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For THE CANADIAN ENGINEER.

THE MONTREAL, OTTAWA AND GEORGIAN BAY CANAL.

BY ARTHUR J. FORWARD, OTTAWA.*

(Concluded from last issue.)

COMPARISON WITH OTHER ROUTES.

The commercial results to be derived from the opening for traffic of a great waterway by the Ottawa to the lakes could not be otherwise than satisfactory. To quote Mr. Shanly once more :—" To those who have made the laws that govern western traffic their study, I leave it, to estimate the height to which Canada would be elevated in commercial importance by opening through the heart of her Dominion a continuous navigation, shortening by fully one hundred and fifty miles, the shortest water communication that now does or ever can exist besides between tide-water, whether on the Gulf of St. Lawrence or the estuary of the Hudson, and the broadest extent of grain growing country in the world." Late years have brought about a most noteworthy shifting of trade centres on the lakes, the change being one altogether in favor of the Ottawa route. In the first half of the century, the commercial transactions of the country bordering on Lakes Erie and Ontario were everything. There was no West. Later on came the unparalleled growth of Chicago, and the development of the country about Lake Michigan. Now, Lake Superior bids fair to far surpass them all in the magnitude of her traffic, while Lake Erie ports derive the major share of their present importance from being receivers of the grain, ores and timber of Lakes Huron, Michigan and Superior, except

in one or two instances where they are large shippers of coal. For various reasons the growth of the Canadian North-West has been slower than was hoped for. But Manitoba has this year a wheat crop estimated at 25,000,000 bushels, which will tax every existing means of carriage to the utmost to provide transportation for it. And nothing is more certain than that the centre of the grain-shipping area will move steadily northward year by year. This has plainly an important bearing on the future of the Ottawa route, because it affords the most direct line possible from Lakes Huron, Michigan and Superior to tide-water. The general course from the mouth of French River to Montreal varies but little from a direct line, the route lying almost along the 46th parallel of latitude from a point near the entrances to Lakes Michigan and Superior eastward to Montreal, a distance of nearly 600 miles. A gentleman well acquainted with the Ottawa writes as follows :—" The route from Lake Superior to Montreal by way of the Ottawa River is *more nearly an air line than any other stretch of inland navigation which can be found in all the world*, and presents besides, physical conditions which will enable it to be improved for the passage of the largest vessels for a less cost than any other which can be found."

The saving in distance due to this feature is very great.

Chicago to New York via the Erie route....	1,415 miles.
" " Montreal " " St. Lawrence..	1,348 "
" " " " " Ottawa.....	980 "

From Lake Superior ports the showing is even more favorable to the Ottawa, owing to the more direct course through the north channel of Lake Huron to the mouth of French River. Montreal being 280 miles nearer Liverpool than New York is, the total distances from Chicago to Liverpool will compare as follows :—

Via the Erie route	4,495 miles.
" " St. Lawrence	4,148 "
" " Ottawa	3,780 "

The actual advantage in distance is greatly increased also by the comparatively small amount of canalizing to be done on the Ottawa. Thus taking Mr. Clark's plan, as altered to meet existing conditions, there would be 33½ miles, as against 71 on the St. Lawrence, and 351 on the Erie route, or 220 via the Welland canal and Oswego. The net result will be a saving of from 30 to 40 hours on the trip as compared with the St. Lawrence, and not less than 90 to 100 compared with the Erie. Nor will this be materially decreased by the additional lockage required, three to four hours being a sufficient allowance for the amount above that on the St. Lawrence, and about one hour for that in excess of the Erie. Not only will this saving of time render possible a larger number of trips, and thus the carrying on of a larger traffic in proportion to capital invested, but the absolute safety of the route will reduce insurance rates to a minimum. All the way from the Sault to Montreal, with the exception of a few miles on Georgian Bay, is practically a land-locked channel which the flimsiest of river steamers may navigate in safety.

All these elements combined make the Ottawa the

*By an error the first instalment of this article in last issue was credited to another writer.

cheapest possible through route for the grain traffic. Average wheat rates for the past eight years from Chicago to New York by the several American lines have been :

- 1—Via lakes and Erie Canal..... 6 19c. per bushel.
- 2— " " rail 8.96c "
- 3— " all-rail routes 14.55c. "

Making all due allowance for lack of return freights at the outset, it is calculated that wheat should be laid down in Montreal by the Ottawa route at a cost for transportation from Chicago not to exceed $3\frac{1}{2}$ cents per bushel, or at least $2\frac{1}{2}$ cents per bushel less than the lowest prevailing rates. A much less cut should have the effect of diverting a large share of the traffic from those routes, if the statement in a recent report of the New York Produce Exchange, that $\frac{3}{8}$ of a cent per bushel will suffice to change the channels of trade, is to be accepted as anywhere near the truth.

