am sure that, as an Association, we are delighted with the flattering address which has been made to us by His Worship, the Mayor of Montreal, and the hearty welcome; and in looking over the programme that our good friends here have arranged for us, I am sure that there will be only one opinion with regard to the excellence of it. You know that entertainments such as these are not sold by the pound, as the grocer sells his tea, nor by the yard, as the dry goods man sells his cotton, but they are the spontaneous outcome of noble and generous hearts, and those are the kind of hearts possessed by the citizens of Montreal. This is a progressive and illustrious city. Cities are made of men, consequently the people of Montreal are illustrious, because we have in the city of Montreal some of the most illustrious and liberal men on the face of the globe liberal to the art of electricity — and we believe they have done and will do all they can to make this meeting one of the best we have ever had. I thank His Worship, the Mayor, for his kind address, and we thank the good people of Montreal for the entertainment we expect to receive while we are here during the next few days.

The President then read his annual address, as follows:

PRESIDENT'S ADDRESS.

I beg to give you all a hearty welcome to this the eighth convention of the Canadian Electrical Association. The aim of the Association is to gather together the members of the electrical fraternity and allied interests for the purpose of mutual discussion, and to learn from each other's experience. In this way we try to benefit the whole business interests with which we are all connected. An organization of this kind confers upon its members benefits from the reading of papers, and the discussions which take place disseminate information with reference to the methods that are constantly being tried by different members in the practical conduct of their every day operations and business methods. This Association affords the means for members to become acquainted with one another. The friendships here formed should be used for the purpose of mutual protection and advice when difficulties arise. A free and friendly correspondence tends very much to strengthen, stimulate and encourage many of us in our daily struggle with difficulties. It is a matter of satisfaction to me that during the last two years you have honored me with the office of President, good progress has been made in the direction indicated, but there is still room for great improvement.

It is now almost four years since the last meeting of the Canadian Electrical Association was held in the city of Montreal. During the interval conventions have been held, once in Ottawa, twice in Toronto, and last year at Niagara Falls. On each occasion matters of current interest and importance have been presented for the consideration of our members. There are many reasons why our meeting again this year in the east, and particularly in Montreal, should be at once a source of both pleasure and profit to the members of this Association. The intervening four years have done much for the Dominion of Canada, for its national life and the development of its material resources. In no department of industry has this progress been more marked than in the electrical field, in electric lighting, in electric railway work and in the electric transmission of power; and the work must not be forgotten which has been done in extending the use and improving the service in the older branches, the telegraph and the telephone. From this development of the great modern industry in which we are all proud to have a share, no part of the country is likely to reap greater benefits than the city of Montreal and its vicinity. The Dominion of Canada, at least so far as Ontario and Quebec are concerned, while otherwise abundantly dowered with mineral riches has been deprived of coal deposits, until recently an essential factor in manufacturing and industrial development. To-day, however, the possibilities of electrical transmission have rendered available as a substitute to turn the wheels of our factories, the heritage which both provinces possess in their abundant water powers. It will be our privilege to inspect what has been done in this direction by some of her far-sighted and enterprising citizens for the city of Montreal. We shall first see that great enterprise, carried out in the face of difficulties and discouragements—the successful utilization of the power of the St. Lawrence river by the plant of the Lachine Rapids Hydraulic and Land Company. Of equal interest and importance will be the opportunity given of inspecting the plant and equipment of the Chambly Manufacturing Company on the Richelieu river at Chambly, which will vie with its great rival in the beneficent work of supplying cheap light and cheap power for the citizens of Montreal. It is to be hoped that a fair dividend will be the reward of the shareholders of the two companies for their enterprise.

It is proper, before entering on the work of this convention, that

we should glance briefly over the progress of the past year. A marked feature of electric progress in the Dominion throughout the years 1897 and 1898 has been the inception, and, in some cases, the completion of a number of important plants for the long distance transmission of power. In the province of Quebec there are, besides the two plants already mentioned, the Montmorency plant, which has been in operation for several years, and is no doubt familiar to most of you, and the North Shore Power Company, Three Rivers, a 16 mile transmission, 12,000 volts, delivering 500 h.w. In Ontario there is the Cataract Power Company, of Hamilton, the distance to be transmitted 33 miles, pressure 25,000 volts, with a capacity of 6,000 horse power. This plant, it is anticipated, will be in operation by August 1st next. In British Columbia a transmission installation of 1,500 horse power capacity is being erected to supply energy for the electric railway, lighting and power industries of the city of Victoria, distance 16 miles. The West Kootenay Power Company recently started with an initial capacity of 2000 horse power, pressure 20,000 volts, distance 30 miles. This power will be used for the operation of machinery in the mining districts. We have already referred to the enormous development under way in the vicinity of Montreal. The only point at which satisfactory progress cannot be reported is at Niagara Falls, where, unfortunately, the tying up of the greatest water power in the Dominion in the hands of an alien corporation has prevented its development for the benefit of the people of Ontario. This state of affairs, we trust, will be removed before another year.

Besides the important plants mentioned which are either in operation or in course of construction, a large number of similar enterprises are at present in their initial stages and may be expected to reach their completion within the next year or two. Altogether, it is difficult to foresee at the present moment the benefits which our Canadian manufactures and industries generally may derive from the utilizing of the water powers of the country, scattered without number from the Atlantic to the Pacific. In electric railway work the development of the year has been mainly confined to the extension and the better equipment of existing city and suburban roads. In the field of electric lighting, in which a majority of the members of the Association are more particularly interested, a reasonably satisfactory condition of affairs exists. That industry is on a fairly solid basis, at least in so far as a distribution of current for incandescent and power purposes is concerned, as rendered evident by the failure of the much talked of illuminant of the future, acetylene gas, to make any inroad into the field of the lighting companies. A large majority of the plants now in operation are equipped with reasonably modern and efficient machinery, and the rates at which current is supplied are, it is safe to say, if taken on the average, the lowest in the world.

We will have before us the report of the Committee on Legislation. From this you will see how far the efforts made since our last meeting have been successful in the direction of securing equitable protection of private investments. It is to be hoped that the work of the Association during the convention will be helpful to the members, and that they will recognize the value they receive from their attendance here with respect to the papers which have been prepared for the convention. You will see their practical and helpful nature, and I trust you are ready to criticize and discuss the views set forth in the light of your own experience.

One thing more I feel should be mentioned, and that is, the appreciation of the efforts of the different companies and individuals in Montreal who have so heartily co-operated for the success of this meeting. The proverbial hospitality of our metropolitan city is known to you all. A pleasing feature of our last convention was the regular and prompt attendance of members at all sessions and the keen interest taken in the proceedings. This commendable practice will, I trust, be kept up at this our eighth convention now open for business.

The conclusion of the address was greeted with prolonged applause. The President then called on Mr. J. J. Wright to read the report of the Committee on Meters.

Mr. Wright stated that there was no special business to bring before the Committee on Meters during the past year, consequently it was not convened, and there was no report to make on behalf of it.

The President appointed Messrs. Reesor, Smith and Hunt as members of a committee to strike the standing committees for the year.

The President: The next item is general business that any of the members may wish to bring up, or any questions they desire to ask. We will be very glad to hear from anybody who has anything to say.

Mr. C. B. Hunt: I would move that the Report on Legislation be taken up the first thing to-morrow morning. This will give the members a chance to read it over; we cannot very well discuss it until this has been done.

The President: This appears to be all the business set down for this session, but I think it advisable to now have one of the papers read, and will ask Mr. A. A. Wright to read his paper entitled, "How to Overcome Some of the Difficulties Encountered by Central Station Men." (See page 143.)

DISCUSSION.

Following the reading of his paper, Mr. Wright made the following remarks: If I may be allowed the

time, there is one thing more that I wish to refer to. Perhaps it cannot be done in every instance, but there is one thing I would advise central station men to do, that is, where they have contracts with a town unless they are situated under very favorable conditions, as in some certain towns that I know of, where the owners of the plant pretty nearly own the town itself, where you do not own the town, but the town, rather, owns you, so far as electric lighting is concerned—I would advise everyone to try and form a joint stock company, and not endeavor to run the concern alone, no matter how great their abilities are. Try and get the most influential men in the town as members of the company, and in that way you will have a leverage on the council that you cannot otherwise possibly obtain. It will also prevent other companies from coming in, and will assist you in many ways. I just throw out this as a suggestion, so that if anyone contemplates the formation of a joint stock company, they will try and get as influential men as possible, as it is hard to know sometimes where the lightning will strike. Another thing I would like to mention is that it is well to try and let your lighting contract with the town be the weak arm of your strength, and devote more time to the commercial aspect than to the other; then if you do not get the desired legislation, you will be in a better position to stand the shock than otherwise.

The President: We have listened to Mr. Wright's interesting speech, and we would like to hear from others as to their experience on any of the points mentioned by Mr. Wright. Mr. Wyse, of Brantford, may be able to say something.

Mr. Wyse: I have listened with a great deal of interest to Mr. Wright's paper, especially as it covers many points in relation to experiences that I have lately been through in dealing with the municipal authorities at Brantford, and I think it is something that all central station men and probably very many others can appreciate. There was one point that I would like to ask Mr. Wright about, and that is the collection of bills. He speaks of collecting weekly. Would you not, Mr. Wright, find that this would require a larger office staff than otherwise.

Mr. Wright: That refers to the arc lighting accounts. The man who goes around trimming collects these bills and the incandescents are collected every month.

Mr. Wyse: I thought that referred to your private incandescent customers.

Mr. Wright: No, we collect those monthly.

Mr. Wyse: We find that there are a great number of customers who, as you say, will pay a small bill rather than let a large one run on. There was another thing that I would like to bring to the attention of the members, that is, giving notice. We find that giving notice where the account is not paid promptly is very effective. We have a system of first, second and third notice, and if the bills are not paid after the third notice we disconnect the customer, and this generally results in his paying the bill and asking for re-connection. I think Mr. Wright deserves the thanks of the Association for his very valuable paper.

Mr. Wright: With reference to the insertion of that saving clause, this year I just succeeded in getting it, to use a common phrase, by the skin of my teeth—"one day saved me." It is very difficult sometimes to get that clause inserted. You all understand that there are certain men in the council that you can approach and others that you can not. Just how to get this clause inserted is often difficult. Some of you, I suppose, have sometimes to make up a contract yourself. It don't do to come out straight and say "Here, I want to have this resolution moved," especially as one has to deal with a number of men who are not any too well up. Be sure in making up the resolution to give it to a man who will bring it into the council without any hesitation. This is one of the difficulties I find in getting the thing brought before the councillors.

Mr. Wyse: Could you not arrange to get a longer contract than one year in most instances?

Mr. Wright: I would like to do so.

Mr. Reesor: What is the population of Renfrew?

Mr. Wright: Between three and four thousand.

Mr. Hunt: Do you supply incandescent lights entirely by meters or on flat rates?

Mr. Wright: Almost entirely by meters.

Mr. Hunt: Do you charge a meter rental?

Mr. Wright: Yes; twenty-five cents a month on all sizes.

Mr. Hunt: What is the smallest size meter that you have?

Mr. Wright: $7\frac{1}{2}$ ampere, 3 wire, and we also use 2 wire.

Mr. Hunt: You can now get 5 ampere meters for your 2 wire service that will start on a 5 c.p. lamp.

Mr. Wright: I did not know that there was one that would respond to a 5 c.p.

Mr. Hunt: There is, and we have about 50 in use of the General Electric type.

Mr. Wyse: The Shallenberger meter can also be obtained in 5 ampere size.

Mr. Reesor: As far as Lindsay is concerned, we make monthly collections on incandescent lighting, and the town lighting is also collected monthly. The incandescent lighting and commercial lighting we collect monthly, and we have a rate of discount of $33\frac{1}{3}\%$ if the bills due on the 1st are paid before the 10th. We find this works fairly well. They come to the office and pay, and we are trying to have all of our collections made at the office instead of sending out collectors. Of course we have a few delinquents, but we are trying to weed these fellows out, or educate them to a better system.

Mr. A. A. Wright: Have you everything in your own hands?

Mr. Reesor: Yes; we had two companies, but the other one has been absorbed.

Mr. A. A. Wright: Of course you can see the advisability of collecting your arc accounts every week instead of monthly. We could not work that lamp scheme with them.

Mr. A. L. Breithaupt: I find the system of sending notices very effective. We have in Berlin a number of customers who are intentionally delinquent, and who simply do not want to pay their bill, though they want the light. We found a very effective way to be to send them notice that unless within 48 hours the account was paid, the current would be cut off. We applied that both to our electric and gas customers, and find it works very well. We collect monthly, and try to render our accounts on the 1st. Sometimes they don't go out until the 2nd, and if paid by the 10th we allow 20% discount, that is, bringing it down to a net basis. Most of our bills are paid in the office, except a few of the business men near our office, which we collect; but most of our people pay at the office.

Mr. A. A. Wright: You have no opposition in your town.

Mr. Breithaupt: No.

Mr. Wyse: I would like to ask Mr. Wright if he has any opposition in Renfrew.

Mr. Wright: Oh! we have two others.

Mr. Wyse: In a town of 3,500?

Mr. Wright: Yes. Why, in Eganville, which has a population of about 1,500, they have two companies, and pay \$50 to the government—\$25 each.

The President: Mr. Wright speaks about gathering influential men about you. The great trouble about these men is that they don't stay influential, and don't stay with the council, but stay with the company, and sometimes incur the hostility of the aldermen for not being in harmony with them. In our campaign, I made up my mind that it had to go to the vote. I did not speak to a single member of the council until the whole thing was over, but just prepared, and let it go through, and about two weeks before the by-law came out I got in my work, and instead of them hunting me, they were on the defensive themselves. I had been preparing carefully for six months. The situation was such that I did not think it was any use to deal with the council at all, but simply stand on common sense and put your case before the freeholders. Fortunately in Ontario it is only those who have property that can vote on a by-law, and this is a large protection. There

is an inclination among the property holders not to trust the council with any more money or property than they can get at present. Referring to the system of collecting and sending accounts, we have weekly, monthly and quarterly accounts. The quarterly are the residences and best business places and the stores. The monthlies are billiard rooms, barber shops and taverns, and any customers whom we think it best to place on the monthly. For the weekly, as well as the monthly, we have a collector who calls for the account, but the quarterlies are paid at the office. We have arc, incandescent and power—in fact, a little of everything. In a small town such as we have, we know everybody and know how to handle everybody, whether as individuals or classes, and can tell the best way to treat them.

Mr. A. A. Wright: Although we present our accounts every month, circumstances will, as you say, alter cases.

Mr. Wyse: Could you not save the expenses of that collector by offering a discount off the bills if paid at the office?

The President: You know all these discounts are put on before they are taken off. They are looked upon as a penalty, not as an advantage. The way I look upon discounts, with about 10,000 inhabitants, it is more a penalty than a reduction on the account.

Mr. Dion: I would like to say a word regarding 5 c. p. lamps. We supply lamps free to our meter customers. We have confined ourselves to 10 and 16 c. p. lamps, but a few years ago, customers finding out that lamps of 5 c. p. were made, asked for them to be used as night lamps. Most of our small customers could not afford to burn a lamp all night if it were 10 c. p., and we finally decided to let a customer have a 5 c. p. lamp, only supplying one, and when that burned out exchanging it for a new one. We found it popularized electric lighting in that way, and prevented customers from using coal oil lamps. These night lamps, while not registering on the meter, are small expense to the company, as the load is small at the time when they are used, and we have found it an advantage to allow them to be used in that way.

Mr. Reesor: Sometimes when we make contracts with flat rates for 16 c. p. lamps, we have had difficulty by reason of our customers placing 32 c. p. lamps in their stead.

Mr. Dion: We have a small number of customers on flat rates where there is danger of changing 16 c. p. lamps for 32 c. p., but we make an inspection of all these premises three or four times a year and have reports made so that we can keep a pretty fair check on the lamps.

Mr. Reesor: Where are you living?

Mr. Dion: In Ottawa.

Mr. Hunt: I would like to ask Mr. Dion whether he supplies on both flat rate and meter systems.

Mr. Dion: About an eighth of our business is a flat rate one. We supply the lamps in the first installation and renewals are paid for. On the meter system we supply all lamps free—both first installation and renewals. I may say we do more than that. We have found that customers on the meter system allow their lamps to get very old and black until they hardly give any light and then complain to their friends without coming to the office, so that we have no means of remedying the difficulty. Now we have a house to house inspection for the purpose of putting things in order. The inspector gives attention to loose sockets, etc., and also replaces any lamps that had better be out of service. Although an expense, we think the satisfaction to customers more than reimburses us.

Mr. Ellis: Referring to collections, I think we have a unique system of collections in Barrie. We send the account out every six weeks. We have a form with a coupon on the end, which states that "this bill is payable at the bank 15 days after date of issue." If not payer at the bank, customers don't receive the discount. If tendered after the 15th day, the bank won't accept it. We find this system very successful. We pay the bank \$50 a year.

Mr. Hunt: What do you do with the person who does not pay and lets the account run?

Mr. Ellis: When the bank make their returns, we use for delinquents a printed slip which says: "Your account payable at the Bank of Commerce is still unpaid. If not paid within 10 days, your light will be shut off and the account placed in the hands of our solicitors for collection." The discount granted is 30 per cent.

Mr. Hunt: If a customer pays on the second month, will you allow the discount?

Mr. Ellis: No; we keep charging the discount.

The President: I never went to court with a single customer.

Mr. Ellis: We very seldom find it necessary, and of course have to make allowances with some people. Sometimes it is impossible for them to pay at the bank, owing to their being absent from town, etc., and if only a day or two late we don't mind, but the other class of people we don't accept.

Mr. Wyse: How do you arrange with your customer for cash discount?

Mr. Ellis: In sending the bill, we put down the gross amount and deduct the cash discount to be allowed. The contract is made at the gross price.

Mr. Hunt: What do you charge per 1,000 watts?

Mr. Ellis: We charge 17½ cents per 1,000 watts net, and if the bill is over \$12 in six weeks, we give a discount of 20 per cent.; our gross rate is 25 cents per 1,000 watts.

Mr. Browne: Do I understand that you give 20 per cent. discount from 17½ cents net in cases where the bills are \$12 in 6 weeks?

Mr. Ellis: Yes.

Mr. Hunt: I have great pleasure in moving a hearty vote of thanks to Mr. Wright for his very valuable paper and for the discussion that it has brought out. I think it has been very beneficial to all of us.

Mr. A. B. Smith: I have great pleasure in seconding that, and I hope Mr. Wright will have the same success with his city fathers in the future that he seems to have had in the past.

The session was then adjourned until 2:00 p.m.

AFTERNOON SESSION.

The convention resumed at 2:00 p.m.

The President read a telegram from the Ottawa Electrical Association, wishing the convention success, profit and pleasure, sure to be derived from a meeting in the Canadian metropolis.

Mr. Magie's paper on the "Electrical Utilization of Water Powers" was then read by Mr. W. H. Browne. (See page 139).

DISCUSSION.

Mr. A. A. Wright: If not out of order, I would like to ask if the position of permanent reader of papers is open; if it is, I would like to move that Mr. Browne be offered the situation. (Laughter.)

The President: This is a very important paper, and I would like you to carefully discuss it and ask any questions you may wish.

Mr. Wm. Thompson: I really have to regret that I did not have the opportunity of seeing Mr. Magie's most remarkable paper before, and I say "remarkable" advisedly, because he has covered the whole ground, which is something that writers of papers seldom do. I regret that this paper has only reached our hands to-day. I can quite understand that Mr. Magie, the writer of this paper, is not to blame for this, because, as we all know, he is a very busy man, but this paper covers too many important points in electrical engineering to enable one to attempt to thoroughly discuss it without thorough study. There are, however, one or two points brought out very forcibly, and those of us who have felt the progress of electrical engineering during the last five or ten years, can appreciate the importance of the information that is given within the columns of this paper. I, myself, have barely turned 30 years of age, and still I can distinctly remember my grandfather who ran a mill in Yorkshire, having in operation one of those huge wheels about 30 feet diameter. I can distinctly remember a "chap," as they would say, coming up

from London and asking why he did not have buckets attached so that the water could drop into them. These were put on, and it was a remarkable fact to me that that mill, instead of turning out a few barrels per day, increased its capacity by more than four times. To my mind, the most important point in Mr. Magie's paper is the fact that evidently water wheels and water motor installations have come to stay. We have this evidenced by plants all over Canada, some of which have been very successful, others almost total failures. As it is the investor who produces the money for the electrical engineer to carry out his ideas, it is wise to remember that there are times when such installations as these are not advisable. I feel almost sorry that our large installations in the vicinity of Montreal are not further advanced, so that we could see or begin to appreciate the profits which the investor will receive from his capital in those large concerns. While passing Lachine Rapids one day I noticed that they had only two generators running. Now, they have a capacity there of something like 20,000 h.p., and they have been operating this plant for some little time. Possibly the total expenditure has been in the vicinity of a million and a half, but it struck me that there was going to be an immense lot of capital tied up in that plant for years to come without its earning any profit for the investor. If this had been a steam plant installation, it could have been made as the plant was required. This opens a large field for discussion, so much so that I do not feel like entering it, because I might, to use a vulgar expression, "put my foot in it." For this reason I would like to have had time to study Mr. Magie's paper very carefully and have prepared myself, and I feel almost like asking that this paper be carried over until next year, postponing the discussion until the next convention. The paper has far too much important matter in it to be laid on the table, simply read and allowed to drop.

Mr. Bonner: I think it is a very excellent suggestion of Mr. Thompson's that the paper be left over until next year, but I think there are one or two statements made somewhat disparagingly towards steam men. Representing one department of the steam power business, I have just a little to say on these points, but am unable to get actual data so as to place it before the members in an interesting and valuable way. We have not at the present time any data pertaining to Canadian plants which would be of special value to the Association, but it is my hope that during the next six months we will be able to make some tests on one or two complete plants, and if such is the case, I should like very much to present that data in the shape of a paper at the next meeting, and have that considered, perhaps, in connection with this suspended discussion of Mr. Magie's paper.

Mr. Browne: While I appreciate the importance of a very extended discussion of this paper, I fear that the postponement of it for a year may bring us, perhaps, into other phases of the subject, and that the present phase will be practically lost sight of. There are several gentlemen here, I think, abundantly competent to discuss the points thrown out by Mr. Magie's paper, and in order to perhaps provoke discussion and have a little contention on it and brighten the meeting, I may refer to Mr. Bonner's statement that there appear to be some aspersions cast on steam plants. I was conscious during the time of reading that Mr. Magie had been careful to point out that an expenditure on original installation, beyond a certain amount, prohibited competition with steam, and I believe, from what I know of the author and the preparation he gave the paper, that he recognizes the fact that there are many water power installations that should not be installed, because the conditions could be met equally by steam. But there is this one important character about water power transmissions, that, assuming that you are able to serve power during 10 hours a day, from a water fall, at the same price or even a little less than steam, you still have the opportunity of obtaining a revenue from the water power during other times of the day without any additional cost. You cannot obtain that additional profit with steam plant without additional cost, and the

future of the water power transmissions seems to me to be in the direction of the utilization of the power in other hours of the day than the usual ten hours, namely, from 7 a.m. to 6 p.m. I may say that already in the city of Montreal probably the largest commercial enterprise has negotiated for electric power, and has made a change in its hours of operation in order to obtain the advantages and benefits of electric power. If that power had to be produced by steam, they simply could not enjoy the benefits, because they could produce the power for less money. This is an advantage that will develop to a larger extent than now with the power from water falls being used at other times of the day than has been the custom in using steam power.

Mr. A. A. Wright: I do not wish to be known for my much speaking, but I am afraid if I keep on that I will. It seems to me, however, that this paper is a very opportune one, and I may say that the fact of its being read was one of the inducements for my being present. It seems that if there is one subject more than another that is of interest to investors to-day, it is the development and utilization of the numerous water powers which are scattered broadcast throughout the length and breadth of this Dominion. Small towns particularly would be very much improved if the water powers within a reasonable distance could be utilized. There are many points which it is almost impossible to take up and discuss this afternoon. I would like to have it stand over for a year, so that we could have time to study it. I have no doubt that Mr. Magie has spent a great many hours in preparing this paper for us. It covers a great deal of ground and covers it well. I should also like to ask what the paragraph means on page 3, wherein he says, "that when electrically transmitted power does not cost more than \$100 to \$140 per h.p. installed, the investment is apt to be a profitable one, providing, of course, it is properly managed." Does that mean where it costs users \$100 to \$140 per h.p. per annum?

Mr. Magie: That is intended to mean the cost of the installation, including the hydraulic and electric as well as the transmission portion of the plant. Of course, there are many cases where it would be very much higher.

Mr. Wickens: I think that this is a valuable paper, and it is a pity that we did not have it in hand a little earlier. It is too big a question to take up in an off-hand way. There is no doubt there are many points in favor of the use of steam, and perhaps, by leaving the matter open and giving the gentlemen an opportunity to follow these up, we can show some very good results. This Association represents all parts of the Dominion, and there are miles of country that cannot be covered by long distance transmission from water powers. In those places we have to stick to the steam plant, and sometimes we manage to crowd the hydraulic plant very close, simply because it takes a large amount of capital to develop the water power. We have had a few illustrations. Take the Cataract power at Niagara. We know they are selling power in Buffalo, but nobody knows what it is costing. We know they have a great deal of money sunk in the ground, and are selling some current to Buffalo. I know that if we had a good steam plant, properly managed, at Buffalo, we would make money with it, and there are many others too far away from water powers to have this power reach at all, and there are more that have to be carefully managed by the engineer or they would not pay. For these reasons it would be an advantage if the paper was carried over, and thus give the members a chance to go and look into the matter carefully. It would be better to have it thoroughly threshed out, rather than have no discussion at all. I honestly hope that some arrangement will be made by which we can take this matter up at some other time. I hardly see that we can make much out of it at this convention. The balance of our time will be well occupied, but if carried over until the next convention, some of the members could give us some more good ideas on these lines.

Mr. J. J. Wright: I don't exactly understand the carrying over of this discussion till the next convention.

It would be in the province of the gentlemen who would do that to bring in some new facts, but it also appears to me that the men who have been speaking on behalf of the steam plant do not appear to be as sure of the figures in connection with it as the electrical men are. I am quite prepared to endorse one paragraph in Mr. Magie's paper, which is the one referring to direct driven and belt driven plants. I think Mr. Magie has hit the nail on the head in this connection.

Mr. Reesor: I think we should dispose of the paper at this session. Its postponement may lead to accumulation at our next convention. Some questions might be got out of this that might lead to others next year, and perhaps leave it to some other wise head to get up a paper as a growth out of this one.

The President: I think we had better go on discussing the paper.

Mr. Magie: In preparing my paper I did not attempt to fight the steam man, and in fact, tried to give him good lee-way, but merely took up the electrical part of it. If it was wanted to fight the steam man, it would be better to get up another paper.

Mr. J. J. Wright: Most electrical investors won't admit that the steam engine is in the same category as the electric power.

Mr. Thompson: In suggesting that this discussion be carried forward, I do so purely from a desire that it would allow of a proper discussion of the paper. I think we all agree with Mr. Magie when he makes the statement that the use of direct current apparatus for high potential and long distance transmission is out of the question, and we also agree with him when he says the original installation per h.p. of from \$100 to \$140 can be made to pay. In fact, if I were writing the paper, I should have said \$200, and then have stated that it could have been made to pay very easily, but the point arises, why put in 20,000, 30,000 or 40,000 h.p. plants, or, as Mr. Wickens points out at Niagara Falls, with an unlimited power, and then only be able to find customers for one-tenth or less of the output. Too many people imagine, as Mr. Magie has pointed out, that because the water fall, as we have styled it, turns the water wheel the power costs nothing. Mr. McFarlane very aptly illustrated this a short time ago in a little story, which I can hardly repeat in Mr. McFarlane's manner and therefore won't attempt it. The substance of it was this, that in a small town they had lights at a few cents a week, and power did not cost anything, because it was water power. A few years later the dam at the water power had broken down; operation of the plant was discontinued, and the people in the town returned to coal oil, as it was stated that "it cost too much to run water powers." But to come to the point, where large experiments have been attempted, an immense amount of money has been sunk in getting power in advance of the demand. With a city like Montreal I think it advantageous both to the company and to the city, because with the shipping facilities we have in Montreal and the large country to draw from, many manufacturing concerns will be induced to come to Montreal and establish their business so as to get cheap power, but that does not apply in every case. A few years ago I was working a few miles west of Toronto and there was a small town of 4,000 or 5,000 inhabitants wanting to get electric light. There was no way to get it according to advice from electric light companies unless they utilized a water power 10 miles distant. They put in a Thomson-Houston arc machine and endeavored to run from it at the same time both arc and incandescent lights. This was very unsatisfactory, and they then installed an alternating current machine, and still the company is not able to keep its head above water, simply because the cost of installation and keeping transmission lines in repair prevented that company from earning any dividend on their capital, while if they had installed their plant in conjunction with some other manufacturing business in the town, I think it very probable that the shareholders, with the assistance of the steam plant, would have made money. They have been for 15 years increasing their capital and receiving no dividends. This is a case where water

power does not pay. Towards the last of Mr. Magie's paper he speaks of the general utilization of electric motive power in manufacturing establishments. I thoroughly believe in that. In 1895 it was my privilege to take a short holiday and go over the greater part of England. I spent six weeks there, and went into an establishment covering 60 acres, and where as a boy I served my apprenticeship. I remember that at that time there was a great big engine in one corner, with shafting, belting, etc., and I found that every shop in that establishment had now an independent steam engine. The consequence was that the power was only costing them about half what it did fifteen years ago, and this saving was not due to improved engines, but simply to the doing away with a lot of useless power. They can now run any part of the factory independent of the other parts, and I think every engineer will agree that this is the most economical way of running, and one that the shareholders will derive benefit from.

Mr. Reesor: I move a very cordial vote of thanks to Mr. Magie for his interesting paper.

Mr. Kammerer: I would like to second that, and while doing so I want to say to the steam engine and boiler men, that next year, if we go to Hamilton, as I hope we will, we will have a still harder nut for them to crack. Mr. Magie's paper speaks of what we expect to realize there, and I hope in a year from now the Cataract Power Co., of Hamilton, will have realized all that they expect to.

Mr. W. T. Bonner then read his paper entitled, "The Unconscious Ownership of an Important Key." (See page 145.)

DISCUSSION.

