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CANADIAN
ELECTRICAL NEWS
AND STEAM ENGINEERING JOURNAL

OLD SERIES, VOL. XV.—No. 6.
NEW SERIES, VOL. VI.—No. 2.

FEBRUARY, 1896

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CANADIAN

ELECTRICAL NEWS

AND

STEAM ENGINEERING JOURNAL.

VOL. VI. FEBRUARY, 1896. No. 2.

MR. E. E. CARY.

THE annexation of the United States to Canada is proceeding satisfactorily. Our latest conquest in this direction is the capture of Mr. E. E. Cary, the newly appointed manager of the Packard Electric Co., of St. Catharines, whose portrait we have pleasure in being able to present to the readers of THE ELECTRICAL NEWS.

Mr. Cary's home since infancy has been in New York City, although he has not resided there continuously. He graduated from the Polytechnic, of Brooklyn, N. Y., in 1884. During 1883-4 and part of 1885 he was public and private assistant in electrical work to Prof. Robt. Spice, of Brooklyn, N. Y. In 1885 he entered the laboratory as assistant in electricity and chemistry to Prof. Weston, then connected with the old U.S. Electric Light Co., of Newark, N. J. In this position he remained three years, devoting much time to the development of incandescent lamps, then in its early infancy as a commercial product. He then accepted an opening with the Westinghouse Electrical Mfg. Co., of Pittsburg, where he remained for two years and a half. While with the Westinghouse Company he was associated for a year with the Russian physicist Dr. Lodyquin in special filament investigation, having to do with high efficiency lamps. He then joined the forces of the Sawyer-Mann Electrical Co., and did special experimental and practical work on 110 volt lamps.

For the past four years he has been connected with the Beacon Vacuum Pump & Electrical Co., of Boston, as superintendent, and latterly as business manager. In December last he joined the Packard Electric Co., Ltd., as general manager. The most of his work in the States has been intimately associated with the development of the incandescent lamp.

Mr. Cary is the author of a number of inventions, having to do with the mechanical and scientific production of the incandescent lamp, and was one of the inventors of the N. and C. Stopper lamp, which, though ultimately not proving a commercial success, owing to its being pushed on the market too soon, involved new principles which some day may be most valuable. It is protected by over 20 patents, issued in the U. S.

It will thus be seen that Mr. Cary is well qualified for the position he now occupies, and the Packard Company are to be congratulated upon having obtained the benefit of his experience and services.

ELECTRIC LIGHT AMALGAMATION IN TORONTO.

THE negotiations which have been in progress for some time past with the object of effecting a closer business relationship between the Toronto Electric Light Co. and the Incandescent Light Co., of Toronto, are understood to have resulted in an amalgamation of the interests of these companies. The bulk of the stock of the Incandescent Company has passed into the hands of the Toronto Electric Light Company, while on the other hand, several of the directors of the Incandescent Company have acquired stock in the older Company, and will occupy seats on the Board of Directors of the amalgamated concerns.

It is stated that Mr. Frederic Nicholls, the organizer and manager of the Incandescent Company will shortly retire, and the management of the amalgamated concerns be placed in the hands of Mr. J. J. Wright, the present manager of the Toronto Electric Light Company. It is believed that Mr. Nicholls will be a Director of the new Company.

Authority will be sought to enable the company to increase its capital stock to at least $1,500,000.

The improvements designed to be carried out by the Toronto Electric Light Company before the amalgamation, including the building of a new station and the installation of an alternating incandescent lighting plant, are being proceeded with. A large power alternator of the C. G. E. type has already been purchased. A test is to be made of Stanley and Monocyclic machines for incandescent lighting, and the system which gives the most satisfactory results will be adopted.

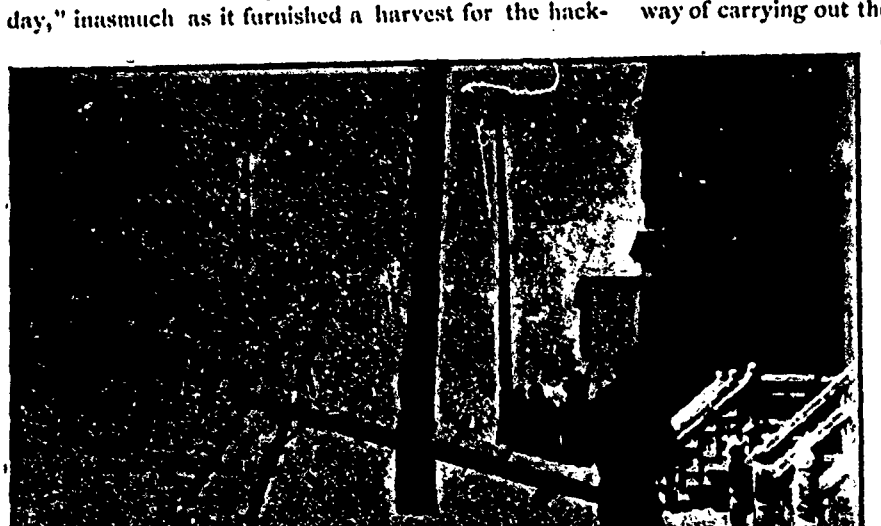
The current generated at the incandescent station on Terauley-street will probably be exclusively used for lighting the business district of the city, while current for power and incandescent lighting in the residential parts of the city will be furnished from the new station, shortly to be erected on the esplanade.

The Vernon & Nelson Telephone Co., have extended their service to Trail and Rossland, B.C.

The Canadian Marine Engineers' Association have elected officers for 1896, as follows: President, O. P. St. John; First Vice-President, J. S. Adam; Second Vice-President, J. Parsall; Council—J. Findlay, R. Hughes, S. Gillespie, D. F. Campbell, R. McLaren; Treasurer, D. L. Foley; Secretary, S. A. Mills; Auditors—R. Childs, J. H. Ellis; Inside Guard, E. Abbey.

THE RECENT SLEET STORM.

The recent sleet storm which resulted in so much damage to the electrical interests throughout the country, and especially in the City of Toronto, which appeared to be the centre of the storm, was indirectly an illustration of the old saying that "every dog has his day," inasmuch as it furnished a harvest for the hackmen at the expense of the Street Railway Company. The storm proved even more disastrous to the electrical companies than the one which took place a couple of years previous. We publish herewith some illustrations which will serve to indicate the destruction wrought in Toronto, and the difficulties with which the electrical companies had to contend and are still contending in consequence. For the photographs from which these illustrations were made, we are indebted to Mr. Arthur M. Rust, of the City Engineer's department.



SAMPLES OF THE WORK OF THE RECENT SLEET STORM.
Ontario Street, looking north from Queen Street, Toronto.

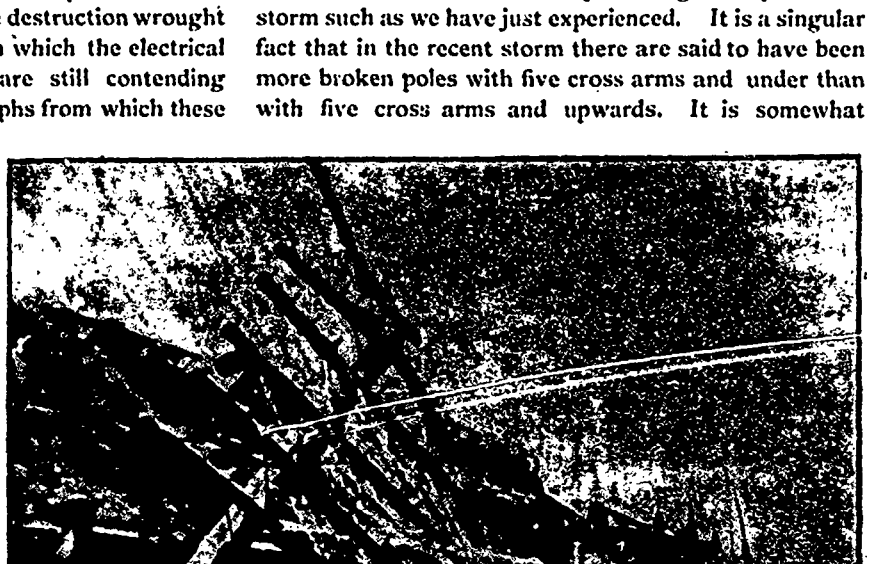
By far the largest amount of loss fell upon the Bell Telephone Co., owing, no doubt, to the fact that its poles were much more heavily laden than those of the electric light and telegraph companies. The latter appear to have come out of the occurrence with comparatively little loss.

The Great North Western Telegraph Company's lines west of Toronto were in operation before noon of the day following the the storm. The greatest difficulty the company experienced was in the vicinity of Scarborough, where its wires and poles were so heavily sheeted with ice as to be unable to withstand the strain.

The Electric Light Co., after consulting with the city authorities, deemed it inadvisable to turn on current on the night following the storm, lest accident might result on account of the tangled up condition of the wires on the streets.

The Bell Telephone Company's loss is estimated to be somewhere between $50,000 and $75,000. The immense destruction to their system has given rise to the opinion, on the part of the public, that in the interests of the company and its subscribers their wires should be placed underground. On the surface this would seem to be a proper view of the matter, but further consideration will show that there are serious difficulties in the way of carrying out the proposition. In the central part of the city, where hundreds of subscribers are bunched together within a limited area, it is possible to place the wires underground, as they can easily be brought up through cables to the top of a pole or building, and from thence distributed to subscribers. This is not the case, however, in the out-lying districts, where subscribers are more widely separated from each other. In such districts poles are an absolute necessity for distribution purposes. If there is any means of distributing current to subscribers in such districts, without the aid of poles, we would be pleased to learn how it could be done.

The opinion has also been expressed that the telephone company made a mistake in adopting the trunk line system of distribution, by which they are obliged to carry from 100 to 200 wires upon their poles, the weight of which, with the addition of a coating of ice, is calculated to cause the poles to give way under a storm such as we have just experienced. It is a singular fact that in the recent storm there are said to have been more broken poles with five cross arms and under than with five cross arms and upwards. It is somewhat difficult to account for this fact seeing that each additional cross arm, with its attendant wires, must increase the weight on the pole. It should be borne in mind, however, that each additional cross arm is located lower upon the pole and tends to distribute the weight.



SAMPLES OF THE WORK OF THE RECENT SLEET STORM.
Rose Avenue, looking north from Winchester Street, Toronto.

It seems to be rather a question of the direction in which the pole lines run, and the amount of shelter they

get, than the number of wires they carry. As to shelter, they get very little, owing to the fact that the poles must be high enough to place the wires beyond the reach of contact with shade trees and buildings. It has been found that the lines running east and west suffer comparatively little as compared with those running north and south. Unfortunately it is not possible for the Telephone Company to run its lines in one direction only, as might be done by a telegraph company seeking an outlet into the country. The Telephone Company are obliged to go where its subscribers are, no matter what the direction may be. Referring again to the trunk line method, it may be pointed out that the adoption of this method in Toronto was also necessitated by the fact that the company's agreement with the city prohibits them from using certain of the principal thoroughfares, so that it becomes necessary for them to mass their wires on certain streets in order to be able to reach their customers.

It has likewise been suggested that wrought iron should be substituted for wood for poles, but the persons who make this suggestion have evidently not considered the question of cost. In Belgium, where iron and labor are cheaper than almost any other place in the world, the cost of wrought iron poles 100 feet high is about $800 each. A similar amount would have to be paid on this Continent for a pole 62 feet high, which is about the height of the wood poles now in use by the Bell Telephone Company in Toronto. These wood poles probably cost the company not more than $10 each, so that it can readily be seen that the use of iron is entirely out of the question. It may be possible at some future time to evolve a method of distribution which will be equally as efficient and less subject to unfavorable weather conditions than that at present in use, but so far the problem remains unsolved.

SAMPLES OF THE WORK OF THE RECENT SLEET STORM.
Terauley Street, Looking North from Louisa Street, Toronto.

The recent storm serves to indicate the necessity for a large reserve fund on the part of electrical companies in general, and telephone companies in particular. It would of course be unreasonable to assume that such a storm is likely to occur every second or third year. Prior to the storm of two years ago there had not been such an occurrence for 12 or 15 years, and possibly there may not be another for a like period in the future.

The purchase of the electric light plant of the city of Kingston, Ont., will probably be considered by the council at an early date. The cost for lighting the streets under the present contract is $7,000.

At Windsor, Ont., recently, Judge Horne decided that the municipalities cannot assess the telegraph wires of the Canadian Pacific railway, as the company is, by its charter, allowed to erect and maintain telegraph lines and to charge for messages sent by them.

LIGHTING FROM STREET RAILWAY CIRCUITS.

A correspondent writes us as follows:

"In asking the citizens of a certain town in northwestern Ontario for subscriptions to help forward a scheme for an electric railroad, they were informed by the promoter that when the road was built, current would be supplied for lighting purposes at the rate of fifty cents per year for each 16 c. p. lamp, a ten dollars per year for each arc street lamp. If 700 lamps were installed, this would in addition to 8 street arc lamps amount to the sum of $430 per year, which would not go far in paying the expenses of the plant, even if the lighting was done off the trolley wire, which is prohibited by the Underwriters' Association. However, at this rate the electric lighting companies will have to "shut up shop" and start farming or some other congenial occupation. Evidently the aforesaid gentleman was trying how much he could make some people swallow without causing them to gag. He must have succeeded beyond his wildest expectations."

We may say, with reference to the above communication, that electric lighting companies have little to fear from the competition of electric railway companies, inasmuch as the Underwriters' Association, as stated by our correspondent, will not approve of current being taken into buildings for lighting purposes from street railway circuits.

This matter came up in Toronto some time ago, with the result that owing to the opposition of the Underwriters' Association, there is at the present, so far as we know, only one instance to be found in the city, of electric light being furnished from the street railway circuit. There is the additional fact that owing to the frequent and great fluctuations in the current on street railway lines, it is impossible to get satisfactory lighting from this source. These two causes are sufficient in themselves to prevent the extension of electric lighting from street railway circuits, so that electric lighting companies need be under no apprehension of losing their business as the result of the competition of street railway companies.

All these difficulties, of which we hear complaint, are evidence of the need of organization and interchange of views and experiences on the part of those engaged in the electric lighting business.

Professor Waddell, of the Royal Military College staff, Kingston, recently delivered a lecture in the Y. M. C. A. hall in that city on "The Electric Current." With the aid of a battery, small dynamo, magnets, volt and ampere meters, he gave in detail the origin of the electric current and the manner in which the pressure and flow were kept constant.

CANADIAN ASSOCIATION OF STATIONARY ENGINEERS.

NOTE. Secretaries of Associations are requested to forward matter for publication in this Department not later than the 25th of each month.

TORONTO NO. 1.

The members of the above association have felt for some time past the necessity of procuring more satisfactory rooms in which to hold their meetings. These have now been secured at No. 61 Victoria street, and consist of one large meeting room, with library room and several anti-rooms adjoining. They are suitably adapted to the requirements of the association, and realizing this, a five-year lease has been secured.

The trustees of the hall are Messrs. James Huggett, E. J. Philip and Geo. Fowler. The inaugural opening took place on the 23rd of January, and was made the occasion of a social entertainment, at which, notwithstanding the inclement weather, upwards of 150 persons were present, many of whom were ladies. The accompanying illustration shows the interior of the main hall.

INTERIOR VIEW OF HALL, TORONTO NO. 1, C. A. S. E.