Enough has been said at least to indicate the importance of the route in relation to the through carrying trade. The magnitude of the traffic on the lakes is very great and rapidly increasing. The American Sault Canal has for a long time annually passed tonnage exceeding by 25 per cent. that using the Suez Canal. In 1892, 12,580 vessels were locked with an aggregate tonnage of 11,214,333 tons. This affords some measure of Lake Superior's traffic. In 1889 the total freight carried on the lakes was equivalent to 15,518,360,000 ton-miles, or 22.6 per cent. of the total ton-mileage of all the railways in the United States for the year ending June 30th, 1889. In 1886 there were only six steel vessels on the lakes, with a combined tonnage of 6,459 tons and a value of \$694,000. In 1890, there were 63 vessels of the same class of 99,457 tons burthen, and valued at \$11,964,000.

Considered from a military point of view there is no doubt the proposed waterway would afford a splendid second line of defence to Canada, and would prove a valuable protection to her commerce in case of war. The canals of the St. Lawrence system are peculiarly liable to attack from without, and could be rendered useless in a few hours by a mere party of stragglers. A ship canal on the Ottawa, being protected by its remoteness from the boundary at all points, would serve to maintain undisturbed communication between west and east, and would give control of the lakes. Sir John Michel, to whose mission reference has already been made, in addressing a public meeting in Montreal after his return said: "You are placed in a position held by no other city that I know of in the world, on the only spot on a vast continent which can be made the receiving house of one-third a continent's exterior trade, and able to dispatch that trade to Europe, but you are unsafely situated. The grand route to the sea by the Ottawa and French Rivers should as soon as possible be undertaken, giving you a backbone of military strength, and bringing to your doors the vast trade of the vaster West."

And the late Hon. Alex. Mackenzie, who was a firm believer in the value of the route, said on one occasion:

"I am convinced that the true route for a canal to the Georgian Bay is up the Ottawa, because that would be giving a backbone to the country. If we had a fine canal capable of carrying vessels of war in that direction it would be a splendid means of defence, as well as a great highway for the commercial products of the West."

A more material point, however, and a greater re-

commendation is that the commercial ties which would be formed with the West consequent upon the opening of this route would tend to knit more firmly the bonds of friendliness that exist between ourselves and our neighbors across the border, and it would thus become a potent factor in the preservation of that mutual good understanding which all true lovers of either country desire.

The opening of this waterway would exert also a great influence upon the development of valuable natural resources within our own borders. Bouchette estimated that the Ottawa valley is capable of supporting 8,000,000 people; but at present it has not more than 400,000 of a population. Portions of the route lie in the midst of rich agricultural land; others pass through or are adjacent to lumber and mineral districts among the richest on the continent. With an open thoroughfare for vessels to Georgian Bay, the lumber of the Ottawa valley would find a western outlet, and a vast and profitable trade would spring up with the timberless western prairie States. Not only would the cheap carriage of grain afforded give an immense impetus to the development of the Canadian North-West Provinces and Territories, but the Algoma, Nipissing and Temiscamingue districts would be still more directly benefited by cheap transportation for bulky products, and the rapidity of their settlement by a desirable class of homesteaders would be greatly augmented.

Doubtless the magnificent water powers of the Ottawa and its tributaries are such as to justify the high encomiums pronounced upon them by various writers. To make a final quotation from Mr. Shanly's report: "Its water power is not only unlimited in capacity, but available to its fullest extent at numberless stages along the route. By the opening of the projected navigation, this great manufacturing agent would be brought into comparative proximity to the granaries of Lake Michigan, and would immediately be turned to account in preparing the cereals of the West for the markets of the East. With such a combination of advantages in possession or prospect, it is surely not difficult of belief that the valley of the Ottawa is destined to become not only the workshop of Canada, but one of the chief manufacturing districts of America."