Mr. Browne: The title of this paper Mr. Bonner insinuated is a conundrum—to know what this key is. I don't know whether I have got it correctly or not, but I take it to be a suggestion to electric and also to steam roads to employ their rails for the transmission of wagon packages in their original packages, to avoid, besides the long haul by horses and the consequent labor, the cost of loading and unloading, perhaps from the near-by farm to the station, and putting it into a freight car and carting it away. And the unconscious ownership of the key is, that having the road-bed and perhaps the power in the shape of a fully and properly developed water fall, that they would be able to provide additional revenue to the investment, and also make unnecessary the aggregation of people in large cities, because with his proposed scheme the aggregation of population in large cities would not be necessary. People could conveniently live away from towns and large cities and carry on their business; and in this direction I may refer again to the possible changes in our civilization due to a system of this kind with the electric development of water falls. It seems to me the time is not far distant when, instead of gathering together in large cities, by the ability to utilize power in small quantities, requiring the investment of capital to a limited extent, that we may probably change our conditions and become more widespread. Small towns will be able to compete in manufacturing, because so much capital will not be required, and in that way I can see a great deal of advantage in the suggestions thrown out by Mr. Bonner that the production of these small places can be transhipped to places of consumption at very low rates, and in this connection I think his paper deserves a great deal of consideration from the owners of railroads and electrical enterprises.

Mr. Geo. Hill: While there is no doubt that this scheme of Mr. Bonner's is a very interesting one, I think that there is sufficient in it for question. He has struck one of the keys to success of suburban roads. I may say that there are other points of considerable interest that may be brought out by this paper that might be valuable to suburban road owners. His claim is largely to do away with the matter in hand, whatever the section of the country through which the road is to pass has to deal with. Certainly the scheme seems beautiful up to the point where the cart or truck is side-tracked and left there while the wagon is being

taken away and returned. This means the lying idle of a certain amount of the rolling stock of the road, and while another portion of it (allowing that the wagon belongs to the railroad) is in use, nevertheless it is a question whether the former could not more satisfactorily bring his supplies down to a central distributing point opposite his or a number of farms, where it could be gathered up by a moving train at a certain hour, than could be done under the present system. If these wagons were allowed to remain uncovered as they are, the farmer's products would be exposed to the inclemencies of the weather as well as the fact that prowlers might get in at them. Then, again, he loses ownership of the material the moment it leaves the yard in trust of the syndicate. This would not satisfy the farmer, and he never would be satisfied until he followed the goods to market and got the very last cent that there is possible out of it, which as a business man he is entitled to. Now, the railroad company is not going to do this work of commission agent for nothing, and it is questionable whether the farmer wants to pay a commission. I have in my wanderings around the country come across quite a number of suburban roads, and some of them and their schemes are very interesting, noticeably that of the Hamilton, Grimsby & Beamsville road, where they seem to have a very excellent system that appears to be giving first-class results as far as they go. But there appears to be a lack of that broad-mindedness of purpose which we find not only in electric street railroads, but also, I regret to say, in electric light companies. They run through a most fertile country (using the Grimsby road as an illustration), tenanted almost entirely by large fruit-growers and farmers, each of which has a certain amount of power in use almost every hour of the day. They have the grinding of the ensilage product, threshing, pumping, churning, and everything of this nature going on, which requires a certain amount of power all the time, and yet, strange to say, none of these suburban roads seem to be willing to do anything in the way of allowing the farmer to take any power from their circuits. The key to the suburban railroad may be in this, but it seems to me that the suburban railway manager is losing sight of a large field of steady utilization of his power, through not canvassing the farmer and getting hold of that power that is being used all the time. In Manitoba and the Northwest Territories I know of a scheme that went so far that it had very careful attention—and some engineers figured the thing out that the farmer in Manitoba, on the large grain fields there, could, with the straw that they annually burn up in heaps every fall, do all the work of his farm that now requires from 100 to 150 teams, according to the size of the farm, by electric power, by centralising his power in one spot, drawing his straw after the season was over and keeping it in spots where it could be used from time to time; he would have sufficient power to do the farm work and do away with this large number of teams, to say nothing of the men to look after them. I trust you will excuse me; being a city hand I should hardly take the floor in convention, but I would like to say to suburban road managers that I wish to illustrate and throw open some new lines for supplying both power and light.

Mr. Hunt: I would like to ask Mr. Bonner if there is a place in Ohio where the system explained by him is in operation.

Mr. Bonner: These photographs were taken at Toledo, Ohio, where they have already built and are now using this system in an experimental way.

Mr. Hunt: The reason I ask is because I myself and some others have a charter for a road running out of London, and something like this would suit us very well.

Mr. J. J. Wright: I don't believe there is a farmer living who would pay one cent to have any work done that his hired man could do.

Mr. Magie: A large electric light company in Philadelphia is selling a good deal of power to be used for driving small pumps, etc., on farms.

Mr. J. J. Wright: I think in some special cases this might be done, but on the ordinary every day farm of

commerce I don't think an electric plant could be put in to run it.

Mr. Hill: That is the kind of remarks we have been looking for during this convention; this is a direct challenge of my remarks. I would like to ask Mr. Wright if he knows of any class of people to-day who employ a greater amount of complex machinery than the farmer of to-day, and if at the same time he knows of any class of people who have to deal with more complex methods than the farmer. The farmer to-day, if he was as broad-minded as the individual who would get up and claim he would not pay ten cents if he could get someone else to do it, would certainly not have brought up his farm to any position where it could stand in competition with the large farms that are scientifically run. I know for a fact of a large number of farms around this mountain where much current could be used, running from 15 to 20 h. p., if the managers of the suburban roads would offer their power to them, and if the power could be had it would make no difference to the farmer whether he had to pay for it or pay the hired man to do it.

Mr. A. A. Wright: In the town of Renfrew we have had under contemplation the utilization of a water power which has been lying idle for years, and when we bring that into use we contemplate putting in motors and selling power. Four farmers living quite a distance from the town have made application for power, and have stated that if we would put in the wires they would furnish the poles and put them up and take the power. You must understand that the methods of farming are changing continually. The production of corn is one of the most important, and this has to be cut during the winter, when if they had a motor it would prove very handy to them. If the power could be given to the farmer he would take it, and could use it often.

Mr. C. H. Wright: On the Montreal belt line we have been supplying power to the farmers and have had more demand than we could supply. Our only trouble has been with the insurance people, who object to the "grounding." As regards the supplying of light from our circuit we have been unable to do it, even at our own hotel, where we have had to put in acetylene gas. Another matter in this paper is the transportation of farmers' produce—this can very easily be taken to the city, but when it gets there the farmer wants to look after it himself.

Mr. J. J. Wright: If anyone can give me an instance of any suburban road refusing to sell current, I will take back what I have said.

Representative of the Montreal Park & Island Railway: We have refused to furnish current, although offered a fair price for it.

Mr. Hill: Last March I visited a relative of mine just west of Hamilton, who has rather a nice place, and he told me he was patiently waiting for the Cataract Power Company's pole line to come through his section, because he had been repeatedly to the authorities of the Hamilton, Grimsby and Beamsville road, whose line was not further than a few hundred feet from his place, and although he was prepared to pay them from \$40 to \$50 per horse power per annum, they refused to supply him.

Mr. A. A. Wright: Mr. Leach, a Scotchman and a bachelor, lives about two miles from Renfrew, and has had his house all wired up and offers to put up the poles at his own expense. He has not yet got the light, but perhaps he will.

Mr. Thompson: I heard a gentleman say that the Park & Island Company refused to give power to himself and others, and very justly so. When he went to Mr. Holgate he said what he could give him was not at all what he wanted, for the reason that they are simply running street railway generators, and oftentimes the line opens. Now, what would be the effect of having a motor on a circuit like that?

Mr. J. J. Wright: As to the Grimsby instance, I think the difficulty is in the price—\$40 to \$50 is not enough for a "farmer's" horse power. I think you will find in the majority of cases the people are not willing to pay a decent price—they have the idea that

this electric power does not cost anything, and they ought to get it for nothing. Why, even in the city of Toronto they are always howling for "cheap power," and if they could, would like to get it for nothing. In cases of friction between purchasers and consumers it is nearly always a case of friction as to cost. People keep telling them that this power will not cost anything, and that the millenium will be here right away, and he thinks he can churn the milk, rock the cradle and pull the cat's tail with electric power. When a man is told he cannot get the current for almost nothing there is a row and a kick.

Mr. Browne: I am reminded by what Mr. Wright says of something that I saw published a short time ago, which goes to emphasize his idea. There is a town in Canada considering the putting in of an electric plant to be driven by water power, and they have actually advertised that they will have power for sale in units of 30 h. p. and up, as low as \$15 per horse power. If the project be carried through, and they be able to sell at \$15 per h. p., it would seem to me to be very unwise for that town to undertake to transmit that current for 16 or 17 miles, when they could pick up the farmers before they got to the end of the 17 miles and make more money. I think the difficulty with railroads in seeking this market heretofore is that they have been built to meet the first demands, and have grown slowly, and have not therefore had the power to spare, because there are peak hours of the day for railroads, when the demand is more than they can supply, and they are not in a position to say to the farmer that at that time he can use the power. But electricity is only in its infancy, and, as Mr. Wright says, people are crying for electric current although some still cling to the tallow candle. The progress is onward, and the day is not very far off when all the farmers will be operating their farms, rocking their cradles, churning the milk and pulling their cat's tail by means of electric current.

Mr. Hill: I move a vote of thanks to the gentleman who gave us this paper, which has afforded such a pleasant discussion.

Mr. Ellis: I second the motion.

The President: Mr. Bonner, I wish to thank you for the interesting way in which you have prepared this paper, and also Mr. Browne for his clear explanation as to the meaning of the unconscious ownership of the key referred to.

Mr. Bonner: I would like to make one or two suggestions with regard to the doubt expressed by Mr. Hill of the farmer trusting his produce into the hands of the railroad company. As is stated on page 6 of the paper, the wagons will be tarpaulin covered at all times, whether loaded or not. Now, it is just as feasible to protect the goods in that way as any other, as they are transported on the English roads in this manner right along; in fact, I don't think I saw any box cars on the other side, and there is ample protection given to the goods by the tarpaulin cover referred to, which is attached by a chain running through eyelets on the edge of the tarpaulin and connected to the sides of the cart, so that it can be locked or sealed just as securely as if the shipment was in a box car. As to the farmer being unwilling to let his goods go out of his possession until they are turned over to the purchaser and he gets his money, I think this is largely a question of education; and as to the question of cost, I understand it to be one of the claims made by the rail wagon company, that they can effect this transportation cheaper by doing away entirely with the re-loading. In that way they will reduce the net cost of transportation from the farm to the consumer, and I believe that eventually this will be recognized as a fact.

The meeting was then adjourned until the following day.

SECOND DAY.

The President called on the Secretary-Treasurer to read his report for the year ending May 31st, 1898, which was as follows:

SECRETARY-TREASURER'S REPORT.

MR. PRESIDENT AND GENTLEMEN:

I have the honor to submit for your information and considera-

tion the following particulars regarding the work of the Association for the year ending May 31st last, together with a statement showing the present standing of the membership and finances.

The Executive Committee have held five meetings since last convention. At the first of these held on June 29th, 1897, accounts amounting to \$360.22 were passed for payment. Messrs. Kammerer and Armstrong were appointed a committee to learn what transportation rates could be secured for this convention.

At a meeting on September 7th these gentlemen reported that the railway authorities had promised to take the matter up after the first of the new year. A Committee on Transportation was then appointed, consisting of Messrs. J. A. Kammerer, C. B. Hunt, J. J. Wright, Wilfred Phillips and F. C. Armstrong. Messrs. C. B. Hunt, A. M. Bowman, A. A. Dion, J. J. Wright, A. M. Wickens, W. H. Browne and the Secretary were appointed a Committee on Papers. The following gentlemen were appointed a Committee on Arrangements, with power to add to their number and appoint sub-committees: Messrs. Wm. Thompson, W. H. Browne, John Carroll, L. B. McFarlane, F. H. Badger, jr., J. A. Baylis and O. Higman. The Secretary was instructed to render accounts to members in arrears for fees and make drafts if amounts were not paid within a reasonable time.

On April 5th, 1898, the Committee on Papers reported that offers of several papers had been received. It was decided that the completion of arrangements for papers should be left in the hands of the Secretary. Mr. Browne was authorized to engage a local stenographer to report verbatim the proceedings of this convention. Owing to Mr. Kammerer's illness Mr. Browne was appointed chairman of the Committee on Transportation. The dates recommended by the Committee on Arrangements were adopted for the present convention, and the sum of \$150 was appropriated to the committee for entertainment purposes. The draft programme for the convention submitted by the committee was adopted with slight amendments.

At the meeting on May 25th nine persons were elected to membership and the resignations of ten members accepted. Mr. Kammerer and the Secretary were appointed a committee to obtain designs and estimates of cost for an Association button to take the place of the badges worn by members at previous conventions. The Secretary was directed to write members who had failed to pay the drafts made on them for arrears of fees that unless payment should be made prior to June 10th their names would be dropped from the membership roll.

In the early part of this year a pamphlet setting forth the character and purposes of the Association was prepared and printed under the direction of the Executive. About eight hundred copies of this pamphlet have been judiciously distributed.

Particulars of the important work which has engaged the attention of the Legislation Committee will be laid before the Association in the report which the committee will present at this meeting.

In view of the unusually full programme of events, it was deemed advisable to reduce the number of papers to be presented at this convention, but they are believed to be of a standard which entitles them to careful consideration and discussion, and places the Association under obligation to the kindness of the authors.

Incidental reference may be made to the recent formation of the Maritime Electrical Association (of which Mr. Bowman, a member of the Executive of this Association and author of one of the valuable papers on the programme of this meeting, is the president) to conserve and promote electrical interests in the provinces of Nova Scotia and New Brunswick.

During last year death again entered the ranks of our members, and we are called on to deplore the loss of Mr. Ross McKenzie, of Toronto, and Mr. Chas. Ernst, of Detroit.

During the year there was dropped from the roll the names of 21 members, 12 active and 3 associate members having resigned, 2 having died and 4 having changed their place of residence and having neglected to furnish their new addresses to the Secretary. Since the 1st inst. two additional resignations have been received, and the names of 13 members have been struck off the roll for non-payment of fees. Thus there have been removed from the membership list between last convention and this 36 names. During the same period there were added 68 active and 11 associate members—a total of 79—leaving the present total membership 234.

Following is a detailed statement of the receipts and disbursements for the year:

FINANCIAL REPORT FROM JUNE 1ST, 1897, TO 31ST MAY, 1898.

RECEIPTS.

| | |
|---|----------|
| Cash in bank, June 1st, 1897..... | \$410.57 |
| Cash on hand, June 1st, 1897..... | 5.25 |
| 111 active members' fees at \$3.00..... | 333.00 |
| 1 active member's fee at \$3.00—paid..... | 2.00 |
| 20 associate members' fees at \$2.00..... | 40.00 |
| | <hr/> |
| | \$790.82 |

DISBURSEMENTS.

| | |
|--|----------|
| Expenses of convention..... | \$351.77 |
| S. Barnett's account..... | \$150.00 |
| W. Phillips, band and floral decorations..... | 34.00 |
| Transportation B. and N. F. electric railway.... | 12.00 |
| Hotel Lafayette (cartage and express charges)... | 1.25 |
| Black' & Co. (100 certificate covers)..... | 8.00 |
| Alexander & Cable (lithographing badges).... | 5.00 |
| George Angus, stenographer..... | 25.00 |
| Electrical News, printing..... | 111.79 |
| Pins and ribbon for badges..... | 3.18 |
| Express charges..... | 1.30 |
| Telegrams..... | .25 |
| | <hr/> |
| | \$351.77 |

| | |
|--|----------|
| Grant to Secretary..... | 75.00 |
| Electrical News, printing account..... | 24.00 |
| Stationary and carbon paper..... | 5.55 |
| Printing 150 certificates for members..... | 1.25 |
| Exchange on cheques and drafts..... | 7.20 |
| Express charges..... | .64 |
| Postage..... | 24.77 |
| Cash in bank, May 31st, 1898..... | 281.18 |
| Cash on hand..... | 19.46 |
| | <hr/> |
| | \$790.82 |

RECEIPTS SINCE MAY 31ST, 1898.

| | |
|--|----------|
| Cash on hand, June 1st, 1898..... | \$ 19.46 |
| 46 active members' fees at \$3.00..... | 138.00 |
| 1 active member's fee for one year and eight months..... | 5.00 |
| 5 associate members' fees at \$2.00..... | 10.00 |
| | <hr/> |
| | \$172.46 |

EXPENDITURE.

| | |
|---|---|
| Postage..... | 22.65 |
| Exchange on cheques..... | 1.10 |
| Receipt forms..... | .30 |
| Telegrams..... | 1.43 |
| Express and duty..... | .41 |
| | <hr/> |
| | \$ 25.89 |
| Cash deposited in bank since June 1st, 1898..... | 113.00 |
| Cash on hand June 25th, 1898..... | 33.57 |
| | <hr/> |
| | \$172.46 |
| Total standing to credit of Association, June 25th, 1898..... | \$427.75 |
| Receipts since June 25th..... | \$161.00 |
| | <hr/> |
| | Total at credit of Association, June 29..... 588.75 |

On motion of Mr. Barrie, seconded by Mr. Breithaupt, the report was adopted.

The next item of business was the consideration of the reports of committees. The President advised that the only one that had been written out was the report of the Committee on Legislation, of which he was the chairman, and which was as follows:

REPORT OF COMMITTEE ON LEGISLATION.

Your Committee beg leave to report that in pursuance of the motion passed at the last Convention held at Niagara Falls, instructing your Committee to take up the matter of securing legislation in connection with the movement among municipalities in Ontario to enter upon electric light undertakings, in unfair competition with companies already in existence, your Committee held their first meeting at the close of the Convention. At that meeting it was decided to procure an opinion from Donald Guthrie, Q. C., ex-M.P.P., of Guelph, and to retain him professionally on behalf of the Electrical Association in connection with the question.

Various questions were submitted to Mr. Guthrie, and his opinion in answer to these questions was considered at a meeting of your Committee held in Toronto on the 9th of November. A copy of the opinion is attached to this report.

We also had a communication from him, giving his views as to the prospects of securing favorable legislation at the last session of the Legislative Assembly. After full discussion your Committee decided to give instructions for the preparation of a short bill to be submitted to the House, which would at least afford some measure of relief to those companies that were immediately threatened with unjust municipal competition.

Another meeting of your Committee was held in Toronto on the 10th of December, when the solicitor was present, and after considering the whole situation fully and carefully, instructions were given for further proceedings.

With that view a bill was prepared which came before the Municipal Committee of the Legislative Assembly on the 12th of January. Your Committee, in preparation for the meeting, assembled in Toronto on the 11th and also on the 12th, and attended the meeting of the Municipal Committee for the purpose of supporting the bill. The Committee had also the assistance of Mr. Lash, Q.C., with Mr. Guthrie.

After discussion those representing us consented to a suggestion of the Honorable Mr. Hardy, Chairman of the Municipal Committee, and other members of that Committee, to allow the matter to stand over for another year. The discussion, however, brought out the fact that there was really no sound answer to the principle of the proposed measure. It also evoked an expression of opinion from the leading men of both political parties to the effect that the underlying principle of the bill was just. The Municipal Committee thought that there was not proper time to consider how the bill would affect places where there were more than one existing plant, also places that derived or may derive power from points outside the municipality, also to consider the length of the life of an electric plant and other questions, and in the judgment of the Municipal Committee any bill dealing with the matter would require more ample public discussion and some modification. The action of your Committee and the discussion the question has received has tended to bring into prominence the injustice of the present law. The necessity and propriety of some measure of relief may be considered now to be more generally admitted. The work thus inaugurated and which has attained a hopeful position, should not be discontinued.

The present law of Ontario is inequitable towards lighting and power companies, because it permits a municipality, after it has given its sanction to the formation of such a company and has encouraged enterprising citizens to embark their capital in it for the purpose of supplying the municipality with light and power, to turn around and destroy, with public funds, and without public necessity or advantage, the value of the property of those citizens who were encouraged to invest their private means in the enterprise. What evidently struck the majority of the members of the Municipal Committee was that the proposed legislation was just and equitable because, while it did not prevent municipalities entering upon municipal supply of lighting if they so desired, it made provision for extending the existing law regarding water works to the case of lighting companies. This law is to the effect that where a municipality desires to supply water and there is an existing water company incorporated for the municipality, the council shall not levy any water rate until the council has, by-law, fixed a price to offer for the works or stock of the company, nor until after thirty days have elapsed after notice of such price has been communicated to the company, without the company having accepted the same or having, under the provisions of the Municipal Act as to arbitrations, named and given notice of an arbitrator to determine the price, nor until the price accepted or awarded has been paid or has been secured to the satisfaction of the company; the price to be determined by arbitration under the provisions of the Municipal Act.

It will be observed that this provision in no way interferes with municipalities going into the supply of water. It simply provides that if they do enter upon such undertaking they are by this law bound first to try to buy at a fair price, or at a price to be fixed by arbitration, existing waterworks. No good reason can be advanced why this law should not be extended to lighting and power companies as well as to waterworks. It is eminently just, and it imposes no hardships on the municipalities; nay, rather, it benefits them, because it tends to extinguish rivalry to themselves, which rivalry might render municipal operation of these works unprofitable, and at all events it puts them in possession, at a fair valuation, of the very plant and material that they would have to purchase from other people if they are going into the business. The proposed legislation is in the public interest, because it will further encourage private citizens to invest their capital in extending and improving existing lighting and power works.

It was generally acknowledged by the Municipal Committee that electric light companies as well as water companies have always come into existence with the consent, encouragement and approval of the municipality, which has granted the use of the streets, etc., for these works.

The last meeting of your Committee was held in Toronto on February 3rd, for the purpose of passing accounts. At this meeting, accounts for legal services, printing, stationery, postage, exchange on drafts and office assistance, amounting to \$622.56, were ordered to be paid. The funds to meet this amount were contributed by the following companies: Brockville, St. Thomas, London, Ottawa, Waterloo, Brantford, Carlton Place, Guelph, Lindsay, Galt, Barrie, Owen Sound, Cornwall, Strathroy and Cobourg Gas Company, in amounts ranging from \$150 to \$100. It will be observed that while there are about two hundred lighting companies (who were all invited to assist) carrying on business in the province of Ontario, all more or less interested in having legislation secured to protect their capital from confiscation, only fifteen of that number contributed to the expense fund of your Committee. We are pleased, however, to say that through the liberality of these companies all claims are paid. It is quite evident to your Committee that if the work in hand is to be carried to a successful issue, a more general, liberal and hearty support will have to be accorded them. It ought to be mentioned here that all the members of your Committee paid their own travelling and other expenses in connection with attending the meetings. The movement amongst municipal corporations to enter into the lighting and power business in competition with those who had the courage to be pioneers is growing, and unless regulated in some way by the legislature, will result in the confiscation of a large amount of capital invested in the business, as witness the town of Barrie now preparing to put in a complete plant, including arc, incandescent and power services, to be paid for out of public funds, for the purpose of competing with and destroying the Barrie Company, a private and lawful enterprise.

Your Committee desire to mention that Mr. Pepler, Q.C., of Barrie, and Mr. Farley, Q.C., of St. Thomas, two of the members of your Committee, rendered valuable services in connection with the promoting of the bill referred to.

Dated 14th June, 1895.

JOHN YULE,
Chairman of Legislation Committee.

GUELPH, 4th November, 1897.

JOHN YULE, Esq.,

President Canadian Electrical Association, Guelph.

DEAR SIR, In answer to the questions submitted by you for my opinion, I have to say:

By the statutes now in force in Ontario touching the acquisition of gas and electric works by municipalities, municipal corporations have the power: (1) To erect gas and electric works and operate the same in opposition to an existing gas and electric light company, without the consent of that company and without attempting to negotiate with that company either for the supply of light or for the purchase of their works, and this notwithstanding the fact that the company might have been organized and carried on with the express sanction of the municipal council. (2) Municipal councils have also power to acquire the rights of a

gas company incorporated on and after the tenth of March, 1882, at a valuation, that is to say, they have power to expropriate the property, and they, of course, also have power to acquire it by agreement with the company. (3) On the other hand, it appears that a gas company or an electric light company has no power to prevent a municipality entering into competition with them in the case of gas and electric works or to do anything which shall compel the municipality to purchase their works at a fair valuation.

In regard to the powers of a municipality to construct water works, there seems to be a restriction which does not exist in the case of gas and electric light works, for, by section 507 of the Consolidated Municipal Act (1892), it is provided that in case there is any water company incorporated for the municipality, the council shall not levy any water rate until such council has, by-law, fixed a price to offer for the works or stock of the company, nor until after thirty days have elapsed after notice of such price has been communicated to the company, without the company having accepted the same or having, under the provisions of that act as to arbitrations, named and given notice of an arbitrator to determine the price, nor until the price accepted or awarded has been paid or has been secured to the satisfaction of the company. By 60 Vic. (897) Chap. 17, Schedule C 88, it is further provided that the price shall be determined by arbitration under the provisions of the Municipal Act.

It seems to me that an amendment to section 507 should be sought, making it to read that in case there is any gas company or electric light company or water company incorporated or existing in the municipality, the council shall not levy any rate for the construction of gas or electric light or waterworks until the council has, by-law, fixed a price to offer for the works or stock of the company, etc. That would place gas and electric light companies on the same footing with water companies.

There is no just or sound reason why Parliament should refuse an amendment to the Municipal Act to give gas companies and electric light companies the same protection as water companies, against municipal interference with an existing business, and subject to provisions for an arbitration. I think such an amendment would be likely to carry. It couldn't be said that its effect would be to prevent municipalities from embarking in municipal lighting. They would still retain full power to do so; but to do so with the plant and works of an existing company, to be first acquired on fair terms.

In case a point was made in this connection, that municipalities should have the power of erecting their own lighting plants without being compelled to purchase the commercial part of a plant of a gas or electric light company, provision could be made for such a case by an enactment compelling a gas or electric light company to sell the part of their works connected with public lighting in case the Lieutenant-Governor-in-Council, or arbitrators to be named by him, considered they ought to be compelled to sell the same to a municipality without requiring the municipality to purchase the part of the works of the company connected with commercial lighting.

In order to secure an impartial judicial investigation and decision on the important questions involved, I suggest that the arbitrators, under all the amendments herein suggested, should be three county judges to be named by the Lieutenant-Governor-in-Council, they to determine as to right to purchase and the extent and price and terms and conditions of purchase.

I may also suggest for your consideration, whether it would not be expedient to consent to a provision for an arbitration to fix the rate for public street lighting which a municipality should pay to an existing company in case the municipality and the company differed. In that case a municipality would be deprived of an excuse for going into gas or electric lighting on its own account.

In England local, in other words, municipal authorities, are only authorized to supply gas for public and private purposes throughout the whole or any part of their district where there is not any company or person authorized by or in pursuance of any act of Parliament or any order confirmed by Parliament to supply gas for public and private purposes, and where such company or person do not supply gas within any part of the district covered by the local authority, and if there is any such company or person so supplying gas, but the limits of supply of such company or person include only part of the district, then the local authority may themselves undertake to supply gas throughout any part of the district not included within such limits of supply, but even then before the local authority may, under the act, themselves undertake to supply gas for the whole or any part of their district, they must obtain a provisional order authorizing a gas undertaking under and subject to the "Gas and Waterworks Facilities Act, 1890"; that is, they have to obtain authority from what, in England, is known as the Local Government Board, which has been, for the purpose of that act, substituted for the Board of Trade. There is also in England provision giving gas companies power to sell their works to local authorities, that is, by mutual agreement.

The law in Scotland is regulated by the Burghs Gas Supply (Scotland) Act, 1876, but the first provision of that act limits its application so that Burghs have no power to supply gas within any part of the area of supply over which any gas company incorporated by Act of Parliament or any co-partnership or person authorized by any provisional order confirmed by Act of Parliament, shall have statutory powers to supply gas at the date of the adoption of the Act in the Burgh.

The Commissioners, under this Scotch Act, for the Borough, however, are authorized to buy from gas companies (that is, by mutual agreement) their works; but there is also a special provision to which I desire to call your attention: Section 21 of the Act, that "Where there is a company not incorporated by Act of

Parliament or authorized by provisional order confirmed by Act of Parliament supplying gas within a Borough, the Commissioners, before they shall exercise any of the powers conferred by this Act, shall give notice to such company that they are willing to buy or to treat for the purchase of the undertaking of the company and of all the rights, powers and privileges and all the lands, premises, works and other property of the company, and if such company shall consent in manner provided by the last preceding section, to sell the same, the commissioners shall purchase the undertaking on terms mutually agreed upon or to be fixed by arbitration in the manner provided by the lands 'Clauses Consolidated (Scotland) Act 1845' respecting matters thereby directed to be settled by arbitration, and if such company shall refuse to sell the same, or shall not within two calendar months after the service of such notice return any answer, the Commissioners may present a petition to the sheriff stating the facts, and the sheriff shall, on being satisfied by evidence of the facts as stated, discern accordingly, and on such decree being announced, the Commissioners shall have and may exercise all the powers conferred by this Act, a clause which seems to me to be substantially in its operation the same as our enactment, section 507 of the Consolidated Municipal Act with regard to water companies.

As quoted in your annual address to the Canadian Electrical Association in June last, section 27 of the British Electric Lighting Act, 1882, provides that where an electric light company is established the local authority or municipality cannot interfere with it until the expiration of twenty-one years or such shorter period as is specified in the application for the provisional order or in the special act, etc. At the end of twenty-one years the municipal authorities may, by notice in writing, require the electric light company to sell their undertaking upon terms specified; if they do not so require, then the company goes on for seven years further, at the end of that seven years the municipal authorities have again a right to purchase, and so on at the end of every seven years. Then it has to be observed that the terms of purchase include not only the value of the lands and works, but also, where part only of the undertaking is purchased, provision must be made for loss occasioned by severance.

With regard to the law in the United States, it is said in a work of Crosswell on the law relating to electricity: "If an electric light company exists in a town, and has been granted by the town certain rights to set its poles and string its wires over the city, yet if this right is not exclusive in terms the city violates no contract or debt towards the electric lighting company by purchasing its own (i.e., a rival) electric lighting plant and engaging in the electric light business. To avoid, however, the practical injustice of such a course, the statutes which authorize municipalities to engage in the electric lighting business generally provide in some way or other for the purchase by the municipality of any existing electric light plant at prices fixed by the commissioners in case of disagreement."

The same work states that in Iowa, Massachusetts, Michigan, Nebraska, Ohio and Pennsylvania, statutes have been passed regulating the subject of the operation of electric light plants by municipalities.