A concert formed an enjoyable feature of the evening's entertainment, the proceedings being presided over by Mr. W. Lewis, president of the association. The programme, which was entirely voluntary, was as follows: Song, Mr. Thos. Seaton; calisthenics, Mr. H. Eversfield; trio, Mrs. Coutts-Bain and Messrs. Towers and Cashmore; comic song, Mr. Allcott; duet, Messrs. James Fax and G. W. Grant; song, Miss Warnock; comic song, Mr. Jas. Fax; phonograph, Mr. Parks; song, Mr. W. G. Blackgrove; comic song, Mr. Fax; song, Mr. Cashmore; song, Mrs. Coutts-Bain; duet, Miss Warnock and Mr. Grant; concertina solo, Mr. Vaughn. A decided hit was made by Messrs. Fax and Grant in a duet entitled "Goodness Gracious." For the benefit of absentees we give one of the verses:

When Wickens first started the C. A. S. E.,
Oh, goodness gracious,
Folks thought he was off of his b-a-s-e.,
Goodness gracious;
But now we've got Edkins and Phillipses too,
George Mooring, Tom Eversfield, doodle-dum-deo,
And then as a climax this hullabaloo,
Gracious, good gracious, goodness gracious.

A brief address was delivered by Mr. A. M. Wickens, in which he referred to the circumstances which led to the formation of the society nine years ago. Previous to that time an average of 312 persons were killed each year in the United States and Canada by the explosion of boilers. These explosions were not accidents, but were the result of ignorance and carelessness. It was therefore decided to make the society, as much as possible, educational in character. At the end of the first year forty members had joined, and in the 3rd year an executive council was formed. Now upwards of twenty branches of the organization are established, and Toronto No. 1 alone numbers about 120 members. At present the association is working under a permissive law, but it was hoped at an early date to obtain a compulsory law.

The President stated that they were desirous of compiling a library, and already a number of books had been promised. It was the intention to invite manufacturers to supply books.

A bountiful supper had been provided which occupied the attention of the guests for some time, after which dancing was engaged in.

The committee appointed to act in conjunction with the trustees, and to whom the success of the evening's entertainment is largely due, consisted of Messrs. G. C. Mooring, chairman, T. Eversfield, C. Moseley, S. Thompson, W. G. Allen and A. M. Wickens.

HAMILTON NO. 2.

The members of our association are becoming more earnest towards education. To this end we have provided ourselves with models, books etc., besides having an indicator of our own for the use of any of the members. We have started our regular instruction meetings, and they promise to be of great benefit during the winter months. At the first of these meetings the Recording-Secretary read a paper illustrating the application of Ohm's law, which will be sent you for publication in the March issue of your journal. At the last meeting some good discussions took place on pumps, also on the proper area of steam and exhaust ports, which will no doubt be continued.

WM. NORRIS,
Recording-Secretary.

BROCKVILLE NO. 15.

Wm. Robinson, Recording-Secretary, writes: The members are taking a lively interest in the meetings and the work, especially the educational part. Our membership is about twenty-four, and taking the average attendance it is really good. We meet on Mondays for regular business, and on Fridays our time is devoted to educational matters. It is the intention of the Executive Committee, I believe, to procure models for the different associations, which will no doubt make a great many things more comprehensible. I trust they will be received before long.

ANNUAL DINNER OF MONTREAL ASSOCIATION NO. 1.

The *sixth annual dinner of the above Association, held at the* Queen's Hotel, on the 30th ult., was attended by about 120 persons, and was perhaps the most successful event of the kind in the history of the Association. Mr. J. J. York, President of the Association, presided, having on his immediate right and left the following invited guests: Prof. Nicholson, of McGill University; Lieut.-Col. Massey; Messrs H. R. Ives, Walter Laurie, Lieut.-Col. Stevenson, Chas. Morton, A. Henry, J. Dyer, Wm. Laurie, D. W. McLaren, O. E. Granberg, J. C. Willison, Chas. T. Smith, J. C. Holden, H. Valance, P. Cowper, Thos. Ryan, Geo. Kell and W. T. Bonner.

There were present the following members, in addition to fifty friends who bought tickets: Past Presidents, Messrs. Jos. G. Robertson, Ryan and Hunt; B. A. York, H. Nuttall, Robt. Doran, Gerry E. Flanigan, J. E. Huntington, John Robinson, A. Mesnard, H. Rollins, E. Hay, Wm. McHalpin, Wm. Allan, H. W. Smith, Wm. Burgess, Chas. Sanderson, Jos. Badger, John H. Garth, J. S. Campbell, J. Glennon, Alfred Ward, Jos. McParlon, Jas. Wilson, H. J. Weaver, John Smyth, J. E. Jones, John Burns, J. Kirwin, Chas. Casey, Jas. Morrison, F. D. Jones, A. W. Brown, Wm. Ware, Geo. White, Wm. Norket, Jas. Elliott, J. B. Goulet, Ed. Orton, David White, J. V. N. Ceeney, E. Valiquette, B. D. Tierman, Wm. Bill, John Murphy, Hugh Thompson, D. Smitherman.

Letters of regret were read from the following: S. C. Stevenson, Secretary Council of Arts and Manufactures; Wm. H. Browne, Manager Royal Electric Co.; Jas. H. Peck, Peck, Benney & Co.; A. Ramsay, A. Ramsay & Son.; G. C. Cunningham, Manager Montreal Street Railway Co.; Henry Holgate, Manager Montreal Park & Island Railway; W. S. Blackgrove, President Executive Council, C.A.S.E.; John Thorpe, Pilkington Bros., Ltd.; James Jackson, Manager Dom. Cotton Mills Co.

After a proper amount of attention had been paid to the excellent menu, the Chairman addressed the assembly as follows:—

"We have now arrived at that part of the proceedings where I trust everyone has sustained a serious loss of appetite. We have also arrived at the point where the Chairman is supposed to say something short and sweet, and let the business of the evening proceed.

"With my brother engineers, I feel highly honored to have the company of so many of the largest steam-users in the city of Montreal, as well as the presence of representatives of two of the greatest educational institutions in Canada—the McGill Univer- and the Council of Arts and Manufactures. We also feel honored by the presence of an old friend, in the person of the Chairman of the Fire Committee, and the many other gentlemen who have so kindly consented to contribute to our entertainment. But it is for the benefit of steam-users particularly that I wish to make a few remarks. I am sure that not one quarter of the steam users of this city know the aims and objects of this Association, and much less about the noble work it has in hand. On the other hand, there are large steam-users here to-night who are pleased to know that there is such an Association, and who can tell you that the Association is directly responsible for the more economic operation of their steam plants. And why? Because it has assisted to educate their engineer, and the engineer has helped to educate others.

"A few words here descriptive of our methods may not be out of place. This Association was formed in the year 1883—about the same time that the question of licensing engineers was before the Council—and at a regular meeting held in the St. Lawrence Hall on Aug. 19th, 1885, Thomas Ryan in the chair, a resolution was passed, the like of which no other body of men has since passed. It recommended an increase in proposed examination fee, or tax, on engineers. This is proof that the only fault we had with this license law was that it was not strict enough. The next few meetings were employed in the work of organization and the framing of by-laws, &c. On Nov. 19th of the same year W. H. Nuttal read the first paper before the Association, entitled "Priming—Its Causes and Prevention." This was the key note, and at every meeting since, with but few exceptions, some subject pertaining to steam engineering has been taken up and discussed.

"This Association is now composed of about 95 members, and includes some of the best engineers of the city. We are possessed of working models, instruments and apparatus to the value of $700; furniture, carpets, &c., $250, and are just about to close an order for $150 worth of books for our library, which, thanks to our friends, already contains several valuable works. If we could only educate the steam-users of this city to take us into their confidence and make the changes suggested by us, and afterwards pay us 25% of the saving effected, I will say without fear of contradiction that we *would in less than ten years own a building* larger and grander than this Queen's Hotel.

"Now Mr. Steam-User, don't think for a moment that we are after your money. Quite the contrary. We are this very day saving you money; all we ask is that you look upon your engineer as a man of responsibility, a man who holds the safety of your factory and the lives of all employed in it in his hands. We would also ask you to keep in view the fact that he has it in his power to increase or decrease your profits as he likes by way of the coal pile. You may think this strange, but I will show you how true it is by telling you something that actually transpired. The owner of a certain factory in this city who did not employ a competent engineer, had from time to time increased the output of his works, and of course the consumption of coal increased also, but in much larger proportion. He paid no attention to this, until one day the the engine absolutely refused to longer put up with the treatment received at the hands of the incompetent engineer, and stopped work. An engine builder was called in; he wanted $75.00 to fix it up, and was told that he wanted more than he would get. He then offered to fix the engine gratis provided the owner would give him the value of the coal the engine would save during a certain time. This was at once agreed to and a contract drawn up, with the result that the engine was soon repaired and that steam user paid to that engine builder upwards of $160. Now what happened? Did he discharge his engineer for incompetence and secure another that would keep his plant in a state of efficiency? No, he did not; he kept the same man on, and to-day that plant is nearly as bad as ever it was.

Why is it that we find in nearly every factory office an expert bookkeeper at a high salary? It is because the owner knows what good book-keeping is, and wants his books kept in the best possible manner. If he only knew half as much about the engineer's duties, I am very sure there would be many openings for competent men next week.

I must not longer trespass on your time, but will add that we do not admit everybody to membership—in fact, during the past year we have refused several applications because they could not demonstrate that they were competent to take charge of a steam plant. I would also take this opportunity to invite every steam user to become an honorary member of our Association, which they can do on payment of the small sum of $5.00. This will entitle him to all the privileges that I, or any other engineer enjoy, with the single exception of voting, and will also prove beyond a doubt that nothing detrimental to your interests is discussed at our meetings. Your membership would, I am sure, be of great mutual benefit, apart from the fact that it would very materially assist us in adding to our library or stock of instruments.

The toasts were replied to as follows: "Council of Arts and Manufactures," Mr. W. Laurie; "Faculty o Applied Science," Prof. J. T. Nicholson; "Boiler Inspection" Col. Stevenson; "Fire Committee," O. E. Granberg; "Brotherhood of Locomotive Engineers," Mr. Thos. Clark and Geo. Kell; "Our Guests," Col. Massey, C. M. Smith, C. Morton, H. Nuttall, W. G. Norris, T. Ryan, H. R. Ives, A. Hersey, John Dyer, Wm. T. Bonner, H. Valance, P. H. Copper and W. D. McLaren. Strange to say a champion could not be found to respond on behalf of "Our Tormentors." Several excellent songs and musical selections were rendered by R. Hilliard, J. Dougherty; Dr. Nicholl, W. Morris, W. Campbell and Vice-President Hunt.

ONTARIO ASSOCIATION STATIONARY ENGINEERS.

Editor CANADIAN ELECTRICAL NEWS.

DEAR SIR,—During the month of December the following engineers have been examined and received certificates: 1st class, Wm. Gray, Galt. 2nd class, G. B. Risler, London; A. J. House, Sudbury; Thos. Leake, Stratford, J. G. Archibald, Woodstock. *3rd class, Jno. Kappler, St. Marys, R. Hatt, Queenston;* J. Wedgerry, Woodstock; J. F. Glennie, Listowel.

The following engineers who formerly held 3rd class certificates have passed the examination and received 2nd class certificates: Wm. Cole, Thos. Young, D. McKay, and R. Topping, all of Woodstock.

During the month seventeen engineers tried the examination, and thirteen were successful.

I shall be glad to send copy of by-laws, &c., to any engineer who will send request for same on post-card.

Yours truly,

A. E. EDKINS, Registrar.

139 Borden st., Toronto.

A CANADIAN MOTOR-CYCLE CONTEST.

By Arthur W. White, London.

Glancing through the different scientific papers, one sees considerable discussion and argument about motor vehicles. Some probably through selfish motives publish what they designate a "Conservative Article," and in some instances an editorial dealing with the question. The articles referred to are inconsistent in the extreme, and the only inference to be taken from them is, that their writers are not ready for the advent of motor vehicles. By all means be conservative, but do not allow personal advantages to be the motive.

Among the best methods, in the writer's opinion, for "pushing this good thing along" in Canada, public trials and tests stand well to the fore. New York is agitating one, and France and Germany will hold a number next summer. The last issue of the London, (Eng.) "Engineer" contains full prize list and conditions of a competition for one thousand guineas.

The present English law prohibits a self-propelled vehicle from travelling more than four or six miles per hour, and places further restrictions on this manner of travelling, enough to make a race impossible without special act of parliament, or a revision of turnpike laws, which changes are now being agitated. There seems to be a difference of opinion as to whether a race could be run in Canada, without the same steps being taken. Should this be the case, would it not be advisable to obtain permission, before a Canadian race takes place, otherwise the contestants, or promoters of the trial, could be held responsible for damages arising from frightened horses, etc.

That a Canadian race should take place goes without saying. We must keep up with the times. If there are no public spirited men who can afford to offer sufficient inducements, in the shape of prize money, forthcoming, the race can be arranged in other ways. In Ontario, we have two large fall exhibitions, the Industrial, of Toronto, and the Western, of London. Either of these should be able to make a paying investment of a motor cycle contest; it would certainly be a drawing attraction, more instructive, more entertaining, better advertised and more in keeping with an industrial exhibition, than balloon ascensions, high diving, second-class contortionists and acrobatic entertainments and wild-west and Arab shows, comprised mostly of toughs from the slums of large cities, who hire a few horses, dress in exaggerated costumes, shout and discharge firearms. Half the amount of money paid for this sort of thing, would make a purse sufficient to induce others besides Canadians to compete. It would make an exhibition Industrial in reality, as well as in name. It would stimulate Canadian inventors, as the Chicago race did United States inventors. Previous to the advertising of this race, motor vehicles were almost unknown in the United States. Over five hundred applications for patents, covering motor vehicles and parts thereof, were made during the time intervening between the first notice and the consummation of the race. If five hundred of our best thinkers started to think, it would mean more for Canada than one can imagine. Motor vehicles are only in their infancy. There is room for great improvement, and competitive tests are among the best methods for their improvement.

Preliminary tests, from which the judges could decide the points of internal friction, design, construction, ease of handling, finish, etc., could be held the first four or five days of the exhibitions, in a building provided for this exhibit. Processions could be given daily in the ring, and a final race starting in the ring, encircling it once or twice, thence to a point twenty or thirty miles into the country and return to finish by again going around the ring. Manufacturers would enter a contest of this kind as much for advertisement as for the prize money, and should, in the writer's opinion, be willing to pay a reasonable entrance fee.

There is no reason why both London and Toronto should not include a motor vehicle contest in their attractions and prize lists, and it is to be hoped that the directors of these exhibitions will give it due consideration. London can offer exceptionally good accommodation. A race from the city to Lucan or Strathroy would be an ideal run- roads that are good in all weathers, with just grades enough to give a good test, and plenty of villages along the route for frequent relay stations.

The vehicles might be divided into two classes, one class for electric motor vehicles and another for carriages driven by internal combustion engines and other small motors, that carry their fuel in small receptacles, enabling them to take enough for the complete trip. The former might show up to good advantage in preliminary tests, processions, and short trips, but, as has been proven by previous races, the latter could make the best time in a long road race.

Should these few rambling remarks, or any personal assistance, be of any value to exhibition directors, or private individuals with a desire to further the advancement of this industry in Canada, the writer will be more than pleased. One thing is certain, the motor vehicle has come to stay, and our country should, as usual, be well to the front in the improvement and manufacture of them.