The recent progress in electrical engineering has greatly enhanced the value of water powers, but it would require the space afforded by a special paper to discuss intelligently the possibilities arising out of the use of the hydraulic force of the Ottawa and its tributaries in the production of electricity for manufacturing lighting purposes, or for the propulsion of vessels, railway trains, etc. On this feature of the project let a single quotation from a letter by Mr. O. Higman, member of the Institute of Electrical Engineers, suffice:—

"It would be difficult," he says, "to find, on this continent, at any rate, a similar succession of waterfalls along a like distance, and through a country so well favored for manufacturing purposes. With the methods of long distribution of the electric current now being perfected by Tesla and others, there is no reason why sufficient energy should not be generated along the Ottawa and its tributaries, not only for local purposes along the route, but for the operation of the Canadian Pacific, Canada Atlantic, and Parry Sound railways between Georgian Bay and Montreal."

It needs no prophetic vision to see the Ottawa valley become, as Mr. Shanly says, "the workshop of Canada," a perfect hive of manufacturing industry,

when these powers now wasted shall have been harnessed in the service of man. To bring about such results, more than a slight expenditure of capital and labor would be justifiable; and, undoubtedly, there can be no one public work undertaken which would be so largely conducive to that end as the opening to navigation of the noble waterway which is the subject of this paper, and which Nature herself has plainly indicated as Canada's great national highway for the traffic between the lakes and the Atlantic.

THE TELEGRAPH IN CANADA.*

BY CHAS. P. DWIGHT.

The telegraph in Canada has so often been made a subject of history and retrospect that one can hardly hope, in a paper of this nature, to do more than briefly outline much of what has already been written concerning its rise and development. The various stages in its practical operation, from the simplicity of the old paper register to the present day, are too well known to require any elaboration at my hands, and I have, therefore, simply put together something which may be considered as a record for this association concerning the more important telegraph organizations which have existed in Canada from the start.

The first commercial telegraph line erected in this country was in the year 1847, between Toronto, Hamilton, St. Catharines and Niagara Falls, connecting at the latter point with a line through to Buffalo, owned by one David Kiscock. The organization under which this line was built was known as the Toronto, Hamilton, Niagara Falls & St. Catharines Electro-Magnetic Telegraph Company—a somewhat lengthy title for a concern of this nature, but one which was thoroughly expressive in regard to the scope and nature of its business. As a matter of curiosity there is laid on the table for your inspection one of the original stock scripts of this company which an antiquarian friend has loaned me for the occasion, and which you will note bears the signature of Thos. D. Harris, president, and P. B. Marling, secretary. The capital stock of this company was \$16,000, and the line was built under contract by Samuel Porter, a man long known afterwards in connection with various telegraph enterprises in the United States, and of whom it was said that "he built for this first Canadian telegraph company an honest and well appointed line."

In the same year, 1847, was organized the Montreal Telegraph Company, with a capital of \$60,000. This company immediately proceeded to construct a line from Quebec to Toronto, and soon afterwards purchased the line erected by the Toronto, Hamilton, St. Catharines and Niagara Falls Company. The line from Quebec, when finished, was looked upon at the time as the best piece of telegraph construction on the continent. The poles were of cedar, thoroughly tamped and well set. Wooden brackets of white oak were used, with glass insulators. The wire was a No. 9 gauge, English galvanized, and was the first of this kind employed for such a purpose on the continent.

At the close of the year 1847 the Montreal Company had in operation 540 miles of wire, with 9 offices, 35 employés, and had sent in all 33,000 messages.

An organization known as the British North American Electrical Association was also formed in 1847, with F. N. Gisborne as the moving spirit. This company, or association, proposed connecting Quebec with

the Lower Provinces, and finally with the Atlantic coast, but for some years the line was extended no further than Rivière du Loup. It was finally extended to Woodstock, N.B., however, where connection was formed with the American Telegraph Company, an organization which had already connected a few of the principal points in New Brunswick at that time, and which had a capital of \$25,000. A second organization, known as the American Telegraph Company, constructed a line about this time from Quebec to Montreal, but was afterwards absorbed by the Eastern Company. All of these lines east of Quebec, however, proved a dismal failure from a financial point of view, and were soon turned over to the Montreal Company without charge, and the line between Quebec and Montreal was also taken over by them at a nominal charge.