I would suggest that your general committee appoint an executive committee to attend to the whole subject of promoting and securing the necessary legislation, and that a short agreement be got from those gas and electric light companies who are willing to contribute towards the expense, in some such form as I now send.

Yours truly,
(Signed) DON. GUTHRIE.

Extract from Mr. Guthrie's opinion to Mr. Yule, President Canadian Electrical Association, 4th November, 1897:

"I therefore recommend that an amendment or amendments, as here indicated, be applied for, and that your Committee on Legislation should take the usual steps in such cases to promote the passing of the measure. This would include interviewing the leading members of Parliament, both on the Government and opposite side of the House; the circulation of printed matter, securing favorable articles in the leading newspapers, so far as possible, having the officers of the various lighting companies throughout the province interview their local members and secure their support as far as possible to the measure; also by counsel and otherwise to support the proposal when it comes before the municipal or other committee of the House to whom such bills are referred, and by other legitimate means have the adoption of the necessary amendment secured."

Mr. J. J. Wright moved that the report be received and the committee continued.

Mr. Hunt. In regard to this report, I think it has gone into the question so thoroughly that it has left nothing for the committee to add to it. I would like if some of the members, who are not on the committee, would express their opinion as to whether they approve of it or can devise some better way of handling the matter. I think some of the members who are not so conversant with it as the committee might give us their opinion.

Mr. Noxon. Those who were at the convention a year ago will probably remember the discussion which took place upon this subject of the adoption of municipal plants by municipalities before they were justified. I stated at that time that I was not directly interested in that question, having foreseen when entering into the

electric light business a probability that a plant instituted by private enterprise might become worthless by competition from a municipal plant, but I am in thorough sympathy with those who have such opposition and may have their plant depreciate, and I think it only right that every effort should be made by those in the business to remedy such a state of affairs. I notice in reading over this paper that they have a law in Great Britain Scotland I believe—such as we are seeking to obtain. This is one of the strongest points the Association can make, as throughout Canada and all English speaking countries the English law has been taken as a precedent, and I therefore have greater hope of accomplishing what we desire in that direction, because in addition to the justice of the position, the fact of a law having been passed in Britain, where they have had more experience probably than we have had in this country, should influence our legislators. I see it is said in this report that it is nothing more than just and right that a municipality should, before embarking in opposition to a private enterprise, be first compelled to take the position of coming to an amicable settlement covering the purchase of the existing plant. I see, however, that a parallel is drawn with the Water Works Act. It is quite possible that those who are promoting this directly and having to do with the legislators, will have the objection made that whereas a waterworks plant is one of permanency, not only in the nature of its construction but also in its general principles, it may not be considered, as a lawyer would say, "on all fours" with an electric light plant, which is liable to a great many changes necessitated by the constant improvements and inventions in the art. It might be said that the electric light plant might become obsolete by reason of later improvements and inventions, whereas a waterworks plant is not likely to be subject to that condition. I don't think, however, this would be a very important contention, because the law would fix the value of the plant as relating to the modern methods of construction and operation, and for that reason there would be no objection or injustice in insisting that whatever the nature of the plant might be, the municipality should be compelled to take it over at its value, considering the special features in the case; and I do not see that this Association can be accused of anything in the way of selfishness in endeavoring to legislate with that purpose and end. We will, of course, as an Association and as members, look at this matter from the other side as well as our own, as nothing can be gained by looking at anything from only a selfish standpoint. You cannot expect your ideas to prevail unless they will commend themselves to those whom you wish to convince, and for that reason we must look at the matter from other points of view. We have endeavored to do that, and I can see no reason whatever why the municipalities should not accept this, and why the government could not provide this legislation. I think the convention is perfectly justified in using its utmost endeavors and influence to bring this legislation about, and I believe that if this is done, by united efforts the legislation can be procured.

Mr. Breithaupt: I am not conservant with this subject, this being the first convention I have attended. I cannot, therefore, say much on the subject. As already brought out, the point of precedent having been set in England and Scotland seems to me to be about the strongest argument aside from the proposed legislation being just for both parties. If it is just for waterworks to have such legislation, why is it not equally just for gas and electric light companies? Taking the three on a par, I don't see why the municipalities should raise great objections, because they can, at any time, have an arbitration before purchasing the plant, and they would not, I presume, expect to pay for the plant less than its par value. In the United States, as is also brought out in the report, there is a similar act which also assists and helps to encourage the individual, corporation, gas and electric light companies. All of these facts together should certainly help the Association in getting this desired legislation. There is another point which certainly needs to be emphasized, and that is that those of us who are central station

managers will certainly have to support the legislation, not only by speaking for it, but also financially. I realize that very clearly. There is a great deal of expense connected with it, and I think we all should do our part in helping to bear this expense. There are a few towns in the west who have had this question brought before them in a very emphatic manner. In our own town they still have some five weeks to decide whether they will bring the matter of lighting to vote, put in a plant, or give the present company a contract for a number of years. A lighting company in a neighboring town, whose manager is also present, have found a good deal more difficulty than we have, and they have the question brought even more emphatically before them than we have. The point brought out by Mr. Wright as to keeping on friendly terms with the members of the town council is a very good one. We endeavor to be so much as possible, and if we cannot secure this legislation, we can at least continue supplying the town with light and power. I would very much like to see this legislation secured during the present year, and the various companies receive the protection that is really due them.

Mr. Ellis: I don't know that I can add anything to that which has already been said. I may tell you a little about our experience in Barrie. We have been for two years without a contract from the town. We have approached them in every imaginable way, and they simply say, "We don't intend to talk to you at all." About three weeks ago I wrote, asking if they intended renewing the contract, that we were anxious and willing to negotiate with them on a fair and reasonable basis, and put in another clause saying that if the town really desired to go into the electric lighting business, we would sell our plant at its value. In reply they wrote us to put in a tender, and, in fact, advertised broadcast for tenders, and asked to have ours put in with the rest. We thought it was unfair to bring us in competition with the manufacturer, as we had a plant that had cost a great deal of money, and no doubt more than it was worth to-day. We had established a business and built pole lines in all parts of the town. We wrote them to that effect, suggesting that we would be willing to have the value of our plant fixed by appraisement, they selecting one representative, we the other, and these two to select a third. But they would not listen to this at all. I know our Mayor has corresponded with the heads of municipalities regarding this matter to get their experience. We are going to have some very strong opposition. I think it is becoming of this Association that we start right in now, and not only talk about this legislation, but interest the members in our constituencies, and put every argument before them, so that they can see we are only asking what is just and right.

Mr. Noxon: I would like to suggest the advisability of discussing the question of the separation, in case of the purchase of the plant by municipalities, of the municipal and private service. In the event of separation I see a great deal of difficulty in the municipality buying only a portion of the plant. The report says it could be separated. I don't see how. It would practically mean the doing away of the private business of the company unless they put in a separate plant, and this, I think, complicates the matter very much and is a very important factor in the disposal of these plants in the event of purchase by municipalities.

The President: I have followed this matter closely, and am glad that others have spoken in the way they did, not only on the report, but on the financial aspect of the case, because my experience has been that the majority of people are always anxious to reap where others have sown. They give all sorts of promises, but when it comes to the point they are not there. What was impressed upon your committee at the last meeting of the legislature, was that these things have to be fairly and squarely met, and have also to be freely discussed. The committee of the legislature did not feel inclined to go on with the bill last session. The House was called two months earlier than usual, and being the last session of the House, members were not disposed to

commit themselves. In place of submitting the regular bill a short bill was introduced that would give relief until the larger bill could be put through, and it was understood that if there was any opposition, the members should not be asked to commit themselves in any way. There are different ways of looking at the thing. One eminent counsel was so impressed with the fairness and justice of the proposed legislation that he said he would not be afraid to go into any constituency and defend the vote of any member. This gentleman went over to the great majority a few days ago—the late Mr. Dalton McCarthy. The ground was broken, however, and we have made, I think, very good progress. Hon. Mr. Hardy made the remark to us as we went out, that he had no doubt that in any question of this kind that might come up in the province during the year, the municipalities would be willing to submit the matter to arbitration, but we find in Barrie that they will not negotiate in any way. I have good hopes of getting a certain amount of protection from the legislature if gone about in the proper spirit and the arguments made in a fair and business like way, and I am sure the work done during the year will bear fruit and help us very considerably.

Mr. J. J. Wright: I think the strongest prominence should be given to the fact that when the plant is purchased by arbitration, it's purchased at its value. Every plant has its value, and the municipalities would only be asked to purchase the plant at its value, which would be the same to the municipality as to the lighting company. I think if that point were given greater prominence that a good deal of the objection would be disposed of. There is another serious objection, that is, the dividing of the two branches of private and commercial lighting. Now, if in some town a small plant was operating commercial and private lighting and the municipality desired to purchase only that part of the plant that they wanted, it would simply mean ruination for the company. The investment of the company would be practically destroyed, because it would leave them with a small dynamo or proportion of one that was used in the supply of commercial lights. This is a question that should be impressed upon the committee, so that they may give that point particular attention.

The President: I think in the English Electric Lighting Act they have a provision for severance.

Mr. J. J. Wright: I think if you go to the legislature and ask that the municipalities should be compelled to purchase the business of a going concern with the good will of the electric light business and the franchise of it, you will not have much success. The only way is to get the municipality to arbitrate and take over the whole business at its value. I know a great many people who, in considering this question, have the idea that it is poor policy for a municipality to go into commercial business, especially electric lighting and power. Why should the municipality go into the business of supplying power to a few users when the socialistic problems of municipal affairs are of much greater importance? For instance, they could go into the coal business, which is a necessity, and let the people have coal at cost prices; also the supplying of bread and other necessities.

Mr. Ellis: Is there a precedent in Canada of any municipality entering into opposition with any company for commercial and street lighting? I ask this because I was reading an article not long ago, which gave the opinion of the Chief Justice of the United States. This matter had been brought up in the courts, and he gave the decision that the demands of the people made it necessary to establish such enterprise, and municipalities encouraged private citizens to invest their money therein, and he said that while it might not be giving them a perpetual franchise, it was in reality the same thing, and he said that that kind of confiscation of the people's money should not be tolerated, and the law must step in and protect the investors.

The President: You will all doubtless remember that some time ago in Toronto, Baron McDonald proposed that the charter of the Street Railway Co. there be cancelled, and the mayor very quickly stepped in with a

report and pointed out the unfairness of cancelling the charter of a company in which the innocent shareholders had placed their money, and that he was, therefore, not in sympathy with it. Why should they do this thing to electric light companies?

Mr. J. J. Wright: I cannot understand why the electric light industry should be singled out as an object of attack by the municipalities.

Mr. A. A. Wright: They think there is a lot of money in it.

Mr. Ellis: I had occasion, as Mr. Smith knows, to go into the court business myself, against one or two of the strongest corporations of Canada, and Justice Rose ruled against me on this account, that the corporation had invested a lot of money and had established a business, and it was not fair for me to go in there and demoralize their business, and he thus gave his decision against me. There was no precedent for it. I think perhaps if I had had the matter brought to the higher courts in Canada they would not have decided in our favor.

The President: From Messrs. McCarthy's and Guthrie's opinions it is very clear that the municipalities have the right to go into competition with the local company.

Mr. W. A. Johnson: There are both commercial and street lighting systems used in St. Marys, where the corporation have put in a street lighting plant and have not gone into the private lighting.

Mr. Breithaupt: The point was brought up why the lighting companies were attacked. I think it is just because of the popular vote, and that is why there is always such a howl made about lighting contracts before election in order to get the vote.

The President: Another idea that some municipalities have is that if a dynamo is set alongside their water works it will light their streets for nothing.

Mr. Ellis: In connection with the Barrie waterworks they have two steam pumps, and two-thirds of the people of Barrie think, and some of the Council lead them to believe, that all they have to do is to hitch a dynamo to the pumps and they can run their street lights.

Mr. J. J. Wright: Why, that is what they think in Toronto.

Mr. Noxon: The question might arise as to how far the electrical supply men are responsible for this idea of municipal lighting. It occurred to me that if the supply men would not encourage municipalities in this thing, it would go a long way towards getting rid of the difficulty. I think it would be only just to ask that the supply men do not do any more than is necessary to encourage municipalities to put in plants of their own—not refuse to give them figures, but protect the legitimate trade by not giving inside information or prices.

Mr. Johnson: On behalf of the supply men, I wish to say that quite recently it was proposed to put a plant in a small town. Elaborate specifications were prepared by the engineers, but they had not any by-law authorizing the purchase of the plant or any money to pay for it. Certain of the supply men got together to consult about the advisability of offering some agreement that no manufacturing company should tender unless the municipality had fully decided to purchase a plant and had made arrangements concerning the funds necessary to pay for it. I think the feeling among the manufacturing companies was that it was a very desirable arrangement if it could be fixed in a workable manner. I might say that within three or four days after the suggestion to make such arrangement, the town councillors and pretty nearly everybody else had heard about it, which, of course, made it impossible to carry the proposition through.

Mr. Ellis: When tenders were called for in Barrie, they were to close on the 6th day of June. About the 5th or 6th they had very few tenders, and an untrue and malicious report was circulated broadcast that we had bought up all the supply men and manufacturers in the country; so they sent their engineers to nearly every place in Canada where they were manufacturing, and I understand they now have a bag full of tenders. In our case I think the supply men

have not shown any tendency to encourage municipal ownership.

Mr. Hill: I trust the proprietors of electric light installations do not look upon the supply men as their enemies. I am sure if they look at them in the light they ought to, that the relations between them would be much improved. Take the question of the installation just spoken of. The gentleman said that it was imagined by those interested that this expert of theirs had bought up all the electrical people in the country, or possibly they had bought him up, but I think it would be necessary for him to do the former in order for him to carry out the specifications in the first place, as in order to carry out these specifications they would be doing an injustice to themselves and the town, and as such the result Mr. Johnson spoke about was brought about. The electrical supply men of Canada are working for the prosperity of the electrical people as a whole. We have brought out nine-tenths of the improvements in apparatus and supplies, from the incandescent lamp back to the dynamo; we are bound up in your interests, and any set-back that the electrical fraternity receive, either in a large or small degree, would be a set-back to ourselves, and I can assure you, from my experience of the supply dealers of Canada, that for you to imagine that we are going to cater to a trade that would hurt the electrical fraternity, would be a mistake.

The President: In regard to the supply men, we know who are our friends and who are our foes. We know a great deal more than they give us credit for sometimes.

Mr. J. J. Wright: That is all right, but there is another class doing more harm than the supply men, and that is a certain class of half-baked people, such as dynamo tenders and supply men, who pose as electrical engineers, and when they are fired out of some reputable concerns in the country, they go around stirring up lies.

Mr. Bowler: There are some people that that remark might hit pretty hard. I am running a municipal plant. I think Mr. Wright should name the parties to whom he refers.

The President: I don't deny for a moment that any municipality has a perfect right to go into the lighting business if they wish.

Mr. Browne: I believe, however, that it is not admitted that an electric light station already installed in a town or city can be attacked by the municipality investing in a plant to compete with it.

Mr. Reesor: I would like to draw your attention to this fact, that according to the Ontario Statutes municipalities, when they donate a bonus to any manufacturing concern coming to their town, must not interfere with existing interests of the same class of manufacturers. Now, the municipality, in putting in a new plant to do its lighting, is really using the taxes contributed by the private individuals who own the other plant, to purchase and sustain the opposition plant.

The President: There is another view, that is, the difference between the manufacturing and the electric light plant. If we were on the same basis as a manufacturing institution, and could move, we would not bother with the municipality, but we are tied down, and have capital invested which cannot be moved. We hear every day of offers being made to factories to move to other towns, but lighting companies do not have that advantage.

Mr. A. A. Wright: This is a very difficult subject to handle; there are so many interests at work. There are the political enemies and the aspirants to office which you have to deal with, and a certain class of people and a certain class of supply men. I know of one supply company that sent their best man into our town to work up an opposition plant, and they succeeded in doing it. I remember it and will remember it for a long time, but, fortunately for our town, I don't think there is much danger of their going into the electrical business, because they are involved in debt and cannot do it. However, I think they would be inclined to treat us fairly if they did. With reference to our keeping a sharp eye on the electrical supply men, I

think we should do this, but still you must understand this is a very dangerous ground, for these men who are our opponents, by telling half the truth, will make the people believe that we have arranged with the supply men not to sell to municipalities either plants or supplies. So we have to be very careful what we say and do, but it is well to let the supply men know that although we don't do a great deal of talking, we do a lot of thinking, and although we don't ask that they tell the municipalities that they won't sell them a plant, still, at the same time, they should, in justice to themselves, because it is the electrical men who are going to buy their supplies, be very careful and throw all reasonable cold water on the scheme. I think we should make every exertion to secure that amount of legislation which will protect us from new plants. It seems to me that that is the place where our strongest defence should be, and that our energies should be earnestly devoted to this matter.

Mr. Hill: There is another phase of this question worthy of consideration. Mr. Wright has stated that we should watch the electric supply men. Now, the electric supply man is out for business pure and simple. I am speaking now of Canadian electrical supply men. If he can get the electrical business of Canada he is satisfied, but where the managers of certain companies come to the conclusion that all they have got to do is to go across the border to buy their plant and supplies, the electrical supply men think that the town in which his company operates is not one that is assisting home industries, and immediately attacks that town. We have got to patronize one another, and where we find we cannot approach the manager of electrical industries at present in Canada, we are bound to get into that town if we possibly can, and use our energies to secure that portion of the trade.

Mr. A. A. Wright: I don't think there are many owners of plants but that always give the preference to Canadian supply men, and I think that the majority of supply men treat us fairly. There are members of churches who are not very good Christians, and there are also members of the supply fraternity who are not good business men. Really, I think if the supply men would tell the whole truth it would be better.

Mr. Hill: We generally do that.

Mr. Johnson: There have been manufacturers who have made it a policy never to interfere with a local illuminating company in the way of starting a plant in the same town or inducing the municipality to go into the business, but on the other hand I can say that there are manufacturers who have done both of these things, and there have been other cases where the illuminating company's employees have gone so far as to instigate and encourage the starting of a municipal plant in another town, and have done it in the shape of a fee for the consulting engineer.

Moved by Mr. J. J. Wright, and unanimously resolved, that the report of the Legislative Committee be adopted, and that the Committee be continued as a part of this Association and instructed to prosecute the work.

Mr. Reesor, on behalf of the committee appointed to name standing committees for the ensuing year, reported as follows:

Committee on Statistics—J. A. Kammerer, Toronto; A. A. Wright, Renfrew; S. J. Parker, Owen Sound.

Committee on Meter Inspection—A. A. Dion, Ottawa; E. E. Carey, St. Catharines; J. J. Wright, Toronto.

Committee on Legislation—A. L. Breithaupt, Berlin; C. Berkley Powell, Ottawa; John Yule, Guelph; C. B. Hunt, London; B. F. Reesor, Lindsay; J. J. Wright, Toronto; W. H. Comstock, Brockville; F. Pepler, Barrie.

This selection of committees was unanimously approved of.

The President: The next item is the deciding of the place of meeting for next year, and in that connection

I have an invitation from the Cataract Power Company, of Hamilton, which I will read:

HAMILTON, Canada, June 25, 1898.

C. H. MORTIMER, ESQ.,

Sec'y Canadian Electrical Association, Montreal.

DEAR SIR,—The Cataract Power Company takes pleasure in extending to the Canadian Electrical Association its most cordial invitation to hold its next annual convention in the city of Hamilton.

We will by that time have some matters of modern electrical engineering, as well as the industrial applications of electric power, which would probably prove of interest to the members of the Association.

We trust that we shall have the opportunity of entertaining the members of the Association at their next meeting.

Yours truly,

THE CATARACT POWER CO. OF HAMILTON, LIMITED.
H. R. LEYDEN, General Manager.

After the reading of the invitation, Mr. Black, of Hamilton, said: I have been thinking for some time that we should go to Hamilton. I feel a little reluctant in moving that the convention go to Hamilton, following after Montreal. They have treated us so well here and promised us so much to come, that I fear that a visit to Hamilton will be tame after being in Montreal, still I think there is hardly another place in the Dominion where you will be so well treated as in Montreal, but you have to take the little with the great. I move, therefore, that the convention go to Hamilton.

Seconded by Mr. Wyse, of Brantford.

Mr. Gordon J. Henderson: Representing the Hamilton Electric Light & Power Co., I beg to join with the Cataract Power Co. in asking you to come to Hamilton. The work which has been done at St. Catharines so far will, I am sure, prove a benefit to any who come to Hamilton next year. We will do our best to make your stay enjoyable, and trust you will accept the invitation.

On the motion being put to the meeting, it was adopted unanimously.

The President: The next item on the programme is "General Business."

Mr. J. J. Wright: Under that head I would like to have taken up the remuneration of the Secretary of the Association for services during the past year, and move that it be made \$125.

Mr. Reesor: I second the motion.

Mr. Kammerer: I also second the motion. I know the amount of work done during the past year, and there is no doubt whatever that it is worth a great deal more than the amount which has been named.

The President: For the past two years I have also known the work that Mr. Mortimer does, and know that \$125 is not half enough for the work there is connected with this organization.

The motion was adopted unanimously.

Mr. Hill: I would like to ask if it is the intention of the Association to take any steps in the matter of the action of the Underwriters' Association in regard to inspection, etc., and whether it is the intention to adopt any of the numerous sets of rules that are upon the market, and whether we are to take any action in conjunction with the Fire Underwriters' Association to try and adjust this matter. I don't know whether it is a matter of very great importance to the members from Ontario, but I can say that, speaking from a Montreal view, it is a matter of very great importance. The way in which we have been treated by the underwriters during the last year or two has been, to say the least, very unsatisfactory. We do not know where we stand to-day or where we will stand to-morrow. To-day it is iron-armored conduit; to-morrow it is flexible cord; the next day it is wire on cleats, and the day after wire without cleats, etc. The rulings have been simply surprising, and we think it is about time that the Canadian Electrical Association should take a stand in this matter, and that members should feel that they are not going to be run by inspectors not capable of filling the positions they hold. I therefore bring the matter before you.

Mr. Dion: I am very glad this matter has been brought up. I think we have reached a stage in some parts of the

country, in our relations with the insurance inspectors, that calls for some sort of united action on the part of this Association. In Ottawa we have a peculiar state of things. We have a lot of buildings wired years ago when underwriters' rules were not known, and also later when underwriters' rules did exist, but when they were not enforced. It was then in the power of the underwriters to start things right, but they did not, and so things got into a certain groove and continued so until a few years ago. Our company had decided to do no more wiring. Some men without any experience then undertook to do wiring, and it was necessary for the electric companies to protect themselves against bad wiring, and for that purpose they came to the conclusion that no connections would be made to a customer's premises until an underwriter's certificate had been granted. From that day to this we have adhered strictly to that rule, very often to the inconvenience and the annoyance of our customers who were in a hurry to get the light. The result is, that for all customers since that day, we have an official certificate from the underwriters. This certificate has been granted by the official inspector, who, I understand, is under the Ontario branch of the Underwriters' Association. Now, the Quebec board or branch, which seems, as far as I can judge, to have no connection with the Ontario branch, have sent special inspectors, who make reports at variance with the local inspector. A Quebec inspector made an examination of a number of places and made a report which is very damaging in some respects, and unjustly so. Among the places he reported against were a number which had been certified by the local inspector not long ago. Now the proprietors resent this, and they don't want to get the wiring done again, and state, "We have a certificate that the installation has been done in accordance with the underwriters' rules, and if we proceed to have more changes made what guarantee have we that in three or four years we may not be asked to have it done all over again." As far as we are concerned, we don't object to a good set of rules, but we think that there are circumstances where some allowance should be made. My object in speaking about this is to invite discussion so that I can find out what other electric light companies in other cities are doing in the matter. We propose sending a representative from our Board of Directors to confer with the underwriters here in Montreal so as to arrive at a better understanding, and I think it would be well for me to find out what others are doing before proceeding, as it would not be wise for us to move on behalf of Ottawa and some other party on behalf of another town take another stand, but we should all work together.

Mr. W. B. Shaw: Speaking as a supply man and electric light man, and representing construction interests, I have great sympathy with what Mr. Dion has said. I think Mr. Dion must refer to the same inspector who refused to pass on a shunt rheostat because the wires in it were not insulated. I know of one customer here who has given us carte blanche to fill the underwriters' requirements. His wiring was condemned in 1895 by an inspector who was a painter a few weeks before that, and the following year by an inspector who, I believe was a mechanic, and the third year by another inspector whose previous business I don't know. As this customer has given carte blanche to do what the inspectors wanted, he naturally asks now if he has to do something every year. We don't know where we are standing.

Mr. Hill: In order to put this in a proper way for discussion, I would move that the Canadian Electrical Association request the Fire Underwriters' Association of Canada to appoint a competent inspector for the Dominion, whose decision on questions of electrical inspection shall be final, and that we adopt the rules of the National Board of Fire Underwriters.

Seconded by Mr. W. B. Shaw.

The President: My opinion is that the appointment of a small committee to confer with the Association would be a better way to go about it.

Mr. Wyse: The underwriters have the powerful leverage of saying that they won't insure a building

that has not been wired in accordance with their rules, and can, therefore, dictate terms to suit themselves. I agree that a committee should be named.

Mr. Dion: Who are the underwriters that are dealing with us? Are they not the Canadian Board of Fire Underwriters' Association?

Mr. Smith: I think I can give Mr. Dion some information. The provinces of Ontario and Quebec are divided by the line of the Kingston and Pembroke Railroad. Everything east is handled by the underwriters with headquarters at Montreal. Everything west is under the control of the Board of Fire Underwriters with headquarters at Toronto, and there is, of course, a central association, but the direct cause of the whole of your trouble comes from the management here in Montreal. If anyone has anything to say about trouble in the west, I am here to answer.

Mr. Dion: Although we are in the eastern district, our local inspector draws his salary and receives his instructions from Toronto.

Mr. Smith: No, he has been entirely under the control of the board at Montreal.

Mr. Dion: Well, he certainly informed me otherwise. One thing I wish to mention is that the local inspector has got the Canadian Underwriters' Code of Rules, and the last inspector who came from Montreal judged the installation under the National Code, and there is, of course, quite a difference between them. The local inspector says he has never received instructions to change the code. Another thing that I wish to mention is that a great deal of the trouble has been due to the fact that the inspections have taken place after the work has been finished. What we want is better local inspection, so that troubles will be discovered immediately after they occur, and not some time after the work is completed.

Mr. Browne: The question of fire underwriters' rules has necessarily been a matter of progress, and in the formulation of these rules undoubtedly a great many grievances have been created. It has been part of my experience to work under the most severe inspection of underwriters' rules, and we found no difficulty in complying with them. I agree with Mr. Dion that in the Quebec section there has been a total absence, until a very short time ago, of any attempt of controlling the method of wiring, and the result is that there is a great deal of bad wiring now extant in Quebec province. Our own experience in this city is unsatisfactory, because there is no established head representing the Board of Fire Underwriters. The Board of Fire Underwriters seems to assume that because they have established rules we will all follow them explicitly and honestly, and that we are so honest, all of us, that we don't need an inspector, and the result is that when they are called upon to make an inspection they often find work done in contravention of the well-known rules. There is not a company in Quebec that does not know that the Quebec Board intend to have the Canadian Fire Underwriters' rules carried out, which are an adaptation of the National Electric Light Association rules. It would be well if a committee from the Canadian Electrical Association, representing those particularly operating in Quebec, could be organized to bring the Quebec Association into the condition that they would appoint an inspector and give him a set of rules, and not leave it to his arbitrary decision to change, so that when we do a piece of wiring we will know it is all right. We don't want an inspector to come around and say, "We want something else done." We must apply to the Canadian Board and get them to appoint an authorized inspector, instead of having one for Ontario, one for Quebec, etc.

Mr. Hill: There are two points that have been brought up at this discussion. The first is the question of the committee. I may say that it has been my pleasure, and at the same time my labor, to go before this Board of Canadian Fire Underwriters in my capacity as a humble citizen, in my capacity as an electrician, as one in the supply trade, and one of the committee of an as-

sociation we had here, called the Montreal Electric Association. In all these meetings we have done our utmost to have the Fire Underwriters educated up to the proper point, but our meetings have been more than unsatisfactory, for this reason which I want to emphasize, that there is no head, as Mr. Browne has said, and my intention of putting in one head for the Association is that we can get a set of rules for the provinces of Ontario and Quebec alike. Now, if they had a head of that sort, when it came to be a question as to whether interior conduit should be fixed to a brick wall or put through clay tubes, it would not be for an inspector to finally decide on the large installations, but it would go to the head authority, who would be the Dominion Inspector, and it would be his duty to give that decision and stick to it. The great difficulty has been that the inspector has given his decision one day and gone back on it the next, simply because he could not stick to his original decision or had been bought up by somebody. Now, this is a very important question to the members of Quebec, and I think it would be wrong to put it in the hands of a committee, because I believe nothing would come of it. I think if we put before the Fire Underwriters a resolution of this nature, calling upon them to put in a head of that department, that we will gain a point.

Mr. A. A. Wright: If these other gentlemen are in a peculiar position, what kind of a position am I in? The Kingston and Pembroke Railway runs right through the town. Half the town will be on one side and half on the other. (Laughter.)

Mr. John Shaw: Mr. Dion has a kind of compulsory inspection in Ottawa, but we have none here. I know where one of our power companies refused to give light to a building on account of the objection to the wiring, and the consequence was that the party turned around to another company and had the thing done. The whole question is, that this inspection to be of any use must be compulsory, and we should have a municipal law making it so.

Mr. Browne: I indicated in my remarks the very idea that Mr. Shaw has just spoken of—the absence of official authority. I may say that our company has solicited the secretary of the Quebec board to appoint some one with authority to compel the certifying of every installation by the inspector, and that he be given a specific set of rules to be followed, out and that from date all work should be done in accordance with those rules. We have not been successful in having that inspector appointed, and our company is, in its own way, undertaking to impose obligations as to the wiring, but we are frequently met by this condition, that when we undertake to refuse to give light because the wiring has not been properly done, the prospective customer says we have an interest in it because we want to do the wiring and leaves us. If we can get a representative committee of this Association to meet the Quebec Board of Fire Underwriters and impress upon them, if possible, the necessity of appointing some man and giving him a set of rules, we will accomplish a great deal. I believe it to be to the best interests of this Association and of our business generally to secure that. I think in Toronto that Mr. Smith has a good system in force and a fixed set of rules. There is another factor in the case, that is, the American Factory Mutual Associations, who have still more rigid rules than the Canadian Underwriters, and they insist on having the rules complied with. It is not a question of how severe the rules are, but the fact that they will be adhered to. As to the insurance, perhaps your municipal law will cover that. I would have no objection to a municipal officer. All I care about is some authority to regulate this matter.