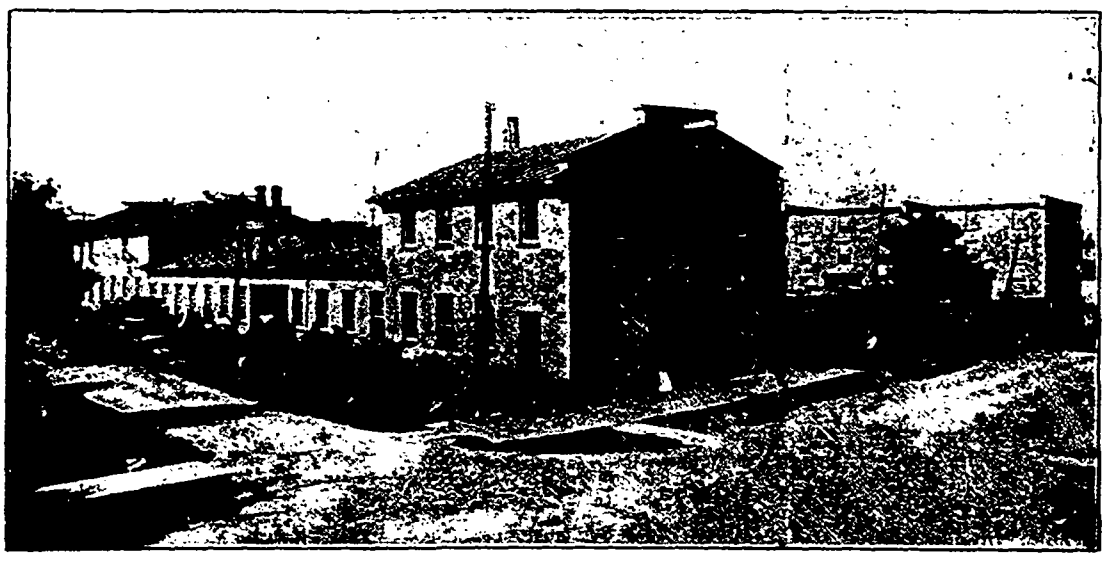
[The above letter, we believe, expresses the sentiments of many persons who are engaged in the manufacture and development of motor vehicles, as well as a considerable number of outsiders who take sufficient interest in the progress of invention to realize the benefits to be derived from such a contest. It is hoped that this letter will result in promoting a discussion on the most feasible plan of conducting the race. We are pleased to be able to state that the management of the Toronto Industrial Exhibition Association look upon the idea with favor, and are at present considering what steps to take in the direction of assisting to bring about a test in Canada. That such a test would prove a drawing card for the Industrial Exhibition goes without saying. It would seem that the amount of the prize money offered by the Association would be determined to a large extent by the number of probable competitors. On the other hand the number of competitors would depend in some degree at least on the amount of the award. In any case should such a race be decided upon, manufacturers should at once make known their intention of entering the contest. The route of the proposed race will be a matter requiring careful consideration. It is certainly desirable that the test should take place over a road corresponding in character with the highways upon which such vehicles would be required, but whether the Exhibition Association management would consent to the test taking place beyond the boundaries of the fair grounds is yet a matter of doubt. We have reason to believe, however, that this

difficulty could be overcome. The new Board of Directors for the Industrial Exhibition Association will be elected about the middle of February. Nothing definite will be known before that date regarding the attitude which the Association will assume towards the proposed contest.—Ed. Electrical News.]

WM. KENNEDY & SONS, OWEN SOUND.

One of the most enterprising firms of to-day is that of Messrs. Wm. Kennedy & Sons, of Owen Sound, Ont., who have been established for upwards of forty years. They have become known throughout the Dominion as manufacturers of the well-known "New American" water wheel, electric water wheel governors, turbine wheels, and heavy mill machinery. The turbines now operating the lock gates at the Sault Ste. Marie canal, recently opened, were manufactured at their factory.

The works comprise two large buildings, one being two storeys high, 200 x 40 ft., and the other a three-storey stone building, 78 x 40 ft., at the corner of Beech and Stephen streets. The business was originally established by the late Wm. Kennedy, in 1858, the present firm being formed in 1864, and being composed of Messrs. Matthew, Alexander and William Kennedy, jr., the two former residing in Owen Sound and managing the general business, while the last-named resides in Montreal and has charge of the branch in that city. They give employment to between forty and fifty men. They have received several medals for their propeller and water wheels, including silver medals from Philadelphia, Paris and Toronto, several bronze from Philadelphia, and one from the Colonial and Indian Exposition held in London, England. The success of the town of Owen Sound is due in no small degree to the energetic efforts of the members of this firm, who have always been public-spirited in advocating whatever would benefit the town. Mr. Matthew Kennedy is president of the Board of Trade.



Wm. Kennedy & Son's Foundry, Owen Sound, Ont.

Dr. G. W. Strange and Messrs. J. C. Stokes, L. E. Hambly and A. B. Armstrong are promoting the scheme for an electric railway between Schomberg and Aurora.

A suit has been entered against the Montreal Street Railway Co., by Elizabeth Kerr, claiming damages for $4,115. It is alleged that she fell while descending from a car on Notre Dame street, tripping on some encumberance on the step.

2,080 VOLTS FAILED TO KILL.

We have received from Mr. J. A. Farlinger, Gouverneur, N.Y., the following additional particulars of the accident of which he was recently the unfortunate victim: On Sunday, Dec. 8th, I was asked to go up a 25 foot pole and cut out the commercial loop of one arc circuit. On this pole there were three arc circuits and two 2080 volt alternating circuits. Having received such a severe shock my memory was affected, so that I cannot remember even going to the pole, therefore don't know how the accident occurred, and for three days after I was unconscious. The alternating current was the only one on at the time, so I must have got across 2,080 volts of a three phase alternator, burning the flesh off the front of my hands, on some fingers leaving the bones as clean as if scraped with glass. My position on the pole was such, the minute I lost control of my body I fell backward and down, breaking my grip on the wires; I fell head first. Striking another wire in the fall somewhat righted my body and prevented my brains being knocked out. I fell on my cheek bone, breaking it in two places and paralyzing one side of my jaw. This fall is all that saved my life as otherwise I consider the doctors would not have been able to resuscitate me. I believe I am the only man who lives to tell of getting 2,080 volts of an alternating current through him.

ELECTRICITY IN PAPER MILLS.

The extensive works of the Canada Paper Co., of Montreal, situated at Windsor Mills, Quebec, are shortly to be operated entirely by electricity, instead of, as heretofore, by steam and water power combined. The company has developed a large amount of power on the St. Francis river, which will be transmitted to their mills about a mile distant. Here it will be distributed to electric motors ranging in power from 5 h.p. to 150 h.p. each running the various machines. The entire factory will also be lighted with incandescent lamps, and an electric railway is to be constructed from the power house to the mills, for the purpose of carrying pulp. The total amount of power to be transmitted will be about 1,000 h.p. The entire work has been placed in the hands of the well-known electrical engineer, Mr. George White-Fraser, of Toronto, who has just completed a careful survey of the locality, and is now engaged on the specifications. This is the largest enterprise of the kind in Canada, and will, no doubt, be the forerunner of many similar.

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

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Storage Batteries.

THE storage battery as a central station auxiliary is just now receiving a very great deal of attention at the hands of engineers. A recent meeting of the American Institute of Electrical engineers held in New York was entirely devoted to a discussion of its proper place in central station practice, and the census of opinion seemed to be that the storage battery must be regarded and accepted as a most important and dividend-making necessity. Everyone familiar with the operation of an electric plant will be able to trace out a load diagram for himself. If the capacity of the station is 1,000 lamps, then he will know that from about 5 p.m. till 8 or 9 p.m. every lamp will be going, but that from 9 p.m. till midnight he will not have more than a fifth of full load. Now every educated steam user knows that an engine or dynamo works most economically when it is doing its full rated work, and that in proportion as it's load becomes lighter, so does it's efficiency become less, so that the operation of a plant at one-fifth load is a most uneconomical necessity. Any device, therefore, which will permit of machinery being operated at full load for a considerable proportion of it's running time is worthy of very careful examination, and such a device is the storage battery. During the period of very light lamp load, the battery may be charging, thus bringing up the station load line to full capacity, and when the short period of very heavy load is reached the battery and the dynamo may be thrown into multiple on bus bars, each taking it's proportion of load. At present, the dynamo and engine capacity of a station must be

sufficient to cope with the maximum load that can be placed on that station, so that whereas the average load is perhaps less than 500 lamps, the dynamo, etc., must have a capacity of 1,000 lamps for the sake of the two or three hours of heavy load, and be run all the rest of the time at a most inefficient rate. Now, if the station plant consisted of say a 700 light dynamo and a storage battery with a capacity of 300 lights for four hours, then from about 11 p.m. until shutting down time, when probably not more than 300 lamps would be burning, the current for the other 400 lamps could be used to charge the battery, allowing the engine and dynamo both to be operated at full load. At starting up time again next day, when all 1,000 lamps were required, the storage battery (which was fully charged last night) and the dynamos could each be called upon to take care of their proper shares. The dynamo and engine would still be run at full load, and therefore highest efficiency. In this way it is seen that, first, the steam and dynamo plant need only be of 700-light capacity, instead of 1,000-light, and will run most of the time at or near full load. It is true that a storage battery requires a direct current to charge it, but instances can be referred to when alternating dynamos have been used with a rectifier for the purpose, with perfect success. We shall refer to this matter again.

Motors for Single Phase Alternating Currents.

THERE are a great number of central stations throughout Canada that could very profitably operate a day load of small motors in factories, saw mills, stores, etc., but which have been precluded, hitherto, from working up such a business because their machinery was single-phase alternating, the current from which could not satisfactorily be used for power purposes. A single phase alternating motor will not start up with a load on, which defect, of course, renders it useless. Mr. C. G. Bradley, however, has elaborated a method of splitting up a single-phase E.M.F. into any number of symmetrical phases, with the view of overcoming this commercial disability of the single-phase alternating machine. The method is somewhat complex to describe, involving the use of condensers and inductances, but the results reached seem to be very satisfactory, and hold out the reasonable hope that alternating current stations may be able to work up, and avail themselves of a very profitable power business, without requiring to change the type of their machinery. Of course the method of "transformation of phases" involves some small losses which are eliminated in a properly constructed two or three phase system; but the money value of these losses is apparently so much less than the interest on the increased capitalization required to change all the machinery of a station from single to two or three phase types, that central station men would do well to look into the commercial advantages of this method.

Central Station Men and the C. E. A.

A LETTER was printed in the January issue which seemed to indicate a feeling on the part of some central station owners and managers that concerted action on the part of the operating branch of the electrical industry is becoming more necessary as electric lighting and power is becoming more general. The desirability of union and co-operation has been endorsed in the United States, where there is a National Electric Light Association and many independent local associations organized for the same purpose. In Great Britain questions relating to the methods of operation of central stations are discussed at meetings of municipal engineers' societies, gas engineering societies, and wherever there are found sufficient engineers interested in electricity, to give their views or experience. On the continent of Europe, central station engineering is recognized as being a special branch of electrical study, and the central stations band together in order to promote their mutual interests, to further their knowledge of operating economics, and to guard themselves as an industry against the encroachments of the public on one hand and the manufacturing companies on the other. This spirit of co-operation has even taken the form in Germany of committees appointed by the central stations to investigate and examine into very many matters affecting the interests of the industry, and in which the experience of the individual is valuable as contributing to a sum total of conclusions which could only be formulated after such an exhaustive enquiry. Their latest committee, for example, has performed a most important service to the general body within the last few weeks, by making a most minute examination of the conditions of the incandescent lamp service and supply, making enquiries in every direction and bringing forward many points hitherto but little understood, and which have most important influence in operating expenses. The advantages to be gained by the co-operating of central station men will be perfectly evident when it is considered that they are required to supply to the public one of their greatest necessities light; that they have to do this in competition with gas companies and also against that of the oil wells; that they are no longer able to get fancy prices for electricity, and that their dividends depend on their economical operation. They will be still more evident when it is considered, that this economical operation involves the study of problems connected with steam machinery as well as electric machinery and all sorts of electrical appliances. If it requires special training to qualify a steam engineer, and different special training to qualify an "electrician"; how much more special must be the training of the man who has to manage an electric light and power business in which both classes of machinery are used? The manager of every central station, large or small, has acquired experience with lamps, coal, carbons, rates, and what not, and such experience collected and published would be of great service to many other managers, who, having given their attention to other and equally important questions, would be able to reciprocate to the general benefit of the entire industry. We all want to know how our neighbour is getting on with some particular class of apparatus, and very likely will be able to give him some little valuable pointer in return for his suggestion, but at present every individual plant has to gain its experience for itself, often to buy it dear, whereas a little cordial co-operation would enable everyone to profit by the experience gained by some other one. A central station must indeed be in a position of ideal perfection if it can learn nothing at all from some other one. The Canadian Electrical Association is a body formed for the express purpose of facilitating this interchange of ideas and experiences. At the annual meetings many valuable papers are presented dealing with matters that come under the daily notice of central station men. It is this want of any organization in the electrical industry that is a principal cause of the crudeness of central station practice alluded to in our last issue. It is not too much to say that everybody loses by the present incoherence in the electric lighting profession. The public loses because the central station owners do not know the latest and best methods of supply nor keep themselves abreast of the times; the central station men lose greatly because each one buys his experience for himself, and since he is not able to compare his results with those attained elsewhere is most likely to fall into a groove. The manufacturing companies lose because they have more difficulty in introducing any new and more efficient machinery when they have to deal with each customer separately, than they would if they could present their new goods to an association, each member of which would be able to keep in touch with the others. But the central station man loses most of all, because every improvement in machinery, or in the method of its operation, tends to reduce costs of operation, and hence to increase profits.

CENTRAL STATION BOOK-KEEPING.

By Geo. White-Fraser, E. E.

II.

Having generated our steam, we have to use it to the best advantage, and so must know something about the engine, how it works, whether it requires attention to valves, and so on. Steam has an expansive force as well as a direct pressure, and the greatest economy is attained when we make use of both in their proper proportions. If we admit steam to the cylinder, and allow it to act with full boiler pressure during the whole length of stroke, when we open the exhaust port this high-pressure steam will be allowed to go free without our having got nearly as much out of it as it is capable of. But if we admit steam during only a certain portion of the stroke, and then shut it off from boiler pressure, letting it expand itself down to a gradually lower and lower pressure, so that at the opening of the exhaust port it has no expansion force left—then we make use of all the power it can give us, and we use it economically. What is the good of letting steam go free into the atmosphere when it has force left in it still? What is the good of raising it to 100 lbs. pressure in the boiler, if we let it out of the cylinder when it still has 10 lbs. pressure left? We might just as well raise it to 90 lbs. in the boiler, and exhaust it at no pressure, or atmospheric pressure; only in this case we lower the power of the engine. The last thing to do is to so arrange that steam shall be admitted at boiler pressure in such quantity that when the exhaust opens it shall have expanded down to about no pressure. Then we shall have got all the good out of it it is capable of, and shall be using it economically. As a rule, engines are so proportioned and rated, that steam is admitted at boiler pressure for one-quarter of the stroke, and allowed to expand down during the other three-quarters, and that when this proportion is observed, it will be exhausted at just sufficiently above atmospheric pressure to ensure its freeing itself quickly.

It is understood that in the above I do not consider throttle valve engines, but only those that regulate power, and consequently speed, by means of cut-off valves. These engines are so made that they will automatically vary their own steam consumptions, in accordance with the work that they are required to do, by admitting steam for a longer or shorter period during each stroke; and an engine that has a rating of 100 h.p. at one-quarter cut-off will actually do much more when it allows half cut-off, or much less when it shuts off at only one-eighth of stroke, and these variations it can make itself, as it is running. It must, however, be clearly understood, that if this engine has such a large load placed on it as requires steam to be admitted at boiler pressure during half of a stroke, this steam will be exhausted into the air before it has nearly exhausted its expansion force, and so will be used wastefully. Or again, if a 100 h.p. quarter cut-off engine is run at so small a load as requires steam to be admitted during only one-eighth of stroke to keep the speed down to its proper number of revolutions, then this steam will have expanded down to atmospheric pressure some little time before the exhaust port opens, and as the piston still moves forward, there will be a partial vacuum formed where there actually should be a pressure, which is again a most extravagant and undesirable condition. The valves that open and shut the admission and exhaust ports are of course all movable, and are actuated by eccentrics or cams, or what not, that are also movable; which eccentrics are in turn thrown and their actions regulated by some form of governor, which is again in constant motion.

Now, I think that a general statement may be made that no one will feel disposed to contradict, viz: No piece of machinery that ever was made, simple or complex, is so perfect that it cannot get out of order or adjustment. This is especially true of a steam engine. The valves will most certainly wear out in time and leak; they may slip; the eccentric on its strap may work loose; the rod lengthen the sixteenth of an inch through a nut slacking; or the governor stick, or slip, or do some other vexatious thing that none would expect of it. Who can say what an engine is or is not capable of doing, when it it is held together with nuts and bolts, and built of material that must wear? And any little thing it does wrong means extra expense and less profit.