In the Eastern Provinces there is on record a project set on foot by Mr. Lawson R. Darrow in 1847, for the purpose of connecting the lines then in Nova Scotia with those of Maine, and an act of incorporation was granted for this purpose in 1848. In the same year a line was built from Calais, Maine, to St. John, N.B., under the organization just mentioned, and which has now been incorporated into a company known as the New Brunswick Electric Telegraph Company, with a capital of \$40,000. A line to St. John *via* St. Stephen's, St. George and St. Andrews, was completed January 1st, 1849, and during the ensuing summer the line was completed from St. John to Hampton, Sussex, Salisbury, Dorchester and Sackville to Amherst, where connection was made with the Government line then in Nova Scotia, which was built from Amherst to Halifax in November, 1849, and which for the first time gave Halifax connection with New York.

In 1856 the lines of the New Brunswick Telegraph Company were leased to the American Union Telegraph Company, and some ten or twelve years later came under the direction of the Western Union Telegraph Company.

The Government line between Halifax and Amherst was built by F. N. Gisborne, for the purpose of forming a connection with the American and New Brunswick lines at the former place, in order to meet the demand for communication with New York, consequent upon the arrival of steamers at Halifax with European news. In 1851 this line was sold to the Nova Scotia Electric Telegraph Company, an organization chartered in March of that year, and which afterwards extended the line from Pictou to Sydney, C.B., and from Halifax to Yarmouth. Upon completion of arrangements for the landing of Atlantic cables in Newfoundland, the lines of the Nova Scotia Company were leased to the American Union Telegraph Company in 1860. In 1866 this lease was taken over by the Western Union Company, who purchased the lines outright in 1872.

Returning to the Province of Quebec again, we find that in 1849 there was organized what was known as the Montreal and Troy Telegraph Company which built a line the same year from Montreal to the frontier, and thence *via* Whitehall to Troy. This company was organized by Ezra and Alonzo Cornell, who also constructed the line, and which worked for several years afterwards in connection with the Montreal Company. A. B. Cornell, whom it will be remembered was afterwards Governor of New York State, acted as manager of the company at Montreal for two years after the construction of the line. Some few years afterwards the section of the line from Whitehall north became the

* A paper read before the Canadian Electrical Association at the Ottawa Convention.

property of the Montreal Telegraph Company, under a compact with the American lines, known as the Six Party Contract, whereby certain divisions of territory were made and allotted each company.

In 1850 there was projected and built a line between Montreal and Bytown (probably the first telegraphic connection enjoyed by Ottawa) by the Montreal and Bytown Telegraph Company, of which Edward McGillivray was president, and which a few years afterwards was purchased by the Montreal Telegraph Company.

In the year 1852 the Grand Trunk Telegraph Company was organized, and built a line between Buffalo and Quebec, and seem to have given the Montreal Company a pretty lively opposition between these points. After a few years, however, it went the way of so many of its predecessors, and was purchased by the Montreal Company for the sum of \$11,000. Then sprang up another organization, known as the Provincial Telegraph Company, which built a line over the same route, but it too was soon absorbed by the Montreal Company.

In 1868 was organized the Dominion Telegraph Company, which had soon built lines embracing all the important points between Buffalo, Detroit and Quebec, and whose opposition became more lively as time went on. Rates were reduced, and the outcome promised disaster for all concerned. When in 1881, therefore, a proposition was made for the consolidation of these conflicting interests, under lease, by the Great North Western Telegraph Company, considerable satisfaction at the prospect was expressed by all concerned, and a deal on these lines was accordingly put through, and is in operation to-day. The combined mileage of the two companies at the present time, as operated by the Great North Western Telegraph Company at the present time, is 18,000 miles of poles, and 40,000 miles of wire, with some 1,800 offices throughout Ontario, Quebec, New Brunswick, Manitoba and Northern New York State.

By means of this amalgamation the telegraph business of the country was for a time almost entirely in the hands of the Great North Western Telegraph Company. In every city and town where two offices had previously been maintained the wires were all taken into one, and sweeping reductions in expenses consequent upon such a move were at once inaugurated. The monopoly thus brought about was not destined to last long, however, and almost immediately afterwards the Canada Mutual Telegraph Co. was organized, and constructed lines between Niagara Falls and Toronto, Montreal, and the boundary line, and Montreal, Coteau and Ottawa. Some three or four years after the amalgamation had been effected, the Canadian Pacific Railway Co. had also commenced the construction of telegraph lines along the route of their road, and between many of the principal cities and towns of the Dominion, and in September, 1886, had opened 366 commercial telegraph offices throughout Ontario, Quebec, Manitoba and the North-West Territories. Since that time they have been constantly adding to their plant, and at the present time have somewhere in the neighborhood of 25,000 miles of wire in operation, and 800 offices.