It was moved by Mr. J. J. Wright as an amendment to Mr. Hill's motion, seconded by Mr. Wyse, of Brantford, "That a committee of the Canadian Electrical Association be appointed, consisting of Messrs. P. G. Gossler, A. A. Dion, F. H. Badger, jr., and Alderman Sadler, to interview the Quebec Board of Fire Underwriters and the municipal authorities in regard to the adoption of permanent rules governing electric installa-

tions and a means of enforcing compliance with the same."

(The above amendment is as finally put to the meeting and not as originally proposed).

Mr. Hill: With reference to the amendment, I would say that I would be willing to withdraw my motion provided Mr. Wright will attach the name of some one who is interested in this question. The men who have been most hurt by the inspectors have not been the electrical companies, but the contractors; and if the contractors—who are an important section of this Association—are not to be recognized as having any say on this subject, I think it wrong. I would therefore suggest that Mr. Wright add to the committee Mr. W. B. Shaw.

Alderman Sadler: Mr. Shaw and Mr. Browne have mentioned the matter with regard to a municipal law. I would like to say to the convention that the building by-laws of the city of Montreal have been somewhat changed; a committee, consisting of some of the aldermen and also of members of some of the different trades, such as plumbing, etc., have met on a great many occasions during the past eighteen months. Those laws have not been adopted yet by the council, and it seems to me that in fixing a committee, it might be well if they intend to establish certain rules, to have them embodied in some form in the municipal by-laws, because you might come in conflict with our building inspector, and I think it necessary that any laws relating to buildings should also be accepted by the building inspector. If you deem it wise, I would suggest that that committee confer with some of the city representatives; in fact, as far as I am concerned, I will be only too glad to assist when the building by-law comes up.

Mr. J. J. Wright: With the permission of my seconder, I would amend that motion so as to include conference with the municipal authorities and also add the name of Alderman Sadler.

Mr. Browne: I would suggest that Alderman Sadler remain on the committee. Although in his capacity as representing the city, he would be able to do for us whatever may be necessary there, yet being a member of the committee, working for them, he would be able to present to the council the views of the Association. It has been suggested by Mr. Shaw and also another party that a wiring contractor be added to the committee, and for that part, if Mr. Wright will consent, I would suggest the addition of the name of Mr. W. B. Shaw.

Mr. J. J. Wright: I decline to make any alteration in the amendment.

Mr. Hill: Speaking to the amendment, I would be willing to withdraw the main motion provided I felt the amendment was going to thoroughly cover the point. This is not with me a question of to-day, and I feel that to do full justice to the subject you must widen the scope of that committee. There are very wide interests not represented there, and I fail to see why the mover of the motion, who has been asked by the seconder, refuses to put on that committee a representative from the province of Quebec who has an interest in that committee.

On the amendment being put to vote, 27 members voted yea, and 2 members nay, whereupon the President declared the amendment carried.

Dr. J. K. Johnston then presented his paper, entitled "Experiences of an Inspector." (See page 145.)

DISCUSSION.

Mr. J. J. Wright: Taxers as a rule are not very popular, but in this case I am glad to say that the relations between the taxer and the taxed, as far as I can see, have been of the most amicable nature. I have pleasure in moving a vote of thanks to Dr. Johnston for the good feeling expressed in his paper.

Mr. Dion: In seconding the motion I might, perhaps, refer to the last part of Dr. Johnston's paper, suggesting that there may be some potent charm about electricity. I think this is a phase of an electrician's char-

acter that we sometimes overlook, that on account of his coming in contact with so many kickers he cultivates patience and becomes a very genial person.

As Mr. James Milne was unable to be present at the convention, Mr. Weeks kindly read his paper, entitled "The Steam End." (See page 152.)

DISCUSSION.

Mr. Hunt : I suppose it is on account of Mr. Milne's bashfulness that he does not enlarge on the mechanical firemen he speaks about. I may say we have some of these in use, and they are giving good results. I have much pleasure in moving a hearty vote of thanks to Mr. Milne for his paper.

Mr. J. J. Wright : Mr. Milne was right in giving credit to the firemen, as a great advantage can be obtained by the employment of a superior class of firemen. I see his modesty prevents his coming out more strongly in that regard, but the apparatus that Mr. Milne is interested in has every advantage over the ordinary run of such things. It undoubtedly has merits in a good many ways, in its saving of fuel and labor and prevention of smoke. I should like to have discussed these matters more fully, but our time is too limited to go into them.

A paper was then read by Mr. Bonner, entitled, "The Quimby Screw Pump." (See page 149.)

DISCUSSION.

Mr. Thompson asked if the Quimby pump could be used for the ordinary purposes of a suction pump, and Mr. Bonner, explaining that Mr. Quimby was present, asked permission to call upon that gentleman to reply to the enquiry.

Mr. Quimby said : I am much obliged for your permission to address the meeting, and answering the question brought up, the pump described can be used for a suction pump for 10 or 12 days without priming, and if primed will hold anything up to 28 or 30 feet. The pump will answer all the conditions which will be met by any ordinary plunger pump. I recommend them primed at 20 feet, which is about as much as you should run any pump without watching it.

Mr. Reesor : I beg to move a vote of thanks to Mr. Bonner for his able paper.

Seconded by Mr. J. A. Kammerer and carried.

The President then declared the meeting adjourned until the following day at 9:00 a.m.

The afternoon was devoted to a visit to the works of the Lachine Rapids Hydraulic and Land Co., by joint invitation of the owners of the works and the Canadian General Electric Company, by whom the electrical plant was manufactured. Mr. W. McLea Walbank, managing director of the company, was present to give information regarding this important enterprise. After an inspection had been made of the works, the visitors were invited to partake of luncheon, which had been provided by the Canadian General Electric Company. Before starting on the return trip, a very hearty vote of thanks was moved on behalf of the visitors by Senator Thibeau to Mr. Walbank, the directors and officers of the company, and the Canadian General Electric Co., for the courtesies so kindly extended to members and friends of the Association.

THE BANQUET.

The annual Association banquet was served in the Windsor Hotel on the evening of June 29th, and was attended by nearly 150 members and guests. The retiring President, Mr. John Yule, presided, and fulfilled the duties of toast-master.

The Secretary read letters of regret from a number of persons who were unable to be present. Among these was one from Mr. F. C. Armstrong, written while en route to England, the reading of which was followed by the company rising to their feet, at the suggestion of Mr. W. H. Browne, and singing, "He's a Jolly Good Fellow."

MENU.

LONG-DISTANCE TRANSMISSION.
Fire Island Cocktail—50,000 Volts.

INTERNAL RESISTANCE.

Cucumbers. Radishes. Tomatoes, Strain Insulators.
Olives, triple Braided.

ELECTRIC JUICE.

Green Turtle, a la Water Rheostat.
Cream of Asparagus, a la Ozone.

SUBMARINE.

Saguenay Salmon, a la Hello. Potatoes, Rachel.

SHUNTS.

Spring Lamb Cotelettes, Carbon-Trimmed. Sweet Breads.
Asparagus—"Arrester" Points.

JOINTS—"Soldered and Taped."

Filletts of Beef, Larded.

RELAYS AND SOUNDERS.

String Beans. Boiled New Potatoes, Anchors. Cauliflower.
Asparagus. Sweet Peas.

TROLLEY OFF.

Punch au Champagne.

RECONSTRUCTION.

Roast Philadelphia Capon.

PLANTS.

Lettuce and Tomato Salad.

BOOSTERS.

Cabinet Pudding, "sound-proof."
Gelee aux Oranges, "insulating compound."
Savarin aux Ananas, "Vacuum Light."
Vanilla Ice Cream, "self cooler."
Sponge Cakes, "Leather Belting."

DESSERT.

Fruits, "potential currents." Nuts and "wrenches."

ELECTRIC HEATER.

INCANDESCENCE.

Cafe Noir.

Cigars.

TRANSFER.

RING OFF.

OPEN CIRCUIT.

"30."

The appended copy of the menu will suffice to show its unique and excellent character. The toasts honored on the occasion were : "The Queen," "Electrical Montreal," "Our Association," "Our Guests," "Electrical Research," "Allied Interests," "The Press" and "The Ladies." His Worship, Mayor Prefontaine, responding to "Electrical Montreal," gave a number of interesting and instructive particulars regarding the electrical development of the city. The Royal Electric Co. began in 1884 with a dynamo of 13 arc light capacity, a dozen employees, a small workshop, and a capital of less than \$50,000. To-day it has a manufactory covering an area of about 40,000 square feet. The total employees of the company in its manufacturing business is upwards of 500 ; its capital invested upwards of \$2,500,000. In 1886 the streets of Montreal were first illuminated by electric light, 113 lights being then placed. To-day there are nearly 1,500 street lights. The Chambly Manufacturing Company's enterprise, by which electric current will be transmitted to Montreal not later than September next, represents a development to the extent of 20,000 horse power. Another enterprise which was a credit to Montreal was the Lachine Rapids Hydraulic and Land Company's development, where a capital of nearly \$2,500,000 is being expended to harness the St. Lawrence. In August, 1892, the street railway began operations by electric power, with two dynamos, of a total capacity of about 500 horse power. To-day it has installed a capacity of about 10,000 horse power. They have 80 miles of track. In 1894 the Montreal Park and Island Railway was begun. It is now running to Back River, Outremont, St. Laurent, Cartierville, Westmount and Lachine. It has a track mileage of about 60 miles. The Bell Telephone Company has somewhere about 8,000 telephones in use in the city, besides those of the Merchants' Company, numbering about 1,200.

Hon. Senator Thibeau, speaking for "Our Guests," referred to the transformation which electricity in its varied applications had wrought throughout the Dominion.

In the absence of Prof. Herdt, due to illness in his

family. Mr. W. H. Browne ably responded to the toast, "Electrical Research."

The "Allied Interests" were responded to by Ald. Sadler and Mr. D. A. McDonald, Montreal; Messrs. C. L. Weeks and J. A. Kammerer, Toronto; Mr. E. E. Cary, St. Catharines.

Mr. B. A. MacNab, formerly a knight of the telegraph key, responded for "The Press," and for "The Ladies," Dr. W. H. Drummond recited a poem descriptive of the heroism of a young Quebec girl, Madeleine Verchere, in 1692. Dr. Drummond in like manner favored the company at an earlier stage in the evening.

In addition to the pleasure derived from the presence of an excellent orchestra, the company greatly enjoyed the singing of Mr. Fred. Hickey, Mr. J. R. Wilkes and Mr. Ernest R. Jenkling.

THIRD DAY.

The convention re-assembled at 9:30 a.m., when the election of officers was proceeded with.

For the office of president Mr. Cary nominated Mr. W. H. Browne, of Montreal. This was seconded by Mr. John Shaw, and meeting with universal approval of the members, Mr. Yule declared Mr. Browne to be the unanimous choice of the Association for the office of president for the ensuing year.

Mr. J. J. Wright nominated Mr. H. P. Dwight, of Toronto, for the office of first vice-president. Mr. Dwight was declared to be unanimously elected.

Mr. J. A. Kammerer nominated Mr. A. A. Dion, of Ottawa, for second vice-president. Carried unanimously.

The following members were elected to constitute the Executive Committee: J. J. Wright, A. B. Smith, Toronto; John Carroll, William Thompson, W. McLea Walbank, Montreal; G. J. Henderson, H. R. Leyden, George Black, Hamilton; O. Higman, Ottawa; E. E. Cary, St. Catharines.

A hearty vote of thanks was tendered to Mr. Yule for his services as president of the Association during the past two years.

It was moved by Mr. J. J. Wright, seconded by Mr. A. A. Wright, and resolved, that the most hearty thanks of the Association be tendered to the following gentlemen for the very handsome manner in which they have looked after the interests and comfort of the visiting members and for hospitalities extended: Members of the Reception Committee; Montreal Street Railway Co.; Canadian General Electric Co.; Lachine Rapids, Hydraulic & Land Co.; Montreal Park and Island Railway Co.; Royal Electric Co.; Chambly Mfg. Co.; McGill University; Montreal Belt Line Railway Co.; Windsor Hotel Co.; Great North Western Telegraph Co.; Canadian Pacific Railway Telegraph Co.; Bell Telephone Co.; R. E. T. Pringle; Packard Electric Co.; Eugene Phillips Electric Co.; Dominion Wire Mfg. Co.; Ness, McLaren & Bate; D. W. McLaren Co.; Sadler & Haworth; W. T. Bonner (Babcock & Wilcox Co.); W. E. Gower (Street Railway Chambers); members of the local press.

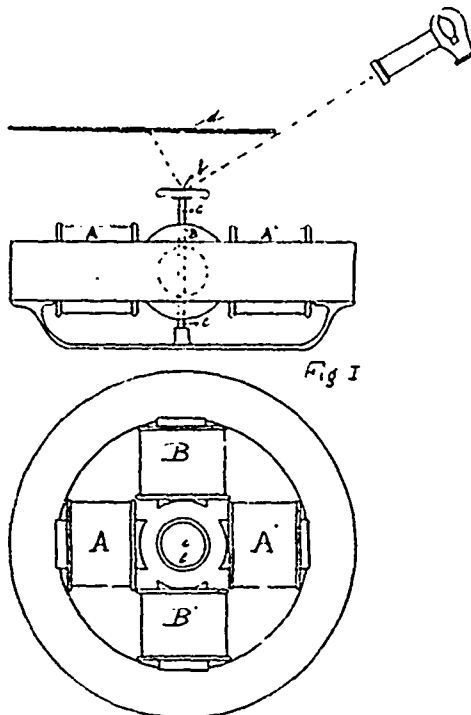
VISIT TO MCGILL UNIVERSITY.

Upon adjournment, the members and their friends proceeded to McGill University. Experiments had been prepared in the electrical laboratories in view of the visit of the members of the Association, but, owing to the little time at their disposal, all of the experiments prepared could not be carried out.

In the McDonald Engineering Building, the experimental rooms, testing rooms and laboratories were thrown open to the visitors, and the extensive collections of standard instruments, models, etc., called forth loud praise from the visitors.

In the dynamo room, the very fine equipment of dynamos and motors was seen running. Of special interest to the electrical fraternity was the 12 k.w. Nordey alternator, the coils of which can be moved round through any angle and two or three currents of any phase difference obtained. The mains leading from this

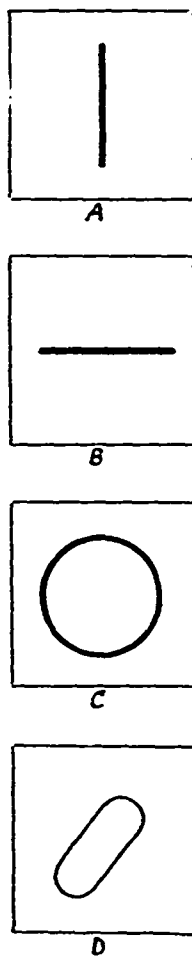
machine are led to the high tension current laboratory on the floor above. It is there that the special work of research on alternating current is carried out. A speed indicator and speed regulator of a novel form enables the experimenters to regulate at will the speed of the



motor driving this alternator. A little model of a two-phase motor, as shown in Fig. 1, was set up. It consists of a ring of cast iron, with four inside polar projections. There are four bobbins wound on these. The windings A and A' are in series, and independent of windings B and B', also in series. In the centre is placed a flexible cast iron rod, C, firmly held at one extremity; the other end carries a plane mirror, b. A ray of light is thrown on this mirror, and is reflected on a pane of ground glass, d.

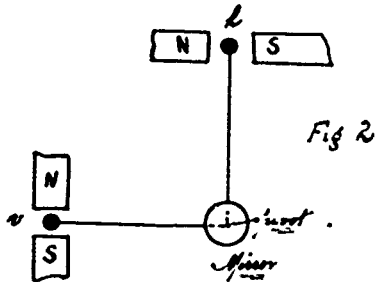
If an alternating current is sent into the coils B and B', a pulsating field is produced, and the rod C will be set vibrating. A stream of light will be cast on the glass, as shown in diagram A. If a second alternating current of 90° difference of phase is sent into windings A A', a pulsating field is produced at right angles to the first one, and will cast a ray of light as shown in diagram B. If the two currents are acting at the same time and are of the same value, a rotating field is set up; this rotating field is shown by a circle clearly drawn out on the plate C. If the difference in phase between the two currents is more or less than 90°, the curve drawn out is no longer a circle, but will be of elliptical form. A number of interesting experiments can be carried out with this very simple apparatus. A little drum of copper placed inside the motor will start to rotate.

Another apparatus (Fig. 2) for similar work, but of much greater value and more remarkable results, was also set up. It was devised by Prof. Carus-Wilson, and consists of a small mirror pivoted at its centre and attached to a wire, v, capable of a vertical displacement, and also to another wire, h, with a horizontal displacement. These wires, in which were passed alternating currents, are placed in constant magnetic fields. The



mirror, following the relative displacements of the wires v and h, and through a reflected ray of light, beautifully draw out the approximate line curves of the alternator.

In the lecture theatre of the Physics building the visitors were shown each in turn the power of the X rays to throw a shadow of one's anatomy on the fluorescent screen. They were then given a demonstration of the



breaking down of the insulation afforded by a large glass plate by a very high potential alternating electric discharge. For this purpose a large induction coil was used as a transformer, the primary being connected to the street mains. The demonstration was closed by a display of a few of the fine Geissler tubes belonging to the well-known collection of the McDonald Physics building. The lighting and power plant of the University was also inspected by the visitors.

At 1 p.m. a visit of inspection was made to the headquarters of the Bell Telephone Co. and the manufacturing and lighting station of the Royal Electric Co. At 3 p.m. members and invited guests were conveyed by special train to the electric transmission works of the Chambly Manufacturing Co., where luncheon was served.

The convention then closed.

SPARKS.

The town of Thorold purposes extending its electric light plant, and will issue debentures for \$7,000 for the purpose.

The ratepayers of Listowel, Ont., recently defeated a by-law to provide funds for increasing the electric light plant.

It is claimed that the necessary capital has been secured to build the proposed Lanark and Perth electric railway.

The Lakeport Preserving Company have given an order for the installation of a lighting plant for their factory to the Canadian General Electric Co.

The Toronto Railway Co., who recently ordered a number of Canadian General Electric C.G.E. 1000 motors, has given an order for additional equipments.

The town of Whitby, Ont., invites tenders up to July 30th for lighting the streets of the town. Thomas D. Jackson is chairman of the Committee on Street Lighting.

The Central Electric Light Co., of Portage la Prairie, Man., are said to have under consideration the equipment of a telephone exchange, in opposition to the present company.

The city of London is advertising for tenders for the supply of an electric light plant of 350 2,000 c.p. capacity, together with steam plant for operating same. Tenders close August 3rd.

The Hull Electric Co. recently elected the following board of directors; Messrs. A. Fraser, president; W. J. Conroy, vice-president; C. Magee, J. B. Fraser, R. J. Conroy, W. N. Taylor and David MacLaren.

The Laprairie Bay Ice Co., with a capital of \$100,000, has been organized in Montreal, for the purpose of supplying ice cut by a patent electric ice-cutting machine, the invention of G. D. Pearson. Power for operating this machine, as well as for an electric hauling apparatus, will be obtained from the Lachine Rapids Hydraulic & Land Co.

The Lachine Rapids Hydraulic and Land Company, of Montreal, have given an order to the Canadian General Electric Company for the installation of a seven panel power house switchboard, which is to be built in accordance with specifications and drawings prepared by R. S. Kelsch, superintendent for the Lachine Rapids Co.

The Canadian Pacific Railway, which have recently acquired the smelter at Trail, B.C., formerly operated by Aug. Heinze, have concluded negotiations with the West Kootenay Power & Light Co. for the supply of electric current to operate their smelter, and have ordered from the Canadian General Electric Co. two 75 k.w. three phase revolving armature type synchronous motors, which will be operated at a potential of 550 volts. They have also ordered three 50 h.p. induction motors and three 30 h.p. induction motors, which will also be operated at a potential of 550 volts.

British capitalists are said to have secured a controlling interest in the New Westminster & Burrard Inlet Telephone Co., of Vancouver, B. C.

Edward Slade, electrical contractor, of Quebec, is installing an electric plant in the steel boat Orleans, plying between Quebec and St. Trettonille.

The Robb Engineering Co., of Amherst, N.S., has received an order for two engines of thirty horse power each, for running blowers in the works of the Verity Plough Company, Branford, Ont.

The electric light plant of McCurdy & Co., Antigonish, N.S., is being extended, the company having secured the contract to light the streets of the town. The Robb Engineering Co. are supplying the engine and boiler.

The R. Forbes Co., Limited, of Hespeler, Ont., have placed an order with the Canadian General Electric Co. for two 500-light generators. These generators will be of the Canadian General Electric Co.'s latest four-pole type.

The City Council of St. Thomas, Ont., have appointed a committee, consisting of Aldermen Chant, Wallace, McCully, Sanders and Robertson, to report as to the advisability of establishing a municipal electric plant for street lighting and commercial purposes.

The West Kootenay Power & Light Co., who have just closed a contract with the C. P. R. authorities for the supply of electric current to operate their Trial smelter, have placed an order with the Canadian General Electric Company for the supply of three 135 k.w. transformers of the well known air blast sub-station type.

The Dominion Telegraph Co., at its annual meeting held last week, re-elected directors as follows: Thomas Swinyard, president; Hon. Sir Frank Smith, vice-president; General Thos. T. Eckert, Chas. A. Tinker, A. G. Ramsay, Henry Pellati, Hector Mackenzie, Thos. F. Clark, Thos. R. Wood, and F. Roper, secretary and treasurer.

The town of Barric, Ont., recently invited tenders for an electric light plant, to be operated under municipal control. It is understood that a number of tenders were received, and that the Electric Light Committee have recommended that a by-law be submitted to the Council to raise the sum of \$35,000 to purchase and install a plant for arc, incandescent and power services.

The attention of the electrical fraternity and others interested is directed to the advertisement of the Croftan Storage Battery Company on another page, and also to the description of the battery which appears in this issue. The Croftan battery undoubtedly has many points of merit, and the company have good prospects of building up quite an extensive business in Canada.

The Napanee Electric Light & Water Co., which has been supplying lights for the streets of Napanee during the past ten years, has decided to go into the incandescent electric lighting business, and for this purpose has placed an order with the Royal Electric Co. for a 35 k.w. two phase generator and 500 light capacity in transformers. The company has already secured in the neighborhood of 400 lights, and expect to have the generator fully loaded within the next two or three months. They are arranging the plant so that an enlargement can easily be made.

The Lang Tanning Co., of Berlin, Ont., have recently given an order to the Canadian General Electric Co. for a 100 k.w. multipolar direct current dynamo, which will be operated at a potential of 250 volts. This generator will supply current for the operation of two of the Canadian General Electric Co.'s latest type of multipolar direct current motors, each having a capacity of 50 h.p., and one 10 h.p. motor. The order given to the Canadian General Electric Company also includes the installation of a marble panel switchboard containing the necessary instruments for the operation of the plant, and the wiring up of their factory.

The second annual meeting of the Canadian Telephone Co. was held at Sawyerville, Que., on June 27th, when the following were elected directors for the current year: J. Laroche, Sawyerville; A. Adam, Paquetteville; Jos. Lemieux, St. Malo; P. A. Barbeau, Cookshire; Jas. Hunt, M.L.A., Bury; F. F. Willard, Angus; E. Roberge, Notre Dame des Bois; N. P. Tanguay, Weedon; and M. Matheson, Lake Megantic. Mr. H. Laroche was re-elected president, Mr. Joseph Lemieux general manager, and Mr. J. Fournier secretary-treasurer. A dividend of 5 per cent. for the past year was declared. The report stated that the company had built during the past year 60 miles of poles, with 114 miles of wire, and actually owned 220 miles of poles and 347 miles of wire. The company have 12 exchanges, with 322 subscribers.

Last week the town of Perth, Ont., was visited by the largest fire it has experienced since its existence. The new waterworks system was put to a practical test and worked admirably. The water pressure remained perfectly steady and even. This is, we believe, the first instance in Canada where the waterworks pumps were electrically driven, and from the satisfaction given at Perth by the use of electrical apparatus, other cities with the waterworks operated from a steam plant, and where electrical power is available, will no doubt sooner or later adopt the use of electricity. The installation of the pumps, generators and motors was conducted by the Royal Electric Co., and the motor used for pumping purposes is one of their 75 k.w. "S.K.C." two phase machines operating as a synchronous motor from a 180 k.w. "S.K.C." generator situated at a water power six miles distant.

The corporation of the city of Joliette, Que., is remodelling their entire system of electric lighting. This corporation has a water power in the city which has been utilized for supplying arc and incandescent lighting throughout the city. The contract for the work has been awarded to the Royal Electric Co., who will supply a 180 k.w. "S.K.C." two phase generator and the necessary arc apparatus to replace all the old machinery. The matter of making the change has been hanging fire for a long time, and after consultation with the best engineering skill obtainable the council came to the conclusion that it would be better to change over the whole plant than to repair the old apparatus, or make additions of less efficient or up-to-date apparatus. The changing of this plant should be gratifying to the electrical trade, as it shows the trend of investors, and the corporation of Joliette is also to be congratulated on the up-to-date stand which they have taken in the matter.

ELECTRIC UTILIZATION OF WATER POWERS.

By L. D. W. MAGIE.

THE utilization of power going to waste in fast running streams has commanded for many centuries the attention of mankind. Regarded, on the whole, as "wasted energy" and as power that could be obtained "for nothing," the question of how to make it useful perplexed our forefathers, and is still giving us some study to-day. Although it would appear that, during the reign of Augustus, about 40 A.D., the first water wheels were made and used by the Romans, the scientific development of the water wheel appears to have been left until the present era, for until within the last few years, comparatively, the only devices used to convert the kinetic energy of streams into effective mechanical energy were the various forms of undershot and overshot wheels.

Crude as were these instruments, they have played a most important part in the world's history, for they have done much to develop countries with natural resources.

Manufacturers who sought cheap power adopted the "wheels" available and located their plants along favorable streams, where these crude transformers of energy were made to grind corn, saw wood, make cloth, etc.

The inventors of the present century awakened to the necessity of improvement and have provided the present types of wheels. To their higher perfection and adaptability is due the fact that almost every power producing stream in settled districts of the civilized world is utilized.

The harnessing of water powers is not an easy task, but requires a great deal of thought, scheming, trying and fitting by the engineer. The records of the stream have to be looked up and studied into, with reference to high and low water, during a period covering many years, and due provision made for getting rid of the maximum flood of every season.

The possible storage capacity must be looked after, for oftentimes by a little forethought and a comparatively slight additional expenditure, a stream that naturally gets very dry at certain seasons can be made, by properly arranged storage, to give a practically constant output the year round.

Again, by carefully arranging the surrounding conditions, a stream may be made to give for a comparatively short period, when power may especially demand, double or triple its normal output capacity.

Probably one of the most important things to study, especially in localities subject to severe winters, is the question of frazile or anchor ice. This is a condition which has caused hundreds of thousands of dollars to be spent, either from the lack of knowledge or want of forethought; in some cases the conditions have been such as to make it almost impossible to successfully cope with them, without expending such sums of money as to practically ruin the enterprise. To overcome it successfully, the only way seems to be to provide a large pond of still water, extending to as great a distance as possible, even several miles, if attainable.

Many other details must also be studied before determining the best location of the water motor power house, so as to obtain the greatest available head with the least expenditure. In the study of the question the natural conditions of the soil, water and climate, all have an important bearing, on not only the engineering success, but also on the financial success of the enterprise.

As water falls cannot themselves be moved from one place to another, manufacturers have had to locate the sites of their plants at the falls. In many cases it is necessary, and in nearly every instance very desirable, that the power be transmitted to a certain distance. When the distance has been comparatively short it has been accomplished by belting, gears and line shafts, but when the distance extends beyond a few hundred feet, this system becomes so inefficient, expensive or impracticable that some other way has to be found.

Rope transmission has been used quite successfully, even to a distance of a mile, and in a few instances over that distance, but as the best practical efficiency is not

over 60%, and the first cost, as well as maintenance, is usually very high, this system has not yet been so successful as to command its adoption very extensively.

Compressed air has also been used for the transmission of energy with some success, more particularly in Paris, where there is a large plant still in existence; but here again the engineering cost has been great, efficiencies low, and maintenance high, and consequently, like the rope transmission system, has not met with general use and practice.

The electric dynamo and motor have given an entirely different aspect to the transmission of energy. Although invented in the early part of this century, it is, however, only within the last few years that the electric dynamo and motor have been developed practically and commercially.

The success and high efficiency attained by electric transmission of energy is such that the "water fall" is gaining prominence as a source of energy.

The pioneer work in electrical transmission was done with direct current system, and too much credit cannot be given for achievements attained. However, although in a few instances the distance transmitted by the direct current system has been up to twelve miles, yet, on the whole, for commercial reasons it has not been desirable to transmit power by direct current to a distance of over two miles, and even the advisability of this is looked upon to-day doubtfully. The reason for this is not because of the inability to transmit the power effectively, but because of the inadaptability of direct current apparatus for use at high voltages. The construction of direct current machines is such, having, as they do, so many auxiliary parts, that at high voltages they are very liable to break down, especially at the commutator and armature cores, except with very costly construction, and even then they are not at all sure; at high voltages the brushes are liable to spark and cause trouble at the commutator; and as the high tension parts require continual attention and adjustment while the machines are in motion, they are dangerous to the attendants.

Probably, however, one of the most important reasons for the inadaptability of direct current machines for long distance transmission at high voltages, is the inability to reduce the voltage to that at which it would be safe to operate at the place of consumption without the use of expensive and cumbersome as well as inefficient banks of motors. Such motors of high voltages, having parts under high tension, which require attention and adjustment while in motion, could not or rather should not be used except under the care of expensive special experts in every separate mill or factory where such motors were installed. To place them in the care of uneducated men would be unwise, and, in fact, foolhardy.

The highest voltage that D.C. apparatus can be wound for, commercially and safely, seems to be, as universally adopted, from 500 to 600 volts. The reason that power at this voltage cannot be transmitted great distances is purely a commercial one. There is no electrical reason why power by the means of direct current might not be transmitted to an indefinite distance, entirely effectively and successfully.