Now consider for a moment what the consequences of a very little slip or stick in a valve may be. An exhaust valve may open a shade too soon or too late. In the former case steam will be exhausted before it has expanded down enough; in the latter it will not have time to get quite away, and some will be imprisoned in the cylinder to produce a back pressure. In the former case steam is wasted, in the latter a little more steam will be required to overcome the back pressure than would otherwise be necessary. In either case money is being wasted in fuel. Now, if oil is allowed to cake with a little dust around the release of the exhaust valve, it may cause it to stick, and every person familiar with machinery knows how it can get out of order in the most inexplicable fashion. All these considerations serve to emphasize the necessity of keeping some track of the engine's working, and we have a means, in the indicator, of employing a private detective who will report to us with unfailing accuracy, everything that engine does. Is the cylinder or piston wearing? Are the rings getting loose? Is the admission valve getting the worse for usage? The indicator card gives indications of the steam blowing through. Are any of the valves opening or shutting too soon or too late? There it is on the accusing little diagram. Is anything wrong at all? The little indicator will run the offender to earth. Therefore it is, I say, do not trust your engine too much. Keep a watch on it, and record its operation frequently. Everyone has not got an indicator, but I think I should like to take cards once every week, and in order that the information may be complete, it would be necessary to record, at the instant of taking the card, the boiler pressure, the reading of the ammeter and the volt-meter of the dynamo or dynamos run by the engine, with the speed of engine, these in order that the load on the engine may be calculated, to compare with the indicator diagram. Cards should be taken at intervals throughout the run, when the load is at different points, so as to know what the engine does at all proportions of load.

The load on the engine for any card can be calculated by multiplying the ammeter and volt-meter readings together for wattage, and adding in the shafting and dynamo frictions, taking also into consideration the proportionate inefficiencies of dynamos at various loads, which can be obtained with more or less accuracy from the manufacturers.

The method of calculation of the real load on the engine corresponding to any observed ammeter and voltmeter readings, will be as follows, which will be quite close enough for all practical purposes:

Assuming a dynamo with the following manufacturing company's data and rating:

Capacity, 50 k.w.; commercial efficiency at full load, 95%; at half load, 90%; at one-quarter load, 85%. Full load current, 50 amperes; voltage, 1,000, and (for the sake of simplicity) no over-compounding, and allowing for no drop.

Then this machine will require to run it at full load

$\frac{100 \times 50}{95}$ kilowatts or $\frac{100 \times 50}{95 \times 749}$ horse-power;

at half-load $\frac{100 \times 25 \text{ k.w.}}{90}$ kilowatts or $\frac{100 \times 25}{90 \times 749}$ horse-power;

at quarter-load $\frac{100 \times 12\frac{1}{2} \text{ k.w.}}{85}$ kilowatts or $\frac{100 \times 12\frac{1}{2} \text{ k.w.}}{95 \times 749}$ horse-power.

Next an allowance must be made for the power wasted by the belt, which will depend in amount on the state the belt is kept in, but which, if that state is good, may be taken at say 8%, and an allowance for the shafting of say 10%. These amounts added together will show what the engine had to do when the card was taken, and a neat number of such cards can be averaged. The results can be collected and set forth in the form shown below, and the cards themselves should be very carefully studied by an experienced person, and the horse-power indicated by them recorded, with any remarks tending to explain their meaning.

Engine Number..... Date.....

Card Number	Ammeter		Volts		Total Watts	Total h.p. Electric	Belt	Shaft	Total Load
	Dy. 1	Dy. 2	Dy. 1	Dy. 2					

If it be impossible for any station to take cards so frequently, then they should by all means manage to have it done not less than every three months.

Before leaving this part of the station, there is one set of experiments and records that should be kept by everyone using a condensing plant, viz: records at fixed times during the run, of reading of vacuum gauge and temperatures of condensing water, and water of condensation. If the condensed steam is to be used and fed back into the boiler, it is of advantage that it should be discharged from the condenser at as high a temperature as possible. But the less heat that is taken out of the exhaust steam, the lower will be the vacuum; consequently there will be found a point where increased temperature of water of condensation, far from being an economy, will actually be a disadvantage, and the most truly economical balance must be arrived at by experiment and calculation, and then preserved by constant care and attention.

We have now obtained a method of recording our steam genera

tion and utilization, which will, I think, give the average central station a very fair insight into this important department, and I would suggest that every steam-using plant should experiment with different kinds of coal; mix different kinds together till, by comparing results, they arrive at what seems to be best for them. Then try to raise the temperature of their feed and so on, and whatever they do, keep moving and observing and learning. There is a link between the engine and dynamo which requires some attention—the belts. There is always some slip to a belt. It may be minimized, but some will always be there, and the amount of slip will to a great extent depend on the condition of the belt. I am of course assuming that it has been bought of sufficient size and strength. Now, this slip can be observed in the following way: Everyone knows that if an engine and a shaft are connected together by a belt, the speeds of their two pulleys will be in the inverse ratio of their diameters. That is the theory. Now, if an actual test be made of the speeds of an engine and of a shaft, by trying them at the same time, with hand speed counters, any difference between the calculated speed of the shaft and the observed speed can be set down to the slipping of the belt. Slipping means that the power of the engine is not being fully utilized, and therefore the belt should be made to grip tighter, either by tightening it up to its proper limit, or if that limit has been reached, by dressing it more thoroughly. This record of observed speed may or may not be set down in the reports—but I should certainly recommend the observation to be made at frequent intervals. The more checks you have on the operation of your machinery and apparatus, the better are your results likely to be.

We pass now to the records concerning the electric plant, merely mentioning that as the one engineer generally looks after the engine and dynamos, etc., the reports from the engine room may include the dynamo records as well as the consumption of waste, oil, sandpaper, etc., notice of which will be taken in the general summary. Among the dynamo records which I consider to be really necessary to an intelligent management is certainly one that I do not believe a single one of my readers will keep—for the reason that either they will think it too much trouble, or, alternately, if they think of getting a machine to do it for them, they will consider it too much expense. I allude to some record that will enable them to see how much electricity has been manufactured by the dynamo, and delivered to the lines each night. There are only two ways of doing this, either to use a recording station wattmeter, which will keep track of every watt of electric energy sent out, and which will cost in the neighborhood of $100, or to make the engineer put down on paper at intervals of fifteen minutes or so the exact readings of the current and pressure indicators from which the station output can be closely calculated.

I think the absolute importance of some such record (preferably the wattmeter) will be evident to anyone if they will consider for a moment what its absence means. It simply means that a central station does not, and cannot know whether it is selling its electricity for more or less than its costs to make it. A farmer knows how much seed he puts into his field, and he measures the number of bushels he reaps from it; the merchant not only keeps account of the goods he buys to stock up with, but he knows how much has been sold each day, and if his stock-taking shows a difference between what he bought and what he has sold, he begins to look about and see whether he hasn't lost any or been robbed of some; in fact, if he didn't keep track of what went out of his store, as well as what came into it, he really wouldn't know what he was doing, whether he was solvent or bankrupt. A central station is in the same position, and if no record is kept of how much electricity goes out, what is the good of keeping track of how much comes in—in the shape of fuel?

It was observed above that there is a very clearly defined relation between the amount of coal burned and the amount of water turned into steam; and that if there is observed (as the result of records) a disparity between that amount of water actually evaporated, and the amount that theory indicates should be evaporated, that the matter should be looked into with a view of securing better results. The inference is drawn that if no records are kept, it is impossible to detect anything wrong, and consequently a great deal of waste may go on with no one knowing anything about it. Now this is exactly the same with regard to the electric plant. Mechanical energy has its equivalent in electrical energy.

If a force of one hundred mechanical horse power be continuously applied in turning a dynamo whose commercial efficiency is 90 per cent., then that dynamo should give out continuously electrical energy to the amount of 90 h. p. If it is observed that this dynamo does not give out this electrical energy, then there is something wrong, some waste taking place, which should at once be remedied—if money is valuable. Now, it is known how much mechanical energy is expended during a run (the coal and evaporation records will give this), and therefore it can be easily calculated how much electricity should have been generated. But if it is not known how much actually has been generated, what is the good of all the other records?

Passing over the intermediate steps—so much coal should produce so much electricity. Does it? If not, why not? There may be something tremendously wrong somewhere in the plant, and it cannot be known without this nightly "stock-taking." How much does your current cost you to make? You cannot tell unless you know how much you make.

For the above reasons I strongly recommend the use of station wattmeters, and that they be read every night at the close of a run. A meter will cost about $100; the interest on this for a year is about $5; and if it isn't worth that much to you in giving you an insight into your business, and enabling you to stop wastes, then there is no advantage in book-keeping.

Other useful records are: The engineer should note the reading of the current indicator every fifteen minutes during the early part of the run, and every half hour later, and construct a "load diagram" for every night. A comparison of these diagrams, week by week and month by month, is often of the greatest value, as indicating possible changes in the business policy of the central station, whereby better results may be attained. He should note every night whether there is a "ground" on the lines, and on which line, so that it may be hunted out and put right next day; and note any unusual happenings—lightning stroke passing through arresters; fuses suddenly blowing, with their cause (if known); new brushes put on dynamo, or anything else of that nature; commutator turned down, and so on.

Below are suggested forms that will be found convenient. Next article will be devoted to the part of the business outside the station, consisting of lines, lamps, etc., with some suggestions as to the store room.

Engine report by S. Smith. Date... .....

Engine No.	Started	Stopped.	Vacuum Average.	Temp'rature Hotwell	Remarks as to Repairs, Accidents &c.

It will perhaps be noticed, that what has gone before constitutes less a mere formulation of accounting systems than it does an enumeration of the inherent inefficiencies of all machinery, with some little indication of how their unchecked operation may affect

Dynamo report by ..... Date...

Dyn. No.	Started.	Stopped.	Watt Meter. Start.	Watt Meter. Stop.	Grounds?	Remarks as to Repairs, &c.

the financial results, and the description of a series of observations which will enable the intelligent manager to detect their undue extension, and hence to apply the appropriate remedies in time. The intention has been to show what very many sources of waste there are in the operation of a steam and electric plant, and that although a central station manager may buy the very best machinery in the world, it will do him not the least good unless he operates it properly. To use very high-class machinery, and to hire cheap labor, is to save at the spigot and waste at the bung hole.

(To be Continued.)

The Toronto Electric Light Company are installing a 75 kilowatt monocyclic generator of the Canadian General Electric Company's make.

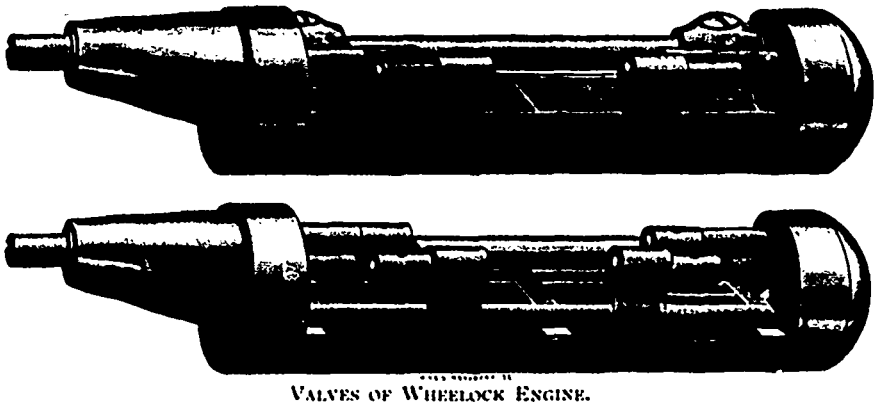
The new power house of the Oshawa Electric Railway Company has been completed. It is entirely of brick, and is equipped with Babcock & Wilcox boilers and two 150 h.p. cross-compound Robb-Armstrong engines, connected with a 200 k.w. six-pole Westinghouse generator. The installation was made by Ahearn & Soper, of Ottawa, and makes a model power-house.

The Toronto Electric Light Company have closed a contract with the Canadian General Electric Co. for a 600 horse-power slow-speed direct-connected power generator. This machine will be the largest in Canada so far installed for the supply of current for stationary motors.

QUESTIONS AND ANSWERS.

"Subscriber," Hull, Que., asks: "Can a direct current of electricity be alternated into a transformer so that it will act on same like a current from an alternating machine? I mean a machine to change the direction of the direct current into the transformer; above machine, or a reserver, to be run by a belt."

Answer. Your question is asked in two parts: First, a direct current cannot be so acted upon by any transforming device as to change its pressure into one higher or lower, as is done with the alternating current.



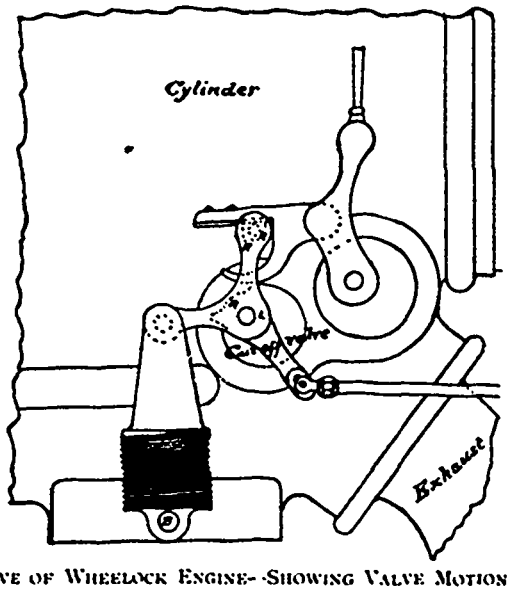
Valves of Wheelock Engine.

Second, the nature of a direct current can be so altered by an appropriate device, that this altered current may be passed through a transformer, with the familiar result. This is actually done in several electro-medical appliances, and in the familiar electric machine often seen at fairs and exhibitions, where an "electric shock" is administered for 5 cents. In this machine the direct current generated by an ordinary battery is sent through the primary of a Ruhmcorff coil (which is nothing more or less than a transformer), and while it is flowing it sets in automatic action a vibrating tongue, which actually forms part of the circuit; this tongue, in vibrating, opens and closes with extreme rapidity the primary circuit; and thus produces the rapidly varying induction in that primary circuit which is the necessary condition before it can affect the secondary circuit. There is no machine for effecting this rapid reversal of current, through the intervention of a belt; it could, undoubtedly, be done by passing a direct current through some form of commutator, which would pick it up from opposite brushes alternately; but the utility of this method is very much open to question. This commutator could be operated by a belt."

"W. B. S.," Montreal, asks: "Can any of your readers tell the writer if there is any book of tables in vogue, stating the number of amperes a wire will carry with a certain amount of heat, and how much increase in heat for each additional say 10 amperes. For example, say the temperature of the work room be 65° and a wire, No. 16, be raised 5° over this, with 10 amperes passing through, how much more will it be raised with 20 amperes passing through it? Will it be directly proportional? What is the safe limit to allow German silver or iron wire to heat up to in a resistance box, say such as a field shunt? i.e., what guage, No. of amperes, assuming box to be freely ventilated, and wire simply in spirals?"

Answer. We do not at this moment know of any book of tables giving the temperature or efficients of wires heated by the passage of a current. Messrs. Houston & Kennelly, of Philadelphia, have conducted careful experiments to determine them, and, no doubt, are compiling a book of such data. Knowing the specific heating effect, the effect with any particular current on any known size of wire is easily calculated by the well-known C^2R rule. Your example can be worked out in the same way—thus twenty amperes will produce four times as much heat as ten amperes will, on the same wire. With wires of different sizes, and different lengths, the calculation is equally simple with the aid of a table giving the specific resistance or the circular milage of wires, and knowing previously the heating effect on one sample piece. Thus it is seen that the heating effect is not directly proportional to the increase in current, but it is proportional to the square of the current increase or decrease, and directly proportional to the resistances. The safe limit of heat for rheostat wires is a matter that depends on ventilation, as much as anything else. A current that would heat a wire to a red heat in a confined space will be perfectly safe when cool air circulates around it freely. Knowing the current that the rheostat will want to shunt (maximum), it will be safe to allow about one square inch of radiating (cooling) surface of rheostat for every ten watts absorbed by it."