In certain remote localities along the St. Lawrence and in the North-West Territories, where private companies would hardly be justified in extending their lines, the Dominion Government have in operation at the present time somewhere in the neighborhood of 3,000 miles of wire.

The total amount of capital invested in Canadian telegraphs may be roughly fixed at between six and seven million dollars, and the total wire mileage to somewhere in the neighborhood of 75,000.

In respect to population it can truthfully be said that no country in the world enjoys a more extensive system of telegraphs than Canada. Scarcely a town or hamlet in the whole country but has connection by this means with the outside world. Hundreds of offices are maintained throughout the country in small out-of-the-way places, where the actual business is but trifling, and where the lines in reality prove much more a matter of convenience to the public than profit to the telegraph companies.

The following comparative table, showing the number of inhabitants per each telegraph office, will indicate more clearly the position of Canada in this respect:

Country.	No. of Inhabitants to each Telegraph Office
Great Britain	6,417
Switzerland	2,556
Holland	10,254
France	7,719
Germany	4,510
United States	5,625
Canada	2,320

In respect to rates, too, no country enjoys a cheaper schedule than Canada, distances and other conditions fairly taken into account. The maximum charge between offices in Ontario, Quebec and New Brunswick is 25 cents, and for this sum a message can be transmitted over twelve hundred miles of wire.

In Canada the telegraph companies have always kept well abreast of the times in promptly adopting the various improvements in apparatus which have from time to time been placed upon the market, and two well-known repeaters, the Toye and the Neilson, attest our own ingenuity in this respect. Both the duplex and the quadruplex systems are in daily use over some of the most important routes, and direct and rapid communication is maintained between all the larger centres, as well as with New York, Chicago, and other important American points.

So essential a feature in every day business life as the telegraph has now become is very apt to be regarded in its stability as something from which little more may be expected in the way of improvements. Great things may yet be looked for, however, in the practical operation of the telegraph. From the days of the old Phelps register, when messages were laboriously spelt off the slowly winding tape, the brightest minds in the profession have ever been directed towards achieving that rapidity and perfection of transmission towards which so much has already been done. Numerous contrivances have within recent years been placed upon the market in the shape of printing machines, and the latest achievement in this direction—known as the Buckingham Automatic Printer—gives promise of being an unqualified success. This machine has recently been put to a thorough test over a line one thousand miles in length, and a sample of the work done by this means is laid on the table for your inspection. It is a quadruplex printer, capable of transmitting and printing 150 words per minute.

Predictions are, of course, a little premature as yet, but if thoroughly successful and universally adopted it will readily be seen how much nearer every man's door the telegraph will come.

Within the past two or three years dynamo plants have been installed in the offices of the Great North

Western Tel. Co., in Toronto and Montreal, displacing several thousand cells of gravity battery in each place, and for adaptability and general efficiency there are few superior plants to be found anywhere.

In Canada, telegraph lines are maintained under adverse conditions, which exist in few other countries similarly equipped. Long stretches of lines are maintained through rough and sparsely settled districts, and the sleet storms of winter often mean total abolition of long stretches of poles and wires over the most important routes, and involve an amount of labor and expense in their restoration little understood by the average outsider, why has merely a grumble to offer if his business cannot be got through in all kinds of weather.

Aside from the position which the telegraph occupies in our midst as a simple means of sending and receiving messages, it might not be out of place to enumerate a few of its more important outside functions. I need not say in this connection that there is no more vital adjunct in the operation of our great railways to-day than the telegraph. Railway telegraphy is in fact an art in itself, without which many of our more important railway systems might be likened to ships without rudders.

The collection and distribution of market reports is a service performed by the telegraph companies which is worthy of special mention. By means of tickers and special delivery are daily distributed amongst our brokers and others continuous quotations from the markets of Liverpool, London, Beerbohm, Chicago, Milwaukee, St. Louis, Duluth, Detroit, Toledo, New York and Paris, in both stocks and grain; a service which serves to keep those interested in continual touch with all the great markets of the world.

The gathering and distribution of reports in connection with the Meteorological Department is another service which is of inestimable value to many of the most important interests in the country.