The amount of copper required for the transmission of power is directly proportionate to the amount of power to be transmitted, and also directly proportionate to the square of the distance for a given efficiency. This may be stated commercially by the amount of copper required for transmitting, say, 100 h.p. for both one and ten miles, the loss in transmission to be 8% and the voltage to be 500 volts.

For each leg of a one mile circuit there would be required two No. 0000 wires, or four No. 0000 wires, each one mile long, weighing 15,312 pounds, which at 15 cents per pound would cost \$2,300. For each leg of the ten mile line there would be required twenty No. 0000 wires or forty No. 0000 wires, each ten miles long, weighing 1,531,200 pounds, which at 15 cents per pound would cost \$230,000; or the power would cost, at 10% interest and depreciation on copper alone, \$2.30 per h. p. annum in the first instance, and \$230 per h. p. annum in the second case.

If, however, the voltage be raised to 5,000 volts, and be used for transmitting 100 h.p. for ten miles, the condition would be entirely different, for instead of forty No. 0000 wires, each ten miles long, there would be required for each leg but one No. 4 or two No. 4 wires each ten miles long, weighing 15,300 pounds, which at 15 cents per pound would cost \$2,300, or the same as transmitting the same amount of energy only one mile at 500 volts.

From the above it will be seen that the transmission of power at 500 volts is not entirely prohibitive for short distances, but as the distance increases it becomes one of vital importance, for the cost of copper is not the only item of expense then to be considered; the pole line itself becomes a very grave matter, especially when we have to consider the weight of forty No. 0000 wires, as in the example for only 100 h.p., and the cost becomes one that investors cannot afford, for the reason that power can be obtained cheaper from other sources, so that commercial transmission of power long distances by direct current at practical voltages is not practicable.

Although, as stated before, considerably higher voltage than 500 volts has been used with some success, as at Brescia, the number of such plants are very few.

It is a noteworthy fact that on this continent, where the transmission of energy is further advanced than anywhere else, there is not a single plant of any prominence that is transmitting energy by high tension direct current system.

It may be interesting to know that three or four years ago, when the Chambly plant was first discussed, a European firm planned out and tendered for the construction of that plant for transmitting the energy by means of this high tension direct current system, but, for reasons as above discussed, that system was not adopted.

How to meet the problem of long distance transmission, commercially and efficiently, has been left almost entirely to the alternating current system.

Alternating currents were known about the same time as direct currents, or about 1831, and were explained to the world by the great Faraday, who at that time discovered the elementary principles. From that time on, experiments were made by different inventors on induction coils, but no material progress was attained until May 22nd, 1877, when Jablochhoff obtained British patents for "a new process of producing and dividing the electric light and apparatus therefor."

There were also other inventors at about this time who produced "improved induction coils on secondary generators," as some of them were called, but all seemed to have the idea that they could be operated with their primary coils connected in series, and that their secondaries could be independently controlled.

In 1878 a J. B. Fuller, of New York, suggested a system of using induction coils or transformers in parallel, but no practical results seemed to have been obtained in this direction until 1882, when Messrs. Goulard and Gibbs exhibited two induction coils at the Electrical Exhibition held in Westminster Aquarium in London, which ran in operation from the Siemens alternator.

In the autumn of 1884, Messrs. Goulard and Gibbs gave another exhibition at Turin. In this case, the primary circuit was nearly 50 miles in length. A series of transformers were placed on this line, one being in the Exhibition Building, one at the Turin Railway Station at Verine Riesa; another at Lanzo, a small village in the Alps of Savoy; incandescent and arc lamps were supplied at the various places.

The first parallel system that was started on this continent was by Wm. Stanley, Jr., in 1884, in the small town of Great Barrington, Mass., where light was supplied throughout the town by means of a parallel alternating current transformer system. From about this time commenced the era of alternating currents, although as far back as 1840 alternating current generators were devised.

Commencing with 1885 the alternating current system made great strides.

To employ waterfalls as sources of cheap power, high potentials became necessary. For these conditions the A. C. was especially effective; the ability to step up from low

potentials to high, and thus transmit power to a given distance, then to step down to safe and convenient voltages, entirely effectively, conveniently and without the use of cumbersome and expensive apparatus, rendered the transportation of the energy of water powers feasible and commercial.

Probably one of the first high voltage transmission experiments on this continent was in December 1891, and in January and February, 1892, at Pittsfield, Mass., at which test the writer had the pleasure of participating. The potential used was approximately 15,000 volts. A transmission line about a mile in length was built in an open lot a little ways out of town, where a small experimental station was built. The current was received from the local Electric Light Co. at 1000 volts, raised to about 16,000, sent out on the line, and thence returned, again lowered, first to 1000 volts, and then again to 100 volts, at which voltage energy was consumed in water rheostats. On the line experiments were made with porcelain insulators, as well as the oil type of insulators.

At this time, of course, comparatively little was known about electric current at this potential, so that everything had to be handled with gloves, as it were. The experiment proved to be not only useful and satisfactory, but highly successful, and gave considerable encouragement.

Although experiments were commenced, and discoveries made pointing to the advancement of A. C. motors in 1879, still practical results of any real value were not obtained until in the year 1890 to 1891, when the poly-phase systems were introduced. From that time it can be truly said that water powers could be utilized for the general distribution of power at distant localities.

One of the first and most notable exhibitions of this kind was made at the celebrated Frankfort Exposition in 1891, which proved not only interesting to the town of Frankfort, but to the world at large, for it taught lessons and set aside errors that would have taken years of toil and hard labor to have done otherwise.

Poly-phase generators having a total capacity of 300 h.p. were installed at Lauffen and operated by water power. From these, the current was transmitted a distance of 110 miles to Frankfort; several voltages were tried on the transmission line during the experiment, the highest of which was 31,000 volts; in the exhibition grounds were arc and incandescent lamps and small alternating current motors, all provided with current from the hitherto "wasted energy" of the streams of Lauffen, and with a loss of efficiency in the line of not more than 25%, which, at that time, was certainly a most noteworthy accomplishment.

During the next two or three years manufacturers spent a great deal of time and energy in perfecting their systems. The induction motor has been perfected to that of an ideal, and the usefulness and necessity of synchronous motors have been established.

For a few years following 1891, an occasional poly-phase plant was put up in different parts of the world. They were subjected to all sorts and kinds of trials, depending upon the character of the work to be performed at each individual installation, and although there was often much cold water thrown upon them at the start, and obstacles placed in their way, still they always came out ahead and proved a success, not only from the engineering point of view, but to the financial backers.

When we stop to consider that it has been only within the past six or seven years that a complete system has been devised for the utilization of distant water powers, and that all of the important transmission plants have been put in during that time, it is no wonder that there are yet some sceptics. But perhaps worse for healthful commercial developments are those who make a wild rush for some transmission scheme, without first considering all of its surrounding conditions, thinking that because someone else has made a certain project successful, their project must be also. It falls upon the engineer to bring the sceptic to lines of true reasoning and to teach him facts in their true light, so that he will see and believe, that with such resources at

his command, great things are possible; the engineer must also hold the enthusiast in check and prevent waste of money in impracticable undertakings.

The primary or fundamental question is to ascertain the point at which transmission of water powers will be a source of profit to the investor.

Many people think that because water strictly follows certain given laws of nature, and in doing so continually and constantly exerts energy, therefore the energy obtained thereby costs nothing.

People with such ideas are fortunately gradually growing less as time progresses, although the engineer often encounters men who have a few hundred h.p., or often times when the true facts present themselves, only 25 or 50 h.p., that they wish to transmit 5 or even 10 miles, in hopes of making vast sums of money by the use of this transmitted power in some small town for lighting and power.

The cost of electrically transmitted power is represented by the interest on the capital invested; the depreciation; the maintenance; the operating expenses and numerous other small contingencies, and besides, in some cases, the amount of money that has to be expended for water and land privileges. The sum of these accounts per year, divided by the amount of h.p. actually sold, will be the actual cost per h.p. for the case in question.

Probably the greatest competitor to electric power is steam power. In a few instances, power derived from gas or petroleum engines may also compete. The cost of producing steam power in any given locality is a fair criterion by which to determine how much electric power should cost. The cost of power produced from other sources can usually be disregarded.

The cost at which steam power can be produced in a given locality being ascertained, it can be determined what cost per h.p. may be expended on the construction of an electrical transmission plant to make it profitable to the investor, provided again a sufficient market can be obtained for power.

When electrically transmitted power does not cost more than \$100 to \$140 per h.p. installed, the investment is apt to be a profitable one, providing, of course, it is properly managed.

But what should it cost to harness and utilize water powers? This is a question that has to be figured out for each individual case, for there are hardly two plants where exactly the same conditions exist.

The first item of expense is amount required for water privileges. In some cases this is rather an unimportant consideration, while in others it is the chief expenditure, for it may involve the buying of thousands of acres of land surrounding the stream, because the necessary dams may cause to be submerged a great deal of valuable land, or large tracts have to be bought for building storage reservoirs, or the right of way for pipe lines, etc., have to be secured.

When land is cheap, these considerations are often not objectionable, but where good farming land, or land valuable for other reasons, has to be thrown to waste, the question is often a perplexing one.

The cost of the dam, power house and hydraulic machinery is, as a rule, dependent almost entirely on the characteristics of the stream being utilized. Entering into the question is the amount of water in the stream, both under normal as well as abnormal conditions at various seasons of the year; also the head or fall and whether it is dependent on natural conditions or requires the building of large dams.

Generally speaking, other things remaining equal, generating plants, comprising the power house, hydraulic and electric machinery, as a whole cost less as the head increases, until certain limits have been reached.

When the head is low, as ranging from 4 to 10 feet, it requires a comparatively large wheel for a relatively small amount of power, and then slow speeds can only be attained. Where large units are desirable, a number of these wheels must be coupled together in order to get the required power. The speed attainable can be raised or lowered to a certain extent, depending on the size of the wheel. If higher speeds at low heads be desired for large units, many wheels must be operated together, requiring not only a great deal of

room, and consequently larger power house, but considerable line shafting, gears, couplings, etc., which not only increase the initial cost, but increase expenditure of operation and maintenance of the plant, as well as introducing another source of inefficiency.

With higher heads a larger amount of power can be obtained from fewer and smaller wheels with higher speeds, and, therefore, cheaper generating apparatus.

The cost of generating apparatus for a given capacity, other things remaining equal, is almost directly proportional to the speed at which it runs, and for this reason it is always desirable to refrain from too low speeds wherever possible.

There are many people who are imbued with the idea that it is impossible to build a modern station without direct connecting all of their apparatus, and that belting at no time should be used.

Although direct connection is desirable, still it must not be carried to extremes.

A good engineer will hardly warrant the expenditure of, say, \$15,000 for a 300 k.w. generator to run at a speed of say 75 to 100 r.p.m., when a machine just as good in every respect, and sometimes better (because it is a standard size), can be bought in belted units for \$5,000. Yet this is sometimes done, burdening the plant with many thousands of dollars on which it has to pay money, for no other reason than that "so-and-so's plant is direct connected and I want a plant just as nice and good as his, and belts are always an awful nuisance."

As stated before, direct connected units are always desirable where conditions will warrant them, still it must be borne in mind that belts have been in successful operation now for a good many years, and there are many instances where the maintenance of them has not cost 1% per annum, and although their use involves a loss of efficiency of somewhere between 2 and 3 per cent. at times of full load, still this loss in a water power plant is not a critical amount, and in fact is almost always inappreciable.

The next item of considerable expense is the transmission line—always rather an uncertain item, on account of its variations in cost for different distances and the conditions of local distribution.

The poles, with their appurtenances, exclusive of wire, will cost between \$250 to \$500 per mile, varying according to circumstances.

Rights of way for the placing of poles may often be expensive.

The transmission wire must be considered separately.

Reference has been made earlier herein to the voltage or size of wire. The voltage at which it is practicable to run now-a-days is reaching vast proportions. There are two or three plants being installed in which 20,000 to 22,500 volts will be used, and a plant is likely to be installed soon that will use 60,000 volts.

The use of high voltages in the past has been limited greatly by the insulators. The glass insulator has proven itself insufficient for most climatic conditions. The oil type of insulators was introduced some years ago, and a great deal expected from them. They did give excellent results in the laboratory, but unfortunately the oil evaporates, and the impracticability of renewing the oil, especially when the line is in use, soon put them in disfavor.

Porcelain insulators appear to have solved the problem. The trouble at first was to get them properly vitrified, but this difficulty seems now to be overcome, and the insulators have proven all that can be desired when used with the usual voltages now employed. As to whether they will successfully cope with the higher voltages now contemplated is a question yet to be answered.

The cost of the transmission wire is often the most important part, but is always different with each case, dependent, as it is, upon the amount of power to be transmitted, the transmitting voltage, distance, and the allowable loss. As a whole, it is always best to keep the transmitting voltage as low as possible and still keep within commercial conditions. Many people are carried away with the idea that if they could only use high voltages the cost of transmitting would be reduced to a minimum.

It must be borne in mind that with the use of the higher

voltages the cost of insulators increases, the electrical apparatus necessarily costs more, and moreover, the risks are greater throughout the system, and consequently necessitates more skilled attendants to look after the plant.

All of these items have to be carefully considered before looking into the possible saving of copper on the line.

For mechanical reasons, a wire smaller than No. 6 B. & S. should not be used for line work. More cautious engineers will say it should not be smaller than No. 4 B. & S. It is foolish to attempt to use voltages which allow the use of smaller than No. 6 wire. Where a shut-down would mean heavy damages, it might be even advisable to use a wire not smaller than a No. 2 B. & S.

If these facts are always borne in mind, the question of voltage will often times adjust itself, and the use of very high voltages will not be found necessary unless the transmission be for especially long distances, and the amount of power particularly large.

The permissible drop is dependent upon the power obtainable at the generating station and the amount to be delivered at the end of the line. There are a few instances where power is scarce at both ends of the line, and where it is desirable for this reason to keep the loss of transmission as low as possible, but such cases as a rule are rare, and we are more often met with the reversed conditions.

To get good results electrically, the loss in the line should not be more than 15%. If it be more, it will, with the other losses that are necessary in the rest of the apparatus, especially where the load is liable to be a fluctuating one, render good service almost impossible.

The figuring of drop on transmission lines should always be left to competent engineers, for with A. C. the question in many instances is not a simple one, because it involves other conditions besides the ohmic drop. When alternating current is sent through a conductor, it has to deal not only with the electric resistance of the wire, but also with a resistance due to the fact that the electric magnetic stresses set up at any point of the conductor, create electromotive forces at other points of the same conductor, which oppose and retard the passage of the current, or in some cases, tend to shove it ahead.

As to how far power can be transmitted, the engineer can conscientiously say to an indefinite distance, and he would be fully prepared to figure out, and contract for, if necessary, the fulfilment of his statement, but it rests with the commercial men to cry halt. The distances attainable, however, on a profitable basis, have been growing greater from year to year, as the manufacturers have been prepared to extend the limit to which they are willing to build high tension apparatus. At present it would appear that where the distance to be transmitted is over 75 to 100 miles, no matter how cheap the hydraulic development, commercial competition is not practicable with existing power where coal can be obtained for \$2.00, \$3.00 or even \$4.00 per ton.

The step-down station and the distribution of power are the next items of expense, including the cost of the necessary switchboards, transformers, &c.

The location of the step-down station and the method of the distribution of power constitute a very important question. Unfortunately, very often this subject is entirely omitted or overlooked by the promoter, but is one to which should be given considerable thought.

The step-down station itself should be centrally located, so as to make the distributing lines as short as possible.

It is not generally advisable that transmission lines of very high voltages and large currents be extended through thickly settled communities where they might be liable to disturbance from fire or accidents of similar character, in the immediate locality of the line. In some places, to enable the distribution station to be centrally located, transmission wires are placed in conduits under ground, when they pass through thickly settled districts so as to avoid the danger that would otherwise exist, but this, of course, is expensive construction, and the cost of it must always be balanced against the advantages of having the step-down station centrally located, as against its being placed at the outskirts of the town.

All the various items require careful study to obtain least cost and avoid unwise economies.

When all these various factors have been properly

adjusted and the resulting condition of the water power electric plant is that the power available twenty-four hours every day is at or about the cost of steam power in any given locality, the future profitable operation will be, no doubt, assured, because the popularity of electric power is not due alone to the fact that it can be produced cheaper than power obtained from other sources, but also to its superiority in other directions. This is evidenced by the fact that in mills and factories, where both sources of power have been tried, electric power is displacing the steam plant. Owners having experience with both invariably state that they would not be willing to return to their former power plants, even if power could be produced as cheap or cheaper than they are now obtaining it for electrically. The reasons for this are very numerous. The power is always on tap day and night, year in and year out; there is no waiting for boilers to be fired, nor shut-downs on account of strikes at some distant coal field; less room is required, and consequently floor space formerly occupied by belts and shafting can now be utilized for manufacturing purposes; also electric power can be easily sub-divided into any number or sizes of units, and thus independent departments and machinery can be worked separately instead of from one big unit.

Overtime work in any department is much cheaper, for by having departments separately operated they can be run independently at will, without running all the other machinery in the mill. The fire risks are less, and rates of insurance less for mills operated electrically than by other means.

Removal of so many belts, line shafts, pulleys, etc., secures less danger to life of mill employees, and the mill is lighter and cleaner, and consequently the health of operatives better.

On account of the extreme simplicity of the A. C. electric apparatus, anybody with ordinary intelligence can start it in motion, and thus avoid depending on one or two men.

Moreover, with electric power it is possible to maintain a closer speed, which in many instances enables the turning out of a larger quantity of better product commanding higher price; and so on for most every department and branch of business, some advantage is gained without anything lost.

All of these advantages are not evident to the consumer before or when he first puts in electric power, and he often refuses to listen to them, thinking that they are entirely imaginary, but a short experience brings the conclusion that electric power is "cheap at any price."

It may be interesting to note here that there is a project now on foot in which it is contemplated to transmit 30,000 h.p. a distance of between 30 to 40 miles; the transmitted power to be used in mills now operated through shafts, gears and belting by water wheels, because of the advantages to be gained by using electric power.

The use of electric power is not confined to driving machinery in mills or factories, for it is fast finding its usefulness in other directions. The use for "electro chemical" enterprises is fast reaching vast proportions, and there are plans now on foot for the utilization of at least 150,000 h.p. in this way during the next two or three years.

There are many thousands of h.p. being used in the street railways, while the big trunk lines are seriously considering its use, and are continually asking the manufacturing companies for plans and estimates.

Then there is the electric welding, the electric plating, the supplying of energy to horseless carriages and electric launches, to say nothing of the hundreds of thousands of incandescent and arc lamps that are used for general lighting.

The utilization of the water power by electric transmission has not stopped with the commercial world, but has forced itself into the privacy of our own homes, not merely with incandescent lamps, but with electric cooking utensils, smoothing irons, electric heaters, fan motors, etc.

What would our forefathers say if they were told that to-day we are depending on such and such a river, so many miles distant, to cook our meals for us and to have our boiled shirts laundried; but we would better not laugh now, for the coming generations may have as much occasion to laugh at us.

HOW TO OVERCOME SOME OF THE DIFFICULTIES ENCOUNTERED BY CENTRAL STATION MEN.

By A. A. WRIGHT, Renfrew, Ont.

In treating this subject I shall do so from the standpoint of one who has to deal with customers living in a town of moderate size, and not from that of the owner of a plant in a large and populous city, because the circumstances would be, in many respects, quite different, and the requirements, as well as the mode of arranging the service, would be altogether different. I shall take it for granted that the central station is equipped with an arc and incandescent plant, that the proprietor not only does commercial lighting, but supplies light to the corporation as well.

1st. Let us take up arc lighting on the streets. This brings us at once into contact with the corporate fathers, many of whom know nothing of arc lighting, except that it is not only necessary, but their special duty, to appear wise in order that they may look well after the interests of the town.

And now let me make my first suggestion, and that is, that you leave municipal politics entirely alone. If you have an inordinate craving after politics, which you have not the power to restrain, let your light shine before the throne of the Legislative Assembly or in the chamber of the House of Commons, but restrain yourself from meddling with municipal politics, lest you make to yourself enemies who will be sure to avenge themselves, sooner or later, in crippling your lighting contracts with the corporation. I do not wish you to infer from this that you should not exercise your franchise when the day for voting comes around, but on the contrary, let it be known that you and your employees always vote for the progressive and enterprising men of the town and as every aspiring alderman will want your assistance, you if you do not make too much noise, will generally manage when he is elected to get his. Be careful not to make political enemies but to have as many of the town authorities with you as you possibly can. In most towns the contracts for street lighting are made annually, and not as in cities, for a term of years. See to it then, that your contract is so arranged that it shall terminate on the 1st of March. You can do this by informing the proper authorities that your books are so arranged that your Electric Light year begins on that date. Then see that the following harmless looking saving clause is inserted near the closing part of the contract. "And it is further agreed that either party may terminate this lease at the end of its term by giving the other thirty days notice in writing prior thereto and in default of such notice this agreement shall continue in force after the termination thereof, for one year, and upon the same terms and conditions as are herein expressed and in like manner thereafter, unless such notice is given at least thirty days before the corresponding date in each succeeding year, a like renewal and extension of this lease from year to year shall be considered as made and executed by and between the parties hereto." Furthermore have your payments fall due quarterly and on the 1st of March, June, September and December. You know that in Ontario at least, our Municipal Elections are held at the beginning of the year, and as most of the Aldermen will be aspiring to re-election, and would like to have your assistance to re-elect them, they will quite naturally forget, as the term of their holding office is drawing to a close, to give notice of the desirability of terminating that contract, and you almost invariably escape that threatened danger from the outgoing council. Then the new council does not assemble till the last of January and as very little business is done at the first meeting and many of the members are new ones, Electric Lighting is not thought of till your quarterly account is presented in March when it will be too late to give the required notice, and so your contract runs on, in this manner from year to year, renewing itself without any trouble whatever. Another difficulty, which you are almost sure to encounter, is the height of the poles on which your lights are placed on the streets. Some will want 50ft. poles some 75 ft. and some even higher than either of these. When your contract is made be sure and have the clause worded in this way. "That the hangers from which the lamps are suspended shall be — feet from the natural level of the surface of the ground at the foot of the pole," and not, that the lamp, shall be so many feet high, as you will notice that this makes an important difference in your favor. It is well to have it so arranged that you need not run your arc plant on moonlight nights, not merely on account of the direct saving that there is in this, but it sometimes is very convenient, if there are accidents, in giving you an opportunity to make needed repairs.

And now as to your commercial lights. Have your contracts made with your customers on a yearly basis, with some renewing clause that there is in your contract with the town, but with this difference, that the payments in this case be made to you weekly, and then see to it, that you make your collections in this way, for a man will frequently pay you a small sum weekly, when he would not pay the same amount if paid quarterly. It may not be amiss to mention that in all these contracts, when stating the candle power of the lamps you are to furnish, that you should be sure and employ the words "nominal candle" power, as it may save you under certain circumstances no small amount of trouble also.

And next, as to your incandescent service. This will, of course, be largely, if not entirely, a commercial service. You will have all manner of people to deal with, and you may expect, in many cases, to have your patience sorely tried.

Then to begin at the beginning. Never under any circumstances do frer wiring. By that I mean that you should never undertake to wire a house for nothing, in order that you might thus get a customer for your current. Of course you should do all primary work as low as possible, but not at a loss. If your power is at all limited, or if you run by steam, you will find, in my opinion, that you will make more by running your lights on the meter system than you will by giving a flat rate, unless you get an exceptionally good price for them.

I understand that in many places it is customary to take the readings of your meters quarterly, as it thus saves a good deal of time in taking the readings, making out the accounts, collecting them, etc. In this, as in other things, the old adage holds good that "Short accounts make long friends," and by no means should you allow your accounts to pass more than one month without being rendered, and, if possible, collected. It might not be so bad, in the short nights of midsummer, if quarterly collections were adopted, but in the end it will amply repay you to take your readings on the first day of each month, and make your collections on the 2nd.

And now as to the location of your meters. We were instructed when installing our plant to locate them in some out-of-the-way place, where they would not be seen, and high up, so that they would not be meddled with. Now this may all be very good advice in its way, but my advice to you is, not of course to put it in the parlor, or in such a place as to cause it to be an objectionable feature in the household, but, be sure and place it low enough, that your man can get at it with as little trouble as possible, and also in a place where there is an abundance of light, so that the readings may not only be taken quickly, but accurately. When you have a large number of readings taken monthly, it becomes a matter of some moment that meters be so arranged that the work can be done quickly and accurately as well. You will be frequently told by your customers that the meter is wrong—that they know they never burned that amount of current. In such pronounced cases as these, when the assertions are very strong, I find it is better at once to say, "Well, it is possible as you say that there is something wrong; you know we are none of us infallible; we will see and have a second reading made at once," and look into the matter and at once, do as you have promised, no matter though you feel almost sure that it is all right. You may find that there is an error, and if so you should of course immediately see that it is corrected, but if you find that the reading is correct, and that Mrs. Julius Caesar still insists that that meter is no good, and declares that the thing runs whether there are any lamps on or not, and tells you in a most emphatic manner that she can hear the thing sing like a rattlesnake, lights or no lights, and she knows that it runs on wheels, what then? Above all things do not allow yourself to answer back harshly, for doubtless she really is sincere in her protestations, and it is not wise to contradict her too rashly. I have found a good remedy in replying that of course it is just possible that the meter is not absolutely correct, but that you feel quite confident that it is, and that to cover just such cases as these the goverment has appointed an electrical expert, to whom both parties can appeal, and if she, after considering the matter over, still thinks there is something wrong, that you will write and have the inspector come up and examine the meter, and if he finds it wrong, that you will bear all the expenses connected with the inspection, but if it is correct that she is to bear all expenses. Tell her just to think the matter over and let you know, and so far as my experience goes that ends the matter.

Another difficulty that you will doubtless meet when running on the meter system is in having your customers send out of town for 5 c.p. lamps and when only one of these is used your meter will not respond. This you will easily discern when at the end of the month you perceive that no current has been consumed, and I may just here mention that this is another reason for taking your readings monthly instead of quarterly. Such cases are not numerous, yet they do turn up where the family is small and its members are contented to do with a minimum of light. This difficulty can also largely be overcome by making a minimum rate of say 50 or 75 cents per month, which amount can be arranged according as the circumstances of the case may require.

There are of course many other difficulties that central station men have to deal with, but it is impossible to consider many in an article of ordinary length and the remaining ones will be left for others to treat with, as they, in their wisdom, may see fit.

THE IMPORTANCE OF PROPER METHODS OF ILLUMINATION.

By F. A. BOWMAN, A.I.E.E., New Glasgow, N.S.

In the last few years, since the electricity supply business has got beyond the stage of "systems" and controlling patents, there has been accumulated a great deal of most valuable information in regard to improvements in the generating and distributing plant, and to the best methods of realizing in practice the benefits from these improvements. From time to time there have arisen most animated discussions on the best system of rates, and methods of charging for the use of the current. The keynote of these discussions is the fact, brought to light by the accumulated experience of those companies that have been supplying electricity for some years, that the fixed charges grow steadily with the maximum demand on the plant, and that therefore the customers should be educated to use the current as many hours per day as possible. This is a matter of the most vital importance, and every central station man in this Association should procure a copy of Mr. Arthur Wright's paper on "The Profitable Extension of Electricity Supply Stations," read before the National Electric Light Association at Niagara last year, and also one on the "Cost of Electricity Supply" read by him before the Municipal Electrical Association in England, and to study them until he knows them by heart.

It should be distinctly borne in mind, especially by the smaller companies, that to do a growing and really successful business, something more is necessary than to merely induce your customer to put in so many lamps and then to get as much pay as you can from him for them. It is now clearly demonstrated beyond a peradventure that the margin of profit is as narrow in the central station business as in any other, if not a great deal narrower, and that even when there is no competition from gas or a rival company the closest economy and best management

are necessary to yield a profit to the shareholders and provide for future contingencies. In view of this the manager should realize that he must educate his clientele and give them the best satisfaction in every way. Too many managers are satisfied when they have succeeded in persuading a customer to take a certain number of lights. If in addition they are giving full pressure at the lamps and a reliable service they consider that their duty to both the company and the public is done. Now, this is a wrong principle. Attention should be paid to the purpose for which the light is required. Take for example a shop. The purpose for which it is to be used, its size, the height of ceiling, finish of the walls, kinds of goods to be displayed and sold, arrangement of counters and show-cases—all must be noted and considered. It is useless to attempt to light a modern drug store and a ready-made clothing store in the same way, and expect equally satisfactory results in both cases. The manager should be looked upon as an authority on methods of lighting, and if he gives the matter a reasonable amount of attention he very soon will be. He must remember that he is a dealer in light, and to be a successful one must know all about it—how it is best used and what are the latest fashions in it. If you go to a tailor for a suit of clothes you expect him not only to sell you the cloth and to make up the suit so that it will fit you fairly well, but you expect him to be able to tell you what are the latest styles and fashions and which of them are best adapted to the purpose for which you want them. Some managers will say, "Oh, I have a class of customers who do not care about fitting up nicely and will not spend money on it. All they want is that I will run the wires in and hang the lamps on cords as cheaply as possible." This man is mistaken. There is no community that will take electric light at all where a decided amount of education cannot be carried out. Education of his customers is a very material part of the work of every successful manager in the electrical business, and is one of the principal reasons why the business cannot be properly carried on by some one who has a number of other interests to look after as well. The manager must study this question of proper illumination so as to master the main principles necessary to a clear understanding of it. He must study his customers so as to know what their tastes and requirements are. He must carefully watch the advertisements in the technical journals and the catalogues that are so plentifully distributed, and many of which contain accurate and valuable information, and then correspond with the advertisers to see if the articles that strike him as suited to some of his customers can be brought within their reach. Then he must canvass carefully and patiently, and if he fails one year must try again the next, because by that time he will know better how to work, his customers' ideas will have advanced somewhat, possibly prices will have dropped a little. The net result of all this is that he at last secures a contract for fitting up that is a pleasure to him to undertake and gives eminent satisfaction to the customer when done.

When first installing lights in the smaller towns and villages cheap, but not poor, work must be done to get the light introduced, but it should be looked upon as introductory only, and later on an earnest and continued effort be made to weed it all out.

A very common case that arises is that of a customer occupying a shop who is always making trouble about the bills. He has a certain number of lights screwed about without any definite arrangement, one switch to shut off the whole thing when he leaves, no shades, no reflectors, and the shop is half dark when all the lights are on, and if he is on meter and turns off a few to save money he has not light enough to do his work. The result is he is constantly growing himself and making others do the same.