"J. B." writes from a Western Ontario town, as follows: "I am in charge of a Wheelock engine, but have never seen the valves of this engine nor even a cut of the valves. I have seen instructions in mechanical papers for setting valves of other engines, but never a Wheelock. Could you tell me where I could get the information I want?"



Valve of Wheelock Engine—Showing Valve Motion at End of Cylinder.

Answer.—The accompanying cuts and diagram, for which we are indebted to the Goldie & McCulloch Co., of Galt, Ont., the Canadian manufacturers of the Wheelock engine, will doubtless enable our correspondent to understand the valve mechanism. The diagram shows the dashpot and a portion of the valve motion for one end of cylinder. On the arm of cut-off valve will be noticed the letters R and L. When the valve is at rest and the hook detached, the line R should be

perfectly perpendicular; the dashpot will be down and the spring closed. Should the line not be perpendicular, the stud B has an eccentric pin on the end and the dashpot can be raised or lowered by loosening the set screw and turning stud. Sometimes this is necessary owing to the leather under dashpot getting worn thin. With the crank of engine on dead centre and the hook attached so as to hold the cut-off valve open, the line L will be perfectly perpendicular. With this correct, the engine will have the proper lead, for the line L shews the lead line. If this is not correct, it can be changed by moving the eccentric on shaft. After taking a diagram, should the engineer find more load on one end of cylinder than the other, all that is necessary to do is to shorten or lengthen the rod between the two trips, as the case may require, it having a right-hand thread at one end and a left-hand thread at the other; one of the trips is shown on diagram at C. The rod shown on diagram is not the rod referred to, but extends back from the trip C to the valve at back end of cylinder, the diagram being taken from front or frame end of cylinder. The rod shown is from the valve motion to the governor and this should not be changed by the engineer, as it is always set before leaving the shop; in fact, none of the rods should be changed except the one mentioned between the two trips. The valves are always carefully set before the engine is shipped, but the points mentioned may become necessary by the valve motion getting worn. No changes should be made unless the person making them is thoroughly conversant with all parts of the engine.

"A CONSTANT READER," Whitby, Ont., writes: "Please answer me the following questions in your next issue of the ELECTRICAL NEWS: "Describe a pump, an injector, a boiler, a steam engine; also how is it, when lamps are connected in series, as in railway circuits, the highest voltage lamp always gives the brightest light?"

ANSWER.—Proper and thoroughly comprehensive answers to your questions would involve writing a treatise on steam machinery which would somewhat exceed the limits of one of our ordinary issues—but, assuming that you have at least an elementary knowledge of physical and mechanical principles—the following answers may satisfy. (a) A pump (assuming it to be a water pump) is an apparatus for attaining two objects, viz.: Either for raising water from a lower to a higher level against the force of gravity; or for forcing water into some receptacle against some counteracting force. (b) An injector is an apparatus for forcing water into a receptacle against a counteracting force. It is used in connection with a steam plant to force feed water into the boiler against the pressure of steam in that boiler. In so far, it serves the same purpose as a "feed pump," but its method of doing so is different. (c) A boiler is an apparatus in which is made the steam required for use in a steam engine. It is so constructed that the steam raised from the heated water is not permitted to escape in the atmosphere but is imprisoned within it until required for use. (d) A steam engine is a device for enabling man to avail himself of the enormous power of steam under pressure. The above definitions are all that can be given in such a short space. If they be not sufficient then there is an immense technical literature on the subject, which will probably give a better idea as to why. When lamps are connected in series, the highest voltage lamp always gives the brightest light. It is a phenomenon we have not observed ourselves, and, therefore, cannot say. There is probably some difference in the lamps themselves. We should like to hear a little more about it.

SPARKS.

The Ottawa Electric Railway have adopted the fare box system of collecting fares.

The project to build an electric railway from Vancouver to Port Langley, B. C., is again being revived.

The Canadian General Electric Co. have been granted a franchise for electric lighting at Tavistock, Ont.

Messrs. W. H. and E. C. Breithaupt have purchased a controlling interest in the Berlin and Waterloo electric street railway.

In the city of Ottawa there are 13.14 miles of electric railway, composed of 3.94 miles of single and 9.78 miles of double track.

Mr. T. Viau, the promoter of the electric railway between Hull and Aylmer, Que., has disposed of his franchise to an Ottawa syndicate.

The Crystal Beach Improvement Co., of Ridgeway, Ont., propose constructing two miles of electric railway, extending from Crystal Beach to Ridgeway.

A company is being formed at Hamilton, Ont., to open a summer resort at Chedike Park, and to build a double track electric railway along Herkimer and Queen streets.

The car stables of the Oshawa Electric Railway Co. were recently destroyed by fire. In the sheds were two open summer cars and one winter car, which were also burned. The loss to the company is placed at $10,000.

Incorporation will be asked at the next session of the Ontario Legislature for the Manitoulin & Pacific Railway Co., with power to construct a steam or electric railway across Manitoulin Island. The solicitors for the company are Messrs. Clark, Bowes, Hilton & Swabey, of Toronto.

Messrs. H. A. Beatty and J. W. Horn, of Toronto, representing a syndicate of capitalists, propose to construct an electric railway in the town of Chatham, Ont. The prospects are that a railway will be constructed embracing the principal towns and townships within a radius of thirty miles.

The ratepayers of the village of Lanark will vote on a by-law to bonus the Lanark County Electric Railway to the extent of $10,000, to build a road from Perth to Lanark. The members of the company are J. B. Reilly, Alex Wender, Thos. Henry, A. H. Edwards and James Fowler.

The Hamilton Radial Electric Railway Company will make application to the Ontario Legislature for an act extending the time for the completion of their road, and authorizing the extension of one of their branches from Mimico to the city of Toronto, and another from Brantford to Woodstock.

The contract for the construction of an electric railway for the town of Cornwall, Ont., has been awarded to Messrs. Hooper, of New York, and Starr, of Montreal. The contractors expect to have the road completed by the 1st of June. The franchise was held by Mr. W. R. Hitchcock, electrician, of Cornwall.

Negotiations for electrifying the St. Thomas street railway are said to have been abandoned. The reason assigned is that owing to delay the company was unable to secure the financial assistance expected, and cannot proceed unless the city guarantees its bonds. An offer to sell the franchise at a low figure is now made.

The trustees of the Manitoba Electric and Gas Light Co., having made default in calling a meeting of debenture holders after the necessary notice had been given, certain holders, representing one-fifth in value of the debentures have given notice that a meeting will be held at the office of R. A. McLean & Co., London, Eng., on the 28th inst., to consider the appointment, if considered advisable, of a successor to Mr. Duncan McArthur, one of the trustees.

We have received a copy of a special souvenir number of the Providence, R. I., "Telegram" containing, among other features of interest, a series of illustrations showing the growth of the Eugene F. Phillips Electrical Works, together with portraits of the founder and present officers of the company. There is an illustration also of the branch works in Montreal, but we were disappointed at not seeing the portrait of the enterprising manager of this branch Mr. John Carroll.

BY THE WAY.

Mr. John Langton, the well-known electrical consulting engineer, of Toronto, has recently been acting in that capacity in connection with several electrical enterprises in the United States, and is considering the question of opening a branch office in New York city. I took advantage of the opportunity afforded by his recent visit to Toronto to submit to him a few questions regarding the directions in which the greatest development is taking place and is likely to take place in the applications of electricity. Seeing that a commencement has been made in Canada in the direction of transmission of electricity for power over considerable distances, I enquired what, in his opinion, would be the future developments along this line. His reply was, that he believed there would be a considerable development in power transmission schemes over distances of from 5 to 15 miles, a less number over distances of from 15 to 25 miles, and very few over longer distances than 25 miles. He does not anticipate as great development in the direction of the application of electricity to railway purposes, as many persons look for. One of the most promising fields he believes to be in the manufacturing world, in connection with the increased use of electric motors and a greater number of private lighting plants. Turning to the subject of the cost of electric light and power, Mr. Langton stated that prices are very much lower in Canada than in the United States; indeed he found, by comparison, that an estimate given him recently for a constant supply of current for power purposes in New York, was almost exactly double the price given him in Toronto for an intermittent service. Of course the value of real estate and the consequent expensiveness of doing business in New York city accounts to some extent, for this difference in price; but allowing for this, the fact remains that prices in the United States are not cut to nearly so fine a point as in Canada, and it is difficult to see any reason for the unprofitable rates which prevail in this country. As to the result of the introduction of acetylene gas, Mr. Langton has been informed by a gentleman, said to be well qualified to speak with authority on the subject, that acetylene gas has for some time been manufactured and used in Switzerland, without regard apparently to the exclusive patent rights to which Mr. T. L. Wilson, the alleged inventor, lays claim. The surprising thing is, if this gentleman's statement be correct, that Mr. Wilson should have succeeded in obtaining from the gas companies of the United States such large amounts in cash for territorial rights to the use of his discovery.

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A correspondent of the Hardware Merchant reports the following interview at Dunnville, Ont., which goes to show that even bright lights of the church are sometimes not above attempting to shine in "borrowed" light at the expense of the electric light company:—"Where's the boss?" I asked as I strolled into J. H. Rowe's store, Dunnville. "Up at the Baptist church," was the reply. And feeling that as the mountain was unlikely to come to Mahomet, Mahomet would have to repair to the mountain, I wended my way to church (?) After greeting me, and in reply to my query, "What are you doing?" he said: "I think I am one too many for the Electric Light Co. I am interested considerably in church work, and, wanting to light up the basement of our church with the incandescent light, I asked the company if they would make any reduction in price charged for arc light in church. Being answered in the negative, I racked my brain for a scheme to get ahead of them, and finally struck upon the plan of making a hole through the floor. And on Wednesday and Friday nights the arc light above can be lowered into the basement, and now we will get three nights' light for 50c. per week instead of one."

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In the pioneer days of telegraphy in Canada an Irishman, whose son had gone to the North-west, wanted to send his boy a pair of new boots, and conceived the idea that the quickest method of delivery he could adopt would be the telegraph. Somebody had told him that communications could be sent very quickly that way, and he didn't see why a pair of new boots shouldn't go in the same manner. He wasn't quite sure how to go about it but concluded that the proper way would be to hang the boots on the wire, which he did. Soon after, a tramp passing the spot, caught sight of the boots slung across the wire, climbed the pole and appropriated them, hanging up his old ones in their place. By and bye the Irishman returned, and seeing the old boots, exclaimed: "Bedad, Jimmy's sint back his old boots t'let me know he got the new wuns."

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Mr. John Carroll, the well-known representative of the Eugene F. Phillips Electrical Works, Montreal, is repeating with much relish a story of which he was recently made the recipient at Lancaster, Ont. A farmer living on the outskirts of that town was recently boasting to his urban neighbors that his house was entirely lighted with electricity. The announcement was received with incredulity by the townspeople, who wouldn't believe that the agricultural population had so suddenly decided to put on airs and add to their expense account. They finally decided to accept the farmer's invitation to visit his house and see for themselves. On their arrival at the farm house this is what they saw: a single incandescent lamp suspended from the ceiling of the dining room, with sufficient cord attached to enable the farmer and his family to transport the light to any part of the premises. The difference in cost between an incandescent lamp and a lantern, is all the farmer's progressiveness cost him, and this, no doubt, is offset by a reduction in his insurance premium consequent upon the lessened fire hazard.

SPARKS.

The Leamington Electric Light Co. are installing a 60 kilowatt Canadian General single-phase alternator.

The number of passengers carried over the Galt, Preston and Hespeler Street Railway in 1895 was 175,000.

Mr. Beemer, the promoter of the electric railway at Quebec, is said to have made the necessary arrangements for carrying out the work.

The Montreal Street Railway Company recently placed an increase order for 40 C.G.E. 800 and 20 C.G.E. 1,200 railway motors with the Canadian General Electric Company.

Mr. Isaac McKay, of St. Thomas, who was engineer of construction of the London electric railway, has accepted an offer to superintend the construction of a new street railway in Cleveland.

The electric light plant at Alexandria, Ont., is now in operation. The power house, situated about two miles from Alexandria, is a substantial stone building, and is equipped with a 60 K. W. 2,000 volt alternator, driven by a Robb-Armstrong engine. The switchboard is of marble, and the whole plant is a very substantial and practical piece of work, and reflects credit upon the contractors, Messrs. Ahearn & Soper, Ottawa.

WATER TUBE BOILERS.*

By W. T. Bonner.

When your worthy secretary called upon me for a paper on water tube boilers, I little realized the difficulty attending the work, for the subject has already been so fully and so ably discussed in the technical journals, and even in the ordinary trade catalogues, that I fear my humble contribution to the proceedings of this Society will contain little that is new or interesting. However, hoping that I may at least be fortunate enough to glean from fields which possibly some of you have passed over, I beg your indulgence and attention to certain facts, which we of the water tube persuasion believe to be proof positive of the correctness of our system.

OLD AND NEW.

Not at all unfrequently are the promoters of water tube boilers called upon to furnish evidence of the extent to which such boilers are, and have been used. The prevailing idea in the minds of many steam users appears to be that of mistrust in the principle and effect of water tube boilers. It is not what their fathers used, neither does their local boiler maker approve of them, a negative premise naturally calling for a negative conclusion.

Why are not water tube boilers in more general use? Because, as was explained in a discussion of the subject by the American Society of Mechanical Engineers, they require a high class of engineering to make them successful. The plain cylinder is an easy thing to make. It requires little skill to rivet sheets into a cylinder, build a fire under it, and call it a boiler; and because it is easy and anyone can make such a boiler, because it requires no special engineering, they have been made, and are still made, to a very large extent. The water tube boiler, on the other hand, requires much more skill in order to make it successful, a fact proven by the great number of failures in that line.

Water tube boilers are not new. From the earliest days there have been those who recognized their advantages, and in modern practice to refuse them equal consideration with the best known mechanical appliances of other types, is only pardonable on the ground of ignorance or injustice.

I was greatly amused recently to find in a so-called engineering *journal, the following item of news*:—

"At Davenport, Ia., the old battery of four boilers at the Arsenal is being replaced by two boilers of novel construction in that region. The new boilers are 200 h.p. each, and instead of the heat passing through tubes surrounded by water, as in the ordinary boiler, the process is reversed, and the water in pipes passes through a current of hot air, thus giving a greater heating surface and insuring the greatest safety."

Plainly these are nothing more or less than our ordinary water tube boilers, and it is quite evident that the author of that item gauges the progress of this world by the developments on the little rock island in the Mississippi, occupied by the United States Arsenal.

Contrast with this another item of news in the Youths Companion, to which my nine-year old boy called my attention only a few days ago. It read as follows:—

"An interesting discovery has recently been made in the Museum at Naples, where the works of art and utensils found in the buried city of Pompeii are preserved. Careful inspection of one of the ancient copper vase-shaped vessels there, has shown that it is in reality a tubular boiler. That this form of boiler should have been known to the Romans two thousand years ago is somewhat remarkable. For just what purpose it was used is not known, but the boiler is well-constructed and contains five tubes running across a central fire-box, and so arranged as to permit the water surrounding the fire-box to circulate through them in a continuous current. The soldering of the tubes was so skilfully done that it remains intact to-day, and the cover of the boiler closes hermetically. The entire height of the machine, which, as remarked above, is shaped like a vase with two side handles and three feet, is only about 17 inches. It has been suggested that it may have been employed for distilling purposes. However that may be, its preservation under the ashes of Vesuvius proves that tubular boilers are not altogether a product of modern invention."