The press service of the telegraph companies is also an important feature in connection with their business. I need not remind you that it is by means of the telegraph, broadly speaking, you are enabled to discuss so readily the affairs of the world, and look so wise and weighty. In Canada a regular system is in operation, whereby every telegraph agent is also an agent indirectly of the press; forwarding to headquarters such items of public interest happening in his town or neighborhood as he is required to send, and which is afterwards sifted and made use of by papers here and elsewhere. That the politics and political opinions of the country are largely moulded by the press, there is little question. In fact many papers are primarily in existence for no other purpose than to serve political ends. Latter day enterprise in journalism is a source of constant wonder. In the dissemination of both political and legitimate news there is no one factor more important than the telegraph.

These are of course facts almost too well known to require repetition at my hands, but mere mention of the part played by the telegraph company in connection therewith is sufficient to indicate the magnitude of its mission. As an instrument in the higher civilization of man it has no peer, and that we in Canada have shown ourselves so thoroughly alive to this fact is certainly a matter for congratulation.

Owing to the space taken up by reports of conventions, we are obliged to greatly curtail the news items and to hold over a quantity of editorial matter.

STEAM BOILER EXPLOSIONS.

BY A. E. EDKINS, TORONTO.

Scientists have given the subject of "Steam Boiler Explosions" a good deal of attention; in fact some of them have given it so much attention in the past that the cause of such accidents would be shrouded in mystery far too deep for men of average learning and common sense to fathom, if all the theories advanced by them as the cause for explosions were taken for granted.

We are supposed to, and we assuredly have, more experience in the design and construction of steam boilers than our predecessors of 30 or 40 years ago, yet in spite of this it is no uncommon thing for boilers to give way without a moment's warning, through imperfections or mismanagement, and in many cases such accidents have been attended with the loss of many valuable lives and the destruction of much property.

It is at times difficult to draw the line strictly between what constitutes an explosion and what might be termed a burst, rupture, or local explosion. I think myself that the term "boiler explosion" should infer that the whole of the stored energy within the boiler had been instantaneously released, and the boiler itself rent into two or more pieces. Anything less than this I think would be properly designated as a burst, rupture or collapse, as the case may be. On the other hand, some engineers will insist that either one of these occurrences constitutes an explosion, and, as I have said before, it is sometimes difficult to draw the line exactly at the spot where the rupture or burst merges into the explosion. But, as "operative steam engineers," we are more directly interested in the most probable cause and the most efficient means to be adopted for the prevention of explosions.

A steam boiler under pressure is practically a storehouse or magazine containing a certain amount of energy or explosive force, and this amount (which is always enormous) is exactly proportionate to the weight of water and steam contained within it. This is a fact which, so far as I have been able to ascertain, is not realized by the average attendant of steam boilers, as it is quite a common thing, in the event of an explosion of great violence, to hear men attribute the cause thereof to a lack of water in the boiler, and some will even go so far as to infer that the boiler must have been empty and red hot, and the explosion caused by turning on the feed pump and throwing cold water on the red hot sheets, which being evaporated into steam (instantaneously), is of sufficient pressure to cause the destruction of the boiler. One of the principal objects of this paper will be to try and put the "low water theory," as a cause for violent explosions of boilers, before you in such a light that we may all see the absurdity of this most commonly accepted theory given as the cause of so many violent explosions.

The total energy or explosive force contained within a steam boiler under pressure is just as computable a quantity as the power developed by a steam engine, and for the information of those who may feel inclined to go into the matter fully, I would refer them to "Steam Boiler Explosions," by R. H. Thurston; but for the purpose of this paper I have thought it best to take the results of such formula and experiments which have been arrived at and made by such eminent engineers as the several who have treated and experimented on and with this question.

The energy of water and steam confined in a steam

boiler under pressure has been computed, and it has been found that a cubic foot of water, at a temperature due to a pressure of 60 or 70 pounds of steam to the square inch, has about the same explosive energy or force as 1 pound of gunpowder.

In exploding, gunpowder produces sufficient force to raise its own weight to a height of nearly 50 miles, while water, under the conditions existing in a steam boiler under pressure, has energy stored in it sufficient to raise its own weight nearly one mile in height.