When a case of this kind comes up the manager should go to him and suggest that by rearranging things he can have better satisfaction for less money, talk the matter over and work out a scheme that will put the light just where it is wanted, and add a few switches so that the groups of lights can be readily turned on and off. After the exercise of considerable tact and unlimited patience the customer will begin to be convinced and finally consent to refit. When this is done and the lights placed just where wanted, very possibly lamps of smaller candle power than before can be used on some of them. The result is a well lighted shop, which is a good advertisement for both the customer and company at a somewhat reduced cost to the customer and satisfaction all round.

The fewer lights the customer can install and yet get satisfaction from, the longer hours he will burn them all, and so tend to smooth off the peak of his individual load line. And the cheaper he can do it while still yielding a profit, the better for the company, as he is an advertisement and attracts others. Five customers each of whom has ten lights and uses them all three or four hours each night, are better than one with fifty lights who uses them all for one hour and then turns off as many as possible.

It must be clearly borne in mind that the candle power of a lamp and the amount of illumination we get from it are two entirely distinct things. The useful illumination is the amount of light reflected back to the eye by the objects on which the light falls, and the quantity and quality of the light so reflected is the important and controlling factor, not the candle power of the source of light. The unit of illumination is the "candle-foot;" that is, a light of one candle power one foot distant from the object to be illuminated. This is a comfortable light for reading. The illumination is given by the formula:

$$\frac{\text{Candle power}}{\text{Distance in feet}^2}$$

Thus a 16 candle power lamp 4 feet away gives 1 candle foot of illumination.

The illumination yielded by a certain lamp can be very materially increased by the use of reflectors. The illumination of an object which when seen by a small light is 1 can be increased to 23 by a paper reflector, to 30 by a white glass one, to 64 by a polished one, and to 200 by a silvered glass hemispherical one. White reflectors throw a very nice soft light and smooth off the edges of the shadows so as to produce a very pleasing effect. In using them it should be remembered that the ordinary law of reflection of light, viz., that the angle of reflection is equal to the angle of incidence does not apply to them; but that the rays of light at whatever angle they may strike the reflector spring off from it in lines perpendicular to its surface. Consequently there should be no attempt at the mathematical shapes of optical re-

flectors, but large flat surfaces must be used. They should always be painted a dead white. The enamelling of reflectors to have a shiny surface is a mistake; they do not give as good an effect to begin with and even the best rapidly lose their gloss.

The following table, due to Dr. Sumpster, gives the reflecting power of various surfaces and shows what a wide variation in the number of lights required for a given illumination may be caused by a change of interior decoration:

| | |
|----------------------------------|------------|
| White blotting paper..... | 82 percent |
| Ordinary foolscap..... | 70 |
| Newspapers..... | 50-70 |
| Yellow wall paper..... | 40 |
| Blue paper..... | 25 |
| Dark brown paper..... | 13 |
| Dark chocolate paper..... | 4 |
| Plain deal (clean)..... | 40-50 |
| " (dirty)..... | 20 |
| Yellow painted wall (clean)..... | 40 |
| " " (dirty)..... | 20 |
| Black cloth..... | 1.2 |
| Black velvet..... | 4 |

When studying out the lighting of a given place we must consider whether we merely wish for a general sense of the space being nicely or brilliantly lighted, as in a ball room or dining room; or whether particular spots or objects need to be clearly illuminated, as the goods in a shop or the tables in a library.

The most important step to good illumination is to secure to the utmost extent possible that no bright spots or lines of light shall strike the eye. The moment the eye sees the source of light it closes itself up for protection from the direct rays and consequently cannot receive as much of the light reflected from neighboring objects, and therefore does not see them distinctly. The following experiment will illustrate this very clearly: Take a shop with two show windows and hang the lights in one window about the level of the eyes, as is so commonly done, and in the other put the same number of lights in good reflectors close up to the ceiling. Now go across the street and note the result. In the first window the goods on exhibition are fairly well lighted, but it is a discomfort to look at them long and nothing is seen behind them. In the other window the goods are shown up beautifully and you can look at them as long as you wish and at the same time can see right back into the shop and see the goods on the shelves and counters.

In the smaller towns and in many cases in the larger ones the question of getting exactly the best illumination and effect from the lights must be subordinated to that of the cost both of the fitting up and of the current consumed. Also a certain amount of deference must be paid to the ideas of the owners.

Thus in lighting show windows the very best method is to light them from overhead, or from the corners, with lamps in deep and powerful reflectors that will throw the light directly on the goods to be shown and will shield it from everywhere else. If it is necessary for the proprietor to be as economical of light as possible this can hardly be done as these lamps are useless for general illumination in the shop. In such a case as this clusters under good flat reflectors on the ceiling of the window are best. These show the goods in the window very nicely, they make the front look much brighter, and at the same time throw a very considerable quantity of light into the front part of the shop where it is most required.

An exceedingly common case is a shop from 20 to 25 feet wide, 40 to 50 feet deep with two show windows, the ceiling being from 10 to 12 feet high, and used for dry goods, tailoring, groceries, etc. A very good arrangement for this is to put a three-light cluster and flat reflector in each window, and three similar three-light clusters down the centre of the shop. The main switch should be placed at a convenient spot near the door by which the employees enter and will of course turn on all the lights. Another switch should then be arranged to turn off the window lights, and another to turn off two lights in each of the clusters in the centre. This will be found to be a most convenient and economical arrangement for the customer, who can proportion his light to the weather and amount of business doing. While the central station man will find that, if the shop is open in the evenings at all, the whole of the lights will be on long enough to cover the maximum demand, or standing charges.

These clusters should not be more than 10' 6" from the floor; were these lights raised to 15 feet the direct light from them would be reduced one half, calling for double the number to produce the same illumination, but since in this case the reflection from the ceiling and walls would be somewhat increased, probably an increase of 50 per cent. in the number of lights would be sufficient.

Drug stores generally call for very special treatment, and the lighting must be made to harmonize with and to show off the fittings. Brackets on the top of the shelving and a handsome electrolier in the centre are generally very acceptable, but as the result desired is more in the way of brilliant effect than of mere illumination for the showing of goods each case must be studied out to suit the purse and the tastes of the persons concerned.

In the matter of churches the great desideratum is the even distribution of the light, with absence of shadows and the total avoidance of all spots or lines of light that will strike the eye of the congregation, or of the minister, especially during the sermon. The minister, the choir and the organist of course require plenty of light, and it often calls for considerable ingenuity to supply their needs without having a bank of lights most unpleasant to the congregation. If such a group of lights cannot be avoided it should be provided with a switch within convenient reach so that it can be turned out during the sermon. In Anglican and Roman Catholic churches which have chancels separated by an arch from the main body of the building, the lights can often be arranged on this arch so as to be entirely hidden from the congregation and yet throw a very pleasant light on the choir and reading desks.

Lodge rooms should be well lighted, and as they are often finished in very dark colors this is a difficult matter. The lights should be divided into groups controlled by switches, and those at the desks of secretary and treasurer are often wanted to be independent of the others in the room. A dimmer is a valuable addition and should be arranged to con-

and all the lights except those just mentioned. It should be a regular theatre dimmer of ample capacity. Lodges are not as a rule paying customers because their use of the light is irregular and the income per light from them very small. Nevertheless it pays to give a good deal of attention to the fitting up of them, because many get educated to reach lighting through them whom it would be difficult or impossible to reach in any other way. It will require a good deal of work to get the first one well done and especially to get the dimmer introduced, but after that it will be comparatively easy.

EXPERIENCES OF AN INSPECTOR.

By J. K. JOHNSTONE, Inspector of Electric Lights, Toronto

WHEN honored by an invitation from the Executive to prepare a paper for the Society, I was somewhat in doubt as to the choice of a subject. I wished to furnish something that might be of interest to you and at the same time to avoid any of the important branches of electrical science which might leave me liable to criticism from gentlemen so highly qualified; hence, with your kind permission, I will confine myself to giving you a few impressions as received in my capacity as inspector.

At the introduction of the government inspection of electric lighting, there were a few, as you may remember, opposed to the act, and I acknowledge that it was with some misgivings that I went forth on my duties. However, it is with pleasure that I can now recall every visit made to the electric light stations in my district, and in every instance have I not only been kindly received, but every suggestion of improvement offered by me has been acted upon immediately and with evident pleasure. I need not tell you that in not one instance have I found any attempt on the part of electric light companies to defraud their customers, although occasionally appealed to by consumers on that ground. An investigation usually resulted in discovering old lamps, too few lights for the space lit, wastefulness where a meter was in use, or some other fault in the power of the consumer to correct.

The persistence of many purchasers of electric light in clinging to old and useless lamps is a common source of annoyance to the companies and a difficult matter to overcome. The old lamp is often expected to give as brilliant a light as when first installed, and when unable to do so the charge is frequently made that the company supply a too low voltage. To please these grumblers, a mistake is sometimes made in endeavoring to supply a current sufficient to brighten these worn-out lamps, and this, too, at the expense of new lamps, whose brilliancy is thus deteriorated. As it is impossible to compel the purchase of new lamps, and as the companies are anxious to please their customers, I have suggested, when consulted, that new lamps should be supplied at their actual cost, thus throwing the blame on the consumers when their lights were poor, economizing electric current and sparing new lamps.

The question as to the advisability of using meters, where practicable, can only be answered in their favor. By the employment of a meter a just system is accorded to manufacturer and consumer alike; the wasteful man is made to pay fairly for his neglect, while the careful and honest man is charged only for the light needed and current consumed. Under the flat rate system, it is not uncommon to see large shops brilliantly illuminated throughout the entire night. Managers tell me that it is difficult to introduce the meter where flat rates have been charged, but, despite the objections, many are making the change. The several types of dial registering meters which I have inspected are usually accurate, and I am told prove satisfactory as measuring instruments for either power or light.

A lack of uniformity in rates, both by meter and flat rate systems, has been a subject of complaint with some managers. There is evidently no remedy for this unless an arrangement can be arrived at by the manufacturers themselves and a standard charge agreed to.

In several towns in the district visited by me a system of street lighting by incandescent lamps has been adopted. When properly arranged the appearance is quite pretty and the light well distributed.

In concluding, permit me to tell you that the managers and electricians I have met in my work are without exception kindly and intelligent men, and in this favorable opinion I am borne out by other inspectors with whom I have spoken upon the subject. It has been suggested to me that there may be some potent and subtle charm in the electric current which develops the best qualities in a man's character. Can this be so?

THE UNCONSCIOUS OWNERSHIP OF AN IMPORTANT KEY.

A PLEA FOR THE INTRODUCTION OF GOODS TRAFFIC ON OUR SUBURBAN TRAMWAYS.

By W. T. BONNER, Montreal.

THE first consideration in exploiting any new suburban tramway is the possible or available passenger traffic. That being found inadequate to guarantee a fair return on the cost of installation and maintenance, the project is usually abandoned for the reason that only passenger traffic can be considered, owing to the high cost of handling goods traffic at the terminals. While a motor-man and conductor are sufficient to handle a two or three-car electric train for passenger traffic, with very little expenditure of time or assistance for loading and unloading, all railways under present systems require a large additional force to conduct the hundreds of details attending the reception, checking, loading, transferring, unloading and proper delivery, in good order, of either car lot or package freight.

It is not the railway investors alone who suffer the effects of this handicap, but the property owners also, since the latter have no recourse, while the capitalist has but to seek other more profitable fields for investment.

It may therefore be conceded that the whole subject presents two phases of commercial economy, viz.:

(a) From the standpoint of the agriculturalist and land owner; how best to provide a means for increasing the value of remote but otherwise valuable agricultural lands, and at the same time retain present value of adjacent property by converting it from market gardens into residence and manufacturing sites.

(b) From the standpoint of the capitalist and manager of railway properties; how best to increase the earning capacity of existing or proposed suburban lines.

DEPRECIATION OF FARM LAND VALUES.

With the ever increasing centralization of population and commerce, inaccessible property becomes less valuable; all land, whether barren or fertile, suffering alike, according to its distance from the centre of demand for farm products, which we call markets. Such distance is not always measured in actual miles, but rather in accessibility, since in our day we find frequent examples of the paradoxical long and short haul rates. The Minnesota and Manitoba farmers will deliver their wheat at the seaboard at a lower cost per bushel than the farmer who may live a hundred miles off the coast. The eastern farmer may have just as fertile land as his western competitor, but he is handicapped by having to haul his wheat forty or fifty miles over poor wagon roads to reach the nearest railroad.

In either case, the terminal charges, including the cost of loading the produce at the farm, is approximately the same, but the difference in cost of haulage per ton-mile by railroad and wagon road is so tremendously in favor of the former that without such facilities the farmer may as well retire from business. It has been stated as a fact that to transport a ton of coal from Buffalo to Chicago costs no more than to move the same quantity of coal across the sidewalk in either city.

In a late number of the Marine Review some interesting comparisons were made between the present cost of shipping coal to the Northwest and prices which obtained previous to the introduction of modern vessels and automatic coal handling machinery. Car-dump machines can now load four thousand tons in ten hours, as compared with two or three days under old methods; and coal is now carried from Lake Erie ports to the head of Lake Superior at twenty cents per ton, as against fifty cents, which was considered a ruinously low rate a few years ago.

It is frequently asserted that since the introduction and development of steam railways, they have gradually superseded the earlier methods of transportation and traffic, and as a consequence highways are no longer an indication of progress. This is true only to a limited extent. Railroads have changed the character of suburban traffic, and personal travel is no longer dependent upon the condition of the highways, but commercial intercourse, as represented in the exchange of products, is as much dependent upon the condition of the public road to-day as it ever was, for the reason that it is impossible to construct a railroad to the door of each producer and consumer. Hence railroads can never entirely supersede the common road, and every ton of freight carried by them must be conveyed over a highway at either or both terminals, and the cost of this highway transportation has a marked influence, not alone upon the price paid by the consumer, but also in the profit realized by the producer.

Few people have any knowledge of the real cost of transportation by horse and wagon, or comprehend the amount of money expended needlessly every year through failure to provide proper roadways and modern tramways.

The following table shows the results of actual observations on the cost of moving a load of one ton a distance of one mile on level roadways, with different pavements and under average conditions.

TABLE I.

COST OF TRANSPORTATION BY HORSES AND WAGONS PER TON-MILE ON DIFFERENT SURFACES.

| | |
|---|--------------------------|
| Iron Rails..... | 1.28 cents per ton-mile. |
| Asphalt..... | 2.70 " " |
| Stone, paving, dry and in good order..... | 5.33 " " |
| " " ordinary condition..... | 12.00 " " |
| " " covered with mud..... | 21.30 " " |
| Broken Stone, dry and in good order..... | 8.00 " " |
| " " moist and in good order..... | 10.30 " " |
| " " ordinary condition..... | 11.90 " " |
| " " covered with mud..... | 14.30 " " |
| " " ruts and mud..... | 26.00 " " |
| Earth, dry and hard..... | 18.00 " " |
| " ruts and mud..... | 39.00 " " |
| Gravel, loose..... | 51.60 " " |
| " compacted..... | 12.80 " " |
| Plank, good condition..... | 8.80 " " |
| Sand, wet..... | 32.60 " " |
| " dry..... | 64.00 " " |

The comparative cost of transportation over rough roads may be estimated from Table No. 2, which shows with sufficient exactness for most practical purposes, the force required to draw loaded wagons over inclines. This table shows the force exerted by the load in its downward tendency, as well as the force required to draw it up grades of various inclinations; also maximum duty performed by an average horse, weighing, say twelve

hundred pounds, the friction of the surface being taken at one-fiftieth of the load drawn :

TABLE II.

| Rate of Grade. Ft. per 100 ft. | Pressure on the plane in lbs. per ton. | Tendency down the plane in lbs. per ton. | Power in lbs. required to haul one ton up the plane. | Equiv. Length of level road miles. | Max. Load in lbs. which a horse can haul. |
|--------------------------------|--|--|--|------------------------------------|---|
| 0.0 | 2240 | .00 | 45.00 | 1.000 | 6270 |
| 0.25 | 2240 | 5.60 | 50.60 | 1.121 | 5376 |
| 0.50 | 2240 | 11.20 | 56.20 | 1.242 | 4973 |
| 0.75 | 2240 | 16.80 | 61.80 | 1.373 | 4490 |
| 1. | 2240 | 22.40 | 67.40 | 1.500 | 4145 |
| 1.25 | 2240 | 28.00 | 73.00 | 1.622 | 3830 |
| 1.50 | 2240 | 33.60 | 78.60 | 1.746 | 3584 |
| 1.75 | 2240 | 39.20 | 84.20 | 1.871 | 3290 |
| 2. | 2240 | 45.00 | 90.00 | 2.000 | 3114 |
| 2.25 | 2240 | 50.40 | 95.40 | 2.120 | 2935 |
| 2.50 | 2240 | 56.00 | 101.00 | 2.244 | 2725 |
| 2.75 | 2240 | 61.33 | 106.33 | 2.363 | 2620 |
| 3 | 2239 | 67.20 | 112.20 | 2.484 | 2486 |
| 4 | 2238 | 89.20 | 134.20 | 2.982 | 2083 |
| 5 | 2237 | 112.00 | 157.00 | 3.444 | 1800 |
| 6 | 2233 | 134.40 | 179.40 | 3.986 | 1568 |
| 7 | 2232 | 156.80 | 201.80 | 4.844 | 1367 |
| 8 | 2232 | 179.20 | 224.20 | 4.982 | 1235 |
| 9 | 2231 | 201.60 | 246.60 | 5.480 | 1125 |
| 10 | 2229 | 224.00 | 269.00 | 5.977 | 1030 |

From the foregoing tables, and from statistics gathered by both state and national bureaus, it has been calculated that the average cost of transportation by animal power is twenty-five cents per ton per mile. Furthermore, the rate of transportation by animal power is, and always has been, excessively high, and the evidence of all statistics, both ancient and modern, shows but slight

wheat, beef, pork, molasses, wagons, horseshoes, butter and clothing. Within the writer's memory, these articles were produced at home, or in small shops and factories distributed, like the population, quite equally throughout the country at cross-roads and villages, utilizing crude methods and operated by the old-fashioned treadmill or horse power, and overshot water wheels. The output of flour per man per day in those mills did not exceed ten barrels. At the great Winnipeg and Keewatin mills and at Minneapolis the milling business has been so concentrated that to-day the output per man exceeds one hundred barrels and the cost of production is correspondingly reduced. But of what benefit to inaccessible property in the interior is this reduced cost of production, unless like facilities for transportation are afforded?

The measure of benefit which any improvement in production in one community bears to another community, depends entirely upon the transportation facilities between the two places. Recently a customer came into our office from one of the interior mining districts. We estimated the plant he required would cost \$1,255. To help him out all we could, we eliminated every possible item not absolutely essential to the proper working of the plant, and allowing also for erector not being required, we found we could reduce our price 10%, making the net total \$1,130. But how insignificant our discount appeared when we learned the freight from Montreal to the mine would cost \$1,248, notwithstanding no part of the route required mule-back transportation. Although further distant from Montreal, the same plant could be transported to Vancouver for less than \$250.

Concentration of population and production requires for the better equilization of supply, and price of materials and provisions, that such centres must be provided with commercial veins and arteries which shall quickly and cheaply transport or exchange urban and suburban passengers and commodities. While long haul rates of transportation by railroads and steamships have been

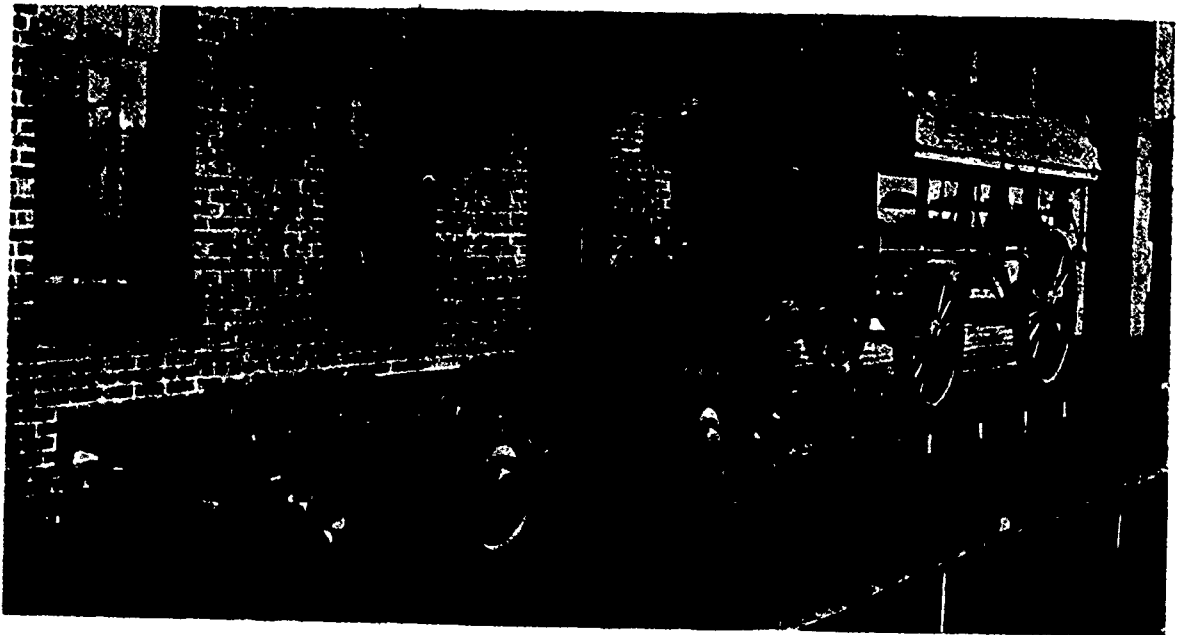


FIG. 1.

improvement as compared with the progress made in other departments of industry, and by other means of transportation. It being true that the value of land and wages of labor are affected by the cost of transportation, we should expect to find that where so high a rate as twenty-five cents per ton-mile prevails, the land would diminish in value, and the rewards of labor bestowed upon such lands would grow less and less. What we expect to find, we do find.

A forcible illustration of this fact was brought to the writer's attention a few days ago. A resident of Long Island, living about fifty miles out from New York city, owns 500 acres of as fertile land as may be found anywhere. Although beautifully situated, and with every natural advantage to favor production, the cultivation of all staple products has been abandoned by him owing to lack of proper transportation facilities. With potatoes jobbing at eighty cents to one dollar per bushel in New York, he was compelled to sacrifice his entire crop, giving away hundreds of bushels, rather than allow them to rot in his cellars.

It is not necessary for the careful observer to rely solely upon official reports for information, for the above is but an every-day example of the result of excessive cost of transportation, the ever-decreasing price of inaccessible land, and the diminished rewards of labor bestowed upon it. The price of land and the value of labor decreases in almost inverse proportion to the distance over which the agricultural products must be transported by horse power.

One fact is patent to all, that whereas formerly the distribution of population was approximately equal over the face of the country, it is gradually becoming concentrated into large cities to such an extent that already fully one-half of the inhabitants of the older sections of the country live in cities. The evident reason for this is competition, the demand for increased output at reduced cost. Concentration indicates increased power for production. Take, for instance, some of our commonest staples, like

wonderfully cheapened, there still remains a space of fifteen to twenty-five or even forty or fifty miles surrounding every commercial centre, which has never been covered by any cheap method of transportation. Such distances are beyond the possibility of cheap or efficient service by animal power, and the terminal charges and bulky plant required, precludes any possibility of much reduction in railroad tariffs. What we require therefore is a new system of transportation which shall be alike available for freight and passengers.

The problem of handling exclusively passenger traffic is comparatively simple; indeed it has already been solved for those districts where the population is sufficiently dense to support steam or electric railways requiring no other source of revenue. Experienced railroad men are unanimous, however, in agreeing that no road, whether steam or electric, will pay in a thinly settled district, unless assisted by a bonus or by the addition of freight traffic.

In this day of great competition capital is constantly seeking methods for reducing costs. Manufacturers calculate even the individual bristles required to make a brush, and the ounces of warp in a yard of cloth. An extra hair in a brush or an ounce of warp more than is necessary, does not amount to much in a single brush or a yard of cloth, but the savings in a day's output might make a perceptible increase in the dividend account. Cost of operation and maintenance are to-day the great factors in every commercial or manufacturing calculation. Capital is ever ready to supply the installation provided it can be insured a fair return on the investment.

This age has not only developed the mechanical and the electrical engineer, but to-day they are striving harder than ever to distance as far as possible the civil engineer whose development of the highway, the canal and the railroad, made him famous years ago. That the civil engineer has achieved wonderful results in the operation of steam roads no one will deny, but for the

solution of the short haul problem we must eliminate his cumbersome trams, his extensive terminals and expensive equipment and service generally, before we can hope to approach the mean line of tariffs which shall re-establish the movement of commodities within every part of the short-haul circle. Then may we expect a more even balance of land values, and from the increased traffic

mediate benefit of the higher city market rates for their produce, as well as competitive selection and prices for supplies. Local and sub-stations were to be established at frequent points along the line where the farmers could deposit their produce to be forwarded by next train to a central clearing house in the city from whence it could be delivered at once to the consumer. The

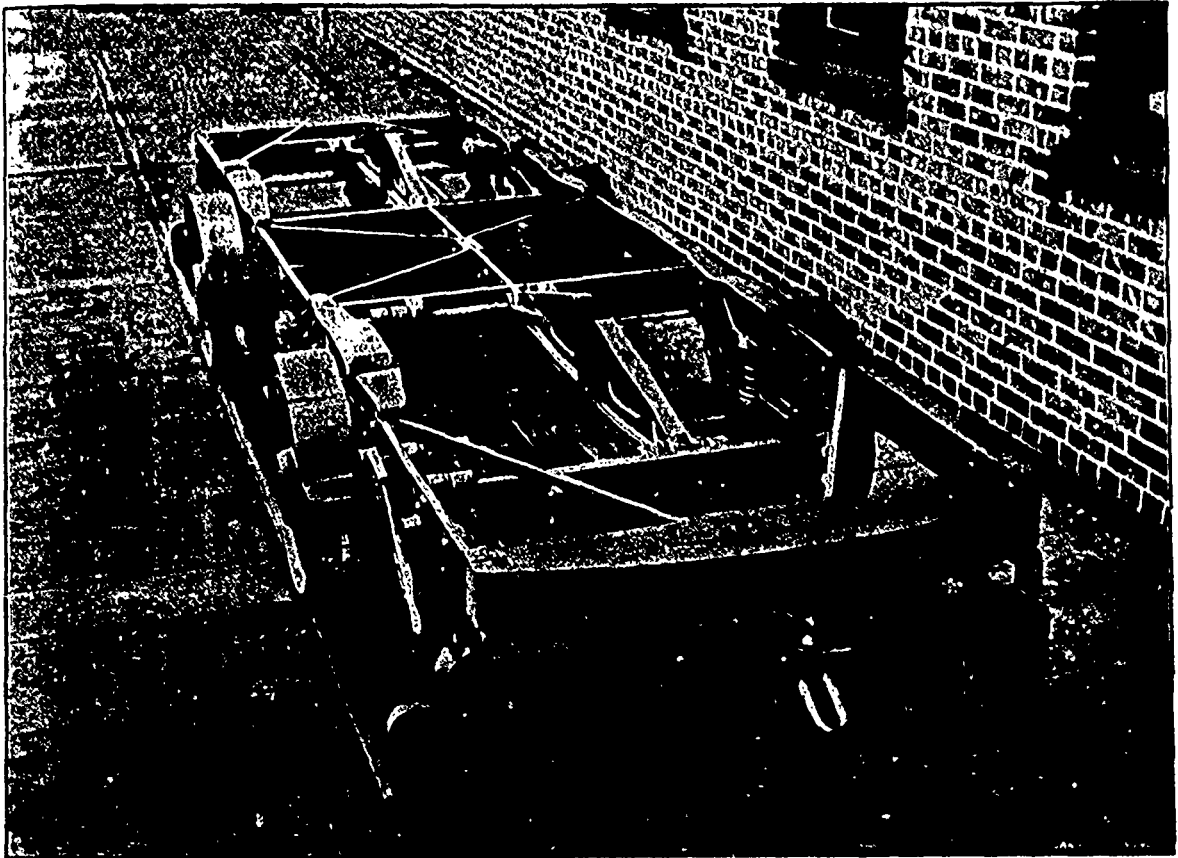


FIG. 2.

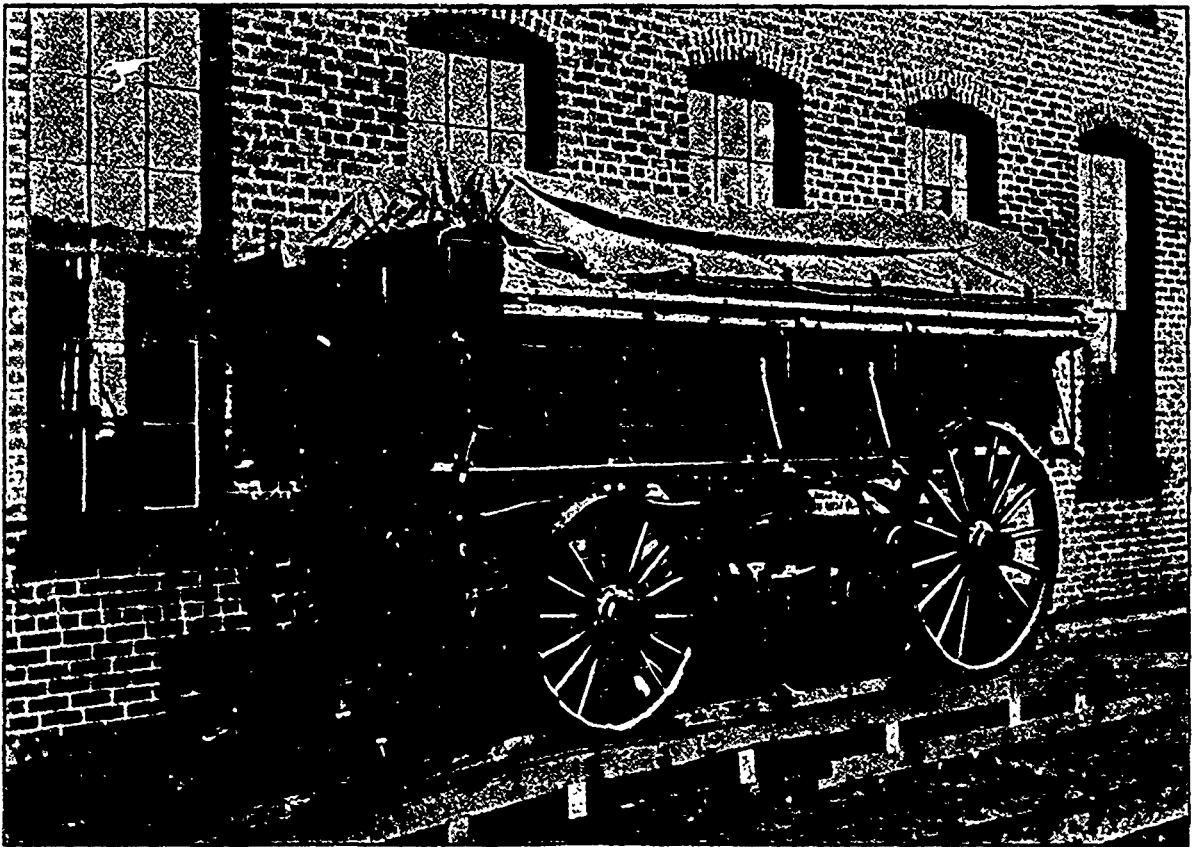


FIG. 3.

will come substantial dividends to the investor in railway securities.

