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CANADIAN ELECTRICAL ASSOCIATION CONVENTION
TORONTO, JUNE 17, 18, 19, 1896

CANADIAN ELECTRICAL NEWS AND STEAM ENGINEERING JOURNAL

OLD SERIES, VOL. XV.—No. 6.
NEW SERIES, VOL. VI.—No. 6

JUNE, 1896

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CANADIAN

ELECTRICAL NEWS

AND

STEAM ENGINEERING JOURNAL.

VOL. VI. JUNE, 1896 No. 6.

THE ELECTRIC LIGHT INSPECTION ACT.

REFERENCE was made in the May number of the ELECTRICAL NEWS to complaints regarding the operation of the Government Electric Light Inspection Act. Pursuant to the promise then given, further inquiry has been made, the result of which shows the system of government inspection to be extremely unpopular with the electric lighting companies throughout Canada. The large number of such companies who have written us their opinions on the subject take the ground that a system of compulsory inspection by the government is unnecessary, and that no equivalent is given either the companies or their customers for the yearly fee which the former are compelled to pay the government. Companies doing a limited business in competition with coal oil in small towns and villages are especially bitter in their complaint of the uselessness and injustice of the system.

With the object of eliciting an expression of views upon the subject, a copy of the following circular was recently mailed to the electric companies throughout the Dominion:

OFFICE OF
CANADIAN ELECTRICAL NEWS
AND
STEAM ENGINEERING JOURNAL.

Confederation Life Building,
TORONTO, May 1st, 1896.

DEAR SIRS:- Having lately heard some dissatisfaction expressed with the system of electric light inspection put in operation last year by the Dominion Government, I would feel obliged if you would kindly favor me with your opinion, on the line of the undermentioned inquiries, as to the extent to which you consider the operation of the system advantageous and satisfactory.

In case it is found to be defective and burdensome on the companies, the ELECTRICAL NEWS will endeavor to have it improved or abolished.

What is your opinion of the present system of government inspection of electric light? (a) Is it an advantage to the seller?

(b) Is it an advantage to the consumer?

Is the annual inspection fee in your opinion a fair one?

Has the inspection been productive of any better understanding between seller and buyer?

Are the consumers more satisfied with their bills now than they were prior to the date when the inspection system went into operation?

What is your experience of the performance of direct current mechanical meters with commutators, after being sealed up by the government seal? Do you find them slow?

What is your general opinion as to the advisability of government interference between buyer and seller? Would you consider the competition between different methods of lighting a sufficient safeguard of the interests of the consumer even in places where there is no gas, where the ideas of the community are about the size of a coal oil lamp, and where electricity has of necessity to be sold cheaply enough to be an inducement for its adoption?

Remarks:

C. H. MORTIMER, Publisher.

The large number of replies received to the above inquiries, and the very decided language employed in expressing disapproval of the inspection system, are, as already stated, evidence of the widespread feeling of indignation which prevails as a result of the injustice to which the lighting companies feel they are being subjected. In order that the Inspection Department may see exactly the condition of affairs, we print verbatim the following opinions:-

ENGINE AND DYNAMO ROOM, INCANDESCENT STATION, TORONTO ELECTRIC LIGHT CO.

"Our opinion is there is no necessity for such interference."—St. Marys, Ont., E. L. Co.

"The Government have no right to interfere, as there is not the slightest call for such. Government inspectors are not educated for their position. Should any company be in opposition to the government, the officials could injure their business. Have already expressed our views very strongly to ministers of the crown in opposition to the system of inspection. Nothing less than an imposition."—Kemptville, Ont., E. L. Co.

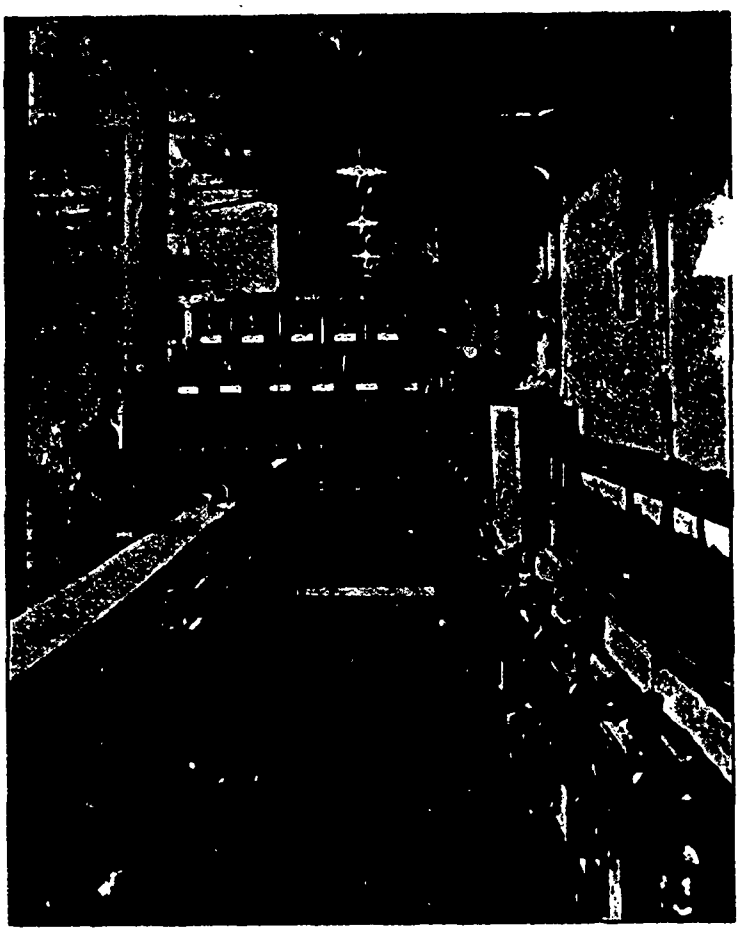
"(a) Yes, if we could induce our customers to adopt it. (b) No, not when compared with a flat rate. Its an unfair tax for which no benefit is given. There is no gas here, but we find we have to compete against the cost of coal oil, and this necessarily keeps the price down or we could not get the business. This appears to us to be sufficient security to the consumer. When the price is

not satisfactory they cannot be compelled to use electric light."—Citizens Telephone & Electric Co., Rat Portage.

"The biggest fraud on earth—an advantage to no one. Never saw the inspector; has never been here. We do not use meters at all. Rent by the year, and consumers use as much current as they want. Do not approve of government interference at all. Believe this law was made more for the purpose of furnishing some hungry politician with an easy and lucrative position than for any benefit it might confer on either buyer or seller. It is the biggest farce we know of."—Cayuga, Ont., Lt. & Power Co.

"We consider this inspection fee one of the most unfair things that was ever adopted. If we took money from any person without giving him an equivalent better than what we get for this inspection fee, we would feel that we had stolen the money. The inspector came and said, 'I want $25.00; I don't know anything about the electric plants, but I must have the money.' So he got it, and that is the last we have seen of the thing and is likely to be until they want more. It does not do any good in small places at least; it is too bad. Kindly do what you can to have it abolished altogether."—

"We have been expecting inspection of meters for the past year, but have not got it yet; cannot say whether same will be satisfactory. The fee is not a fair one—it is altogether too high. The competition in the lighting business is in most places very keen, and there is no danger of the public being overcharged for light. A meter of any kind is by the consumer generally considered an unreliable machine, and as one of those having to do business by meters, we think the inspection by government a good thing to fall back upon, and will to some extent satisfy the consumers." People's Electric Co., Windsor, Ont.



SWITCHBOARD, INCANDESCENT STATION, TORONTO ELECTRIC LIGHT CO.

"(a) (No, we run all flat rates.) We get no value. Have never seen or heard from inspectors except to collect fee. Where current is sold by meters, and meters are inspected and value given by inspectors for work done, there is some excuse for collecting an annual fee, but it is certainly a hardship to be compelled to pay a fee to a department which is of no earthly use in any manner or form. This applies to all stations selling current on flat rate basis."—Gananoque E. L. & Water Supply Co.

"I do not think the government should interfere. It seems to me to be only a scheme to raise revenue, as we have paid $25.00 for a registration fee and so far have had no inspection, nor do we know who the inspector is for this district. It also seems, in the case of municipalities, a farce for the Provincial government to give power to establish lighting systems, and then for the Dominion government to say we will charge them a certain sum for availing themselves of the legislation enacted by the provincial authorities."—J. N. Christie, Town Clerk, Mitchell, Ont.

"We paid our license of $25.00 and have had no inspection up to the present time. The only thing we know about it is, we are $25.00 out.—Stratford Gas & Electric Co.

"There should be no interference. If any one wants government or any other inspection let him get it and pay for it. Why should the government compel me to pay a registration fee for selling electricity for lighting purposes and allow others to sell coal oil and other illuminants without paying a fee? The government gives no value in return for the registration fee, and money taken without value given is simply robbery.' A. Groves, Fergus, Ont.

"We have paid $25.00 and not received a single cents' result. It is simply robbery of small plants of villages or towns. We do not sell by meter, and there is really nothing for a government inspector to do. There is further no advantage to buyer that we can see, because if they cannot afford electric light they need not take it."—W. Moore & Sons, Meaford, Ont.

"Do not think it necessary in small places, even where there is no competition but oil, as prices are so low there is not a living profit to be made. The yearly government fees are altogether too high for small plants." Stanstead, Que., E. L. Co.

"We only run the arc system of lighting and therefore consider inspection a perfect farce. You can only get so many amperes out of a certain wound machine, which during inspection, can be run to full amperage but with a self adjusting lamp running and producing a clear light on any current from 4 to 12 amperes, it can easily be seen that government inspection won't amount to anything or be any safeguard. Competition will do it, and nothing else. The fact is the move is calculated to close out small plants, and set back our villages into the old Egyptian darkness."—Owen Sound Electric Illuminating & Mfg Co.

"(a) No, it only takes money from him and gives nothing in return. (b) Not that we have been able to find out. We think it a humbug; the party that inspected our plant did not know an alternator from an engine, but sat in our office and wrote just what we told him about our plant, and charged us $10 for it."—Thamesville E. L. Co.

"(a) Only in case of controversy. (b) Yes. Do not know what inspection fee is for. Have not been operating long enough to say whether inspection is productive of better understanding between seller and buyer."—Peterborough E. L. Co.

"(a) It is of no advantage to the seller or buyer in our case as we use no meters. The government taxes us $25.00 annually, which we consider most unfair as we get no return therefor whatever. The buyers are perfectly satisfied and many of them do not know that such a thing exists. We consider that in towns of this size where the light has of necessity to be sold cheap, that there is no reason whatever for government interference, and we can see no valid reason why we should be compelled to pay a revenue tax of $25.00 annually, when we get no return whatever for the money paid out. If we were in the tobacco or liquor trade, doing a business which some people might consider was derogatory to the welfare of the country and upon which the profits were large, we would not mind the tax. We cannot understand why the manufacturers of electric light should be compelled to pay a government tax to the revenue department any more than the manufacturers of furniture or agricultural implements. If the consumers were dissatisfied with the light given or with their meters, why could not an inspector be appointed to rectify and measure the same, and be paid by the company or the purchaser for his work without compelling us to pay out $25 annually, same as an hotel keeper or a man wanting a fishing license. We would

favor the removal of the tax which we consider unnecessary and wrong."—Citizens' Electric Light Co., Smiths Falls, Ont.

"(a) We do not think so. (b) We do not think it would be. If the consumer be dissatisfied, he could discontinue at any time. We consider the government has no more right to interfere in this than with the buyer and seller of any other commodity. If parties don't want the light they need not buy it. We think the inspector would only tend to make or cause trouble. For instance, if the inspector arrived here during high water, we could at such time

ONTARIO PARLIAMENT BUILDINGS, TORONTO.

perhaps not give the buyers 16 c. p. We cannot see that any good would come to anyone except the inspector." Robertson, Rowland & Co.

"(a) No. (b) No, we will have to charge higher rates. We do not use meters. The fee should be only nominal in small towns like Brampton. Charge should be larger where a large quantity is sold. Five dollars would be ample fee for our town."—J. O. Hutton, Brampton, Ont.

"We do not know anything about the working of the inspection act as yet, except that we had to pay the fee, $25.00. We do not consider that in a town like our own that anything of the kind is necessary. We are obliged to make the rates low and keep the bills small, often cutting the amount down without saying anything about it, as our people really cannot afford to pay but a limited amount as a rule, and we govern ourselves accordingly. From our experience we would say local conditions are quite sufficient to keep business right."—Carleton Place E. L. Co.

Our only competitor here is coal oil, and in order to induce the use of electricity we are obliged to make the price very low $4 is the highest price we get for 16 c. p. incandescent lamps by the year. We cannot see any advantage to the buyer from government interference. We presume it was to protect him the system was adopted. In our case especially, where no inspection was made, the buyers could not have been benefitted, and even had there been an inspection and we were found to be using a less voltage or amperage than we say we do, we would then simply say, 'That is our price for whatever voltage or amperage it is. So long as the light is satisfactory you can keep it, and when it is not we will take it out." John Beaman, Chesley, Ont.

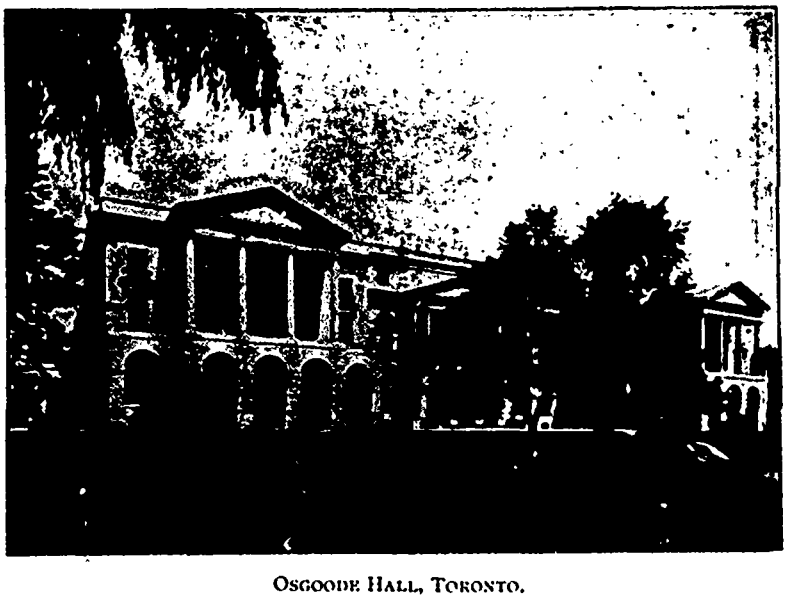
"(a) Cannot see that it is. (b) We have not seen the advantage. Fees too arbitrary. Many companies not paying expenses. We find meters after being sealed run slow and some do not go at all. Do not consider that the electric lighting industry has arrived at a point where it requires government inspection." Sherbrooke Gas & Water Co.

"So far as we are concerned we have seen no beneficial effects from the act. We were simply taxed $20 for our plants and that is all we ever heard about it. Therefore we consider this inspection fee as only a piece of imposition." Lakefield E. L. Co.