No doubt you have all read Lord Lytton's account of the last days of Pompeii, and recall his description of the wonderful therme or baths, which formed so prominent a feature of every Roman city during the first century. Possibly this ancient boiler was designed by one of those bright Roman or Grecian mechanics for heating the water for the Sudatoreum or warm baths.

We *find it duplicated almost exactly in the Galloway water* tubes of the present day, and I have no doubt if we could follow up this investigation of ancient boilers, we would find the knowledge possessed by the ancient Greeks and Romans was not confined to Poetry, Sculpture and Art, but that even water tube boilers and heaters were known to them.

The principle of the Galloway tube originated at the time when probably the first steam boiler made in this world was constructed. It is not known when the first steam boiler was constructed, but the first steam boiler recorded was made at least 200 years before the year one of our era.

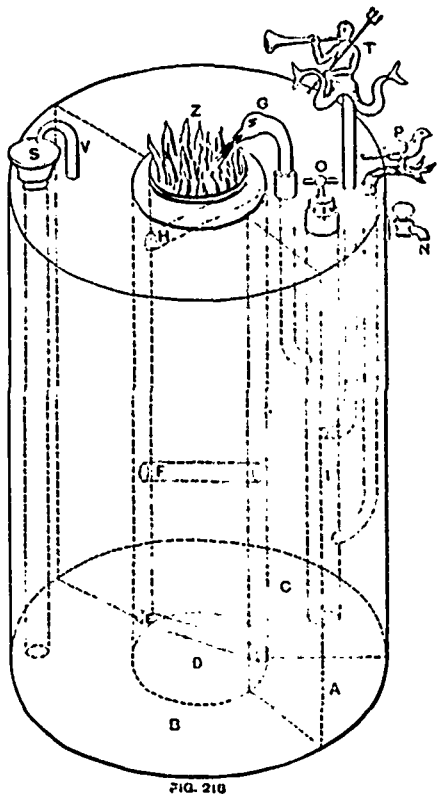


FIG. 216

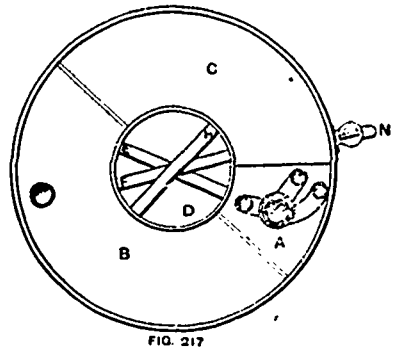


FIG. 217

In a discussion of various forms of shell and water tube boilers at the New York meeting of the American Society of Mechanical Engineers in 1885, Mr. W. F. Durfee gives an illustration of this very unique boiler, copied from the first Latin translation of the Pneumatics of Hero of Alexandria, who lived and wrote about 200 B.C.

Its construction is shown in Figs. 216 and 217. The figure is copied from the Latin translation referred to, and represents a perspective elevation of the boiler and its appendages, showing its internal construction by dotted lines. The second figure (217) was drawn by Mr. Durfee to facilitate explanation; it shows a horizontal section of Fig. 216 taken just below the top.

The apparatus consists of a vertical cylindrical shell, whose ends are closed by heads, through the centre of which passes a vertical cylindrical flue, D, whose upper end is provided with grates for the support of the fire, Z, the hot gases from which passed downward through the flue. The space between the flue and shell is divided by diaphragms into three unequal compartments, A, B, C, in the first of which steam is generated, the others being simply reservoirs of hot water. The central flue, D, is crossed by three cylindrical tubes, H, F, E, the tubes, H, F, connecting the hot water spaces, B, C, act in the same way as the Galloway tubes, now in common use, but the bottom tube is closed at the end, E, its opposite end opening into the smallest or steam compartment, A. The compartment, B, is provided with a funnel, S, whose tube extends nearly to the bottom of the boiler; and also with a safety tube, V, whose curved upper end is immediately above the funnel, S. The compartment, C, has a cock, N, from which the water is drawn. The compartment, A, has within it a three-way cock, I, the three discharge pipes of which are connected *with the goose-neck blow pipe, G, the triton, T, and the* singing-bird, P, respectively. The three-way cock, I, is operated by a cross-handle, O, and the upper end of its plug has graduations which, when brought opposite an index mark on the shell

* Paper read before the Mining Association of Quebec.

of the cock, determine which of the three discharge pipes shall receive the steam generated in compartment A.

The principal function of this apparatus was to furnish hot water, and it is so contrived that it is impossible to draw any considerable amount of hot water from the cock N, without putting in an equal quantity of cold in the funnel S. In order to put this apparatus at work, the compartments B and C were filled with water to a level above the upper water tube H, by means of the funnel S. The goose-neck G was then removed and water poured into the compartment A, sufficient to fill it nearly to the lower end of the three-way cock I. The fire was then lighted, and as soon as steam manifested itself, the goose-neck G was returned to its socket and placed in such a position that the fire Z was blown by the issuing steam. The three-way cock I could be turned by its handle O, so that the steam would cause the triton T to sound his trumpet, or the bird P to warble, and thus announce to interested parties that the water was "boiling hot." In case any steam generated in the compartments B and C, it found an exit through the safety-pipe V, and any entrained water re-entered the boiler through the funnel S. In case it was desired to draw hot water in any great quantity from the cock N, it was necessary to supply an equal quantity of cold water through the funnel S, this requirement insuring a constant volume of water in the boiler.

But I need not weary you with ancient history. It may satisfy our curiosity and lend some additional color to Solomon's proverb that "There is nothing new under the sun," yet we cannot expect ancient Greece or Rome to furnish models for our boiler makers of to-day. Only by comparison do we really begin to appreciate the vast changes by which the engineering talent of to-day is taxed to its utmost to produce machinery and appliances which will accomplish the greatest amount of work for the longest period, with the least expenditure of effort. Steam boilers perhaps have not attained that degree of perfection usually accorded to the steam engine, yet when we note the progress which has really been made, and realize how close we have approached to the theoretically perfect boiler, we have great cause to feel encouraged.

Of the two hundred and sixty odd boilers recorded in Mr. Bell's most valuable Directory of Canadian Mining Industries, 30% or 5,400 h.p. are of the water tube type, and 50% or 9,000 h.p. are shell boilers, leaving 20% or 3,600 h.p. unclassified.

Since practically all of the above water tube boilers have been installed within the past ten years, we can safely infer that in the mining trade at least, more horse-power of water tube boilers are now sold each year, than all the other types combined.

There is no better evidence of the survival of the fittest in modern boiler practice, than a comparison of the various types exhibited at the Centennial Exhibition of 1876, with those shown at the World's Fair, 17 years later. At the Centennial there were exhibited 14 different types of boilers, of which two were cast iron sectional, four were shell or tubular boilers, two were shell boilers with water tubes crossing internal fire tubes, while seven were exclusively water tube boilers. Of the whole number exhibited at the Centennial, but one, the Babcock & Wilcox, reappeared in its original form at the World's Fair in 1893. Of the fifty-two boilers exhibited in the main boiler room at the World's Fair, all were of the water tube type, while thirty-one of them were distinct copies of the original boiler patented by Stephen Wilcox in 1856, just forty years ago.

THE PERFECT BOILER.

What really constitutes a perfect boiler? Mr. George H. Babcock in his life-time undertook to formulate the twelve fundamental principles upon which it should be built. It was about twenty years ago that his formulas were first published, yet those same principles still live, and are looked upon to-day as the acme of scientific boiler construction. I need not repeat them here; they have long occupied a prominent page in the Babcock & Wilcox Co.'s book "Steam." But rarely do we find so much truth in so few words.

Few boilers there are entirely devoid of all good talking points, but do not be satisfied with a boiler simply because it is made of good materials and workmanship, or because it has a mud drum, or because it has large water and steam capacity, or because it has a large disengaging surface, or because it has a good circulation, or because it is built in sections and is therefore safe in the event of explosion, or because it is able to withstand high pressure and unequal expansion, and has its joints protected from the fire, or because the furnace is provided with chambers for the proper combustion of the gases, or because the heating surface is composed of thin metal so arranged that the hot gases will cross it at right angles, and only leave it when the greatest possible heat is extracted from them, or because it will work up to or over its full rated capacity with the highest economy, or because it is fitted with the best quality gauges and fittings. Each of these qualities add greatly to the value of a steam boiler, but that one is best which combines the greatest number of such qualities, and therefore proves the best investment independent of first cost.

Messrs. Galloways, Ltd., of Manchester, Eng., illustrate on page 94 of their late catalogue, what they are pleased to designate as their "Manchester Boiler," but which is in reality a reproduction of the ordinary inclined water tube boiler, built by so many manufacturers of to-day. In explanation of this marked deviation from the Galloway, Lancashire, and Cornish boilers which they have been building for so many years, Messrs. Galloways, Ltd., say:—

"For ordinary pressures the Galloways boiler possesses great advantages, but beyond that, cylindrical boilers are frequently of large diameter, necessitating extremely heavy plates, and although for marine practice this is carried out, yet for situations where the conditions are less rigid, it is advisable to have a boiler more suited to the requirements of the case.

"In addition to this, where transport of large pieces is difficult, the Manchester boiler offers considerable advantages, as the largest piece is the upper vessel, which rarely exceeds five feet in diameter, twenty feet in length, and four tons in weight, the tube rods and boxes being separate. It will be seen that all the tubes are inserted into one water box or chamber at each end, the front one connected to the upper vessel by a wide neck, and the back chamber by a large circular connection, by which means an even circulation is kept up. The boiler is further provided with an internal arrangement in the upper vessel for separating the steam from the water, thus preventing priming and its attendant evils. This arrangement of boiler has been largely adopted on the Continent, and we anticipate that when its merits become known, it will be received with great favor by steam users requiring boilers for high pressure."

That is good; coming from such an eminent authority, we can only interpret their adoption of the water tube principle as a strong endorsement of the work accomplished by their predecessors in that field of engineering. I fully expect, however, in the next issue of their catalogue, Messrs. Galloways will have overcome their prejudices sufficiently to limit the diameter of their drums to 36" or 42", and that they will further arrange to enclose the drum so as to utilize its surface for heating rather than condensing. Then they may add to the merits of their boiler, safety and economy.

I might add that although Messrs. Galloways are pleased to limit the use of their water tube boilers to stationary work, the boilers of that type are just now making tremendous strides in the race for supremacy in marine practice.

As an example in proof of this statement I might refer to the steamers Turret Cape and Turret Crown, which have just closed a very successful season in the coal carrying trade between Sydney and Montreal. From their lessees the Dominion Coal Co., I learn that the two steamers have a combined record of 27 trips, extending over a period of 44 weeks, during which time they brought 66,981 tons of coal into this port. To this total should be added 11,700 tons for short cargoes, made necessary by the very low water in the river and canal, which difficulty prevailed through all of last season. Had there been a sufficient depth of water, both steamers could just have easily have brought in a full cargo each trip.

The actual carrying capacity of each of the Turret boats is 3,000 tons. They are fitted with water tube marine boilers, 2,200 square feet of heating surface being the total for each boat. They have been kept in continual service right through the season, and the captain's log shows a clean record for the boilers.

Many other and larger steamers fitted with water tube boilers have gone into commission during the past few months, and in every case the boilers have given the greatest satisfaction.

CAPACITY.

The term "Horse Power" is one which admits of a wide interpretation, being little understood by some and often misapplied by others. Originally used as a unit of capacity by James Watt, and supposed to be the average amount of work performed by a good strong English cart horse, its value is 33,000 lbs. raised one foot high per minute. It may be expressed in any equivalent of this unit as one pound, raised 33,000 feet high per minute. At best this is but an arbitrary unit, since the actual value of a horse-power depends, as a Yankee boiler maker has very aptly expressed it, upon the size of the horse. The evolution of the term "horse-power" as applied to steam boilers, has been gradual but not the less marked.

Prior to the advent of compound and triple-expansion engines, it was always customary to calculate the steam consumption of the ordinary slide valve engines then in most common use, at the rate of one cubic foot of water per hour, or say 62½ lbs. For instance, a 10 h.p. engine would require a boiler capable of evaporating 625 lbs. of water per hour. In general practice it was found boilers of different types of construction varied in evaporative capacity according to the efficiency of their total heating surface, the amount required per h.p. averaging about as follows:—For plain cylinder boilers, 10 square feet; for large flue boilers, 12 square feet; for horizontal and multitubular boilers, 15 square feet.

Of late years tremendous strides have been made in the development of the steam engine, so that instead of one cubic foot of water, or 62½ lbs. steam consumption per h.p. per hour, the modern engine builder knows that he must develop a horse-power with less than 30 lbs. of steam for simple non-condensing engines, and from that down to 13 lbs. or less for triple expansion condensing engines, depending upon the size of plant and number of cylinder expansions.

Here then arises a serious complication in the determination of horse-power. Shall it be a large or a small horse? The prospective purchaser should consider this matter carefully, and demand that all tenders must state specifically the actual evaporative capacity of boilers to be purchased, to be determined if necessary by a practical test. The American Society of Mechanical Engineers has very properly solved this problem by the favorable consideration of its Special Committee's report at the New York meeting in 1885, whereby the equivalent evaporation of 30 lbs. of water from a temperature of 100° Fah. into steam at 70 lbs. pressure, is fixed as a boiler horse-power.

American manufacturers generally have adopted this standard, and while they may differ in the number of square feet of heating surface they allow for developing a horse-power, there is no longer any doubt as to the size of the horse.

I cannot leave the subject of horse-power capacity without first making a strong appeal for a more uniform rating of boilers, a rating which has some tangible basis. Not until you are able to compare boilers by the actual number of square feet of effective heating surface they contain, or the actual number of pounds of water they will evaporate under ordinary working conditions, can you judge whether one boiler is cheaper than another.

I confess I was greatly shocked only a few days ago, to hear the admission of a fire-tube boiler man, that he only figured the upper half of his tubes as effective heating surface. I shall always remember him as an honest man of good sense. There is no question but that fire tubes and shell plates exposed to the direct action of hot gases, form very efficient heating surfaces when they are clean, but who is there who will claim the possibility of keeping such surface constantly clean while the boiler is in active service.

Effective heating surface is that which receives the direct contact of the hot flame or gases and continues to do so without interruption from soot, or interference by close furnace walls, or baffle plates. This is the proper basis upon which to purchase your boiler, other conditions of course being equal.

SAFETY.

I have been asked why a water-tube boiler is necessarily a safety boiler. It is not necessarily a safety boiler; in fact I could name a number of water-tube boilers which are safe in name only. Certainly a boiler with very wide flat stayed surfaces, enclosing chambers receiving the combined circulation of all the tubes, should not be considered a safety boiler. Stay bolts and braces at best are a constant menace to safety, since they are usually located in inaccessible places, difficult to inspect and repair. But the principal objection appears to be the impossibility of providing braces which brace at the proper moment. How is it possible to assemble a number of pieces of metal, all of different sizes and shapes, and subject to greatly varying temperatures, and expect them to expand, contract, and remain uniformly tight at all times? But it is to be regretted that in defending the principle of water-tube boilers, there are other weaknesses to apologize for than braces and stays. There are those with tubes closed at one or both ends, the aggregation of pipe and fittings, and the bent tube monstrosities, so aptly described in a recent publication called "Facts," all more or less dangerous because they cannot be cleaned.

That a boiler can be made so as to be practically safe from explosion is a demonstrated fact, of which no one at all acquainted with modern engineering has any doubt. Of this class of boilers the Babcock & Wilcox is a pre-eminent example from the length of time which it has been upon the market, and the large number which have been for years in use under all sorts of circumstances and conditions, and under all kinds of management, without a single instance of disastrous explosion.

The Babcock & Wilcox water tube boiler has all the elements of safety, in connection with its other characteristics of economy, durability, accessability, etc. Being composed of wrought iron tubes and a drum of comparatively small diameter, it has a great excess of strength over any pressure which it is desirable to use. As the rapid circulation of the water insures equal temperature in all parts, the strains due to unequal expansion cannot occur to deteriorate its strength. The construction of the boiler, moreover, is such that, should unequal expansion occur under extraordinary circumstances, no objectionable strain can be caused thereby, ample elasticity being provided for that purpose in the method of construction.