In 1894 the writer promoted a scheme for uniting one of the large commercial centres on Lake Erie with several surrounding counties by a system of electric railways which would combine both freight and passenger traffic. The arrangement was such that the farmers anywhere along the line would secure the im-

mediate benefit of the higher city market rates for their produce, as well as competitive selection and prices for supplies. Telephone connection was to be established between the city and farm residences through the company's local stations, and direct orders for goods from the city merchant could be received by wire and despatched by next train out. Only samples, or a very limited supply of staple goods,

were to be kept at the local stations, the principal stock to be maintained at the central clearing house, and by the various city merchants who belonged to the syndicate. Electric current for light and power were also to be supplied to consumers along the line. In short it was proposed to so unite city and country by wire and rail that all would enjoy equal facilities for obtaining supplies.

Unfortunately the financial depression of that year so handicapped our efforts that we were unable to carry out the project, but those who gave the subject most careful consideration at the time still expect to see some such system as the above in general use.

The latest development in the line of providing for goods traffic on electric tramways came to the writer's notice some months ago in the shape of a combination vehicle, so constructed as to be readily convertible for use upon any ordinary roadway or upon a railroad track. It can be shifted from one to the other at will, without the necessity of reloading or rehandling the contents between points of shipment and destination. The idea is not altogether new, but the application will no doubt impress you all as novel in the extreme.

Notwithstanding the similarity of names the writer begs to disclaim any connection with the introduction of this scheme, but

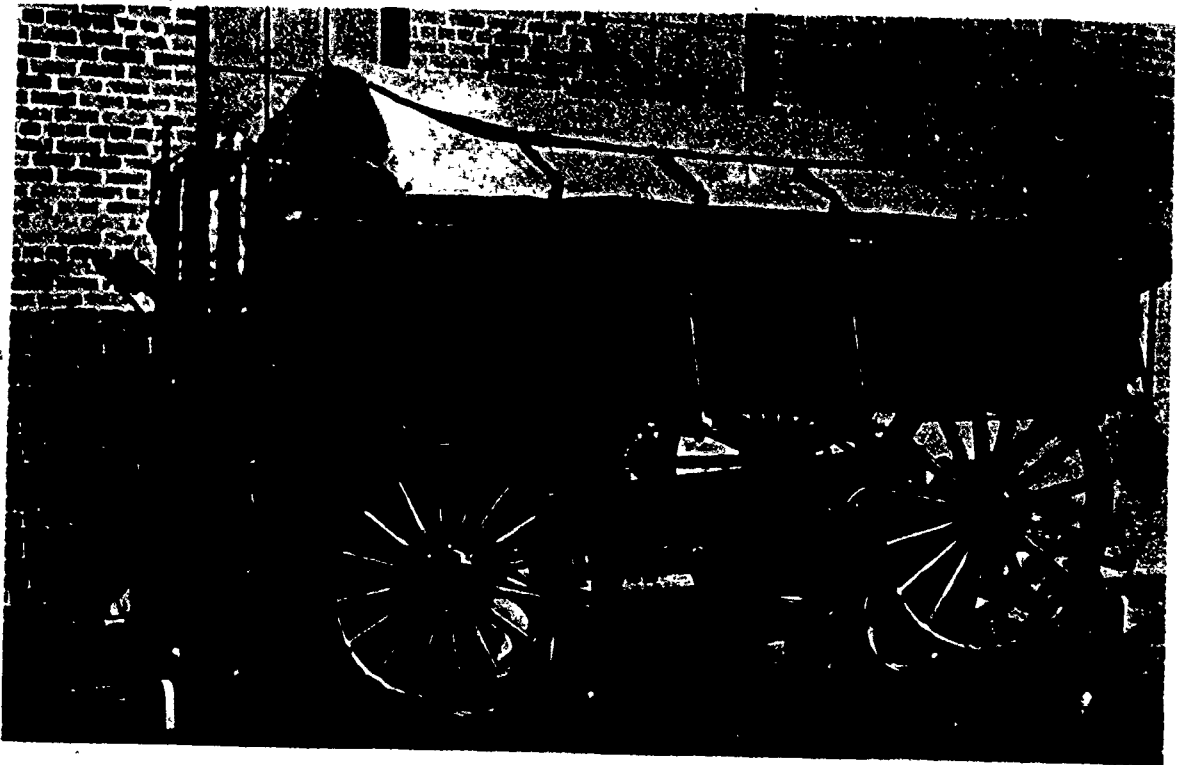


FIG. 4.

nevertheless the principle involved certainly commands attention.

The Bonner Rail Wagon Company, organized about a year ago to develop the patents of Col. Jos. C. Bonner, of Toledo, Ohio, states in its prospectus that it will build rail wagons and operate them through leases or franchises granted to interurban electric railroads. It is proposed that such roads shall be equipped with any stipulated number of rail wagons, thus enabling them to supply patrons at any point along their lines, or at the terminal stations.

The general supervision and control will be vested in the Rail Wagon Company, thus relieving the local electric railways of the detail inspection and repairing, as well as freight contracting. The Wagon Company will contract to provide service as the traffic of the electric roads may require. The wagons will be neat and substantial and tarpaulin-covered at all times, whether loaded or not, after the same manner as the goods vans are covered on English and continental railroads. This provision permits sealing and also provides protection against exposure to inclement weather.

As an essential feature of this enterprise, the Rail Wagon Company will supply horses and drivers for service at terminals, thereby retaining in responsible hands, the execution of traffic agreements and establishing a direct-connecting link between the producer and the consumer. Agents will collect the freight charges, which charges will include delivery to consumer. The tariff rates, covering both freight and delivery, will naturally be much less than prevailing freight charges under old methods of transportation, since no allowance need be made for capital invested in expensive terminals or for maintenance of same.

Figure 1 of the annexed cuts illustrates the integral parts of the combination vehicle. The wagon proper is patterned after the ordinary improved road wagon, modified, of course, for the special nature of the service contemplated. The running gears and springs are of standard construction having a carrying capacity of from three to seven tons, depending upon the class of freight to be carried.

The rail truck is not materially different from the car truck in general use upon our electric railways, except that it is provided with special attachments for automatically gripping and supporting the wagon proper. The truck is exceedingly simple in design and very light in proportion to its strength, being constructed entirely of wrought iron and cast steel.

Figure 2 shows more clearly the detail construction of the rail truck and the arrangement of the cast steel segments or dogs, supported in place horizontally by heavy plate springs, and used for the purpose of engaging the axles of the road wagon as the truck approaches from either direction.

Figure 3 shows the road wagon in position on the loading switch with rail truck underneath, the dogs engaging the axles, ready to pull ahead. As the truck is drawn forward on the level rail by the electric motor, the impact of the projecting dogs against the wagon axles also starts the wagon forward, and as the latter travels down the inclined switch track, the axles gradually settle into the notch provided in the cast iron journal frames.

Figure 4 represents the wagon mounted on rail truck standing on the open track ready to be coupled to a motor car, or electric locomotive.

Figure 5 illustrates a train of five wagons, drawn by a familiar

looking electric locomotive en route across the country, while figure 6 represents several rail wagons side tracked in convenient market stalls, the commission agent or owner serving out the contents fresh from the farm.

The actual time required for unshipping the wagon from the truck for road use, and vice versa, is not more than would be required for coupling together cars in making up a train.

The weight of the combined wagon and truck is sufficient to insure perfect rail traction and the proportion between carrying capacity and dead weight averages about the same as the ordinary freight car.

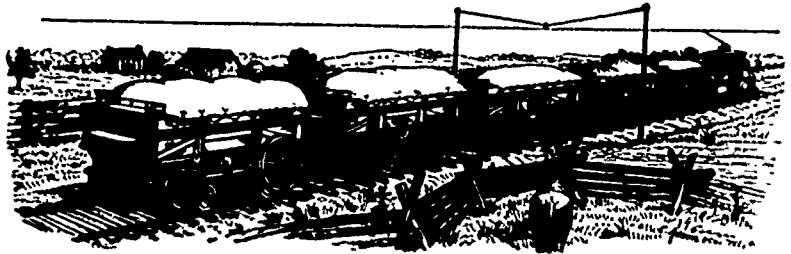


FIG. 5.

By establishing a uniformity of dimensions and making the rail truck interchangeable, the wagons can be loaded either end on from either direction, and any number of rail wagons can be connected and moved in either direction as a train, by steam, electric or other motive power.

The farmer or merchant need have no ownership in the rail wagons. On a signal or other notice to the electric railroad, a rail wagon may be placed on a convenient farm switch or siding. The farmer readily unships the wagon from its rail truck by simply hitching his horses to the wagon and driving off, leaving the rail truck to remain where it stands until he returns with wagon loaded for market. Convenient receiving and distributing stations can be located in the cities. Bulk merchandise can be

handed; parcels, mail and express matter also, the rail wagon making store to store collections or deliveries. The movement of these rail wagons need not in any way interfere with passenger service of the electric railways, the heavy traffic being carried at night, when the electric lines and streets are least in use.

The great value of this novel method of handling goods traffic is readily demonstrated. Not only does it insure economy of time, labor and expense by avoiding reloading in transit, but the reduction in breakage which usually attends the shipment of eggs, glassware, pressed brick, or other fragile commodities, guarantees for it preference over other systems of transportation.

With these changed conditions of suburban traffic the greater part of the haul would be by rail, consequently the weight of the load units can be greatly increased. A team of horses can exert, for a short period, twice the average tractive pull which they would be able to exert continuously throughout a day's work, and, so long as the resistance on the incline is not more than double

trical power, since any appliance which offers increased permanent demand for current must add a corresponding value to his franchise.

As will be noticed by an inspection of the accompanying illustrations, the Quimby pump consists of two parallel shafts, on which are mounted the four screws that act as pistons in propelling the water, so arranged that in each pair the thread of one screw projects to the bottom of the space between the threads of the opposite screws. The screw threads have flat faces and peculiarly undercut sides; the width of the face and the base of the thread being one-half the pitch. The pump cylinder fits the perimeters of the threads, as shown in figure 2.

Space enough is left between the screws and the cylinder and between the faces of the intermeshing threads to allow a close running fit without actual contact. There is no end thrust of the screws in their bearings, because the back pressure of the column of liquid is delivered to the middle of the cylinder, and the endwise pressure upon the screws in one direction is exactly counterbalanced by a like pressure in the opposite direction.

The suction connection is shown at S in Fig. 1, and opens into a chamber underneath the pump cylinder. The suction liquid passes through this chamber to the two ends of the cylinder, and is forced from the two ends toward the centre by the action of the two pairs of intermeshing threads, the discharge being in the middle of the top of the cylinder, as shown at D.

The power to drive the pump is applied to one of the shafts, and the second shaft is driven by means of a pair of gears, shown at G in Fig. 1.

The pump has no internal packing, no valves, and no small moving parts. The only packing is in the stuffing boxes where the two shafts pass through the cylinder head. As these stuffing boxes are on the suction end of the pump, there is no tendency to blow out the packing.

The Quimby electric pump is especially valuable in connection with the hydro-electric operation of elevators. These pumps have been in use for elevator service for several years with very satisfactory results, and have been successfully applied to the pressure tank system, the gravity system, and for pumping directly into the elevator cylinder.

When used in connection with the pressure tank system, the suction is connected with the elevator discharge tank, the pump discharging into the pressure tank. The pump is controlled by means of a pressure regulator and starting box, as illustrated in Fig. 3. When the pressure in the tank falls, the regulator operates the starting box and the pump runs until the pres-



FIG. 6.

the resistance on the level, it follows they would be able to draw over short hills the maximum load they are capable of drawing along a level road.

Such a system as the above would at once render accessible endless acres of fertile interior lands, and open them up to the systematic energy of the thrifty market gardener, the dairyman and the fruit grower. Improved conditions would result to the truck farmer, who would no longer be obliged to spend his night in long weary drives in order to reach the early market. Instead, his day's harvest would be transported to town during the night by electric rail wagon while man and horse refresh themselves in sleep.

Thus would we increase the market value of distant agricultural lands, and at the same time retain present values of nearby property. With the increase of land values and production, must also come increased traffic for existing or proposed suburban railways.

THE QUIMBY SCREW PUMP.

By W. T. BONNER, Montreal.

THE probable increased demand for electric current due to the introduction of this new type of pump, which has entered the field of competition for commercial success within a recent period, should offer sufficient reason for describing it briefly in a paper for the benefit of this Association. The novel feature of the pump is its sim-

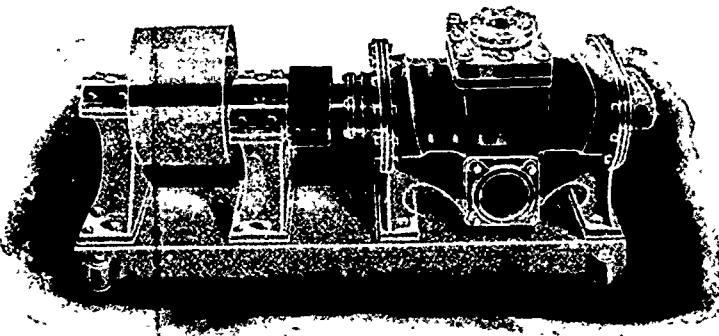


FIG. 1.

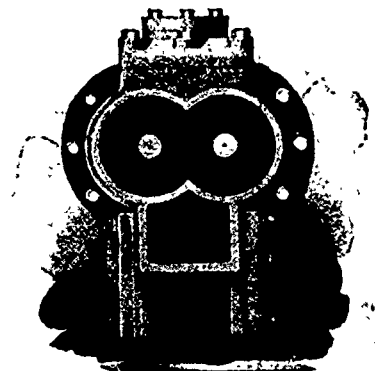


FIG. 2.

licity, utilizing as it does a very simple mechanical principle in a very unusual manner for performing useful work.

Without attempting to refer to the many more or less successful efforts of other inventors, contemporary with or prior to Mr. Quimby, this paper will be confined to a brief description of the pump, with some further reference to its commercial success. The latter is, of course, a first consideration to the manager, or owner of elec-

sure has been restored in the tank to the required number of pounds.

By the peculiar construction of the Quimby pumps there is no pulsation, and the flow of water is smooth and continuous, thus enabling the pumps to pump air into the pressure tank easily and without danger of air binding.

When used in connection with the gravity system, the pump section is connected with the lower discharge

tank, and the discharge from the pump is elevated into the roof tank. The pump is controlled by means of a float in the discharge tank, and a starting box. When the discharge tank is full the float rises and starts the pump; the pump then runs until the discharge tank is empty and the roof tank is full. When the discharge tank has been emptied the float stops the pump. This system of control is simple and works exceedingly well in practice.

For pumping directly into the elevator cylinders, these pumps have a very high efficiency. The multiplication of cylinders in a reciprocating pump diminishes the in-

be automatically operated, thus doing away with the constant care and attention required by a steam pump.

Figure 5 represents a switch for automatically starting and stopping electric motors up to and including five horse power. It is arranged to allow the current to gradually enter the motor through resistance, preventing undue sparking at the commutator at the time of starting the motor, thus taking the place of a starting box or rheostat, which is usually operated by hand. For pumps of larger size it is advisable to use the controlling apparatus shown in Fig. 3.

Whether operated by belt or direct connected to

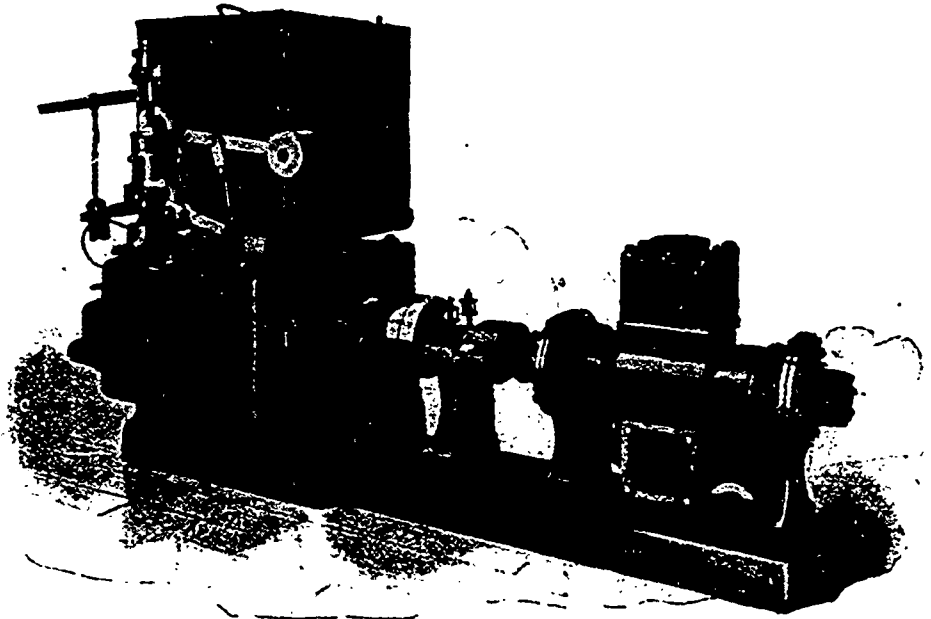


FIG. 3.

tensity of the effect of the pulsations by increasing their frequency, but does not entirely remove the pulsations. Where Quimby pumps have been applied to pumping directly into the elevator cylinders, the motion of the cars is as smooth as in the pressure tank system. The advantage of direct pumping is that the pressure against which the pump works is proportional to the load in the car, and as the average elevator load is about half the maximum load, the saving in comparison with the pres-

electric motors or steam engines, the Quimby pump has many advantages. For waterworks, oil refineries, or other service where liquids are pumped through long pipe lines, any pulsation in the delivery adds to the difficulty of maintaining tight joints. The Quimby pump, however, has an absolutely pulseless delivery, and at the same time a very high efficiency. Long series of tests show an average efficiency of more than 55 per cent. from wire to water. In many instances tests have shown as high as 65 or 66 per cent. efficiency. The log of two tests is given below in order to show the variation in output of current per gallon of water pumped under different heads.

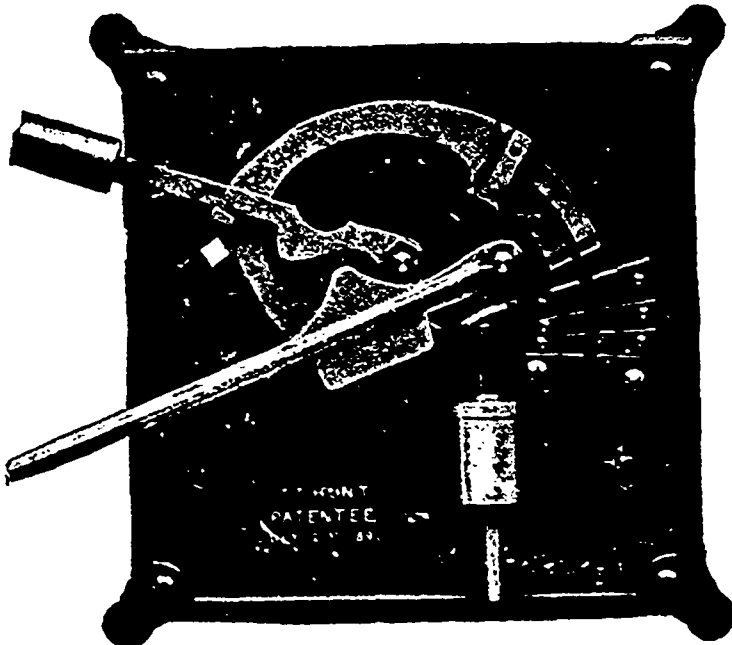


FIG. 5.

sure tank system is obvious. Where an elevator has been operated by water from the city mains, a considerable saving can usually be effected in the cost of operation and the service much improved by the application of an electric pump.

It will be seen from the foregoing description that the Quimby electric pump, when applied to an elevator, can

TEST NO. 1
No. 2½ Quimby pump direct connected to 1 h.p. Lundell motor.

| Pressure. | Volts. | Ampere. | Revolutions. | Dis. | Time |
|-----------|--------|---------|--------------|------|--------|
| | | | | | 1 min. |
| 2 | 226 | 1.25 | 1860 | 292 | - |
| 10 | 230 | 1.75 | 1650 | 244 | - |
| 20 | 230 | 2.00 | 1520 | 208 | - |
| 30 | 220 | 2.50 | 1280 | 178 | - |
| 40 | 226 | 3.00 | 1255 | 160 | - |
| 50 | 222 | 3.25 | 1130 | 133 | - |
| 60 | 228 | 3.75 | 1130 | 122 | - |
| 70 | 234 | 4.5 | 1020 | 102 | - |
| 80 | 224 | 4.5 | 990 | 81 | - |
| 90 | 222 | 5.0 | 955 | 76 | - |
| 100 | 234 | 5.5 | 950 | 75 | - |

TEST NO. 2.
No. 5 Quimby pump direct connected to No. 4 Otis motor.

| Pressure. | Volts. | Ampere. | Revolutions. | Gallons. | Efficiency |
|-----------|--------|---------|--------------|----------|------------|
| 30 | 210 | 35 | 1280 | 316 | 56 |
| 40 | " | 43 | 1260 | 300 | 57 |
| 50 | " | 49 | 1220 | 286 | 60 |
| 60 | " | 57 | 1180 | 273 | 59½ |
| 70 | " | 62 | 1160 | 250 | 58½ |
| 80 | " | 68 | 1100 | 231 | 56 |
| 90 | " | 75 | 1080 | 222 | 55 |

The peculiar construction of the Quimby pump is such that it will readily handle thick products, such as paraffine, hot tar, pitch, white lead, melted sugar, glucose, soap, lard, etc. For this service reciprocating pumps are not desirable, for the reason that heavy liquids are likely to be churned by the action of the plungers, and the friction of the material passing through the valves and ports, greatly reduces the capacity and efficiency.

The Quimby pump has now been in actual use suffi-

ciently long to have passed the experimental stage. It is being used for all kinds of service, under most trying conditions, and the results have proved its efficiency, durability and economy.

The writer recently inspected one of the number seven pumps installed in the New York Sun building, where it is being used in connection with elevators operating on the pressure tank system. The arrangement of the pump and motor is the same as shown in Figure 4, while the rheostat and controlling device are similar to that shown in Figure 3. The instant the pressure on the gauge tank indicated a discharge of the water, the controlling device would close the circuit and start the pump, which would continue to run until the pressure reached the normal limit, when the current would be shut off, and the pump would stop. In its operation, both pump and motor appeared to be perfectly automatic, and the absence of noise and vibration was very noticeable.

The writer was also shown other installations of

including five submarine cables of a combined length of about 16 miles.

From Quesnell the main line crossed the Fraser river to the westward, and following a north-westerly course, with Behring Strait as its next objective point, reached the Naas river—about 400 miles distant from Quesnelle—when the second Atlantic cable was successfully laid, and operated July 29th, 1866.

The construction party of about 250 men—and which included explorers, surveyors, choppers, line builders, operators, and transport gangs—on receiving the news of the completion of the cable, remained in camp two or three days, awaiting developments. At the end of this time, finding the cable continued to work well, they set out for civilization, leaving their tools, stores and material to the tender mercies (in great part) of the Hudson's Bay trappers and the native red man, as their transport out would have cost more than the new article.

During the winter of 1866-7, a station was maintained at Fort Stager, on the Skeena river, where an operator by name of McCartney and a companion domiciled until the following spring, and where oftentimes during those—to him dreary winter months I held converse with him by wire from Yale.

In addition to the construction party, the company owned and had in service a fleet of vessels, steam and sail, plying upon ocean and river, some in the transportation of material, supplies and line

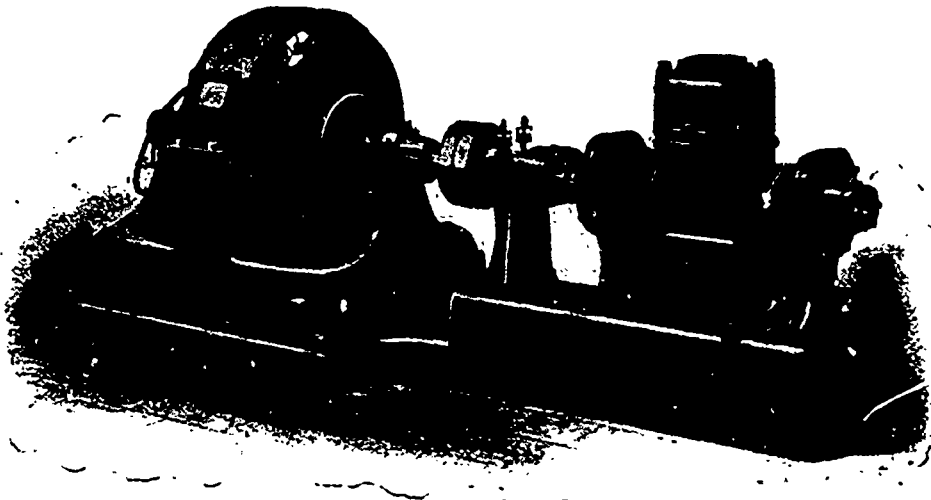


FIG. 4.

Quimby pumps for various purposes, such as tank service for high commercial buildings, elevating melted sugar from the basement to the top floors in refineries, and for other service.

Altogether the Quimby pump appears to offer a wider range for the utilization of electric power than any other apparatus presented for some time past and in a field also where cost of installation and operation are both very important factors.

THE TELEGRAPH IN BRITISH COLUMBIA.

By R. B. McMEIKEN.

SINCE that excellent paper on the "Early Construction of Telegraph Lines in the Dominion" was submitted at the fifth convention by Mr. Charles P. Dwight, I have had in mind the need of a supplementary clause concerning the introduction of the telegraph into this province in the early sixties, and which was to constitute a section of the somewhat formidable undertaking of connecting the New with the Old World by means of about eighteen thousand miles of land line.

It may be—it doubtless is—within the recollection of some of our members that, on the failure of the first Atlantic cable in 1858, there was set in motion as a means of attaining the same end—i.e., telegraphic communication between the two hemispheres—a gigantic enterprise, known as the "Collins Overland Telegraph (Russian Extension) Company," having in view the stretching of a wire from the telegraphic system of the Pacific States, through British Columbia and via Behring Strait to Russia and Europe.

With marvellous energy and enterprise, the work of construction was commenced in 1863, the line entering British Columbia from the south in Longitude 122 W. in 1864, being carried thence to New Westminster, from which point it followed the valley of the Fraser river and the Cariboo wagon road northward to Quesnelle, a distance of about 350 miles, which point was reached in 1865. Offices were established along the way, and from Quesnelle southward the line was soon opened for commercial business. The enterprise proved a great boon to the early colonists, both by reason of the large expenditure necessary in its construction and operation, as well as by the facilities offered thereby to the widely separated settlements for speedy communication.

In 1865, also, a branch line was run across the San Juan Archipelago to Vancouver Island, connecting Victoria, the capital of British Columbia, with the main line at Swinomish, Washington Territory. This branch was about 74 miles in length,

equipment, others in preparing for the placing of a cable across Behring Strait, a distance of about 60 miles—quite an undertaking at that date.

Of the fleet, I now recall the ocean steamer "George S. Wright," the river steamer "Mumford," barques "Onward," "Clara Bell," "H. L. Rudgers," ship "Nightingale," schooner "Milton G. Badger." The "Onward" made a trip to Siberia with material and supplies, was caught in the ice—where she remained all winter—and became a wreck when the ice moved in the spring.

The Behring Strait cable was to stretch from Cape Prince of Wales, on this side, to Plover Bay, on the Siberian shore, from which latter point inland about 350 miles of line had been erected, while southward from Cape Prince of Wales, in Russian America, about 300 miles of land line had also been constructed.

The course of this contemplated line through the British possessions and down the great waterways of Russian America would doubtless have brought it into close proximity to the present Klondyke gold fields, and near Dawson City, in which event it is not improbable that the hole-digging necessary would have developed the riches of that section at least 30 years earlier, and have given to the former generation an additional important mining epoch.

The history of the building of this line, and the causes which led to a work having for its object the encircling of the world by wire at so early a date, is likely always to be read with interest.

The company—which subsequently merged into the Western Union Telegraph Company—maintained the line northward as far as Quesnelle until purchased in 1870 by the British Columbia government, which in turn handed it over to the Dominion government on British Columbia entering the Confederation in 1871. Later still, the Canadian Pacific Railway assumed control south from Ashcroft. While under government control, and previous to the influx of population consequent upon the building of the Canadian Pacific Railway, the revenue fell far short of the expenditure yearly.

In 1867, Buie Bros., merchants, built a branch line from Quesnelle to Barkerville, in the Cariboo gold region, a distance of 60 miles. This branch, together with the main line between Quesnelle and Ashcroft, is still operated by the Federal government.

The original expenditure in the construction of the British Columbia section of the Intercontinental line reached the large sum, roundly, of three million dollars.

I have written from memory, yet, doubtless, with comparative accuracy, through having been in the company's service during construction and for some years afterward, and while in charge of Quesnelle office in 1866 becoming the medium by which the news of the successful laying of the Atlantic cable, July 29th, 1866, reached the construction party 400 miles north-west of that point on July 30th, 1866.

THE STEAM END.

By JAMES MILNE.

In a paper read at a former convention of this Association, it was stated that purchasers of electrical apparatus made very careful enquiries as to the efficiency of same, the price being of secondary importance. If this applies to the electrical, why should it not apply to the steam end as well? I am sure that there are very few plants where the proprietors, or those in charge, inquire as to the efficiency of the boilers and engines, the price with these items being the very first consideration, generally.