"(a) Yes, it saves us a great amount of trouble with our customers. (b) Yes, because he can find out whether his meter is correct. The fee is not a fair one. Five dollars is enough. Decidedly the inspection has been productive of a better understanding between seller and buyer it has settled all disputes, and we think the buyers are more satisfied with their bills. About 10 per cent. of meters run slow; we seldom find one running fast. We are decidedly in favor of some government supervision over all lighting companies gas as well as electric but we consider the present scale of fee charged for inspecting electric meters is too high, and in the interest of the consumer as well as the companies should be reduced at least 50 per cent. The London Electric Co.

(a) So far as towns and villages are concerned, as they get no returns from it whatever, inasmuch as their meters are never inspected, consequently it cannot be of any benefit, unless it might be where a dispute arises between the buyer and seller, when the inspector might be called in to decide the merits of the case. (b) No. Why should a small village like Eganville, for example, where there are two electric light companies, be compelled to pay $50 to the government as a direct tax and get no returns from it, whereas the city of Ottawa, with one large remunerative plant only pays $25 into the public treasury and yet have the advantage of having their meters inspected regularly. There is no better understanding between buyer and seller because there is really no inspection, and the consumers do not so much as know that there is an inspector. We never had a meter sealed the only sealing we ever had was the sealing of our $25. My opinion is that a competent inspector should be appointed to whom all matters in dispute between the sellers and consumers should be referred, but other than that I see very little use for one." A. A. Wright, Renfrew, Ont.

"(a) It is not. (b) No. No better understanding between seller and buyer than before. Meters do not work satisfactorily



OSGOODE HALL, TORONTO.

without periodical inspection. Competition of other methods of lighting is ample to safeguard the interests of the consumer. Government interference is burdensome and unwarranted. Hamilton E. L. & Power Co.

"We have no inspection at Joliette. We sell our lamps so much a year, and the consumer must be satisfied with the light the corporation furnish." A. L. Marsolais, Secretary.

"(a) It is no advantage to the seller. The customer compares his bill with the size of his gas bill and cares nothing whether his meter is inspected or not. (b) No, because the companies are

not a charitable institution, and the tax must eventually be paid by the consumer. The fee is not a fair one. There is no better understanding between seller and buyer. The customer says he does not care a hang for the meter being inspected; he says, "Give me cheap light or I will go back to gas. He is no better satisfied with his bills than before. Sometimes the meters go and sometimes they don't. This country is too much governed and so are the cities. There is altogether too much interference with the liberty of the subject and most of it is done in the interests of blood sucking parasites of the government, both state and municipal, and not to the advantage of the already overburdened taxpayer. Toronto Electric Light Co.

"(a) No. (b) No. The fee is not a fair one. No better understanding between buyer and seller. In this small community, where electric light must be nearly as cheap as a coal oil lamp, it is difficult to get a fair price to make a plant pay expenses. Strathroy E. L. Co.

"(a) No. (b) No. Inspection fee not a fair one. No better understanding between seller and buyer. We have no meters in use. The government should not interfere. I consider the Inspection Act of no use to any person, and it should to my mind be abolished at once. J. B. Kelly, Blyth, Ont.

"(a) No, as his lights will cost more, therefore he will not be as well able to increase his business. (b) No, because he will have to pay more for his lights. Fee too high in my case, as no inspection has been made. I do not think there is much use for a government inspector; it is only creating a government office which takes a lot of money from owners of electric light plants without any value being given in return. I think with gas and coal oil at present prices, the interests of the consumer are perfectly safe. D. McIntyre, Paisley, Ont.

"(a) No, it is a disadvantage to the amount of the tax collected. (b) No, as we have to charge more to make up for the tax. It is a useless expense. We do not use meters. We have to sell very low to compete with coal oil. With the various illuminants for shop lighting, no man is compelled to use electric light, therefore the seller must make electric lighting an object to the buyer, both in cheapness and efficiency of light. Hamilton & Proutt, Forest, Ont.

Scene in Reservoir Park, Toronto.

"In my case it was simply highway robbery. No advantage to either seller or consumer. Inspection fee not a fair one. Consumers no better satisfied. No experience with meters. This is a case of sticking a nose in where it was not asked for. Last year I paid a fee under threat of a heavy fine. At the same time I had not a single meter in public use, and the plant has never been inspected in any way. We have no agreements with private firms, but put in lamps by the month and get a settlement each month. The lamps must all give the best of satisfaction before we can hold the job. Any one that isn't blind can tell whether a lamp is giving enough light by simply looking at it. In my case it has not made one iota of difference, and if you can find one single user of mine asking for inspection, I will give you the amount of the fee. As there was no value given I believe I could resist payment in court. J. Warner Freure, Port Rowan, Ont.

Queen's Avenue, Toronto.

"(a) It is certainly no advantage to the seller. (b) It is no good to the consumer. The inspection fee is not a fair one. The consumers are no better satisfied than before. We find the meters slow, and if anything goes wrong with meter there is no way of correcting it, and the station may be out of its just revenue for a long time. We think the lighting rates in Ontario at least very reasonable, and fully 50 per cent. lower than for the same service on the American side. What industry have we to-day that is a poorer investment than electric lighting? We consider the lighting rates low enough without competition, but this same competition will always be the means of keeping the price low enough." Water, Light & Power Co., Burk's Falls, Ont.

"We do not use meters on our lines and therefore do not figure in the inspection question. We recognize the right of the consumer to be protected from inferior light, both electric and gas, and the consequent duty of the government to furnish such protection. Where there is sufficient competition we believe the necessity for such interference would be greatly reduced almost to the vanishing point." Stormont Electric Light and Power Co.

"I know but little of the workings of the Act. The only experience we have had with it is to pay the annual fee or tax. Our meters have not been tested by the Government Inspector, though we got notice that he was to have been up this way last December." J. W. Schell, Electrician, A. Walker & Sons, Ltd., Walkerville, Ont.

"Government inspection stops all disputes as to correctness of meters, and prevents friction between company and consumer. No inspector has yet been appointed in this district. Manitoba Electric and Gas Light Co., Winnipeg.

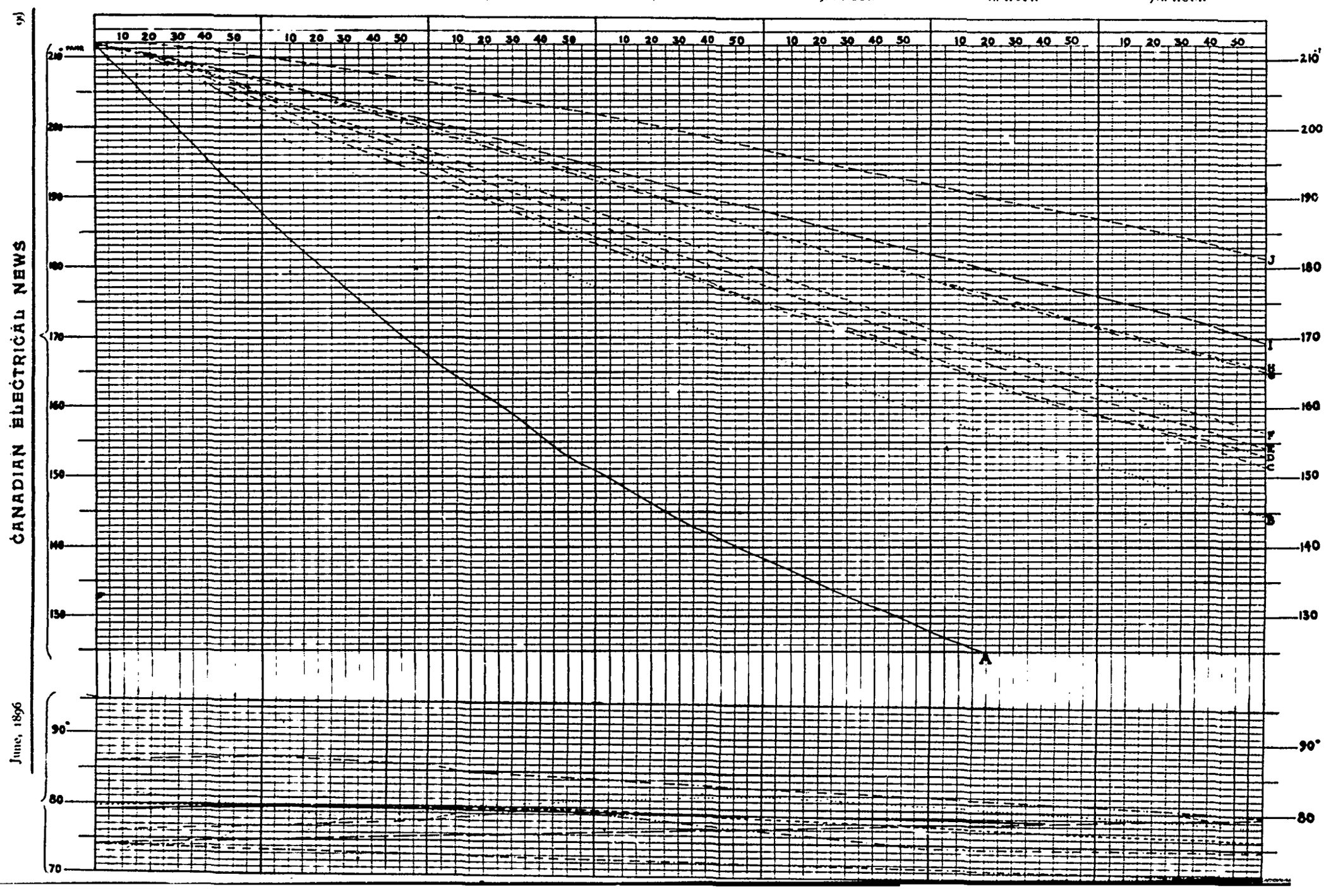
"Our general opinion is that the government should not interfere at all." Stayner E. L. Co.

"We think the act is all right in cities of 25,000 or more inhabitants. It seems a hardship and a useless one in small communities. Considering that gas inspectors do the work without extra pay, and that meters are brought to them and taken away and current furnished to them free of charge, the fees are too high."—Ottawa Electric Co.

DIAGRAM OF EXPERIMENTS WITH BOILER COVERINGS.

Reproduced from Canadian Pacific Railway Company's Chart.

[For particulars see next page.]



CANADIAN ELECTRICAL NEWS
June, 1896

EXPERIMENTS WITH BOILER COVERINGS.

On the preceding page will be found a reproduction of a diagram of experiments with boiler coverings made by the Canadian Pacific Railway Co. to test the values of various compounds as non-conductors of heat.

The order in which the experiments were made, and the materials tested were as follows:

1st	Expt.	Tank uncovered	
2nd	"	" with air space of ⅞ in. next tank, wood lagging ⅜ in. thick, and outer coat of Russian iron	H
3rd	"	" same as in 2nd Expt., but with Asbestos woven cloth ⅛ in. thick, inserted in the ⅞ in space and placed next tank	I
4th	"	" covered with Plastic Asbestos Compound, and outer coat Russian iron Comp. 1½ in. thick	
5th	"	" covered with Sectional Magnesia Blocks, and outer coat Russian iron Comp. 1½ in. thick	G
6th	"	" covered with Patent Mineral Comp sition, and outer coat Russian iron Comp. 1½ in. thick	C
7th	"	" covered with Plastic Asbestos, taken off C. P. R. Boilers, and outer coat Russian iron Comp 1½ in thick	B
8th	"	" with air-space of 1½ in. next tank, air tight iron c at 1/16 in. full thick and outer coat Russian iron Comp ½ thick	E
9th	"	" covered with Patent Mineral Composition. Comp. 1½ in. thick	F
10th	"	" " " Mica Boiler Covering... " 1½ "	J

The position of the various coverings on the chart may be found by the corresponding letters.

It will be seen that water at 212° was used, the relative value of the coverings as non-conductors being determined by the number of degrees of heat which escaped through the different substances and the consequent cooling of the water in a given time. A reference to the chart shows that ten experiments were made. It will not be necessary, however, to refer to all of them, as the results of some were so unimportant, as in experiments 4, 6 and 9, as to render them of little interest or value. It is only necessary to say that the trials were made under as nearly similar conditions as possible, as will be seen by the diagram of the atmospheric temperatures during the tests. The readings were taken from thermometers passed through the coverings and down into the body of the water.

The chart shows the loss of heat in the uncovered tank up to the 5th hour only, and to make a fair comparison the others should be taken for same time. The temperature at beginning of each test was 212°, and the following table shows the temperature at end of fifth hour, the loss in five hours, and the loss in the fifth hour:

	Loss in 5 hours.	Temp. at end of 5th hour.	Loss in 5th hour.
Bare tank	84°	128°	11°
Asbestos compound	53°	159	9°
Sectional magnesia blocks	33¾°	178¼°	7°
Wood lagging and air space	"	"	"
Asbestos and wood	30°	182°	6°
Mica	20°	192°	5°

The mean temperature of the surrounding atmosphere during the 5th hour may be taken as having been 78°.

The fairest comparison of the merits of the coverings is made by considering the loss of heat in one hour per degree of difference of temperature between the tank and its surrounding atmosphere.

The following table shows this worked out:—

	Mean temp. during 5th hour.	Difference between tank and atmosphere.	Loss in 5th hour.	Loss in 5th hour per degree of difference of temperature.
Bare tank	133½°	55½°	11°	.198
Asbestos comp	163½	85½°	9	.105
Sectional Magnesia blocks	181¼	103¼°	7°	.0674
Wood lagging and air space	181¼	103¼°	7°	.0674
Asbestos and wood	185	107	6°	.056
Mica	194½	116½°	5°	.0428

The following table shows the value of the coverings as compared with the bare tank.

Amount of heat which escapes from the bare tank was

1.88	times	greater	than	through	the	Asbestos compound.
2.92	"	"	"	"	"	" Sectional Magnesia blocks.
2.92	"	"	"	"	"	" Wood lagging and air space.
3.53	"	"	"	"	"	" Asbestos and wood.
4.62	"	"	"	"	"	" Mica.

Mica shows by far the best result as a non-conductor of heat, and saved

245	per cent	as	much	heat	as the Asbestos compound.
157	"	"	"	"	*Sectional Magnesia blocks.*
157	"	"	"	"	Wood lagging and air space.
130	"	"	"	"	Asbestos and wood.

It will be seen from the diagram that the loss by radiation through "sectional magnesia blocks" and "wood and air space" was practically the same, there being less than ½° Fht. between them at the expiration of the test.

It will be seen that asbestos cement, which is in very general use, particularly on marine boilers, showed infinitely the worst results. There seems no room for doubt that this is largely attributable to the fact that it is a solid composition, and lacks one of the most vital requirements of successful non-conductivity, i. e., "diffused air." That the air must be diffused or separated into minute cells is strikingly illustrated in experiments 2 and 3. In the first, wood and air space of ⅞ inch next to the tank, as used on locomotive boilers, the loss per degree of difference of temperature was .0674°. When the same air space was filled or packed with asbestos fibre the loss dropped to .056°. In the case of mica, the air theory appears to have been carried to the furthest possible extent, the whole covering forming a veritable air cushion, each leaf or film of mica being separated from the next by minute corrugations, the whole mat presenting the appearance of a porous flexible quilt. The value of this ingenious arrangement was amply proved in the experiments in question, when the loss per degree in difference of temperature was only .0428°. That this is one of the most important qualities of a covering has long been recognized, and a large number of patents have been granted for devices intended to obtain it. But in nearly every instance it has been at the expense of the material. The great differences in the value of the coverings tested by the C.P.R. is due largely to the manner in which the valuable properties of diffused air as a non-conductor have been utilized.