In this boiler, so powerful is the circulation, that as long as there is sufficient water to about half fill the tubes, a rapid current flows through the whole boiler, but if the tubes should finally get almost empty, the circulation then ceases, and the boiler might burn and give out. By that time, however, it is so nearly empty as to be incapable of harm if ruptured.

Its successful record of over twenty-five years proves that by the application of correct principles, the use of proper care and good material in construction, a boiler can be made so as to be in fact, as well as in name, a "safety boiler."

CANADIAN ELECTRICAL ASSOCIATION.

The Executive Committee of the above Association met in Toronto on the 16th of January to discuss preliminaries in connection with the arrangements for the convention which is to take place in that city in June next. Several sub-committees were appointed to further these arrangements, and report to the Executive at another meeting to be held shortly.

Subjects upon which it would be desirable to have papers were considered, and a selection made. An invitation has been extended to a number of qualified persons to furnish papers on these selected subjects, and from the majority the Secretary has already received favorable responses.

Judging by these favorable initiatory proceedings, and taking into consideration the fact that the convention is to be held in the Queen City of the West, in the locality of which a large proportion of the members of the Association reside, and at the most favorable season of the year, there is reason to anticipate that great success will crown the event.

In the interim before the convention, every person connected with or interested in the electrical interests of Canada, who is not already a member of the Canadian Electrical Association, should connect himself with the organization. This especially applies to persons connected with the electric lighting industry, for reasons which have recently been mentioned in these columns.

TRADE NOTES.

Attention is called to the advertisement of Messrs. Ahearn & Soper, in another column, offering for sale second-hand machinery.

The Royal Electric Co. have just completed the installation of a 30 k.w. "S.K.C." two-phase generator, for the Glenwilliams Electric Light Co., at Georgetown, Ont.

The Ottawa Carbon Co. advise us that they are turning out 20,000 carbons per day, and have orders in hand at present sufficient to keep their works employed until May next.

The Packard Electric Co., of St. Catharines, Ont., have opened an electrical repair department in connection with their works. They are making a specialty of re-winding street railway armatures and transformers, and already have several orders on hand.

John W. Skinner, of Mitchell, Ont., advises us that he sold during the month of January, seven electric motors and two lighting plants. Mr. Skinner has had a large experience, having installed, perhaps, as many plants of different systems as any man in the businesss.

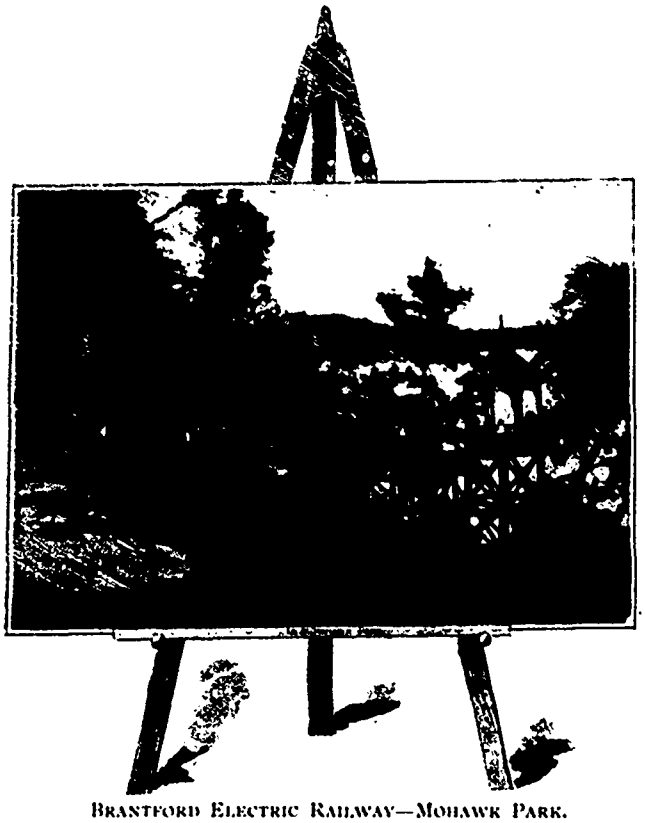
The Power Rope and Belting Co., of St. Catharines, Ont., has been incorporated, to manufacture belting by a new process, under patents granted to Mr. H. Ellis. The capital stock is $20,000, and the promoters are: J. W. Coy, Harry Eliis, H. Flummerfelt, F. Coy, all of St. Catharines, and L. Raymond, of Welland.

Mr. G. A. Powell, assistant manager of the Packard Electric Co., St. Catharines, Ont., informs us that his Company were appointed in October last, Canadian agents for the Bryant Electric Co., of Bridgeport, Conn., manufacturers of electrical specialties, and the R. Thomas & Sons Co., of East Liverpool, Ohio, porcelain manufacturers

ELECTRIC RAILWAY DEPARTMENT.

BRANTFORD ELECTRIC RAILWAY.

This road is principally owned and operated by the Canadian General Electric Co., and has been in operation as an electric road since 31st of March, 1893. The officers are well-known financial railroad and electric men, viz.: Pres., Frederic Nicholls; Vice-Pres., H. P. Dwight; Sec'y.-Treas., W. S. Andrews; Board of



BRANTFORD ELECTRIC RAILWAY—MOHAWK PARK.

Directors, Robt. Jaffray, Hugh Ryan, Geo. A. Cox, W. R. Brock and Thos. Long. The road is under the management of Mr. Jas. T. Madden who has been in the railroad business for a number of years having held a responsible position with the C. P. R. in connection with the construction of their line between Sudbury and Sault Ste. Marie. Mr. Madden is ably assisted in the management by his accountant, Mr. Jno. Murrode.

The Indian City, with the Grand River bending round it, the picturesque scenery on its banks, and Mohawk Park, through which it flows, delights even the traveller who has climbed mountains, travelled through rocky Muskoka or languished in the salty breezes of the seaside, to come and spend a few months in this pretty town with its hospitable people.

Much of Brantford's popularity as a summer resort is due to the Brantford Street Railway Co. Last spring they purchased Mohawk Park—on which they have already spent $12,000—one of the most delightful spots in Canada. It comprises 42 acres, in which is an artificial lake. They cleaned the park up, built a quarter-mile bicycle board track, sodded the centre and erected a grand-stand capable of seating 1,500 persons, and a bleacher of 750 seating capacity. The track is surrounded with trees. Ten arc lights light up the track at night where large crowds assemble in the evening to witness the bicycle races. Fifteen arc lights are scattered through the woods and on the edge of the lake. A large pavilion and casino were erected during the summer. A band plays there three nights a week, and a hungry or thirsty soul can eat or drink to the strains of Sousa's latest production, surrounded by 400 colored incandescent lights. The casino and pavilion thus illuminated present a very pleasing night effect from the lake.

The lake is a mile and a half in length by a mile in width supplied with water from the Grand River. The company propose to dam up the ravine in the park and allow the water to run through the ravine and over the dam. Behind the waterfall will be varied colored incandescent lights which at night will give a very pleasing effect. Bicycle boats and canoes are for hire, or you can step into your canoe at Oxford street bridge, and paddle twelve miles down the river, when you find yourself in Mohawk Park lake, only two miles from home, as the river is so crooked. You leave your canoe there, see the sights and take the street car back to the city. The Hamilton road leads from the city to Mohawk Park, and in one place there is a steep grade on which is a switch, but only one trolley wire, which is used for the car going up the grade on its way to the park. As the grade is steep the down car does not need a trolley wire on the down trip. As it shoots down the grade the lights go out, and this spot has come to be called "the tunnel." Mr. Madden has instructed his conductors to acquaint the passengers of its existence before they come to it, so that they may be prepared. The young people like "the tunnel."

The park was opened on the 24th of May, and on that date a railroad men's pic-nic came to town. The company collected on this inaugural day 18,000 fares. As a money maker no park can beat Mohawk Park.

On the eight and one-half miles of single track twelve cars run in the summer time, but in winter not so much service is required. The "T" rail is used exclusively,

BRANTFORD ELECTRIC RAILWAY—POWER STATION.

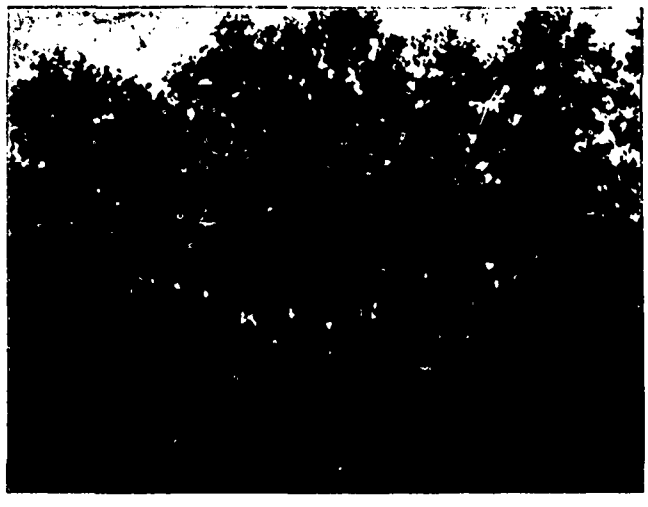
six miles weighing 30 lbs. and the balance 60 lbs.; any new rails will be 60 lbs. in weight.

The centre of the system is at the corner of Colborne and Market streets from which all the lines radiate. The main line runs east on Colborne, with a belt line around the eastern wards, via Alfred, Nelson, Brock and Arthur streets and Park ave., back west on Col-

borne to Brant ave., then north to the Institute for the Blind. Three cars cover this route.

The second line runs from the G. T. R. depot down Market street to the Kerby House on Colborne street making connections with all G. T. R. trains. As the distance is so short only one car is necessary on this route.

The third line terminates in West Brantford at one end and in Eagle Place, a southern suburb of Brantford, at the other. It's course is on Oxford street in West



BRANTFORD ELECTRIC RAILWAY—MOHAWK PARK.

Brantford, to Colborne street, then to Market street, south on Market street to Core street, Core street to Cockshutt road, to Eagle Place. Two cars cover this route.

The fourth line (operated only in summer) with six cars runs east on Colborne street from Market street to the Hamilton road, thence to Mohawk Park.

It took a great deal of persuasion by the company to induce the Council to allow them to lay their track on Colborne street from Alfred to Brock, a distance of three blocks, saving them the journey round the belt line on their way to Mohawk Park. After much contention the Council gave in, and the company therefore save a half a mile by a direct route to the park.

THE POWER HOUSE.

In keeping with the general excellence of the road is the power house, situated on Colborne street, near the G. T. R. tracks. The soil is something akin to quicksand and the foundation is sunk to a great depth. The reason of building here was that a stream ran through the property which affords a supply of water for condensing. The power station is a two-storey brick edifice with the top storey floor on a level with the street. In the annex of 40x40 ft. are the boilers and fuel. The main part is 80x50 ft., and the top storey is used for the general offices, waiting rooms, car storage and repair shops. In the basement of ground floor are the repair pits and lavatories, taking up the front part, while the rest of the building, 62x50 ft., comprises the engine and dynamo room.

The company do a good incandescent lighting business. Besides their railway machines, they have three alternators. The railway generators are two No. 32, 300 h.p. C. G. E. machines, and the alternators are: one 1,000 light C. G. E. and two 750 light C. G. E. machines with exciter. A 25 light "Wood" arc machine supplies the company with light for private purposes. The machines run from a line of shafting extending the full length of the room, having two Goldie & McCulloch clutch couplings attached. Power is supplied by two "Wheelock" condensing engines of 150 h.p. each. From the boiler room steam is supplied from two Waterous and one Doty boiler of 150 h.p. each. The fuel used is Reynoldsville slack. Mr. D. C. Thomas is the chief engineer and is a young mechanic of great promise. An engineer and fireman are on for each twelve hour's run.

The wires are run from the switch-board to the ceiling, thence up through the tower on the side to the poles outside.

The switch-board is of wood panels, and the instruments are on slate bases. Mr. J. Watts is the electrical superintendent and has charge of all the outside work.

Thirty men constitute the regular staff, with fifteen additional in the summer.

The company have just issued a successful report, and as Brantford grows, as she certainly will do, the Brantford Street Railway Co. will by and bye take rank with the largest and most prosperous electric railway concerns of the Dominion.

ANNUAL MEETINGS.

OTTAWA ELECTRIC RAILWAY COMPANY.

THE annual meeting of the above company was held on the 27th of January. The reports presented covered only a period of seven months, owing to the annual meeting, which was formerly held in June, having been changed to January.

The receipts from June 1st to December 31st, were $122,694.39 for car fares, and $5,479.59 from mail cars and other sources—a total of $128,173.98. The working expenses of the road were $73,983.48, leaving a net profit of $54,190.50. From this a two per cent dividend was declared on Sept. 2nd, a 2 per cent. dividend on Dec. 2nd, and on January 9th a dividend of ½ of 2

BRANTFORD ELECTRIC RAILWAY—MOHAWK PARK.

per cent., leaving a balance of $16,166.50 to be applied to the profit and loss account. 2,843,173 passengers were carried during the seven months, and the wages paid out amounted to $45,671.43. The assets of the company are valued at $985,994.63, the profit and loss account amounting to $57,808.05.

The election of directors resulted as follows: J. W. McRea, President; W. Y. Soper, Vice-President; T. Ahearn, Managing Director; G. P. Brophy, W. Scott,

P. Whelan and T. Workman. R. Quinn was appointed Auditor.

TORONTO STREET RAILWAY COMPANY.

The Toronto Street Railway Company held their annual meeting a fortnight ago. Mr. W. D. Matthews, a director of the C.P.R., was appointed a director, and at a subsequent meeting Mr. Jas. Ross, of Montreal, was elected vice-president to fill the vacancy on the board caused by the resignation of Mr. H. A. Everett. The directors were voted the sum of $20,000 for their valuable services during the past year.

The annual statement submitted showed a net profit of $301,310.30, as against a net profit of $250,695.18 for the previous year. From the profits of this year two dividends at the rate of 1¾ per cent. each have been declared, amounting to $210,000, leaving, after the deduction of an allowance for paving charges amounting to $60,000, the sum of $31,310.30 to be carried forward.

The company has in its treasury, bonds amounting to $450,000 available for future use, notwithstanding the large expenditures which have been necessitated for rolling stock, car houses, etc. In the past four years the gross earnings have increased $172,712.31, while the operating expenses have decreased $100,418.50. The assets of the company are placed at $9,775,511.70.

The comparative statement for 1895 and 1894 is as follows:

	1895.	1894.
Gross earnings	$992,800.80	$958,370.74
Operating expenses	$489,914.76	$517,707.53
Net earnings	$502,886.04	$440,663.21
Passengers carried	23,353,228	22,609,338
Transfers	7,257,572	7,438,171
Percentage of operating expenses to earnings	49.3	54.0

During the year the company has built in its own shops 30 open cars, and 20 closed cars, five of which are 30 feet double truck cars, and six sweepers.

HAMILTON, GRIMSBY AND BEAMSVILLE ELECTRIC RAILWAY COMPANY.

At the annual meeting of the shareholders of the Hamilton, Grimsby and Beamsville Electric Railway Company held on the 27th ultimo., much interest was taken in the election of a directorate for the current year. There were two opposing forces, the Lester ticket and the Myles ticket. The former was successful, and the new board is therefore composed of T. W. Lester, president; John Hoodless, vice-president; C. J. Myles, John A. Bruce, John Gage, W. Grieves, and A. E. Jarvis (Toronto).

The secretary-treasurer presented a financial statement, the accuracy of which was questioned by the president. After considerable discussion it was resolved to consider the report at a meeting to be held on the 9th of March. Mr. Adam Rutherford was re-appointed secretary-treasurer.