Taking an ordinary horizontal cylindrical tubular boiler, such as is rated at about 60 h. p., and having dimensions about as follows: Diam. 60 in., length, 15 ft., containing 66 tubes, 3 in. diam., which will have about 900 square feet of actual heating surface, and would likely carry an average of 75 pounds per square inch, and would contain 8,225 pounds (or nearly its own weight) of water and 20.84 pounds of steam; and according to a table prepared by R. H. Thurston, the stored energy contained in the water would be 50,008,790 foot pounds, while that stored up in the steam in the same boiler would be equal to but 1,022,731 foot pounds, or only $\frac{1}{80}$ the quantity stored up in the water. When we reflect that the total explosive force or energy stored up in this boiler, according to Mr. Thurston's calculations, is 51,000,000 foot pounds, or sufficient force to raise its own weight one mile high, with an initial velocity of 600 feet per second, and of this enormous energy but 1,022,731 foot pounds, or about 4 per cent. of the total, are contained in the steam, it is, I think, very plain to us all that the bulk of destructive force in the event of an explosion emanates from the heat stored up in the water, which will at all times be of a temperature corresponding to the pressure of steam carried, and will, in the event of an explosion, expand itself down to atmospheric pressure so suddenly and with such terrific force as to cause great wreck of property, and in some instances a lamentable loss of life.

It follows then, and must be equally plain to us all, that that class of boiler containing the greatest quantity of water must in the event of explosion cause the greatest amount of damage, just the same as a large cannon, if charged proportionately with powder, would carry its projectile to a greater distance and with greater force than would a smaller cannon having been loaded with a less quantity of powder (explosive force). This fact accounts for the terrible destruction which follows the explosion of a large, plain cylindrical, or an English Lancashire or Galloway boiler, all of which contain large quantities of water in one chamber. The same holds good for proof of the claims made by builders of the many types of sectional or water-tube boilers as to the safety from explosions of such boilers, whose water spaces are divided up into many small compartments or sections, and which, in the event of a rupture, the water and steam escapes very much as it would through a blow-off cock, and generally without causing much damage.

The causes to which the explosion of steam boilers have been attributed are legion, and may, perhaps, be classed under the heading of, 1st, the known, 2nd, the possible, and 3rd, the improbable and nonsensical. Among the 1st causes may be classed bad workmanship, defects in design and insufficient staying of flat surfaces, general weakening and wasting of the structure from old age, constant use, external and internal corrosion, which are often much aggravated by mismanage-

ment, careless handling and failure to inspect and detect the many small and constantly increasing imperfections by which every boiler is attacked from the day it is first put into operation until it is taken back to the rolling-mill for scrap; or, as happens at times, when without any warning the boiler itself, tired, so to speak, of being abused and neglected, starts off on a journey of its own accord and creates destruction of property and life as it goes out through walls and roofs. Under this same head may be classed, also, badly arranged and inadequate fittings, especially safety valves, for it is no uncommon thing to find a safety valve on a boiler of so small a capacity that the pressure will accumulate 20 or 30 lbs. above the pressure for which the valve is set, even with the engine running, so that it is not too much to assume that with an old boiler, fitted with too small a valve, and a good fire burning and engine shut down unexpectedly, such an accumulation of pressure might result as to cause the boiler to explode, and in fact I have no doubt that many explosions have occurred from such causes.

I have often seen one safety valve arranged in such a manner as to relieve two or more boilers with stop valves placed between the safety valve and each boiler, in order that a boiler could be shut off at any time, and only one steam gauge for the two or three boilers, as the case may be, and in a case of this kind it would require no great stretch of imagination to suppose that in a case of three boilers fitted up as I have described, and one boiler having been let down for cleaning, is filled up again and fired up, the steam gauge and safety valve being both shut off, and the fact overlooked until the pressure within had reached the point at which the boiler gave way, and this pressure may in many cases be far below the calculated bursting pressure found by the usual formula, owing to bad workmanship, general deterioration, etc. Under this head comes also the overloading and wedging down of safety valves by ignorant attendants, who do not know the danger of such a foolish act, or if they do, are wilful enough to carry it on.

The overloading or wedging of safety valves is in my estimation an offence for which every engineer or fireman caught practising it, should be discharged forthwith from his position.

Only a few days ago, in making a "steam on" inspection of a boiler which was allowed a working pressure of 80 lbs. per square inch, I found a lever safety valve overloaded so that I am doubtful if it would have raised at 150 lbs., and on trying to demonstrate the folly and danger of such a practice to the man in charge (who, by the way, ought to have known better), I was told that the safety valve was leaking a little and he took this means of making it tight, and as he himself said, there was *no danger*, as he never allowed the pressure to exceed 75 lbs., as he was there all the time *himself*. I suggested several possibilities, one of which was that he might go home that night and be taken ill and die, and some man in the mill be deputed to fire up in the morning who knew nothing about the valve, etc., and then he admitted he had done wrong, as he had never looked at it in that light.