The following table will give some idea of what the loss of power has been found to be from uncovered steam-pipes with the steam at 75 lb. gauge pressure:

2	inch pipe..	1	horse	power	loss	for every 132	feet long.
4	"	1	"	"	"	75	"
6	"	1	"	"	"	46	"
8	"	1	"	"	"	40	"
12	"	1	"	"	"	26	"

About 90 per cent. of this waste is easily prevented by a proper covering of the pipes. When it is considered that this loss occurs at the comparatively low pressure of 75 lbs., it is apparent that with steam at 130 lbs. and 140 lbs. and higher, the loss becomes very serious, and the necessity for preventing as much of it as possible is a matter of urgent importance.

The accompanying diagram very clearly demonstrates what can be done in this direction by the use of various compositions, as it clearly shows the qualities and capabilities of each. It is possible that the question might arise as to whether the great differences between these substances would still be found had the trials of the C. P. R. Company been made with higher temperature than 212°.

It appears, however, from published reports of trials made some months ago by the engineers of the Boiler Inspection and Insurance Company of Canada that these differences did exist; that company subsequently issued a special circular on the whole matter, as one of particular interest to steam users. It is stated further that the Grand Trunk Railway Company have lately concluded a series of trials, on a large scale and under high steam pressure, of a number of boiler coverings, including the best of those tested by the C.P.R. and the Boiler Inspection Company, the difference between them being even more marked. As no data, however, is as yet available of these trials, it is impossible to speak of them with accuracy. It is encouraging to notice the increasing attention the whole subject is receiving, in view of the imperative necessity for observing the strictest economy in power and coal and the prevention of all unnecessary waste.

THE ELECTRIC LIGHT INSPECTION ACT.

To the Editor of the CANADIAN ELECTRICAL NEWS.

SIR,—Referring to your article in the May publication in respect of complaints as to the administration of the Inspection Act, permit me to offer a few observations in reply thereto.

You state that "there seem to exist doubts in the minds of some regarding the necessity for such a system." I can very well believe such to be the case. I remember distinctly when the Weights and Measures Act was first put into operation there was manifested very decided opposition to it by the traders throughout the country, who could see no necessity for the interference by Government with their concerns. And in like manner the gas companies saw no necessity for the law when extended to cover the sale of their product. But where will we find the trader of any respectability to-day, or the gas company that will not say that the legislation in question has been wise and beneficial to their interests?

We have on exhibition in the Department here some specimens of what traders in early days considered proper contrivances as weighing machines. Let me give you one illustration out of a large number. It is intended for a set of scales. The beam consists of an old whiffle-tree, such as may be found lying around in almost any farm yard. The centre or back hook was used for the suspension and the pans were hung from the hooks at either end. The pans are made of two pieces of one inch pine board about one foot square, and are suspended from the whiffle-tree by pieces of rope of varying sizes. The owner of this contrivance doubtless considered the confiscation of it by the Department as a most unwarrantable act—in fact had very serious doubts as to the necessity for the system.

In like manner with the gas. The law required that illuminating gas should be of a certain standard of purity and that a Bunsen burner consuming five cubic feet per hour should produce a light equal to 16 standard candles, and that the measure or apparatus through which it was sold should be accurate. At first it was found most difficult to get the companies to satisfy the requirements of this standard—about 12 c.p. being the best they could then produce. Gradually, however, they did satisfy the demand and now find no difficulty in giving 18 to 20 c.p. to the five cubic feet. It is not claimed, of course, that the Inspection Act is entitled to all the credit for these improved conditions, but we do contend that it was a very important factor in bringing them about.

As with the question of gas and gas meters, so it is with respect to electricity and electric meters. The ordinary weights and measures standards could not be used to verify the apparatus through and by which electricity is sold, consequently it was found necessary to legalize a system of standards and verification suited to the new conditions that existed with respect to this commodity. It is, as has often been explained before, simply an extension of the weights and measures system to cover the sale of electricity. This system has been in operation for twenty-five years, and the Government and Parliament of Canada has not up to the present time received a single petition from any section of the people of the country asking that it be abolished.

As to the methods that have been adopted for the inspection of electric meters and pressure, this is, of course, a legitimate subject for discussion between the electric lighting industry and the Government. It was thought at the outset that the gas inspection service could be used advantageously in carrying out this new work. The Department is still of this opinion. The first year's work has been mainly that of organization. The inspectors have been confined almost exclusively to the verification of meters at headquarters, thus enabling them to become acquainted with the use of their instruments and the handling of the electric current. During the ensuing year it is intended that each inspector shall visit each electric lighting station at least twice, and oftener if needed, to verify meters, compare voltmeters and test the pressure under full load.

In respect of the registration fees, about which a good deal of complaint has been heard, the writer is free to admit that for the smaller companies it is somewhat high. Acting under this impression in September last the Department made a rebate of fifteen dollars to all companies having installations of 500 lamps and under. Since that time the Department has been considering whether in future this reduction can be extended to all companies having installations of 5,000 lamps and under. This would include all, with the exception of about a dozen of the larger companies.

In connection with the testing of meters it is claimed that meters, after having been sealed by the Government Inspector, have stopped altogether, "owing to the formation of a substance on the commutator." Is it contended that this formation is due to the fact that the meter has been sealed by the inspector and not by the company? Is it claimed that the seller should have access to the meter and that the buyer should be debarred from such access? Clearly, if there is any sealing to be done at all it is the inspector who tests the meter and who is the disinterested party who should do it. There are, no doubt, isolated cases where the direct-current mechanical meter has "slowed up" under heavy load, but to contend that this is a frequent occurrence, and that it needs cleaning every few weeks, is a libel on the meter. If, however, there are difficulties of this kind with respect to this particular meter, let the manufacturers submit their case to the Department, and I venture the assurance that the difficulty will be met if at all possible.

Your May article also charges our inspectors with "posing as electrical engineers." This matter has been carefully investigated and no foundation whatever in fact can be found for the charge. The inspector at Hamilton, it is true, when appealed to by a personal friend on the directorate of the Hamilton Electric Light Co. for his opinion as to the cause of the enormous consumption of fuel under the boilers of the steam plant there, suggested that possibly the chimney was too small, and offered the mechanical engineer of the company the use of certain works or authorities upon the subject. Beyond this he did not go. If this can be called "posing as an electrical engineer" I fear we shall have to plead guilty.

Now a word in conclusion as to the opinions which have been solicited from the companies in reply to a number of leading questions submitted to them; copies of which you have been good enough to send me. Opinions of this sort can always, of course, be very readily obtained, and the Department might meet them—three to one—with appeals from corporations and individuals all over the Dominion, asking for tests and investigations of various descriptions in connection with electric lighting. The statement that there is no dissatisfaction—no friction—between the contractor and the consumer, is one notoriously at variance with the facts. From personal observation the writer is perfectly well aware of this friction, and is also aware that not a few of the companies have experienced much satisfaction from our work.

Whilst testing meters in a small town some time ago we offered to compare the station voltmeter with the Departmental standard, and on doing so it was found that the pressure had been maintained four volts in excess of what the lamps called for. The company had been blaming the lamp dealers with supplying poor lamps, but the trouble was found to be in the inaccuracy of the voltmeter. The manager was well pleased with the test and expressed himself as being quite sure the saving in lamps would pay the registration fee of $10 many times over.

O. HIGMAN.

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EDITOR'S ANNOUNCEMENTS.

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

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

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Possibilities of Alternating Currents for Railway Purposes.

IN our columns, recently, we have given the ideas of several individuals as to the possibilities of alternating currents for railway purposes. It seems to have been generally conceded that, while there was no reason on theoretical grounds why they should not be used, still for practical reasons, conditions of service would require to be favorable before they could become suitable. It is interesting to observe, however, that quite recently an electric railway working on the three-phase system has been started in the north of Italy, at Lugano. The details of the construction are in many respects so different from those standardized this side of the Atlantic, as to make their study interesting and instructive. The application of the polyphase system itself to railway work, is so far as we are aware, quite the first instance of the kind except for experimental purposes. Power is taken from a water-fall seven and a half miles from Lugano. This fall already supplies power for the electric lighting of the town by the alternating system, and for other electrical purposes. The three-phase generator is of 150 h.p. The voltage is 5,000, generated direct without the assistance of step up transformers. This is in itself a feature of importance, as thereby the inevitable losses in transformation are avoided, and is rendered possible by the design of the generator, which is of the stationary armature revolving field type. The frequency of the alternations is 40, considerably less than the number usually adopted in this country. As all induction, capacity, and hysteresis losses increase directly with the frequency of alternations, the reduction of the frequency is a matter of engineering importance. It is true that below about 60 cycles per second the flickering of lights affects the eye, but as the real field for polyphase alternating currents is for power transmission and utilization, this consideration loses considerably in importance. On

the railway line the currents are conducted by means of two over-head wires, and the rails, which are bonded together in the usual manner. Another departure from our usual practice is in the matter of the power of the motors. The cars have a seating capacity of twenty-four; the grades on the line run as high as six per cent.; the speed averages nine miles per hour; and yet each car is equipped with only one twenty-five horse power motor. In many ways, therefore, the line is worthy of being carefully studied, and might serve as an object lesson to those whose engineering ideas have a tendency to fall into grooves.

Governing Features of Electric Installations.

The absence of really proper and competent consideration of the general features and preliminary engineering of electric plants has been prominently brought forward in two recent cases. A town of 6,000 inhabitants, long and narrow, with scattered houses, was supplied with lights on the direct current system; and a small place of nearly 1,000, concentrated round the railway station, was wired upon the alternating plan. In the former case, a house distant almost 15,000 feet from the power house had to be supplied, and was reached by the ingenious though complex method of transmitting at 220 volts by using the outside wires of the three-wire system, and then reducing down to the lamp voltage of 104 by availing of the additional drop caused by a water resistance. The copper required for feeders, mains, etc., was a very large amount, and the plant did not pay. In the latter case, the voltage being high and the distance small, it was impossible, without using wires too small to put on poles, to keep the voltage at the lamps down enough, and they kept on burning out. And besides this, the resultant cost of generator, transformers, etc., was considerably higher than the price of a direct current installation would have been. Electrical investors should remember that the selection between alternating current and direct current machinery is not a matter which should be decided purely on grounds of personal preference, but it should rest on well considered engineering and commercial considerations. The alternating current system was evolved out of the inadequacy of the direct current system to properly meet certain conditions, but the fact that its use is most advantageous in those circumstances, is no reason for thinking it to be the best under all. Other things being equal, the direct current has the best of it on the score of efficiency, and as for lighting or power, the one possesses no advantage over the other (granting the use of alternating current motors, and disregarding the possibility of using storage batteries). Their comparative merits seem therefore to reduce to a question of comparing the costs of the two systems. Referring everything to the standard of two-wire direct current working, we find that to transmit the same total power, at the same total loss, over the same distance, the direct current two-wire takes 100 per cent. of copper; the direct current three-wire takes 37½ per cent.; the alternating system at 1,000 volts takes about one per cent. So the alternating system has the advantage over the three-wire direct by 36 per cent. But in order to do this we have to use transformers, which may quite counterbalance this advantage, unless the distances be great. And this does not take into consideration the extra losses due to the transformers. In a 1,000 light installation, the cost of the transformers will be certainly not less than $800, so that unless the total diminution of first cost of wire by the use of the higher voltage be greater than $800, the direct current is actually the cheaper system to use. Even if the saving in wire amounts to $800, the direct current will be the more economical system, because the transformers themselves have many inherent losses due to hysteresis, leakage, and heating; and these will necessitate an expenditure for fuel that will be obviated by the direct current. The above considerations show that every lighting or power enterprise should be very carefully considered before deciding on the class of machinery to use.

Lightning Arresters.

It would be interesting to learn what effect the recent violent thunderstorms have had in directing the attention of owners and superintendents of electric light and power stations to the necessity of adopting devices for the protection of their machinery from lightning. It may possibly be but a coincidence that several enquiries regarding lightning arresters were received at this office immediately following the recent storms. The electric stations appear to have come through these storms with very little loss, but this is not likely to happen on every occasion, and protective devices should be regarded as one of the most important features of the equipment of every electric station.

Duty on Steel Rails.

We may shortly look for a final decision regarding the proper interpretation of that section of the Canadian tariff relating to the duty on steel rails. The Privy Council will shortly adjudicate upon the question in response to an appeal taken by the Toronto Railway Co. from the decisions of the inferior courts, under which it was held that steel rails of the weight now mostly used in electric railway construction are subject to duty. The Toronto Railway Co. are seeking to recover a sum exceeding $50,000 paid as customs duties several years ago, in accordance with this interpretation of the tariff. The decision of the Privy Council will be awaited with much interest by electric railway companies throughout Canada, and by the projectors of new roads, whose interests are affected.

The Electric Railway Accident at Victoria.

The dreadful occurrence at Victoria, B. C., on May 26th, is we believe the first accident on an electric railway in Canada in which more than a single life has been lost, or in which injury resulted from the cars leaving the track. Since electric railways have come to occupy in many instances the same position as steam roads, greater precautions than heretofore will be required in their construction and operation. The main cause of the accident at Victoria seems to have been the want of a sufficient factor of safety in the bridge over which the cars were required to pass. Had the proper amount of surplus strength been allowed in the construction of this bridge, it probably would not have collapsed in consequence of the cars jumping the track. On the other hand, the cars seem to have left the rails because of being rendered top-heavy by the overload of passengers seated on the top and clinging to the sides of the cars. Railway bridges of all kinds should be subjected to periodical inspection, and managers of electric railways should not allow passengers to overcrowd their cars in the manner described.

ONTARIO ASSOCIATION OF STATIONARY ENGINEERS.

At the annual meeting of this Association held at Galt on the 1st inst., representatives of the various lodges throughout the province were present, from whom encouraging reports were received.

Officers were elected as follows:—A. Ames, Brantford, president; *T. S. Mitchell, London, vice-president;* R. Mackie, Hamilton, treasurer; A. E. Edkins, Toronto, registrar. Board of Examiners—James Devlin, Kingston; J. W. Bain, Toronto; W. Donaldson, Ottawa; Wm. Stott, Hamilton.

A resolution was passed authorizing careful enquiry by the officers of the Association into the causes of boiler explosions.

A delegation consisting of Mr. James Devlin, Kingston, Mr. A. M. Wickens, Toronto, and Mr. A. E. Edkins, London, was appointed to interview Sir Charles Tupper in behalf of Dominion legislation for the examination of engineers in all parts of the Dominion.

The next meeting will be held in Toronto on the 6th of June, 1897.

A CANADIAN MANUFACTORY OF ACETYLENE GAS.