It is very seldom, in specifications for steam plants, that there is anything said about the efficiency of the boilers, or the water consumption per horse power hour at the engine. This I consider one of the most important points in connection with the steam plant. There are engines running which are supposed to be first-class and up to date, where the water consumption per horse power hour is nearly double what it ought to be, and if the management in some of these plants would go to the trouble of calculating the coal consumption per electrical horse power at the bus, I am of the opinion that the results obtained would simply astonish them. I, myself, have records of the coal consumption of a plant, together with the total meter readings, extending over a number of years, and allowing for the loss on the line, together with that on the generators, and although the plant was a non-condensing one, yet the records there are not out of the way. In another plant where I was making a two days' test as to the relative values of coal, I found the coal consumption per E.H.P. at the bus just double the former plant, which might be considered high by some. This second plant was condensing. The load was of such a nature as to make the engine very unsuitable for the work.

I am inclined to think that builders of engines should be made to guarantee a certain steam consumption per indicated h.p. at say 25% over-load, full load and half load, and that tests should be made to determine if the guarantee has been fulfilled. If the guarantee has been more than fulfilled, let a bonus be given to the builders, and if not fulfilled, so much to be deducted for every 1% below the guarantee; and if it falls below a certain amount, that is to say, the steam consumption exceeds a certain fixed value, the engine to be removed, or the builders to accept a nominal figure for same. I think if means of this kind were adopted we would get engines of a very high order. Engineers, as a rule, are content so long as they get a fine looking card from their engine, but they very seldom from these cards calculate the steam consumption, which is of vital interest.

We have quite a large number of good engine builders in the country, but the number guaranteeing their efficiency is very limited indeed; in fact, I am not aware of any. If tenders are invited for a certain style of engine and the tenderers are called upon to guarantee the steam consumption per B.H.P., the party to receive the contract is the one guaranteeing the least steam consumption per h.p. hour, the cost being of secondary importance. After the engine has been installed and run for some time so as to get down to its proper bearing, carefully conducted tests should be made to ascertain if the guarantee has been fulfilled.

The matter of efficiency of boilers is also one of great importance, but it is not so easily arrived at, owing to the difference in coal. At the same time however, it would not be a very difficult matter to fix on a certain coal for a standard, and to guarantee so many pounds of water evaporated per lb. of that coal. All boilers, I believe, should be sold by the Centennial Standard, and should be capable of developing their rating with easy firing, showing good work with ordinary coal, and should be capable of being forced 50 per cent. above their rating. There was a recommendation something to this effect made by the Committee of Judges at the Centennial Exhibition, the horse power being 34½ lbs. from and at 212°, which is equivalent to 33,305 heat units. We should get an efficiency close on to 80% with good boilers, and this could be roughly determined with anthracite coal, and if we get 12 lbs. of water evaporated from and at 212°, we have approximately this efficiency, the heating value of the combustible being about 14,500 heat units, which is equivalent to 15 lbs. evaporated from and at 212°, therefore 80% of this gives us 12 lbs. With bituminous coals we have not such uniformity, and it is necessary to determine its heating value either by the coal calorimeter or chemical analysis.

After our boilers and engines are installed, we have to face the problem of running them. It has often been stated that men could be got to do anything, men being more easily replaced than machinery, costing practically nothing as it were. I am of the opinion that this is wrong. Cheap men are numerous we know, but are in the long run very expensive. Good men are scarce, and nowhere is this more noticeable than in the boiler room. Good firemen are very scarce, coal shovellers numerous. In my humble estimation, credit is not given to the fireman that should be. If a plant is run fairly economical as far as coal consumption is concerned, the engineer is more apt to get this credit, but as a matter of fact all he does is to turn on the steam and see that the bearings are oiled. Now and again he may walk into the boiler room to ascertain if the fireman is asleep or not.

To have good firing the greatest of skill has to be manifested to get the best results from the coal, and where we are dependent on skill to get first-class results we are depending on a very uncertain quantity. Too much latitude is given the fireman in the matter of coal, and he has it in his power to make or lose nearly a dividend for the company that employs him. Attention is being given to this subject by the largest steam users in the country, whereby the duties of the fireman are being greatly relieved by mechanical devices; their action being positive and not dependent on skill, the machines thus taking the place of the brains of

the fireman. This you will agree is a great step in advance, and makes central station management very independent regarding firemen.

SPARKS.

The Kingston Locomotive & Engine Company have re-elected the old board of directors.

The Whitney Electric Company's works at Sherbrooke, Que., were damaged by fire last month to the extent of \$1,000.

After using acetylene gas in the Methodist church at Leamington, Ont., it has been decided to return to electric light.

At the annual meeting of the St. Martins, N.B., Telephone Co., the former board of directors and officers were re-elected.

A. Schneider & Co., Pearl street, Toronto, manufacturers of electrical machinery, etc., have removed to 106 York street.

Mr. T. A. Crandall, of Picton, Ont., in remitting subscription to the ELECTRICAL NEWS, writes: "I don't think I could get along without your paper."

It is stated that Gordon & Phillips, of Chatham, Ont., will establish a woollen factory at Tweed, Ont., and put in an electric light plant.

The steamer "Lakeside," plying between Toronto and St. Catharines, is shortly to be fitted with a complete new system of electric bells.

The village of Acton, Ont., will probably install a municipal lighting plant. An electrical engineer may be engaged to report on the matter.

The Deschenes Electric Company have submitted a proposition to the council of Ottawa East to supply light and power. The question will be considered at next meeting.

The electric street railway at St. Thomas, Ont., was put in operation last month. The railway cost about \$80,000 and is six miles in length, and the entire equipment is very complete.

The George White & Sons Co., engine and machinery manufacturers, of London, Ont., have recently completed a new building, 175 x 35 feet, in which to manufacture threshing machines.

The village council of Iroquois, Ont., has under consideration a proposal from Mr. Keefe for an electric lighting franchise. Should an agreement be reached, Mr. Keefe will put in the necessary plant.

The employees of the Ottawa Electric Railway recently asked for shorter working days, but were informed by the company that this could only be granted upon a corresponding reduction in wages.

At the session of the Provincial Legislature of British Columbia recently adjourned, incorporation was granted to the Mountain Tramway & Electric Co. and the Nanaimo Electric Light, Power & Heating Co.

An exchange recommends the use of oak bark as a preventive of corrosion in steam boilers. Tests have been made which are said to have proven satisfactory, one or two oak slabs only being put into the boilers.

The Strathroy Electric Co., Limited, have met with so much success that they recently placed an order with the Canadian General Electric Co. for the installation of another 300 light single phase alternator.

The Ashcroft Water, Light and Power Company will erect a power house on the Bonaparte river, about three miles from Ashcroft, B.C., and install an electric plant to furnish light and power to Ashcroft, and for irrigating purposes.

J. R. Goodchild's electric light plant at Amherstburg, Ont., was put in operation last month. The generator is a 600 light Westinghouse of the latest design, the engine 75 h.p., and the boiler 150 h.p. Mr. McLean is electrician.

Mr. O. E. Young, of Magog, is building a small pleasure boat for Mr. L. B. Ward, of Brooklyn, N. Y., to be used on Lake Memphremagog, and an order has been placed with the Jenckes Machine Co., of Sherbrooke, Que., for one of their 7 h.p. Dake marine engines, with boiler to run the same.

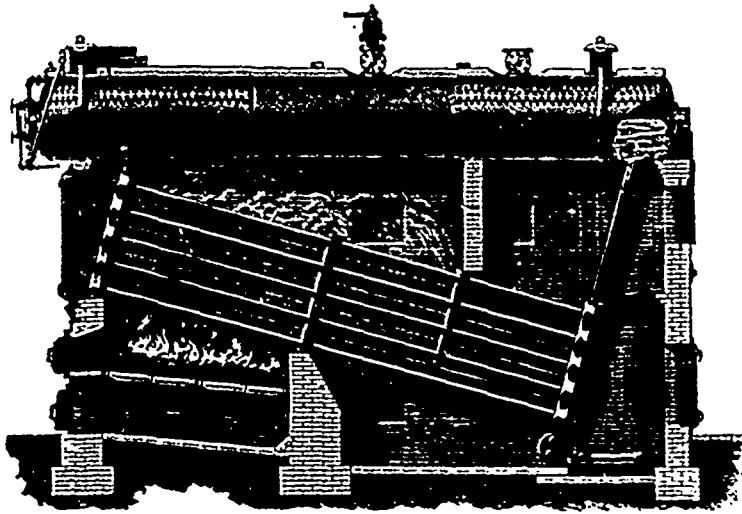
The project to produce water power by the construction of a channel from the Welland to the Jordan rivers has again been revived. Mr. Wm. Pearson, C.E., of Oswego, is said to have pronounced the scheme feasible from an engineering standpoint, and the question of disposing of the power will now be tested. Mr. Pew is the promoter.

The Ottawa Electric Co. have supplied their employees whose duty it is to read meters with a portable electric light worked on the storage battery system. The light is five candle power and will run continuously for twelve hours without change of battery. The article complete weighs only 8 ounces, and the battery may be readily carried in the coat pocket.

The corporation of the town of Granby, P.Q., recently gave the contract for the installation of their lighting plant to the Canadian General Electric Co. This plant will consist of a 100 k.w. monocyclic generator, complete equipment of station instruments, and a 30 light Wood arc dynamo. The contract also includes the complete installation of the pole line, transformers and house wiring required.

The New Brunswick Telephone Company recently elected the following directors: Hor. A. G. Blair, president; F. P. Thompson, managing director; J. L. Black, vice-president; W. E. Smith, secretary-treasurer; Dr. A. A. Stockton, Chas. Fawcett, C. F. Sise, W. T. Whitehead. The directors have decided to replace the present wire on the trunk system between Fredericton and St. John and Amherst, N.S., with copper wire.

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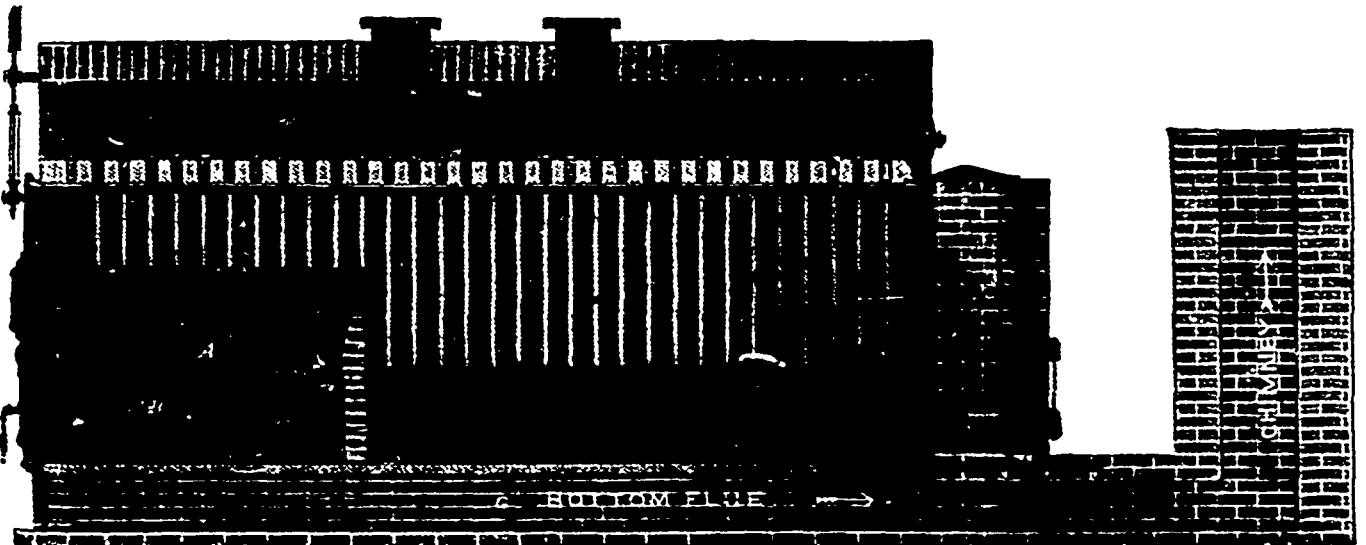
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PROF. C. A. CARUS-WILSON.

It is with much pleasure that we publish herewith a portrait and some particulars of Prof. Carus-Wilson, who recently resigned the McDonald chair of Electrical Engineering at McGill University, Montreal.

Prof. Charles Ashley Carus-Wilson is the youngest son of the late Rev. C. Carus Wilson, Vicar of St. Mark's, Leamington, and grandson of the well known author and philanthropist, the Rev. W. Carus-Wilson, of Caster-ton Hall, Westmoreland. He was educated at Hailey-bury College and entered the Royal Indian Engineering College at Cooper's Hill, near Windsor, by a competitive examination. Two years later he gave up his position at the head of his year, and the certainty of a good ap-



PROF. C. A. CARUS-WILSON.

pointment in the service of the Indian government, in order to devote himself to electrical engineering at home, and subsequently in Paris, Brussels, Antwerp, Vienna and Bucharest, where he lighted up the palace of the king of Roumania. He then went to Cambridge, took his B.A. degree in honours (Natural Science Tripos) in 1887, and the M.A. degree in 1891.

After taking charge for three years of one of the laboratories at the Royal Indian Engineering College, Prof. Carus-Wilson was elected in 1890 to the Mc-Donald Professorship of Electrical Engineering at Mc-Gill University, Montreal. The electrical department of the University was not then in existence, and Professor Carus-Wilson carried through the work of organizing it and equipping the laboratories with great energy and success. The number of students taking this course is now very large, and a practical test of its results is afforded by the work of the graduates in applied science, many of whom already hold with credit important and responsible positions.

During the eight years in which Prof. Carus-Wilson has occupied this chair he has given much attention to original research, especially in connection with the direct current motor. The results of this are embodied in the volume of Electro-Dynamics which Messrs. Long-mans Green & Co., (London and New York) are now bringing out.

Prof. Carus-Wilson left Montreal in April last, and has since been giving a course of Cantor lectures in London on Electric Traction at the request of the Society of Arts.

In the words of the resolution passed by the Faculty of Applied Science at McGill University last April: "Prof. Carus-Wilson has aimed at founding a school of engineering of the highest type, and has made it both his duty and pleasure to encourage in the students that love of investigation which is the only real foundation for any true scientific work. His success as a teacher is best attested by the continued growth of the school and by the prominent positions occupied by graduates in the electrical course, while to the Chair of Electrical Engineering his special researches have given a greatly increased reputation."

MOONLIGHT SCHEDULE FOR AUGUST.

| Day of Month. | Light. | Extinguish. | No. of Hours. |
|---------------|------------|-------------|---------------|
| | H.M. | H.M. | H.M. |
| 1.... | No Light. | No Light. | |
| 2.... | No Light. | No Light. | |
| 3.... | No Light. | No Light. | |
| 4.... | No Light. | No Light. | |
| 5.... | P.M. 7.30 | P.M. 10.00 | 2.30 |
| 6.... | " 7.30 | " 10.20 | 2.50 |
| 7.... | " 7.30 | " 10.50 | 3.20 |
| 8.... | " 7.30 | " 11.20 | 3.50 |
| 9.... | " 7.30 | " 11.50 | 4.20 |
| 10.... | " 7.30 | A.M. 12.40 | 5.10 |
| 11.... | " 7.30 | " 1.30 | 6.00 |
| 12.... | " 7.30 | " 2.20 | 6.50 |
| 13.... | " 7.30 | " 3.20 | 7.50 |
| 14.... | " 7.30 | " 4.20 | 8.50 |
| 15.... | " 7.30 | " 4.20 | 8.50 |
| 16.... | " 7.30 | " 4.20 | 8.50 |
| 17.... | " 7.30 | " 4.20 | 8.50 |
| 18.... | " 7.30 | " 4.20 | 8.50 |
| 19.... | " 7.30 | " 4.20 | 8.50 |
| 20.... | " 7.30 | " 4.20 | 8.50 |
| 21.... | " 7.30 | " 4.20 | 8.50 |
| 22.... | " 8.00 | " 4.20 | 8.20 |
| 23.... | " 8.40 | " 4.20 | 7.40 |
| 24.... | " 9.20 | " 4.20 | 7.00 |
| 25.... | " 10.20 | " 4.20 | 6.60 |
| 26.... | " 11.20 | " 4.20 | 5.00 |
| 27.... | " 11.30 | " 4.20 | 4.50 |
| 28.... | | " 4.20 | |
| 29.... | A.M. 12.00 | | 4.20 |
| 30.... | No Light. | No Light. | |
| 31.... | No Light. | No Light. | |

Total..... 156.30

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(copy.)
THE JUBILEE GRATE BAR CO., TORONTO. Toronto, Jan'y 5th, 1898.
DEAR SIR,--Answering your enquiry as to our opinion of the Jubilee Grates, would say that we have had them in use for over a month, and have found them very satisfactory. We are saving over \$2.00 in our coal bill per day for 10 hours work. With the old grates we could not get steam without using Screened Lump Soft Coal, now we use Soft Coal Screenings, and we are developing about 24 h.p. more than we could with the old grates. You have already taken a memorandum of the tests that were made of the old and the new grates: we have checked over the figures to-day and find them quite correct.
Yours truly,
(Sgd.) THE TORONTO RADIATOR MFG. CO., Limited
Jno. M. Taylor, Secy-Mgr.

THE JUBILEE GRATE BAR CO. of Toronto, Limited,
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MONTREAL

TORONTO

PATENT RIGHTS.

The American Stoker Co. have forwarded to us the following letter, with a request that it be printed in this number :—

The General Engineering Co. of Ontario, Limited, 80 Canada Life Building, Toronto, Ont.

DEAR SIRS,—The American Stoker Co., having an office at Room 54, Street Railway Chambers, Montreal, have submitted to us your circular letter, dated 26th May, 1898, and have also called our attention to an item which you caused to appear in the June number of the CANADIAN ELECTRICAL NEWS, in both of which it is stated that the American stoker now being introduced into Canada by the American Stoker Company is an infringement on certain alleged Canadian patents owned by you, and that as soon as the American stoker is installed in Canada, your solicitors have been instructed to take proceedings in the Exchequer Court of Canada against the user as well as against the manufacturer and importer, and warning the public against the use of the American stoker.

We are instructed by the American Stoker Company to inform you that the stokers manufactured by our clients are protected by Canadian patents, and are not an infringement of any patents legally held by your company.

We are also instructed to inform you that the American Stoker Company have sold and delivered five stokers to the Dominion Cotton Mills Company, and are about making delivery of stokers to other purchasers in Canada, and are prepared to defend any action for infringement or damages which may be brought by your company in virtue of such sales or the use which may be made by the purchasers of these stokers, and we are authorized to accept service of any legal proceedings which you may bring against the American Stoker Company. We have further to inform you that in the event of your company not making good your threats contained in your circular letter and in the article in the CANADIAN ELECTRICAL NEWS, within fourteen days from this date, both of which are calculated to deter prospective users of the stokers from purchasing from our clients, we are instructed by the American Stoker Company to institute legal proceedings against you for damages and for an injunction to restrain you from threatening legal proceedings on the ground of alleged infringement of patents. All other rights are reserved.

Your obedient servants,

MACMASTER & MACLENNAN.

The ratepayers of Hamilton will vote on the question of acquiring the street railway and operating it under municipal control. The questions submitted will be: (1) Shall the city now purchase the Hamilton Street Railway? (2) If the city does not now purchase the Hamilton Street Railway, should the council extend the franchise of the company for fifteen years—that is, until 1928?

SPARKS.

H. C. Baird & Son will probably put in an incandescent light plant at Parkhill, Ont.

The village of Beeton, Ont., has passed a by-law to raise \$3,500 for an electric light plant.

The Hull Electric Company were recently recommended by the coroner's jury to equip their cars with fenders.

Stuart & Harper, Winnipeg, Man., will supply and install a 150 light electric plant in J. Y. Griffin & Co.'s packing house, Winnipeg, Man.

The Electric Co. of St. Johns, Nfld., are increasing their plant, and have ordered a 150 horse power tandem compound engine from the Robb Engineering Co.

The special committee appointed to consider the question of the establishment of a civic electric light plant for the city of Hamilton have recommended that an expert be engaged to report on the subject.

An electric railway fare box which not only receives the ticket, but registers the fare, has been invented by E. B. Nagle, of Ottawa. The device is claimed to be simple, cheap and complete in every particular.

The Goldie & McCulloch Co., of Galt, offer prizes of from \$50 to \$100 for suggestions by their employees regarding the improvement of tools, machines, and for advanced ideas conducive to greater efficiency of the works.

The electric light station at Norwich, Ont., is about completed. It is a one-story structure, 25 x 52 feet, with storage addition. The power plant consists of an 80 h.p. boiler and 40 h.p. engine. The latter may be increased later.

A proposal is to be made to the city council of St. John, N.B., to secure legislation to take over the property, privileges and franchises of the St. John Street Railway Company, to be conducted by the city in the interest of taxpayers.

The agreement between the city of Brantford and the Brantford Electric and Operating Company for street lighting has been signed, the franchise being for ten years. It is said the company will expend immediately about \$10,000 in additional plant.

Mr. John Forman, of Montreal, has just completed the installation of 65 enclosed arc lamps in the store of John Murphy & Co. in that city. It is claimed that this is the first time that these lamps, lighted by an alternating current, have been used in Canada.

The Grand Falls Power Company have decided to proceed at once with the development of the water power of the Grand Falls of the St. John river, in New Brunswick. Senator Proctor, of Vermont; Mr. James Manchester, Mr. G. F. Baird and Col. H. H. McLean, of St. John, are interested in the project, and it is proposed to develop about 80,000 horse power.

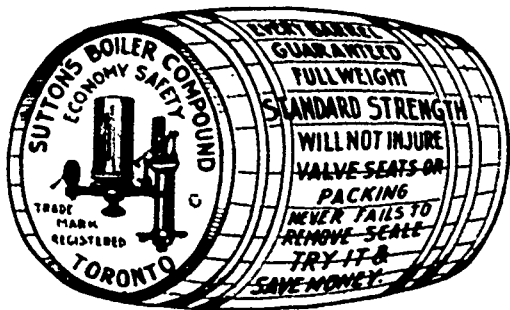
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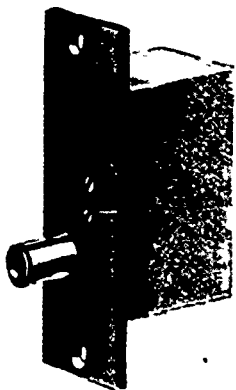
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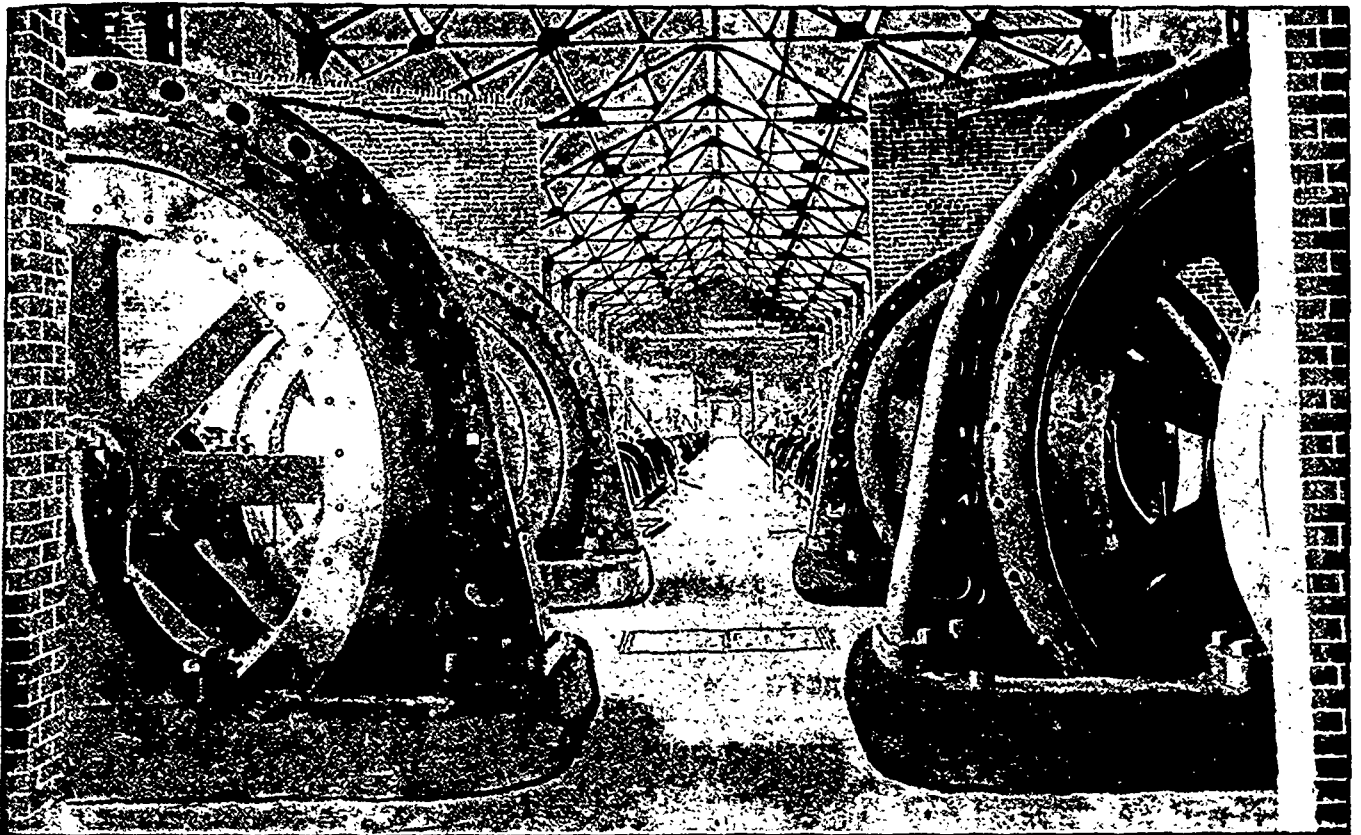
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THE CROFTAN STORAGE BATTERY.

THE Croftan Storage Battery Company, believing that Canada offered a profitable field for operations, have opened a branch at 22 Sheppard street, Toronto, Ont., where they are manufacturing storage batteries which they claim are superior to all others in lightness and efficiency, with an equal amount of durability. The battery is the result of five years' study and experiment by Dr. Croftan, a prominent physician of Chicago, assisted by Mr. J. K. Pumpelly, one of the best known storage battery experts in the United States, and the inventor of the Pumpelly Sorley cell.

In the construction of the Croftan plate chemically pure lead only is used, all foreign substances such as antimony being discarded, for the use of such substances (and they are quite commonly used) shortens the life of the battery, leading to rapid disintegration. The plate is formed of minute particles of lead, deposited to the desired thickness upon a perforated sheet of pure rolled lead by means of a spray, the perforated sheet having 8,100 perforations to the square foot. The sprayed lead forms perfect contact with the perforated lead, and is further secured by perfect union through the perforations. The plate is then run through a corrugating roller, by means of which interces are formed for the reception of further active material. Then, by means of an electro chemical process, the plates are converted into spongy lead, and peroxide plates are formed by further conversion of the spongy lead plates.

A plate is by this means formed whose entire surface is active material and whose "grid" or inactive portion is the perforated lead sheet in the centre, being less than 15% of the entire weight of the plate. All the joints in the battery are burned, no solder whatever being used; thus disintegration or sulphating at the joints is avoided.

The Canadian branch is under the control and management of Messrs. Rein Wadsworth and W. M. H. Nelles, with E. B. Arnold, a brother of B. J. Arnold, consulting engineer of the Electric Storage Battery Co. of Philadelphia, and W. L. Arnold, of the Siemens & Halske Electric Company of America, manager of the manufacturing department. The Croftan battery is claimed to be especially adapted for lighting plants and all work requiring the use of large storage batteries, while their smaller batteries, on account of their lightness and great efficiency, make a perfect cell for the use of doctors and dentists, and are most suitable for carriage lamps.

The Goldie & McCulloch Co., of Galt, Ont., have shipped a Wheelock engine, weighing 19,440 pounds, to the Montreal Belt Line Railway Co.

JAMES MILNE

Mem. Can. Soc. Civ. Eng. Late Gen. Supt. Toronto Incandescent Light Co. Teacher Electrical Engineering, Steam and Steam Engine, Toronto Technical School.

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TRADE NOTES.

The Eugene F. Phillips Electrical Works, Limited, of Montreal, are supplying all the wire for the transmission plant of the Cataract Power Company, of Hamilton, which plant was described in our June issue. This order represents some 150 miles of wire.

La Compagnie Manufacturiers et Electrique de Montmagny have given an order to the Canadian General Electric Co. for a 100 k.w. monocyclic generator, which will be operated at a potential of 2,080 volts, together with the necessary station instruments for the operation of the plant.

The Hudson Bay Co. have given an order to the Canadian General Electric Co. for the installation of a complete lighting plant for their stores at Calgary. The plant will consist of one of the Canadian General Electric Co.'s latest four-pole type generators, having a capacity of 9 kilowatts. Messrs. Goldie & McCulloch Co., Limited, of Galt, are supplying the engine and boiler required for this installation.

The J. C. McLaren Belting Company, of Montreal, by means of a small folder, invited visitors to the Canadian Electrical Association convention to make an inspection of the belting in the generating station of the Montreal street railway system, transmitting 7,000 h.p. This belting, which was supplied by the above company, consists of twelve 24-inch three-ply belts. The number of hides used for its manufacture was 1,630, and the total weight of leather 15,000 lbs.

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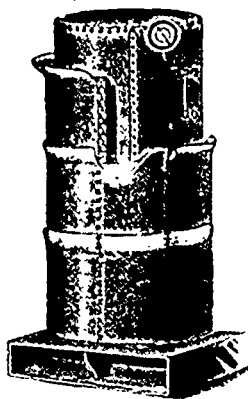
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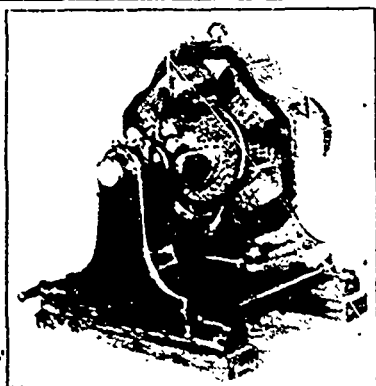
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