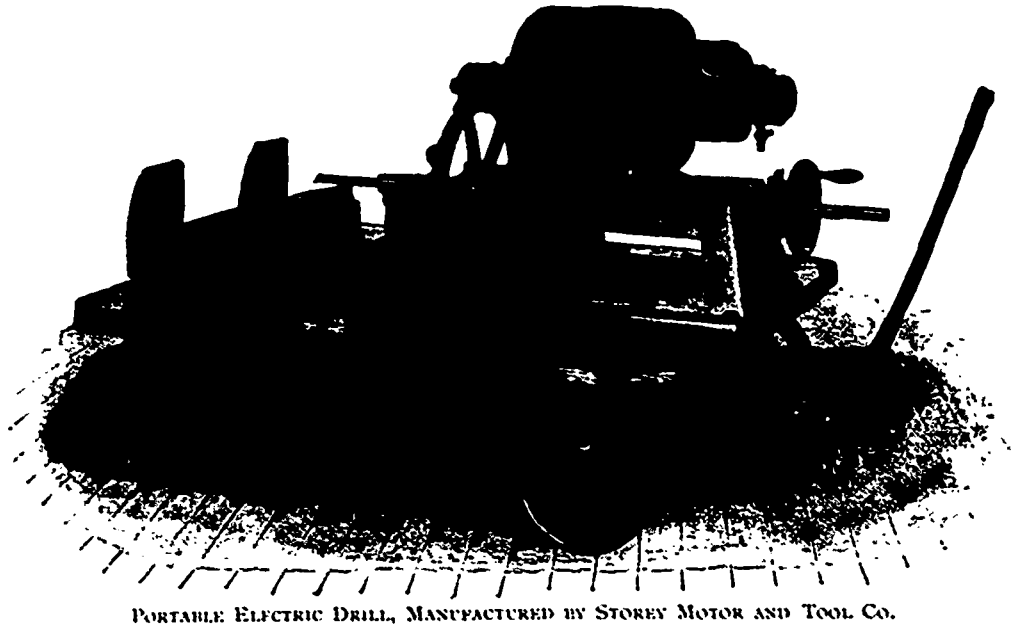
The new management, it is said, propose to take steps at once to secure the extension of the road to Beamsville, and to make other improvements.

PORTABLE ELECTRIC DRILL.

The Storey Motor and Tool Co., of Hamilton, Canada, and Philadelphia, Pa., some time ago put on the market a compact and efficient portable drill, which we illustrate herewith. This machine is adapted for drilling pig iron and copper for test work, drilling rails, and for various other kinds of work. Owing to the type of the motor, which is entirely enclosed, it is suitable not only for indoor work, but can also be used for outside purposes without requiring any specially arranged covering for fire protection. The outfit complete consists of motor and drill combined, together with regulating rheostat for obtaining desired speed, and a drum with 100 ft. of flexible cord, all mounted on a truck, with or without rack for holding material to be drilled, as desired. These machines drill in sizes up to 1½ inches in steel and 2 inches in cast iron, and are furnished with both automatic and hand feeds.

The rapid adoption of electricity in machine shops and factories makes a tool of this kind extremely useful, as it can be moved at will wherever it is needed. These drills can also be placed on a table or in any stationary position, and will cover a large range of work of different classes. As an illustration, two of these drills are mounted on bed-plates, one at each end of a large calender roll, drilling two holes in flanges at the same time and tapping them in the same operation, before the roll is moved. Another adaption of this drill is where it is fitted with a telescoping shaft and is used in yards for drilling holes in the construction of switches and crossings for street car and railroad work.

A different type of portable drill, combining all the features of an up-to-date drilling and tapping machine, is being brought out by the above company, and will be ready for the market in a few weeks.



PORTABLE ELECTRIC DRILL, MANUFACTURED BY STOREY MOTOR AND TOOL CO.

PERSONAL.

Mr. Thomas Ahearn, of Ahearn & Soper, Ottawa, and Mrs. Ahearn, are at present making a tour of the world.

Mr. G. H. Campbell, manager of the Winnipeg Electric Street Railway, was recently in Toronto and Montreal on a holiday trip.

Mr. W. A. Handcock, local manager of the Bell Telephone Co. at Sherbrooke, Que., is receiving the congratulations of his friends upon his recent marriage.

Mr. J. J. York, chief engineer of the Board of Trade building, Montreal, and president of Montreal No. 1, C. A. S. E., was presented at Christmas by the employees in the building with a complimentary address, accompanied by a smoker's set, consisting of two valuable meerschaum and briar pipes and a large box of tobacco.

WHY CENTRAL STATION MEN SHOULD ORGANIZE.

Editor CANADIAN ELECTRICAL NEWS.

SIR, In your January number you publish an extract from a letter written by the manager of a company in an eastern Ontario town, to the manager of a company in a western Ontario town, and you derive from the remarks therein expressed, arguments why central station men should become members of the Canadian Electrical Association. In endorsing your remarks may I be permitted to carry the arguments a step further than editorial discretion prescribed as your limit? You describe the municipalities as the principal gainers by the want of organization among central station men, but it strikes me that the position is very different, and I am sure that a little careful reflection will convince anyone that it is the manufacturing companies who gain more much more than any one else by this want of combination and cordial co-operation, and who require to be watched much more than do the municipalities who are generally very mild offenders.

At the present moment the manufacturing companies maintain very curious relation with respect to the operating companies. They not only manufacture machines, which, of course, is their proper business, but they promote companies to do lighting business, then, as consulting engineers, they advise these companies as to what to purchase, and how to operate; and they endeavour to foster a kind of parent and offspring relationship with the view of opening and keeping a market for their own goods. Any attempt at independence of action on the part of the offspring is deprecated by the parent company, as tending to introduce an undesirable competition, and the manufacturing company also endeavors to guard its offspring against the bad men in the open market who would want to sell their goods by trying to constitute its agents the only means of communication between the operating company and the electrical world outside. These agents go around with their pack of goods, and while the customer is purchasing lamps, etc., they give him little scraps of news as to new apparatus, new installations, etc. A very large proportion of the smaller central station men seek for no better information on electrical matters than is dribbled out to them through the interested channel of a manufacturing company. They are satisfied to receive all their news, and any pointers they may require from the very man who is most interested in keeping them in the dark about the merits of any other apparatus than that which he himself sells.

Now, let any intelligent person consider for one moment what is inevitably the result of this. The central station man is interested in hearing of new or improved lamps, motors, etc., that have been brought out and by the use of which he can reduce his expenses, or extend his business. Is an agent likely to tell a customer of an improved type, made by a rival manufacturing company? Is he in the least likely to say that some rival sells a better lamp than he does himself? Is he not far more likely to religiously avoid mentioning any such thing? Can he be expected to recommend to, or bring to the notice of any customer, any piece of apparatus but that which he sells himself? Plainly, the purchaser, by not making independent enquiries, frequently fails to hear of something really to his advantage, because it is none of the agent's business to tell him.

A little reflection will show central station men how little they regard their own interests when they allow themselves to be kept in leading strings by the manufacturing companies, instead of combining to study central station practice for themselves. A manager should keep his eyes wide open to see things, to do the very best possible with what he has got, and to promptly seize ahold of anything new that affords a means of reducing his expenses or extending his business. Now, any new labor-saving or more efficient piece of apparatus is patented and owned by only one company, and although it may be really the most valuable improvement in the world, no other company is going to recommend its use if it will interfere with their own sales. On the whole, the central station man who expects a manufacturing company to give him really disinterested advice as to new or improved apparatus, is likely to be as badly left as he deserves to be. The enterprising man will hunt these things out for himself, by co-operating with his neighbors, to their mutual advantage. To illustrate: The storage battery has been proven to be of great value as a central station auxiliary. Has any Canadian manufacturing company ever recommended the installation of batteries? I do not think so. BECAUSE NO CANADIAN MANUFACTURING COMPANY MAKES A BATTERY THAT IS ANY GOOD. To recommend it would be to hurt their own business, which is to sell dynamos.

Again, plenty central stations using single phase alternating machinery, could work up a considerable day power business if they could get a good single phase alternating current motor. There is such a motor available, but I shall be very greatly surprised to hear that the agent of any of the Canadian manufacturing companies has mentioned the fact to any of their customers. Why? BECAUSE THEY DO NOT MAKE IT THEMSELVES, BUT HAVE DIFFERENT MACHINERY TO SELL, and it doesn't suit their business to post their customers too well on any good points in their rival's goods. A manufacturing company, if consulted, is going to advise the use of its own apparatus every time; and the demand for new and improved types must come from the central station man, who should use the most efficient, no matter who makes it, and find out for himself what is the latest and best.

As to operating central stations. Is there any manager who thinks he knows all about it? If so, why can't he let some other manager have the benefit of his knowledge? Perhaps he can get a few valuable hints in return. By all means let there be an organized body of central station men working together for their mutual good—telling each other what their experiences have been, and tackling their problems for themselves, instead of allowing themselves to be exploited by the manufacturing companies, who, in the words of a recent sufferer, have "hitherto had a pic-nic." Apologizing for this long letter, I remain,

Yours truly,

GEO. WHITE FRASER.

W. Kennedy, of Hobart, Ont., proposes shortly to put an electric light plant in his mill.

The second electric locomotive has been put in service in the B. & O. tunnel at Baltimore. It has improved on all previous performances by hauling a train weighing 1,400 tons through the tunnel at the rate of 23 miles an hour. In starting this train a draw pull of 58,630 pounds was exerted. The current taken was 4,100 amperes at a pressure of 600 volts.

SPARKS.

J. F. Guay, a dealer in electrical supplies at Quebec, is reported to have assigned.

It is reported that an incandescent light plant will shortly be installed at Brussels, Ont.

The Aylmer Electric Light Co. are said to be considering the purchase of a 1,000-light incandescent dynamo.

The Nelson Electric Light Co. have recently put in operation their new plant at Nelson, B. C. Mr. John B. Bliss is electrician.

The Ira Cornwall Co. is being incorporated at St. John, N.B., to manufacture electrical apparatus, etc. The capital stock is $10,000.

Alonzo T. Cross, a manufacturer of electrical appliances at Providence, R. I., has completed an electric carriage which is said to have given good results.

Mr. E. J. Lennox, architect, of Toronto, has recommended the purchase of an electric light plant for the new city and county buildings. The cost is estimated at $15,000.

Mr. T. Viau, the promoter of an electric railway between Aylmer and Hull, Que., is forming a joint stock company to build the line. The cost of the work is placed at $65,000. The electric road will be seven miles in length.

The Drummondville Electric Co., of Drummondville, Que., has been granted incorporation. The promoters are: William Mitchell, Samuel Newton, William Houston, A. Ouellette, of Drummondville, and W. A. Mitchell, of Nicolet.

Incorporation has been granted to the Barrie and Allandale Electric Street Railway Co. The promoters are J. H. McKeggie, G. Vair, G. Reedy, S. J. Sanford and J. H. Dickinson. The object of the company is to construct an electric railway in the vicinity of Barrie.

The Electrical Review, of London, Eng., in a recent issue compliments Mr. D. R. Street, of Ottawa, on his interesting paper on "Electric Light Accounting," read at the last annual meeting of the Canadian Electrical Association, and expresses approval of the various forms given therein.

At the annual meeting of the Maritime Auer Light Co., held at Fairville, N.B., recently, the following directors were elected for the ensuing year: Messrs. W. H. Thorne, W. C. Pitfield, R. Keltie Jones, G. S. Fisher and S. Hayward, St. John; A. O. Granger, Montreal; L. L. Beer, Charlottetown; F. W. Sumner, Moncton; F. B. Edgecombe, Fredericton.

The Toronto, Hamilton & Niagara Falls Electric Railway Co. has given notice of application to parliament next session for incorporation. The object is to construct an electric railway from Toronto to Hamilton, and from that city to Niagara Falls, Grimsby and Drummondville. The solicitors of the company are Messrs. Clark, Bowes, Hilton & Swabey, of Toronto.

The forty-ninth annual meeting of the Montreal Telegraph Company was held in the City of Montreal a fortnight ago. The assets were shown to be $2,255,888.60, and the liabilities $2,040,540.25. Four dividends of two per cent each had been paid. The election of directors resulted in the return of the old board, and at a subsequent meeting Mr. Andrew Allen was re-elected president.

A prize of $75 and a diploma is being offered by the Verband Deutscher Elecktrotechniker for the best device by which mistakes, such as placing the wrong size fuse in fuse terminals and the interchanging of fuses except by authorized persons, may be rendered impossible. The designs are to remain the property of the author, and must be received by the Verband at 3 Monbijouplatz before April 1st.

Mr. C. A. E. Carr, manager of the London Street Railway Co., recently gave a supper to the employees of the road.

Henry Townsend, whose son was killed in the Scarboro railway accident at Toronto last summer, has been awarded damages to the amount of $1,000.

The Fraserville Electric Power Co., of Fraserville, Que., is applying for incorporation, with a capital stock of $20,000, to operate telephone lines and electric lighting plants.

An employee of the Toronto Electric Light Co., while repairing the wires on Sherbourne street, in some way came in contact with a live wire, and was badly scorched about the hands and face.

A statement of the earnings of the Montreal Street Railway Co. for the quarter ending December 31, 1895, shows the receipts to be $299,460.35 an increase over the corresponding quarter for 1894 of $47,536.97.

At the annual meeting of the London Street Railway Co., held recently, the following directors for 1896 were appointed: H. A. Everett, of Cleveland, president; E. W. Moore, Cleveland, vice-president; Chas. W. Watson, Cleveland; Thomas H. Smallman, London, and H. F. Holt, Montreal. Chas. Currie was appointed secretary and Chas. E. A. Carr was re-engaged as manager.

SPARKS.

The village of Morrisburg, Ont., will shortly consider the question of putting in an electric light plant.

The Royal Electric Co. are installing two-phase generators at Georgetown and Glen William; also at Forest.

Mr. Bonfield, of Eganville, Ont., is requesting permission from the village of Arnprior to enter into the electric light business.

A circular expressing regret at the inconvenience caused to subscribers by the recent storm has been sent out by the local manager of the Bell Telephone Co. in Toronto.

At a recent meeting of the directors of the Kingston Electric Light, Heat & Power Co., Mr. A. F. Folger was appointed manager and director.

The Government of Queensland, Australia, are desirous of receiving applications for the position of electrical engineer to the Government. The salary is £600.

The Western Electric Light & Heat Co. have commenced the construction of their system at Vancouver, B.C. The new company will supply light to private citizens at half a cent per ampere hour. The power house will be built on False Creek.

The annual report of the electrical department of the Michigan Inspection Bureau for 1895 shows a total loss of $74,165 in nineteen fires of electrical origin. Over 816 installations were inspected, with the result of remedying 396 defects.

The Deschenes Electric Company, of Aylmer, Que., has been incorporated. The promoters are: R. H. Conroy and D. B. Gardner, of Aylmer, Que.; W. J. Conroy and E. R. Bisson, of Deschenes Mills, Que.; and J. S. Dennis, of Ottawa.

The Committee of the Lord's Day Alliance has instructed its solicitors to appeal from the decision of Mr. Justice Rose in the Sunday car case, which was published in full in our January issue. The appeal will be heard at the March sittings of the Court.

The C. P. Telegraph Co. are placing a storage plant at Ottawa. Some 300 cells of chloride accumulators are being installed. This is the first storage battery to be used for telegraph work in Canada. If it proves a success it is the intention to adopt the same system in other places.

It is said to be the intention of W. S. Adams, who owns saw mills at Pine Falls, to build an electric railway from Darwin, on the C. P. R., to the Winnipeg river, a distance of twelve miles, and to use the water power for running the mills and supplying electricity for the line.

A bill has been introduced in the United States Senate authorizing the construction of an electrical cruiser, equipped with a system of electrical motors and propellors invented by Richard D. Painton. The inventor claims that a speed of 35 knots an hour can be maintained by cruisers thus equipped.