Within the past month Mr. T. L. Willson, the inventor of acetylene gas has commenced the erection of a factory at St. Catharines, Ont., in which to manufacture the gas. Judging by the size of the factory it is not proposed to conduct operations on an extensive scale. It is reported that Mr. Willson has entered into a contract to supply the St. Catharines Gas Company with a certain quantity of acetylene for enriching purposes, and that his purpose is to endeavor to effect a similar arrangement with the gas companies throughout the Dominion.

PERSONAL.

Mr. E. Carl Breithaupt, of Berlin, was recently elected a member of the American Society of Electrical Engineers.

Mr. H. P. Brown, consulting engineer, of New York, has been engaged by the Hamilton Radial Railway Company.

Mr. W. J. Camp, electrician of the C. P. R. Telegraph Co. was a recent visitor to New York, where he had a conference with the Postal Telegraph Co.

Mr. A. W. Congdon, of the General Electric Company's staff, has been confined to his home by illness for a couple of months past. His friends will be pleased, however, to learn that he is now on the way to recovery and hopes to be able to resume his duties shortly.

Mr. Charles H. Wright, son of Mr. A. A. Wright, of Renfrew, Ont., was eminently successful in his recent examinations at McGill University, Montreal. He took honors in electrical engineering, hydraulics, thermodynamics and physics, and headed the list of passmen in the electrical engineering branch.

Among the visitors from Canada to the recent convention of the National Electric Light Association in New York, were Frederic Nicholls, manager G. E. Co., Toronto; Mr. W. H. Brown, manager Royal Electric Co., Howard D. Black, Prof. Henry T. Bovey, Montreal; F. H. Badger, Jr., manager Montmorency Light & Power Co., Quebec; and Chas. B. Hunt, manager Electric Light & Power Co., London, Ont.

Mr. W. C. Cheney has been appointed general superintendent of the Consolidated Railway and Light Company, Victoria, B. C. He will exercise a general supervision of the system in Victoria, Vancouver and New Westminster, making his headquarters at Victoria and giving the tramway and lighting system his personal attention. Mr. Cheney is an electrical engineer of recognized ability, and resigned as superintendent of the Portland General Electric Co. to accept his present position. He has been connected with some of the largest electric power plants of America.

TRADE NOTES.

The Regina Electric Light & Power Co. have ordered a 500 light alternator from the Canadian General Electric Co.

The Beardmore Co., of Toronto, are putting a new 100 h. p. Goldie & McCulloch engine in one of their tanneries at Acton.

The Rogers Electric Co., of London, have been awarded the contract for an electric light plant at the London water works.

Mr. John Crowe, of Montreal, has placed an order with the *Babcock & Wilcox Company, of Montreal, for one pair of their* 250 h. p. improved all wrought steel high pressure water tube boilers.

The Canadian General Electric Co. are installing a very compact marine lighting set on the new steamer "Corona." The generator is a standard multipolar 250 light machine direct coupled to a vertical marine type engine constructed at the Peterboro' works of the company.

The Canadian General Electric Co. are supplying a very complete isolated plant for the Montreal General Hospital consisting of two generators of 40 kilowatts capacity each, and one of 17 kilowatts capacity. These machines will be of the company's new moderate speed multipolar type.

The Packard Electric Co. are issuing monthly in miniature form a little memorandum book entitled "Daily Notes" containing blanks for memoranda for each day of the month. The last four pages are devoted to the company's advertisements. The idea is a unique one, and will, no doubt assist in widening the circle of the company's acquaintance.

The Kay Electric Mfg. Co., of Hamilton, have recently supplied the following machines:—A 10 k. w. dynamo for the Gendron Mnfg. Co., Toronto; an electro-plating dynamo for the Ontario Silver Plating Co.'s branch at Niagara Falls, N. Y.; a 20 k. w. lighting dynamo for the Eagle Knitting Co., Hamilton; a 30 h.p. motor for Wideman & Clemens, Guelph; a 4 h. p. motor for Gemmel's laundry, Hamilton; a 6 h. p. motor for the McLean Pub. Co., a 4 h. p. motor for Mr. Carlisle, and a 5 h. p. motor for Wm. Beers, all of Toronto.

The Montreal Street Railway Company have placed an order with the *Babcock & Wilcox Company, Board of Trade Building,* Montreal, for three batteries of their improved all wrought steel high pressure water tube boilers. These boilers are intended to furnish steam for the new 4,000 h. p. engine which they have ordered for their William street power house extension. Probably no more perfect installation of Lancashire or Galloway boilers has ever been made, certainly not in Canada, than the present extensive plant in the William street power house. The showing made by the Babcock & Wilcox boilers proved too attractive, however, and the management of the Montreal Street Railway have determined that their plant will be provided with just as good machinery as the great street railway plants in the United States.

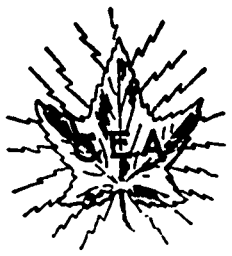
Mr. Wm. T. Bonner, general Canadian agent for the Babcock & Wilcox water tube steam boilers, furnishes the following information regarding the geographical distribution of their orders as given in their last month's sales report: American sales—3,374 h. p. in New York, 560 h. p. in Pennsylvania, 400 h. p. in Florida, 169 h. p. in California, 3,350 h. p. in Massachusetts, 250 h. p. in New Jersey, 200 h. p. in Rhode Island, 6,400 h. p. in Illinois, and 6,880 h. p. in Maryland. The foreign sales were divided as follows: 1,322 h. p. in Russia, 74 h. p. in Norway, 1,353 h. p. in France, 3,453 h. p. in England, 140 h. p. in Belgium, 294 h. p. in Spain, 76 h. p. in Portugal, 126 h. p. in Scotland, 192 h. p. in Germany, 72 h. p. in Holland, 424 h. p. in South Africa, 332 h. p. in Sweden, 52 h. p. in Italy, 280 h. p. in Brazil, and 228 h. p. in Madagascar. The foreign list foots up to 8418 h. p., while the American list amounts to 21,583 h. p., or a total of 30,001 h. p. for the month, of which 7,000 h. p. are marine boilers. The above report indicates only an average month's business. The total number of Babcock & Wilcox boilers now in use aggregates nearly 2,000,000 horse power.

The Lachine Rapids Hydraulic and Land Company have selected the three-phase system of the Canadian General Electric Co. for their new transmission plant. The initial order for the generators covers 12 machines, each of 1,000 horse-power capacity. This will, with one exception, be the largest power transmission plant in the world. A full description of the details of this most interesting installation will be given to our readers in an early issue.

"RADIANT MATTER" as reflected in the countenances of members of the Canadian Electrical Association who contemplate attending the Toronto Convention.

CANADIAN ELECTRICAL ASSOCIATION.

PARTICULARS OF THE APPROACHING ANNUAL CONVENTION.



IN the May number of the ELECTRICAL NEWS reference was made to the Sixth Annual Convention of the Canadian Electrical Association which is to take place in Toronto on the 17th, 18th aud 19th inst. The arrangements for this convention are now practically complete, and we are enabled to publish herewith the exact program, as follows:

HEADQUARTERS—COUNCIL CHAMBER, BOARD OF TRADE.

BUSINESS PROGRAM.

JUNE 17TH.

7:30 P. M. Opening of first session in Council Chamber, Board of Trade Building, Yonge and Front Streets.
President's Address.
Reading Minutes of last Meeting.
Secretary-Treasurer's Report.
Reports of Committees.
General Business.
Presentation of Papers.
Discussion.

JUNE 18TH.

10:00 A. M. Consideration of Reports of Committees.
Election of Standing Committees.
Selection of Place and Time of next Meeting.
Election of Officers and Executive Committee.
General Business.
Presentation of Papers.
Discussion.

JUNE 19TH.

10:00 A. M. Presentation of Papers.
Discussion.
General Business.

LIST OF PAPERS.

"Ocean Cables," (Historical), Chas. P. Dwight, Toronto.
"Acetylene Gas," (with demonstrations), Geo. Black, Hamilton.
"Meters," James Milne, Toronto.
Consideration and Discussion of the Government Electric Light Inspection Act.
"Some Central Station Economics," P. G. Gossler, Montreal.
"Power Transmission by Polphase E.M.F.'s." Geo. White Fraser, Toronto.
"Operating Engines without a Natural Supply of Condensing Water," E. J. Phillip, Toronto.
"The Outlook for the Electric Railway," F. C. Armstrong, Toronto.
Several of these papers will be illustrated by electric projection of diagrams, and the interest thereby greatly enhanced.

SOCIAL FEATURES.

JUNE 17TH.

8:00 P. M. Members and ladies will attend an illustrated lecture by Mr. James Milne entitled "Radiant Matter," to be delivered in the Rotunda of the Board of Trade, showing Prof. Cook's experiments and also demonstrations of Roentgen rays. Interesting shadowgraphs will be taken and exhibited.

JUNE 18TH.

5:00 P. M. Excursion per Steamer "Greyhound" to Lorne Park. Annual Banquet to members and ladies at Hotel Louise, followed by moonlight sail on Lake Ontario, returning to Toronto about 11 P. M.

JUNE 19TH.

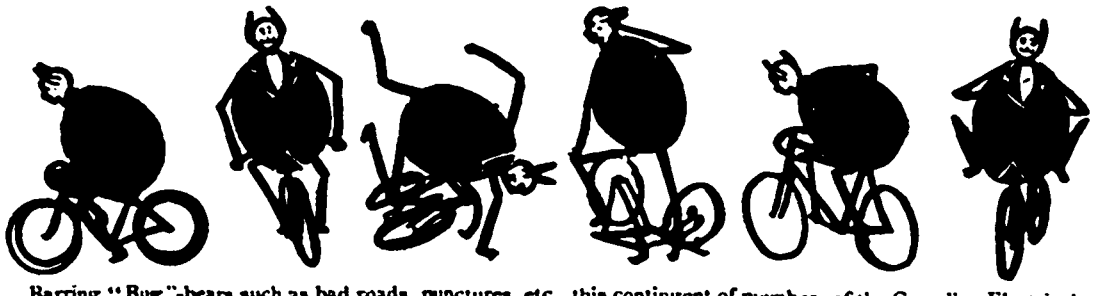
Arrangements are being made for an excursion by boat around Toronto Island, along the water front to Scarboro' Heights, and return.

NOTE.—During the progress of the convention opportunity will be afforded for inspection of the power stations of the Toronto Electric Light Co. and the Toronto Railway Company.

The subjects of the papers to be presented at this convention appear to have been wisely selected. Most of the questions treated of are destined to have an important bearing upon the electrical interests, and their full consideration and discussion at the present juncture is most desirable. We have every confidence in the ability of the gentlemen who have undertaken to prepare these papers to make them both interesting and instructive. We are quite in accord, however, with the view expressed by some distinguished gentleman whose name we cannot recall, that the chief value of papers of this character lies in the discussion arising out of them. If, therefore, the full benefit is to be got from this interesting series of papers, members of the Association must familiarize themselves with the views expressed by reading and carefully digesting the advance copies which are usually available some days previous to the meeting, and come to the convention prepared to express their opinions and do their share towards promoting a full and profitable discussion.

Take for example Mr. Gossler's paper on "Some Central Station Economics." What more interesting or important subject than this to every owner and manager of a central station? If central station men will make a point of attending the convention, take a hand in the discussion of this paper, and compare notes with each other, a fund of information regarding central station management of the greatest benefit to every central station manager will be the outcome It is due likewise to the author of a paper on which much effort has been expended, that his audience should express themselves regarding the correctness or otherwise of the views he enunciates.

There has been manifest at past conventions of the Association hesitation on the part of the majority of the members to express their views. We hope to see this spirit disappear at future meetings. The members will better advance their own interests and the welfare and usefulness of the Association by hazarding their opinions.



Barring "Bug"-bears such as bad roads, punctures, etc., this contingent of members of the Canadian Electrical Association expect to arrive in Toronto at sunrise on the 17th inst.

whether correct or otherwise, than by refraining from taking part in the proceedings.

Opportunity is to be given for a discussion upon the merits of the Electric Light Inspection Act. Judging from the correspondence published in this number, this is a subject in which central station men feel a keen interest, and upon which large numbers of them feel competent to express their opinions. We accordingly look for a good representation of the electric lighting interests, and a lively discussion on the inspection system.

Regarding the social features of the program, they appear to be of a somewhat different character from those of previous occasions, and are commendable on account of their variety in this respect. There is little doubt that they will prove as enjoyable as could be desired. Toronto is at all times an attractive and interesting city, and at no time does she appear to better advantage than in "leafy June." In support of this statement we present in this issue a number of views of her public buildings, parks, etc.

It is hoped and expected that members of the Association, a large proportion of whom reside within one hundred miles of Toronto, will seek relaxation from the arduous duties of the political campaign by coming to Toronto on the 17th inst. and assisting in making this the best convention ever held under the auspices of the Association.

TORONTO BOARD OF TRADE BUILDING,
Headquarters of the C. E. A. Convention, June 17, 18, 19, 1896.

The feed water for a steam boiler should not be introduced in such a way as to allow it to strike against the shell, but should be discharged into the body of water already there.

When a watch becomes magnetized by intimacy with a dynamo, the mainspring, being tempered, becomes a magnet, and, as it unwinds, its attraction, varying in direction or intensity, causes the rate of escapement to vary at different hours of the day.

A writer to a contemporary suggests a means of repairing the insulation of commutators. He says he has found that litharge mixed to the consistency of thick cream with glycerine and applied to the cracks of the commutator, restores the insulation. After being applied it should be allowed to dry 10 or 12 hours and then filed down level with the top of the commutator segments.

SPARKS.

A new metallic telephone line will be built between London and Sarnia.

The Woodstock, N. B., Electric Light Company have recently added two large dynamos.

The Hull Electric Company have purchased thirty acres of land at Aylmer as a site for a park.

Debentures are being offered by the village of Kaslo, B. C., to raise funds for an electric light plant.

The ratepayers of Iroquois, Ont., have voted down a proposition to light the streets by electricity.

The Hull Electric Company are erecting poles and stringing wires for the electric lighting of Hull, Que.

Cunningham & Hinton, electricians and electrical goods, Victoria, B. C., have dissolved partnership. G. C. Hinton continues.

Mr. R. Anderson, of Ottawa, is installing an electric light plant for Mr. Geo. Brigham on his passenger boat which runs between Ottawa and Hull.

The City Council of St. Catharines, Ont., has invited tenders for electric street lighting for a period of five years from 31st October next.

A company seeking incorporation is the Callendar Telephone Exchange Co., of Brantford, Ont., to manufacture telephones and electrical apparatus.

The suit of the town of Three Rivers, Que., against the Royal Electric Company, Montreal, has been dismissed with costs. The case involved an amount of $13,000.

Dr. W. W. Jacques, of Boston, an electrician, connected with the Bell Telephone Company, announces the discovery of a method of taking electrical energy direct from coal.

On May 12th the town of Perth, Ont., granted a bonus of $5,000 for an electric railway between that town and Lanark, the road to be running by September 1st. The distance is twelve miles.

The Victoria Telephone Co. is applying for incorporation, with a capital stock of $25,000, to operate in Victoria county, N. B. Among the promoters are J. E. Porter, Andover; Albert Brymer, Perth Centre; and Stephen Scott, Bairdville.

The rights of the Standard Light & Power Co. to lay wires underground in the streets of Montreal have been transferred to the Citizens' Light & Power Company, which is controlled by the Lachine Rapids & Hydraulic Company.

New Westminster and Vancouver, B. C., are now connected with Chilliwack by telephone, through the enterprise of the New Westminster and Burrard Inlet Telephone Co. The distance is seventy miles. The line used for the connection is the old telegraph wire, which the company have taken over. The manager, Mr. H. W. Kent, states that tariff sheets are now being prepared, and tolls for conversation will be very reasonable. Message rates will be the same as formerly by telegraph. The new line will be equipped with the best and most improved long distance instruments.

THE N. E. L. A. CONVENTION.

THE recent convention and exhibition in New York City under the auspices of the National Electric Light Association of the United States, appear to have been attended by more than ordinary success. The proceedings of the convention were about on a par with those of previous meetings of the Association. On the other hand the exhibition surpassed anything of the kind previously attempted, excepting only the electrical display at the World's Fair. Side by side with the electrical apparatus of to-day were to be seen the rude devices employed when electricity was in reality "in its infancy." The extent of the public interest awakened by this exhibition, may be judged by the fact that on some days the attendance reached the high figure of 50,000.

As foreshadowed in the ELECTRICAL NEWS for May, Mr. Frederic Nicholls, manager of the Canadian General Electric Co., Toronto, secured election as President of the Association for the ensuing year, an honor of which that gentleman and Canadians generally have cause to feel proud. Mr. Nicholls, whose portrait is herewith presented, is too well known on this side of the line to require any extended reference in these pages. He had his birth place in England forty years ago, and in that country and Germany received an efficient education. Upwards of fifteen years ago he became a resident of Toronto, where step by step he has risen to the position of prominence he now occupies in the business world.

MR. FREDERIC NICHOLLS,
President of the National Electric Light Association.

Mr. Nicholls may be classed among the pioneers in the electrical business in Canada, having organized the Incandescent Light Co., of Toronto, and held the management thereof until a few months ago. He is also a director of the Toronto Electric Light Company; president of the Brantford Street Railway Company; vice-president of the Peterborough Street Railway Company; secretary of the London Electric Light Company, a director of the Toronto and Scarboro Railway Company, and in addition is interested in mining, insurance, publishing, and other enterprises.

TECHNICAL SCHOOL EXAMINATIONS.

THE examinations in "Electricity" and "Steam and the Steam Engine," at the Toronto Technical School were quite successful, a number of the students obtaining a high percentage of marks. The following are the names of the successful ones, in order of merit:

Electricity—R. C. Harris, Herbert S. Small, equal; Walter Inglehart, Walter Redpath, Alex. Rose, H. Amos, H. F. Hutchison, Thos. P. Marshall, E. Harris, H. C. Champ, Fred. J. Grant, Wm. Simpson, Wm. Willis, W. Piercy, Alex. Gerry, Sam. J. Evanson.

Steam and the Steam Engine—R. H. Johnston, Walter Inglehart, W. Piercy, Walter Redpath, H. C. Champ, H. Amos, Wm. Simpson, Alex. Gerry, Fred. J. Grant, J. Mitchell.

PRESERVING TELEGRAPH POLES.

IN the preparation of posts for the telegraph service in Sweden, the following simple, effective and cheap method of preserving wood from decay is said to be employed: A square tank, having a capacity of some 200 gallons, is supported at a height of 20 feet or 25 feet above the ground by means of a light skeleton tower built of wood. A pipe drops from the bottom of the tank to within 30 inches of the ground, where it is connected with a cluster of flexible branches, each ending with a cap having an orifice in the centre. Each cap is clamped on to the larger end of a pole in such a manner that no liquid can escape from the pipe except by passing into the wood. The poles are arranged parallel with one another, sloping downward, and troughs run under both ends to catch drippings. When all is ready, a solution of sulphate of copper, which has been prepared in the tank, is allowed to descend the pipe. The pressure produced by the fall is sufficient to drive the solution, gradually of course, right through the poles from end to end. When the operation is ended, and the posts dried, the whole of the fibre of the wood remains premeated with the preserving chemical.

Prof. Palaz gives the following figures as to the relative heating effects of different illuminants: Arc light, 4; incandescent light, 14; kerosene, argand burner, 331; gas, argand burner, 380; candle, 473; gas, butterfly burner, 511.

SOME EXCEPTIONS TO OHM'S LAW.—*It has been observed*, says the London Electrical Review, that amongst the liquids there are certain of low conductivity; for example, benzine, xylene, and turpentine, which do not seem to follow Ohm's law, but which, under the continued influence of a high electromotive force, show a gradual alteration in conductivity. These liquids also exhibit the phenomenon of electrical convection, a current of the electrolyte setting in from the one electrode, whilst the other appears simply to attract the repelled liquid. Recently, Emil Warburg has been investigating these phenomena. He employed mixtures of liquids which possessed low conductivity, gradually reducing the proportion of one of the constituents until the conductivity was nearly that of the other. Such mixed solutions as these were found still to exhibit the above phenomena. The behaviour of these solutions, in fact, was such that Warburg is led to the conclusion (vide Ann. Phys. Chem., 1895 [2], liv., pp. 396—433), that they contain an electrolyte in a state of great dilution, upon which their conductivity depends. He suggests that the extraordinary behaviour of the so-called pure liquids is capable of a similar explanation.

CORRESPONDENCE

A WARNING TO INVENTORS AND PATENTEES.

To the Editor of the CANADIAN ELECTRICAL NEWS.

SIR,—In a recent issue of the Scientific American, a matter was brought before its readers, which, from its importance, deserves to have all the publicity which can be given it, and from that paper are taken the quotations in this letter. There exists in the United States, and in Canada too, unfortunately, a class of men who have adopted the opinion that the inventor is made to be victimized and "who try their best to exploit the community of patentees for their own benefit and the consequent detriment of their clients."

"When letters patent are awarded, the drawings and claims of the patent and the inventor's name are published in the Official Gazette of the United States patent office. This appeals at once to a large number of sharks, calling themselves "patent agents" who see in the inventor a possible source of revenue. As soon as the patent is issued the inventor therefore begins to receive letters from various self-extolled concerns, recommending him to do various things, to apply for foreign patents, or to permit the correspondents to act as his agents for the sale of his patent on commission.

"Many of these letters and circulars contain statements that are absolutely fraudulent. The inventor, for example, will be urged to apply for foreign patents in England, France and Germany, and other countries, when the agent is perfectly well aware that after the patent has issued in the United States and has been published in the Patent Office Gazette, valid patents cannot be procured in those countries, except under the International Convention, which he is seldom able to avail himself of. The patent shark relies upon the ignorance of this fact on the part of the inventor to protect him in his nefarious traffic. He is also protected from detection by the fact that in many foreign countries there is no examination as to novelty, and in due course, and after the payment of the government fees, the patent will issue and he will be provided with the letters patent certificate to present to his "client" who sleeps in blissful ignorance of the fact that the documents are not worth the paper they are printed on.

"In many cases the fees upon examination will be found to be phenomenally low and the inventor will snap at what seems to him a bargain, simply to find that in Germany, perhaps, he has procured a gebrauchmuster, or model of utility patent, instead of a patent; or in Canada he may be led to believe that he has procured a patent for one year when he has simply filed a declaration of intention, which affords no true protection."

Many of the circulars sent out are artfully worded to convey the idea that the invention was accidentally come across and that its value was immediately apparent.

Inventors are usually sanguine and frequently fall into the trap so cunningly set.

Once an inventor falls into the hands of one of these firms he is exploited to the best advantage, and remarkably well plucked as many have found to their sorrow.

The moral of all this is—do no business with any firm issuing circulars tending to inflate the hopes of the patentee; have no dealings with any firm offering to sell a patent and asking for an advance, and in all patent matters consult only solicitors of good standing and proved integrity.

If Canadian inventors will heed the warning given by those in a position to give advice, they will save themselves much annoyance and much hardly earned money; at the same time the much-desired result will be attained of rendering Canada an unprofitable fishing ground for Yankee patent sharks.

Yours, etc.

RIDOUT & MAYBEE.

A BOILER TEST.

BEFORE the Montreal Association of Stationary Engineers Capt. Wright presented a report of a boiler test recently made by him in that city, with a few prefatory remarks, as follows:

Before reading this report, I will make a few words of explanation. About two weeks ago I received a letter from a party unknown to me, requesting me to make a test of the steaming performance of a boiler in this city. I have met so many schemes to burn smoke and make boilers do impossibilities, that I am apt to look at new-fangled designs with suspicion. Yet it must be acknowledged that great improvements are possible. The fact that for every ton of coal you burn on a furnace grate, at least 16 tons of air go up the chimney at a temperature of 500 or 600 degrees, by which one-fifth of the total heat in the coal is absolutely lost, except in so far as it induces a draft, proves that at least in that direction, improvement is possible.

It is unfortunately the case, that this subject is often attacked by men who have not studied the question, and, moreover, are in ignorance of the usual practical methods of dealing with it, as far as the burning of wood or coal in a furnace is concerned. It was for these reasons that at first I had no intention of doing anything in connection with this proposed test. But, hearing who the interested parties were, I called on them, and decided to act.

The circumstances under which the test was made were uncommonly unfavorable a rainy day, a leaky roof, a very poor article of coal, completely saturated with water. When I went there in the morning, no preparations for a test had been made. A Fairbanks scale was got, coal was weighed, a water barrel was mounted on the scale, and connections made from the service pipe to barrel, and from the barrel to injector. This took time, and at 10 a. m. the test began. At noon, after stopping for the hour, I ran over my notes and was surprised at the results. In conformity with the daily custom, the boiler tubes were swept out during the noon hour. What was then accomplished is contained in the report, which I will now read.

D. L. DWINNELL, Esq., City.

DEAR SIR:—According to your instructions, a test was made on the 26th ult., of the steaming qualities and general behavior of the boiler in the works of "The Montreal Toilet Supply Co." on Dorchester street, in this city.

The boiler is of the common cylindrical type with return tubes. The shell is 42" dia. and 11 feet long, with thirty-nine 3" tubes, and a grate area of 13½ square feet. The principal object of the test was to determine whether certain peculiarities introduced in the setting, increased the efficiency of the furnace, and the steaming qualities of the boiler. The test was made under the usual every day conditions of work and began at 10 a.m. ending at 4.50 p.m. Everything was taken as found; no change was made or cleaning done previous to the start. A bituminous lower port coal was used and was an inferior quality of what is known in the trade, as "Run of the mine." City water at a temperature of 34 degrees was alone fed to the boiler by an injector; the overflow water, in starting the injector, was returned to the barrel it came from. This barrel was mounted on the platform of a "Fairbank'

scale with water connections to and from. The change, or weight of water running to each barrel was the same, and the time when filled was carefully noted. The total weight of water fed to the boiler between 10 a.m. and 4.50 p.m., was 6864 lbs. Four barrels of dry coal was dumped in separate heaps on the floor, each heap weighing 238 lbs., a total of 952 lbs. consumed between the hours above named, and the time each heap lasted was carefully observed. In this manner any variation or irregularity is observed at once.

At the close of the test the ashes weighed 90 lbs. Deducting this from the weight of coal laid on the floor, leaves 862 lbs. of combustible or pure coal consumed between the above hours. During the noon hour, the boiler furnishes steam to the coil in the drying room and mangles, and 209 lbs. of water was fed to the boiler, and 52 lbs. of combustible consumed on the grate. This performance forms no part of the test in working hours, for if retained, would destroy the whole, and these amounts of fuel and water must be subtracted from the total between 10 a.m. and 4.50 p.m. and takes this form: Total combustible consumed on the grate between 10 and 12 a.m. and 1 and 4.50 p.m., 810 lbs. Total water fed to the boiler during the same time, at a temperature of 34 degrees, 6655 lbs., which is an evaporation of 8.216 pounds of water from a temperature of 34 degrees to steam at seventy-five by gauge, per pound of combustible burned on the grate, equivalent to an evaporation from and at 212 degrees, of 10.02 pounds of water per pound of combustible. This is the mean performance of the boiler during the working time of the test.

The gauge was kept very regular at seventy-five. The total absence of black smoke from the stack was remarkable. At times when fresh coal had been put on the grate, a thin grey smoke made an appearance for a short time, and generally on looking at the top end of smoke stack there was no visible proof that there was a fire under the boiler. At the close of the test the water level in the glass was the same as at the beginning. The uniform rate at which water disappeared from the boiler was surprising. During the working hours, both forenoon and afternoon, if 209 lbs. of water had been regularly fed every ten minutes to the boiler, the water level in the glass would have been practically the same during the working time of test.

But an unexpected change did take place. The thirty-nine tubes in the boiler were cleaned in the noon hour, and it was observed between 1 and 2 p.m. that the consumption of fuel was forty-seven pounds less than in any sixty successive minutes during the forenoon.

The method of conducting the test permitted this comparison. At first I thought there was an error, but if so, I failed to detect it, and it continued at the same rate up to the close of the test, notwithstanding the weight of water at a temperature of thirty-four degrees supplied to the boiler per hour, was practically the same both forenoon and afternoon.

Between 10.50 and 11.50 a.m. 1236 lbs. of water were fed to boiler and 174 lbs. of combustible was consumed on the grate. Between 2 and 3 p.m. 1237 lbs. of water were fed to boiler, and 127 lbs. of combustible consumed on the grate. This is at the rate of 9.74 pounds of water at a temperature of thirty-four degrees evaporated to steam at seventy-five by gauge, per pound of fuel burnt on the grate:—equivalent to an evaporation from and at 212 degrees, of 11.87 pounds of water per pound of combustible burned on the grate.

The ashes were 9.45% of the weight of coal, and in conformity with all reliable and comparable tests of boilers, the standard results are calculated from the weight of combustible, and the equivalent evaporation from and at 212 degrees.

The boiler house appeared to be formed by a roof, built over a former alley way, between two adjacent buildings.

It rained steadily during the time of the test. The roof leaked and it was a difficult matter to find standing room in front of the boiler where water did not drop on my note book.

The coal used had been kept outside in a yard all winter, and contained lumps of ice, which of course, during the weighing of the coal were thrown out if observed.

In view of the results obtained during this test, it should be repeated under different conditions.

The whole respectfully submitted,

(signed) CAPTAIN JAMES WRIGHT.

Montreal, April 7th, 1896.

The residents of Beamsville, Ont., are urging the extension of the Hamilton, Grimsby and Beamsville Railway to that town, and it now seems probable that work will be commenced this season.

SPARKS.

The village of Westport, Ont., will probably introduce electric light.

Bothwell, Ont., is moving in the direction of securing electric light.

An electrical stamp cancelling machine is in operation at the post-office at Ottawa.

The St. John, N. B., Street Railway Company are extending their line to the park and cemetery.

The Canadian General Electric Co. have been awarded the contract for the electrical equipment of the Hamilton Radial Electric Railway.

The telegraph and telephone companies' cables were damaged at Three Rivers, Sorel, and other points on the St. Lawrence, as the result of spring floods.

The Lachine Rapids Hydraulic & Land Co. have decided to place their wires underground. The management have recently inspected systems of conduits in different cities in the United States.

A citizen of Quebec is said to have sent to Paris for an electric omnibus, which can ascend and descend hills with greater ease than one drawn by horses, and can do its sixty miles an hour comfortably on a level road.

It is said that the Maginn Power Generator and Motor Co., of Chicago, will shortly put upon the market a light motocycle, the price of which will be only slightly in advance of that of a first-class bicycle.

The Steam Boiler and Plate Glass Insurance Company, of Canada, with head office at London, Ont., announce the transfer of their plate glass insurance business to Lloyd's Plate Glass Insurance Co., of New York.

The Upper Ottawa Improvement Co. are replacing their No. 14 copper wire, from Ottawa to Guyon, P. Q., a distance of 40 miles, with No. 9 galvanized iron wire. The construction is in the hands of Mr. Maurice Quain, electrician, of Ottawa.

The Brantford Operating and Agency Co. is applying to parliament for permission to change its name to the Brantford Electric and Operating Co., to increase the capital stock to $50,000, and to purchase the franchise, assets and rights of the Brantford Electric & Power Co.

The directors of the Royal Electric Company have decided to proceed at once with the construction of the water power at Chambly, Que. It will be owned by the Chambly Manufacturing Company, in which name the charter now stands, and the proprietors, ten in number, have subscribed $30,000 each. The Royal Electric retains an interest of $200,000.

The Bell Telephone Company have made application to the City Council of Montreal for permission to lay underground conduits for their wires. The Standard Light and Power Company have certain privileges in this respect which were obtained some years ago, and the Council have decided to refer the matter to the City Attorney before taking any action.

The St. Martins Telephone Company, St. John, N. B., at their annual meeting, elected the following directors: Messrs. W. E. Skillen, John McLeod, Walter H. Allen, C. M. Bostwick and C. D. Trueman. The directors afterwards chose Mr. John McLeod as president; Mr. W. H. Allan vice-president, and Mr. A. W. McMackin as secretary and general manager.

The Hawkesbury Lumber Co., of Hawkesbury, Ont., have purchased a 25 k. w. dynamo of the Edison type for lighting the interior of their six mills, which were previously lighted by arc and series incandescent, from a 60-light Wood arc dynamo and 35-light Ball dynamo and which are now used to light their yards. The change is a decided improvement on the old system.

The following students were successful at the spring examinations at McGill University, Montreal: Electrical Engineering—Charles Harvey Wright, Renfrew, Ont; Harry Alex. Chase, Kentville, N. S.; William Currie, B. A. Sc., Montreal; Homer Norton Jaquays, B. A., Montreal; Wm. Norton Cunningham, B. A. Sc., Montreal; Stewart Fleming Rutherford, Montreal. Mechanical Engineering—James Lester Willis Gill, Little York, P. E. I.; Francis Edward Courtice, Port Serry, Ont.; John William Hunter, Kingston Station, Ont.; Thos. Fred. Kenny, Ottawa; Ernest Randolph Clarke, Stratford; Henry Arthur Bayfield, Charlottetown, P. E. I.; George Alexander Walkem, Kingston, Ont.; Gordon Scott Rutherford, Montreal.

ELECTRIC POWER FROM THE MONTMORENCY FALLS IN CANADA.

By C. C. Chessby.

The Falls of Montmorency, situated eight miles below the far-famed and historic city of Quebec, are the scene of one of the most interesting and successful electric transmissions of power in America. The cataract,

Montmorency Falls, Showing Nos. 1 and 2 Gate Houses.

almost too well known to need any description, is the chief natural attraction in that vicinity, and while not possessing the magnitude of Niagara, there is yet something of the same grandeur and magnificence in the wild rush of its waters, and the same deafening roar that stuns for a moment the mind of the most stolid beholder. From a height of more than 275 feet the waters fall perpendicularly over the face of the rock, forming, in succession, furious cascades and seething pools in the ravine below, and rushing off to meet the waters of the majestic St. Lawrence.

It is the especial object of this article to call the attention of those interested in the general development of water powers, and especially of those who may have occasion to investigate the problem of the transmission and distribution of power by alternate currents of electricity, to the method and apparatus there used, in the belief that it is an object lesson, not only of scientific interest, but of great practical value.

To a people less conservative than the "habitant," —less apt to revel in the memories of the shrouded past, utilitarian possibilities of this beautiful cataract might have appealed earlier, but with this mystic people, and within sight of one of the largest cities of Canada, the massive energy of Montmorency was allowed to waste away for years in dashing itself into the chasm below.

It is but a few years ago that a company, organised in Quebec, constructed a dam across the narrow gorge in the Montmorency river at a point 1500 feet above the face of the falls, with the object of utilizing some of the power for manufacturing. A cotton mill was built at the foot of the bluffs, and shortly after, a small arc station was erected for the purpose of doing arc lighting in the city of Quebec.

In the year 1889 the present Montmorency Electric Power Company established, in connection with the arc plant, a small incandescent plant of about 100 horse-power capacity, using 2000-volt alternate current machines, built by the Royal Electric Company of Montreal, and transmitting the current to Quebec with a loss of over 50 per cent. This very unsatisfactory and uneconomical plan was continued until the summer of 1894, when a change of management brought to the service of the company the well-tried experience and engineering ability of Mr. Frank H. Badger, Jr., as general manager, and Mr. Louis Burran, as electrician, to whose intelligent work and attention to the practical details the final success of this plant is largely due.

Acting under the advice and direction of these gentlemen, the company increased the capacity of the old dam to a minimum of about 12,000 horse-power. A short tunnel was run through the solid rock, connecting the dam to the wooden flume which continues along the face of the adamantine bluffs for a distance of 1500 feet to the gate house on the brow of the hill. The construction of this flume was a task of considerable magnitude, involving the exercise of much engineering skill. From the gate house, on the brow of the hill, a steel-riveted tube, having a diameter of 72 inches and a length of 1100 feet, is carried down a steep incline to the power house, where the pipe-line terminates in a large steel receiver which supplies the water to the turbines.

The Lighting Station, Showing 48-inch Steel Pipe Supplying the Cotton Company with Power.

Owing to the extremely high head and the great velocity at which the wheels must necessarily run, they were required to be very simple, stronger and more compact than is the general rule. The wheels adopted are the "Little Giant" turbines, manufactured by J. C. Wilson & Co., Picton, Ontario. The noticeable feature of these wheels, besides their simplicity, is the almost entire absence of lateral or end thrust, so frequently

found in the ordinary types. They have two sets of buckets, keyed on the same shaft, and the buckets are so formed that whatever end thrust there may be from the one set is counteracted by that of the other. The particular size installed at the Montmorency falls has a capacity of 700 horse-power and runs at a speed of 600 revolutions per minute. The "Little Giant" turbine is comparatively little known outside the Dominion of Canada, but some idea of its simple and compact nature can be gained from the fact that this 700 horse-power wheel is only 21 inches in diameter and has an extreme length not exceeding 2 feet.

The generating station is a two-storey structure, built of native stone, and is 150 feet long by 50 feet wide. It is situated in a picturesque and convenient spot between the hills and the Quebec, Montmorency & Charlevoix Railroad. The first floor of the building is devoted entirely to the turbines and the necessary gate mechanism. Along one side of the room the numerous wheels are arranged in a row, from which the belts proceed at an angle of 45 degrees to the dynamos on the the floor above. The water is taken from the receiver in this same room and is discharged partly into the tail race which empties into the St. Lawrence river, and partly into the 48-inch steel pipe which supplies water to the wheels in the mills of the Montmorency Cotton Manufacturing Company.

THE DYNAMO ROOM, MONTMORENCY FALLS POWER HOUSE.

The second floor is the dynamo room. It is a large, well ventilated and well lighted space, having practically the same dimensions as the building. To the practised eye of the engineer, it is at once apparent that the design and construction here have been carried out in accordance with the best engineering skill. It is unfortunate that electric lighting stations, as a rule, have been hurriedly constructed with any sort of material that happened to be near at hand, and equipped with that apparatus which was offered at the lowest price, regardless of quality. This room is, therefore, of more than usual interest, since in its equipment, or that proposed for future developments, every necessary improvement has been introduced which in any way promised to increase the reliability and efficiency of the plant, and to reduce the cost of operation.

The problem in electrical engineering which was presented to the Montmorency Electric Power Company is typical of the problems presented to all enterprises for the utilization of a waterfall by the transmission and distribution by electricity of its energy to distant points. The prime requisites in any such system for power transmission and distribution are, necessarily, simplicity and reliability. The simplicity and reliability of the single-phase alternating system are well known to all electricians and the electrical public in general. The system has been proven and tried in numerous cases where it has been the sole dependence of the larger enterprises, and where the practicability of transmitting power in bulk by this system has been demonstrated beyond question. It lacks, however, range and flexibility; it lacks a motor which commercially answers the requirements of power distribution; and it lacks the ability to be readily converted into direct currents for railroad and electrolytic work.

In the multiphase systems, however, which have been developed within the last few years by the various electrical companies, are to be found all these requirements. Coupled with the simplicity and reliability of the single-phase systems, are to be found range and flexibility. The induction motor forms the missing element for commercial power work, and extends its range far beyond that ever realized by the direct-current motor. When we now add the two-phase or three-phase rotary transformers, we have a system, ideal not only for long distance transmission purposes, but ideal for general central station work, whether the energy be primarily furnished by steam or water power.

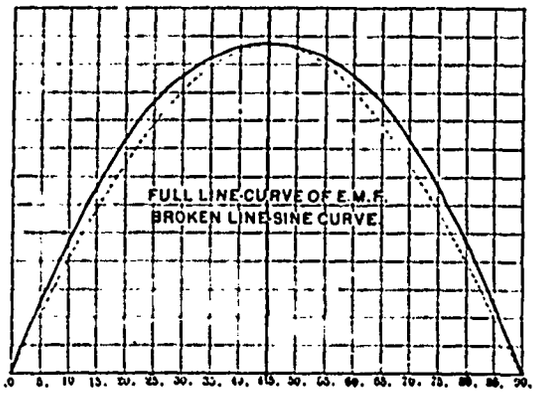
Naturally, then, in order to obtain the most complete and commercial results from the power at its disposal, the system adopted by the Montmorency Electric Power Company is a multiphase system. The particular multiphase system is the S. K. C. (Stanley-Kelly-Chesney) two-phase system as applied by the Stanley Electric Manufacturing Company, of Pittsfield, Mass., U. S. A., the Canadian (manufacturers being the Royal Electric Co., of Montreal.)

The generators are situated on the north side of the dynamo room. The foundations are of solid masonry, through which are run a number of tie rods which hold an insulating cap to the solid bed rock of granite. The insulating cap consists of 10 by 12-inch timbers which have been boiled in paraffine in order to completely remove all moisture. The bed plates of the machines are held in place by lag screws set into the paraffined timber. Each generator delivers alternating currents, differing in phase by 90 degrees, to two independent circuits at an electromotive force of from 5200 to 5700 volts. By means of rheostats in the fields of the generators, the electromotive force can be varied between these limits, to meet the requirements of the circuits.

The frequency is 66 periods per second—that is, the current is reversed approximately 8000 times a minute. The generators are what are commonly known as 8000-alternation machines. This frequency was selected as being one of the standard frequencies advocated by engineers of the Stanley Electric Manufacturing Company

and in preference to 133 periods per second (16,000 alternations); for, while the loss in the core of the transformers was increased from 20 to 30 per cent., and the regulation of the generators from a total of 2 per cent. to a total of 3 per cent., the self inductive drop in the transmission lines was such an important factor that the lower frequency was considered preferable, as giving, on the whole, a better regulating and more economical system.

The currents delivered by the generators are carried



E. M. F. Curve of the Generators at Montmorency.

by heavily insulated cables to the switchboard, where the attendant, by suitable switches, may connect the generators to the transmission lines. Two separate pole lines have been constructed to Quebec. One follows the route of the Quebec, Montmorency & Charlevoix Railroad, carrying two transmission lines, each having a capacity of 500 K. W.; the other follows the old Beauport road, carrying one transmission line of a capacity of 500 K. W., and provision for another line. All the lines are entirely overhead, and are entirely supported on wooden poles, with the exception that at the crossing of the Charles River they are carried across the river on iron poles, 125 feet high.

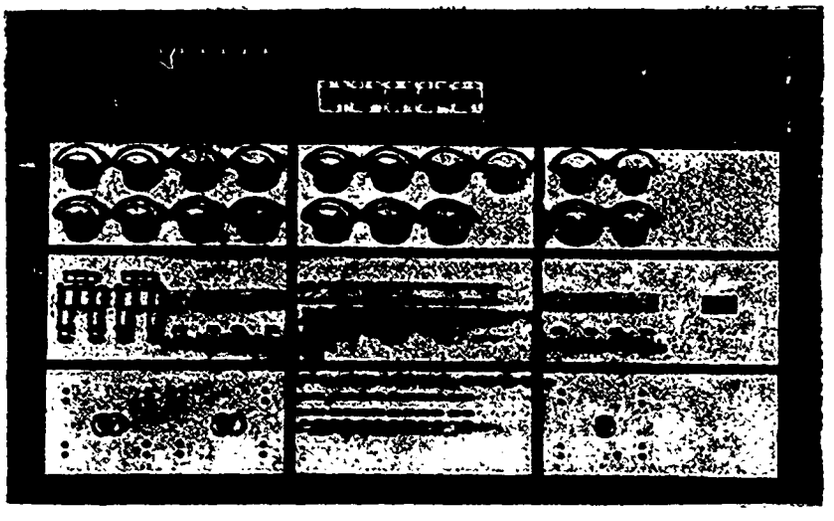
Triple petticoat porcelain insulators were used, and were made especially for this plant by a Canadian manufacturer, differing, however, but slightly from the design now in common use for high-voltage work. The line wire is No. 0, B. & S. bare copper. The drop, due to the ohmic resistance of the wire, is 8 per cent., which is increased by the self-induction to 10 per cent. On the extreme ends of the top cross-arms of each pole line are strung galvanized iron wires, which are grounded at every third or fourth pole.

These iron wires, together with lightning arresters, placed at each end of the transmission lines, give a complete and safe protection from all lightning storms. So perfect has been this protection, that a discharge in either the generating station or sub-station is practically unknown.

The transmission lines enter the city of Quebec in that portion known as St. Rochs, and the sub-station is located in the centre of the industrial district, where power is needed for the tanneries and shoe factories for which the city is noted. The sub-station is 90 feet long by 65 feet wide, and is two storeys high, built of brick, with a stone front. The building consists of a store-room on the second floor, the offices of the company in the front, on the first floor, with the room containing the distributing switchboard immediately in the rear. The transformer house is a part of the same building, but only one storey high.

The transmission lines enter the sub-station through the cupola to the high potential receiving switchboard, which contains special high-voltage switches. These switches are mounted on marble and are fitted with special self-enclosing boxes, which are intended to cut off any possible arc that may be formed on opening the 5,000-volt circuits.

From the transmission lines the current of the generators is carried to the step-down transformers, where the electromotive-force of transmission is transformed into the distributing electromotive-force of 2,000 volts. These transformers are the regular indoor type of the Stanley Company, and are arranged on a rack, in two tiers, five wide and two deep, in such a manner that the air has free circulation, or that they may be artificially ventilated if it be so desired. They are of 50 K.W. capacity, and are connected in pairs. Each is wound for a primary electromotive-force of 2,500 volts, and a secondary one of 1,000 volts. The primaries of each pair are connected in series for receiving 5,000 volts, and the secondaries in series for delivering 2,000 volts to the distributing system. This arrangement gives an additional safeguard by lessening the voltage on any particular coil, and in case of a burn-out in any one transformer, the other will carry the load for a time until the relay transformer can be cut in. The insulation of each transformer was tested with 10,000 volts. The regulation of each transformer from no load to full load is about 1 per cent. The average efficiencies of the entire transformer equipment, as shown by the shop tests, are:—



The Generator Switch-Board, Montmorency Power House.

Efficiency,	full load,	97.8 per cent.
"	half load,	97.9 per cent.
"	quarter load,	97 per cent.

The transformers are divided into two sets of eight transformers each, with a relay of two transformers which can be cut in or out without stopping the service. Three secondary distributing circuits are carried to the distributing board in the next room. Provision has been made, however, for two more circuits of the same capacity.

The current from the secondaries of the two sets of transformers is carried to the bus bars of the distributing switchboard, from which it is furnished to the numerous city circuits for light and power.

The generators are the S. K. C. inductor type of two-phase machines, running at 286 revolutions per minute. Each generator has a capacity, at 5,700 effective volts, of 100 amperes. They are the largest inductor machines that have ever been built, and are the first and only practical machines that have ever been constructed for such a high initial electromotive force.

The armature is stationary, consisting of two sets of laminated iron rings, connected by steel rods four inches in diameter. On the inner surface of each laminated armature ring are fifty-six grooves for receiving the armature coils. The weight of this portion of the machine is 42,580 pounds. The field or exciting coil is circular, 94 inches in diameter, and wound on two copper bobbins, each 4¼ inches wide, with a copper strip four inches wide and .026 inch thick. It is insulated between the layers with a special oil-cloth which is practically indestructible at temperatures under 150°C.

To the dynamo builder the advantage of constructing a field coil on such lines is very apparent. With a free circulation of air, and every turn of the winding being, for cooling purposes, practically in contact with the moving air, there is no possibility of overheating in any portion of the coil. The copper bobbin, absorbing all discharges, prevents any excessive rise of electromotive-force on the coil, which might be caused by carelessly, or, under extreme circumstances, intentionally, opening the field circuit under full charge.

THE DISTRIBUTING STATION, MONTMORENCY FALLS POWER HOUSE.

There are, in all, 56 armature coils, 28 for each phase. The coils are small and were wound in a lathe. Each coil was carefully insulated to stand 15,000 volts before placing it in the armature. The insulation of the completed armature was tested, finally, with 12,000 volts.

The inductor, the only moving portion of the machine, is a steel casting, 43 inches long, and 84 inches in diameter, upon the periphery of which are two sets of polar projections of iron laminæ, fourteen at each end. The weight of the inductor, including the shaft, is 28,470 pounds. The net weight of the completed machine is, approximately, 100,000 pounds.

In the operation of alternating current motors, and also of transformers, it is now generally recognized as important that the currents and magnetic fluxes should vary sinusoidally, for the more nearly such a condition is approached, the less are the losses and idle currents. A first step toward obtaining these conditions is the making of the impressed electromotive-force of the generator sinusoidal. The flux between a field pole and the opposite iron of the armature distributes itself, so that it is, at every point, inversely proportional to the reluctance of the gap at that point, or inversely proportional to the distance from the field pole to the armature iron; that is, the electro-motive force at any instant, is inversely as the clearance. In order, then, to obtain an electromotive-force following the sine law, the pole faces of the inductors of these generators, as well as the pole faces of the inductors of all generators, manufactured by the Stanley Electric Manufacturing Company, are so shaped that their curvature may be expressed by a formula which was derived by Mr. Kelly, of the Stanley Company, and is contained in a United States patent issued to him.

In the design of the inductor machine it has been found by the writer than any deviation from this law, or the use of any other than a sinusoidal electromotive-force has resulted in increased losses in transformers and unsatisfactory running of motors. In one instance the output of a 20 h. p. motor was reduced 25 per cent. on a machine with a distorted wave, and the condensers which were intended to balance the lagging currents of the motor, were absolutely useless for that purpose.

A novel feature has been introduced for the first time in these generators. The entire distributing system has been arranged to be run in parallel, and, in order to do this the generators must be kept in phase. There are some objections, however to paralleling 5,000 volt machines through their principal circuits—also do difficulties occur in paralleling long transmission lines. A defect arising in any wire of one line, such as a ground or leak, affects all the wires in all the lines, so that if at any other point another ground occurs, the generators between the two grounded points are all short circuited. To overcome this difficulty, the mains from the different machines are kept separate and the secondaries of the step-down transformers are connected in parallel with the supply mains.

In consequence, unless the line from one generator has two weak points, there is no leakage, and, at any rate, the leakage due to two weak points can affect directly only one generator. In order to keep the generators in phase under these conditions, a separate and distinct synchronising winding gives an electromotive-force of 120 volts and has a synchronising capacity of about 100 K. W. This, together with the effect that can be obtained through the paralled secondaries of the step-down transformers is sufficient to give perfect parallel running. The load can be readily shifted from one generator to the other by varying the quantity of water supplied to the turbines.

The exciters are two slow speed, direct current machines of 12 K. W. capacity, each of sufficient capacity to excite the fields of the three alternators.

Some of the electrical data of these machines are interesting, as showing the improvement in dynamo design and the possibilities of the inductor type of machine. From the shop tests we have the following:—

Maximum loss in field,	4000	watts.
Loss in armature iron, friction and windage	20,000	"
" armature copper	7000	"

From these we calculate the efficiencies:—

Full load,	95.1 per cent.
Half load,	92.3 per cent.
Quarter load,	87 per cent.

The rise of temperature after a run of twenty-four hours, with full load, is as follows:

Field coil,	12 C.
Armature iron,	21 C.
Inductor iron,	7 C.
Armature coils,	26 C.
Bearings,	21 C.

The regulation, that is, the variation of the electromotive force from no load to full load, with same speed and same field excitation, was 3½ per cent. With full load on one phase and no load on the other, the percentage difference of electromotive force was 3¼ per cent.

The design of the switchboards and the general features of their construction can be best understood by reference to the illustrations on pages 13 and 14. Both the generator and distributing switchboards are built of marble, supported upon wooden frames, and the panel method of construction is followed throughout. Each slab of marble was tested for metallic streaks, with a pressure of 12,000 volts.

The generator board consists of three sections, of three panels each. The lower panel of the left-hand section carries the two rheostats for controlling the fields of two of the generators. They are mounted on the back of the board, and only the handles and the heads of the supporting bolts show. The middle panel carries four machine switches with self-closing arc cut-offs, two for each generator, and one of these for each phase. These connect directly to two of the four-wire transmission lines.

It is never intended to open these switches under load, except in the case of great emergency, when the automatic cut-offs will take care of any discharge from the line, or any tendency to arc. When a generator is to be taken out of work, the load, if it is running in parallel with another, is shifted to the other by gradually cutting off the supply of water to its turbine; after that, the switch can be opened without difficulty. If the generators are running independently, the load is first transferred at the sub-station before opening the switch.

The upper panel contains four ammeters, two for each transmission line, and four voltmeters, with high-potential station voltmeter transformers placed directly at the back. The right-hand section is exactly the same as the left, with the exception that it is, at present, equipped for only one generator and transmission circuit.

The lower panel of the middle section carries three four-pole, single-throw switches for connecting the synchronising windings of the generators in parallel. The synchronising lamps are shown just above.

The middle panel is the exciter panel, carrying the necessary switches for paralleling the two exciters, and for charging the field of any generator from any exciter if the exciters are running independently.

The upper panel contains three direct-current ammeters for the fields of the generators, and also four alternating current voltmeters, with voltmeter transformer at the back, connecting to the 2,000-volt potential lines which return from the sub-station.

The distributing board was originally designed for parallel running only, but it was afterwards learned that on rare occasions ice accumulates in the turbine feed pipes, which affects the speed of the wheels and makes parallel running an impossibility. In consequence, the original design was changed to permit either independent or parallel running of the generators. The two sections on the left of the board are organized for lighting alone, and to permit the transfer of any two-wire circuit upon any of the possible four sets of step-down transformers. This is accomplished by a series of three double-throw, double-pole switches. At the extreme top of this section are the automatic circuit-breakers. The two sections on the right of the board are organised for light and power, and differ from those on the left only in that the four-pole double-throw switches are substituted for the two-pole double-throw.

The two centre sections are the same in design. The upper panels contain the voltmeters and ammeters for the various circuits. The middle panels carry four-pole double-throw switches, and are connected to the secondaries of the step-down transformers in such a manner that, if the switches are thrown up, three sets of two-phase secondaries are connected to three separate sets of bus bars; if they are thrown down, all the secondaries of each phase are connected in parallel. The lower panel carries the ground detectors of the ordinary transforming type. The whole switchboard is 26 feet long and 11 feet high.

All the motors now in use by the Montmorency Electric Power Company are the S. K. C. induction motors. These motors were described by Dr. Bell in the January number of this magazine. They vary in size from one horse-power to 30 horse-power, and do all kinds of work, running the tools of carpenter and machine shops, driving the saws and wood-planers of planing mills, and handling the freight elevators in various mills and in wholesale warehouses with perfect satisfaction. It is now well understood that the magnetizing current of an induction motor lags behind the applied electromotive-force, and that a lagging current in practice involves considerable loss and expense, by necessitating the use of larger conductors and generating apparatus, while it seriously interferes with the proper regulation of the generators, and increases the normal drop of the line.

In the S. K. C. motor the magnetising current is furnished by condensers; the motor then takes current in proportion to the load. Two condensers are connected in multiple with the fields of the motor, and each has a capacity in amperes at the working voltage practically equal to the no-load current of each field of the motor. If there is no distortion of the current wave, the apparent energy taken by an induction motor with condensers is equal to the real energy.

An interesting example of the value of condensers on induction motors is shown in a small plant in New England. The generator was a 60-ampere two-phase machine, manufactured by one of the larger electrical companies, and was furnishing power to a number of small induction motors. The motors were doing all kinds of general factory work and running ten hours a day. The average load on the motors was about one-quarter of their maximum. The amount of current furnished by the generator to the motors was 52 amperes at 1,152 volts. The power factor was 0.505.

When the motors were supplied with condensers, the current was reduced to 28 amperes at 1,150 volts, and the power factor was increased to 0.863. The reason that the power factor was not increased to unity was the existence of harmonics in the curve of the electromotive-force of the particular machine in use.

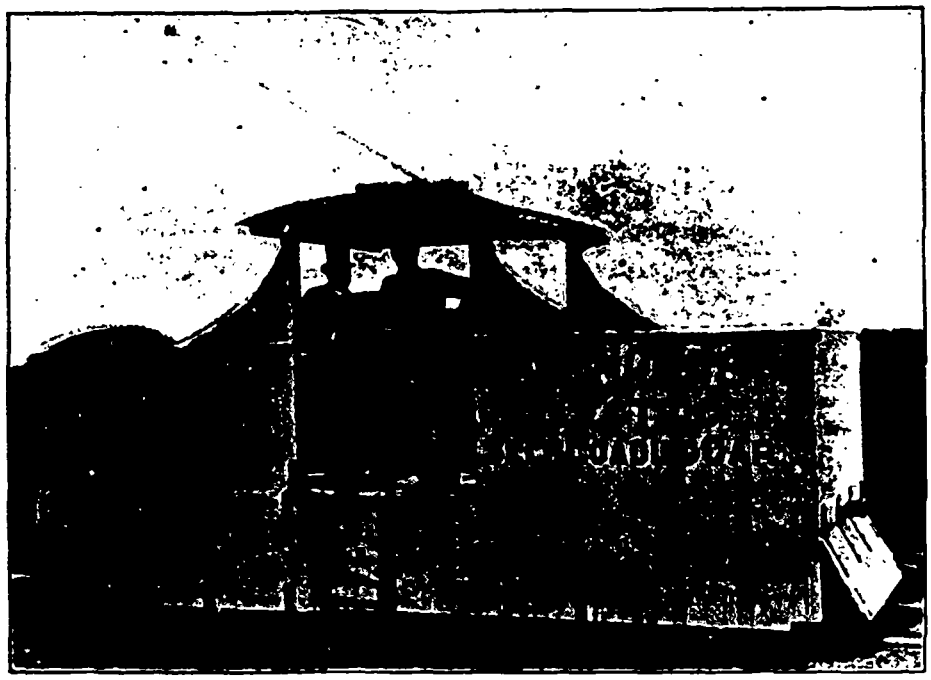
As to the commercial efficiency obtained in this plant, it is interesting to note that, with the generator working at full load, for every 100 K. W. of energy delivered to the pulley of the generator, 95.1 K.W. are delivered to the line at the generating station; 87½ K. W. are delivered to the terminal of the step-down transformers, and 86 K.W. are delivered to the distributing mains of the sub-station.—Cassiers' Magazine.

ELECTRIC RAILWAY DEPARTMENT.

AN ELECTRIC SELF-LOADING CAR.

Mr. A. Jackson Reynolds, of Montreal, has patented an electric self-loading car for street cleaning purposes which is claimed to possess great mechanical ingenuity, and which promises to result in a large saving in the cost of cleaning city streets. The first car manufactured under his patents was turned out of the Rathbun Company's works at Deseronto a fortnight ago, and is shown in the accompanying illustration.

The system of cleaning is as follows: About one-third of the surface of the street is swept from the curb inwardly towards the railway tracks by the ordinary horse sweepers, driven in the opposite direction from the usual way of sweeping from the centre to the outside. The refuse is then taken up by the self-loading car at any desired speed and conveyed to the desired location.



The car shown herewith is 22 feet in length, 8 feet wide and 9½ feet high, very compactly and strongly built in every section. It is fitted with all the appliances for electricity common to a regular trolley car. Contrary to general use the brakes, motors, etc., are all situated above the wheels and axles so as not to impede the full action of the brush. The operating platform on which the persons stand while directing the motion of the car and broom is 8x5 feet, and so placed as to protect them from being touched by the dust thrown from the revolving brush or broom.

The results are accomplished mainly by placing a large rotary brush across the centre of a moving car, said brushes being covered with steel casings, with proper outlets for discharging the sweepings into the body of the car, and covering the brushes with said steel plates, having rubber aprons fitting the pavements. The high speed of the brush forms a powerful suction, which takes up all the itemized matter and deposits it over the brush into the body of the car, which is provided with pivoted dump floors for dropping the load instantly at any point desired. The brushes, steel casings, and rubber aprons are so constructed as to work in either direction automatically. The cars are driven preferably by a stationary motor placed directly over the brushes on the operating platform of the car, the brush being operated from a counter-shaft by sprocket wheels and chain.

The brush, which has been specially manufactured for the purpose, makes five revolutions to each one of a car wheel. It works much on the same principle as a carpet sweeper, and will throw the dust a distance of twenty-five feet. Its capacity is about twenty-eight car loads. The broom, which is fastened to solid heavy axles, is so arranged that it always fills the case in which it is contained, a simple but ingenious device changing the size of the latter to suit the changes made by the wear of material. The broom acts as well one way as another, steel deflectors being so arranged that it can be run backward without any change of machinery or even without touching it. By a change of the trolley the action may be reversed instantly so as to throw the dust one way or the other as may be desired. The broom may be extended so as to cover the whole street outside the car-track if necessary. For removing snow in winter the car may be constructed as long or wide as may be required. The car may be unloaded in thirty seconds, one man doing the whole work by manipulating a lever.

The cost of operating this electric sweeper is claimed to be about $3.00 per mile. The side sweeping by horse machines can be done for $1.50 per mile, which makes the total cost $4.50 per mile. From $15 to $25 per mile is now paid by cities for the same work.

The price of cars will be $1,000, with a royalty of one dollar per mile for all streets cleaned.

The inventor, Mr. Reynolds, now of Montreal, but formerly of Worcester, Mass., has had an experience of thirty-five years in the design and construction of

mechanical apparatus, having spent four years with the best engineers of Paris, London, Vienna, and other foreign cities. He is also the inventor of several other devices for which patents have been granted in Canada and the United States.

Mr. Jackson informs us that he has already entered into agreement with Ontario parties for the exclusive use of his cars in this province, for which privilege the consideration of $45,000 is to be paid.

SPARKS.

The directors of the London Street Railway Company have authorized the issue of a larger amount of stock.

Work has been commenced on new car sheds for the London Street Railway Company, to cost $7,000.

Work on the Hull and Aylmer road is progressing favorably. The first four cars will shortly be shipped from Peterborough.

During the year 1895 the Niagara Falls Park & River Railway carried 499,015 passengers. The receipts were $65,784, and cost of operation $40,630.

The Hull Electric Co.'s power house at Dechenes is completed, while the car shed, of stone, will be finished in a few days. Cars will be running before the 1st of July.

The Petrolia Electric Light & Power Co. are installing a direct current Canadian General Electric Co. power plant for pumping some oil wells near their power house.

The Gananoque Electric Light & Power Co. have increased their three wire incandescent plant by ordering two 600 light machines from the Canadian General Electric Co.

The Consolidated Railway and Light Co., of Vancouver, have ordered two additional open cars from the Canadian General Electric Co. The equipments will be of the standard C. G. E. 800 type.

C. G. T. Clark, superintendent of the electric lighting station at Niagara Falls, Ont., recently had a narrow escape from death at Tonawanda by coming in contact with a trolley while riding a bicycle.

Markdale, Ont. is to have incandescent light. Power will be obtained from a water power about one mile out of town. The contract for the plant has been closed with the Canadian General Electric Co.

The London Street Ry. Co. have placed an order for 12 additional C. G. E. 800 motors with the Canadian General Electric Co. This will make 60 motors of this type operating on the London road.

The ratepayers of Sherbrooke, Que., have sanctioned the construction of an electric railway along the streets of the town. Work will therefore be commenced at once, and the park line completed by fall.

Mr. C. A. Cunningham has entered an action in the courts against the Royal Electric Company, claiming $10,000 for the loss of one of his eyes. The plaintiff met with the accident while in the employ of the Company.

The town of Listowel, Ont., has under consideration the question of installing an electric light plant. A committee of the Town Council has recommended that an electrical engineer be engaged to report on the cost thereof.

The earnings of the Montreal Street Railway Co., for seven months ending 30th April last, are $661,543.86, against $545,864.94 for the same period last year, an increase of $115,678.92, giving an increase in the average daily earnings of $543.10.

An electric railway company is applying for incorporation to operate in the city of Charlottetown, P. E. I. The city council has granted the company permission to operate cars on Sunday, which step is strongly opposed by the Ministerial Association.

The Hamilton, Chedoke & Ancaster Railway Co., who propose building a trolley line to run in connection with the street car system from Hamilton to Alberton, have requested a bonus of $15,000 when the line reaches Ancaster, and the same amount when completed.

The date limit for the commencement of the electric railway at Quebec has expired, which involves the forfeiture of $10,000. It is probable, however, that the City Council will grant an extension of time, Mr. Beemer having given assurances that the work will shortly be proceeded with.

The Port Dalhousie, St. Catharines & Thorold Ry. Co. have recently rebuilt their overhead line changing from the old Van Depoele over-running system to the standard under-running trolley. Additional motors of the C. G. E. 1200 type have also been purchased from the Canadian General Electric Co.

The work of constructing the new electric street railway system at Moncton, N. B., is proceeding rapidly. The Canadian General Electric Company have the contract for the apparatus, which includes a 100 k. w. generator and two double motors C.G.E. 800 equipments. The road is to be in operation by the 1st of July.

Work has been commenced on the electric street railway at Sarnia, Ont. It is the intention of the company to have one of the finest systems in Canada. The road will extend from Sarnia to Point Edward, and then to Weesbeach, a summer resort on the shore of Lake Huron. The city gave the company a bonus of $10,000.

The cars of the Westminster and Vancouver Electric Tramway Company have been improved and remodelled, under the superintendence of Mr. P. M. Smith, the efficient manager of the road. The new Bessemer Sheet Steel Headlight, made by the United States Headlight Co. for the patentees, has also been obtained. This is said to be the most improved headlight obtainable.

Col. Stacey, who recently purchased the street railway franchise of St. Thomas, Ont., has made a formal proposition to light the city with 2,000 candle power lights and electrify the railway system. The price asked from the city is $10,000 for the first three years, $9,000 for the second three years, and $8,500 for the following four years, the city to have the option of purchasing the plant at the end of that time.

At a recent meeting of the provisional directors of the Chatham City and Suburban Railway Company, of Chatham, Ont., there were present Messrs. John Mercer, G. P. Sholfield, Manson Campbell, John A. Walker, Fred Stone, Wm. Douglas, Q. C., and Geo. C. Rankin, London. Mr. Walker was appointed chairman of the Provisional Board, and Mr. Wm. Douglas, Q. C., secretary. It was decided to at once open a stock book.

Work has been commenced on the power house for the Hamilton Radial Railway Company at Burlington. It will be of brick, 53 feet by 100 feet, and will contain three boilers and two engines, each of 250 horse power. The chimney will be 14 feet in diameter at its base and 108 feet in height. Space will be left for additional engines and boilers should they be required. An effort will be made to put the line in operation by Dominion Day.

An exchange says that the enterprise of organizing a company to build an electric railway for Port Hope promises to develop into a definite scheme. Plans have been prepared which demonstrate that for a comparatively small expenditure an electric railway could be opened between Port Hope and Pontypool, thus connecting with the C. P. R., and extending a mail service to Kendall, Orono, Osaca and other places which are at present reached only by stage.

Dr. Oille, President of the Niagara Central Railway Company; Ald. J. S. Campbell and J. C. Rykert, of St. Catharines, and Mr. William McGill, of Thorold, recently waited on the Dominion Government requesting that the subsidy of $100,000 standing to the credit of the road to Hamilton be diverted so that $40,000 of it might be applied to the improvement of the existing roadbed and $60,000 subsequently to an electric system connecting with the Toronto, Hamilton & Buffalo Railway.

The shareholders of the Moncton Street Railway, Heat and Power Company have elected directors as follows: J. L. Harris, president; J. W. Y. Smith, vice-president; R. A. Borden, secretary-treasurer; F. W. Summer, E. C. Cole, J. C. Robertson, F. A. West, and Ald. Girvan. It has been decided to proceed at once with the construction of the road, and it is expected to have cars running in about two months. Stock to the amount of $50,000 has been subscribed. The power house will be erected at the wharf siding at the foot of King street.

The Montreal Street Railway Company are again making extensive additions to their power plant. An order has been given to the Canadian General Electric Co. for a 1,500 kilowatt generator which will be coupled direct to a 3,000 horse-power Laurie engine. This immense unit, in which the weight of the generator alone will be nearly 100 tons, is similar in style to the direct-connected units supplied to the Toronto and Winnipeg Street Railway Companies. With the addition of the new machine, the capacity of the generator in the Montreal Railway Company's power house will exceed 8,000 horse power.

The incorporation is announced of the Cornwall Electric Street Railway Company, with a capital stock of $150,000, the company being formed of H. R. Hooper, C. E., D. A. Starr, F. N. Seddall and Mrs. Hooper, of Montreal, and W. R. Hitchcock, of Cornwall. At a recent meeting of the company, officers were elected as follows: H. Ross Hooper, president; D. A. Starr, vice-president and managing director; F. N. Seddall, secretary and treasurer. The construction of the railway has been commenced, and a portion of it will shortly be in operation. The cars are being built by the Rathbun Co., and the machinery by the Canadian General Electric Co. A powerful 120 horse-power electric locomotive will be used to haul freight, which will be one of the principal sources of revenue. A brick power house, 72 × 30 ft., is being built on Water street near the canal.

The annual general meeting of the shareholders of the Ottawa Electric Company was held at the company's office, corner Sparks and Elgin street, on the 1st inst. The report of the president and directors for the year ending April 30th was presented, showing a gross revenue of $153,788.66, being a very satisfactory increase over the previous year. A dividend of eight per cent. was declared. The total number of incandescent lights installed is 53,331, an increase of about 5,000 during the year. The number of arc lights 497, motors 81, heaters 119. During the year considerable advance was made in the construction of a new switchboard under the direction of the general superintendent, Mr. A. A. Dion, which will result in a complete unification of the company's lines, so that the whole system may be controlled from the central lighting and power station. A vote of thanks was unanimously accorded the president and directors, and upon motion the board was re-elected as follows: Hon. Francis Clemow, Hon. E. H. Bronson, Geo. P. Brophy, T. Ahearn, J. W. McRae, Wm. Scott, C. Berkeley Powell, D. Murphy and Geo. H. Perley. At a subsequent meeting of the directors the following officers were re-elected: T. Ahearn, president and general manager; Hon. E. H. Bronson, vice-president; D. R. Street, secretary-treasurer; A. A. Dion, general superintendent; Redmond Quain and A. Bayly, auditors.

SPARKS.

"Is your town lighted by electricity now?"

"Yes, but only when there's a thunderstorm." -Lustige Blatter.

The Citizens' Light, Heat and Power Co. of St. Catharines, Ont., has been incorporated with a capital stock of $40,000, in $50 shares.

Dr. Corbett, of Port Hope, is increasing the depth of his raceway with a view of obtaining power for an additional 75 kilowatt monocyclic alternator.

This X ray business has gone far enough. A New York physician says that by using the new ray he has "found the stereytococcus erysipelatosus proliferating in the interspaces of the connective tissue." Think of that! -Exchange.

Mr. John Goodwin, an employee of the Ottawa Electric Company, has invented a cleat intended for tightening any wire, rope or cord that may be strung from one place to another, which, it is said will be especially useful in electric wiring. A patent has been secured, and the article is being manufactured in porcelain at the shops of the Ottawa Carbon and Porcelain Company.

The three-phase plant at Trenton was started up recently, and a regular service will shortly be supplied to the town of Trenton. The line to Belleville, 13 miles distant, is practically completed, and will be ready for occupation in a short time. The first motor used in Belleville will be a 75 kilowatt synchronous motor of the Canadian General Electric Co.'s standard type from which power will be supplied to operate the arc machines.

The amalgamation has been consummated of all the important electric heating companies in the United States, including the Western Electric Heating Company, St. Paul, Minn.; the Central Electric Heating Company, New York; the New England Electric Heating Company, the Burton Electric Company, Richmond, Va.; The Carpenter Electric Heating Manufacturing Company, St. Paul, Minn.; the Dewy Electric Heating Company, Syracuse, N. Y.; the Rich Electric Heating Company, Mt. Vernon, N. Y., as well as several others, which have not been active in the business for some time, but which owned valuable patents. The manufacturing will be concentrated at Cambridgeport. J. Y. Ayer, ex-President of the National Electric Light Association, is the general manager. The capital stock is $10,000,000.

A German expert, after a careful estimate, has announced that the total length of telegraph lines in the world is 1,062,700 miles, of which America has 545,600 miles; Europe, 280,700; Asia, 67,400; Africa, 21,500, and Australia, 47,500 miles. The United States has a greater length than any other country, 403,900 miles, and Russia comes next, although European Russia has only 81,000 miles. The other countries follow in this order: Germany, France, Austria-Hungary, British India, Mexico, the United Kingdom, Canada, Italy, Turkey, the Argentine Republic, Spain and Chile. In point of proportion, however, Belgium leads, with 409 miles of wire for every 1,000 square miles of territory; Germany comes next with 350 miles; Holland is only slightly behind Germany, and the United Kingdom has 280 miles of telegraph for every 1,000 miles of country.

CANADIAN GENERAL ELECTRIC CO.

(LIMITED)

Railway Apparatus

We invite attention to the commanding position the Company has attained in the Electric Railway field.

Our Apparatus is now in use on almost, without exception, every independent road in the Dominion, and the fact that we have been awarded practically all the contracts placed during the past year for equipment either for new or existing roads, is the strongest possible testimonial both as to the superiority of the Apparatus itself, and the fair and liberal basis on which the business of the Company is conducted. Amongst the roads from which orders for apparatus have recently been received may be mentioned the following:

Hull & Aylmer Electric Ry. Co.
Moncton Electric Street Railway, Heat & Power Co.
Hamilton Radial Electric Ry. Co.
Cornwall Electric Street Ry.
Halifax Electric Tramway Co.
St. John Street Railway Co.
Montreal Street Railway.
Toronto Street Railway.
Vancouver & Westminster Tramway Co.
City and Suburban Street Ry.
Guelph Electric Street Ry.
Berlin & Waterloo Street Ry.
Port Dalhousie, St. Catharines & Thorold Street Railway Co.
Brantford Street Railway Co.
London Street Railway Co.
Kingston, Portsmouth & Cataraqui Railway.

Lighting and Power Transmission Apparatus

In considering the development of our systems of apparatus for lighting and power transmission, we have kept in view the important fact, that varying conditions of service require varying methods to meet them.

We have in our **Edison Direct Current Three-Wire System,** our **500 Volt Direct Current System,** our **Single-Phase Alternating Current System,** our **Monocyclic System** and our **Three-Phase System,** a series of methods, each superior to all others, for the service to which it is adapted. We are not confined to one system only, but cover the whole range of Direct Current, Single-Phase and Multi-Phase Alternating Apparatus. Our interest in each case, therefore, lies in using the most suitable system, since we manufacture all; not in twisting the conditions to suit one particular system, however ill-adapted to the particular case.

Our recent sales of Lighting and Power Apparatus have exceeded all previous records and include the sale to the Lachine Rapids Hydraulic and Land Co'y, of twelve three-phase generators, each of 1000 h.p. capacity.

Judge White rendered judgment at St. Johns, Que., recently in the case of the Richmond County Electric Light Co. vs. the Sherbrooke Telephone Association, condemning the defendants to pay plaintiffs $213.63 on account of the wrecking of a dynamo at the plaintiffs' station through the act of the defendants in allowing one of their wires to cross the plaintiffs' and produce a short circuit. An appeal will be taken from this judgment.