(2.) Among the 2nd possible causes of explosion may be mentioned low water and consequent overheating of the boiler, with the introduction of cold feed water on the red hot plates, but as I intend to treat some on this question, and submit some experiments which have been made in England by pumping cold

water on red-hot crown sheets, I will leave that subject till later.

(3.) Among the 3rd or absurd causes for explosions may be mentioned the following: The decomposition of water within a steam boiler and the formation of a powerful gas, which, under certain conditions, has been held responsible for some explosions, but which has been proved absurd by such scientists as Prof. Faraday and others. The former, in one of his reports to the British Board of Trade, says: "Decomposition cannot occur in a steam boiler, but if it could happen in consequence of low water and overheated plates, no oxygen could remain free to explosively combine with it."

The spheroidal condition of water has also been put forward as a cause for explosions, but it is never seriously considered in these days. Mr. Zera Colburn, in a paper on steam boiler explosions, and speaking of the spheroidal theory, says: "Much has been said of the spheroidal condition of water when thrown on heated plates. And it would appear that if ebullition were delayed in such a case until after a considerable quantity of water were admitted, the heat of the plate would be so far absorbed in an equal or greater weight of water, that no explosion of the latter could occur. This suggestion is given for what it is worth, but to my mind the spheroidal condition of water under the circumstances has long been an argument against, rather than in favor of, the probability of explosion."

Electricity within the steam boiler has also been given as a possible cause of explosion, owing no doubt to the fact that steam, upon being discharged into the air under certain conditions, has exhibited signs of electricity; but those who have put this theory forward as a cause of explosion have failed so far to furnish proof of the existence of an electrical current within the boiler. Even if the generation of electricity within a boiler when in operation were at all possible, those who know anything of electrical laws will know full well that it would be impossible for it to accumulate in an iron or steel vessel like a steam boiler, which is in direct electrical connection with the earth.

There are few engineers who have not at some time or other witnessed or felt the discharge of static electricity from a leather driving belt, which is at times of sufficient strength to give one a decided shock, and in my estimation it would be equally wise to lay the blame of the breaking apart of a belt so charged to electricity, as it would be to lay to it the serious charge of bursting a steam boiler.

In the case of the explosion of a steam boiler in England during the past year (where, by the way, there is a good and serviceable law in force regarding the inspection and operation of boilers, and which said law is rigorously enforced without respect to any person), it was proved by the enquiry following the explosion that the owner of the boiler had employed a blacksmith to inspect his boiler, and he (the blacksmith) had pronounced the boiler sound and safe for a working pressure of (I think) 60 pounds. However, the said boiler exploded, causing the death of some people and great destruction of property, and Mr. Blacksmith, no doubt considering himself an expert on boilers, gave it out during the course of the case for manslaughter, or criminal negligence, as his opinion, that the explosion of the said boiler was caused by "black heat."

I cannot enlighten you more on this new theory as to the cause of explosions, but it may interest you to know that the owner of the said boiler was fined a

good round sum, and imprisoned for one year for employing an incompetent person to inspect his boiler; and the blacksmith was also fined (I think) £20, and sent to jail for one year for presuming to give advice on a subject of which he was entirely ignorant.

I think such a law would prove beneficial in Canada. Probably the most frequent cause given for the occurrence of steam boiler explosions has been low water, and the pumping of cold feed water on to red-hot plates, which is generally assumed by the public to be a sure way to produce an explosion of the most violent kind; and while there is no doubt in my mind that a large number of ruptures or collapses have taken place through lack of water in the boiler, causing considerable loss of life and property, yet I am inclined to the belief that these accidents have occurred with boilers of the internally fired type, such as the locomotive fire-box, Lancashire, Galloway, and others of similar construction. With boilers of these types, low water generally results only in the collapse of the furnace crown sheet, through which the contents of the boiler may be discharged with considerable violence; but in many cases, the rest of the boiler, if of uniform strength, will not be torn to pieces, though it may in some cases be thrown some feet backward from its original seating.

I was called on once to examine an internally fired boiler, which had had its furnace crown sheet collapsed through lack of water when working at a pressure of a hundred pounds to the square inch or more. This boiler was well made and of uniform strength, and the furnace crown sheet was well stayed, but bore evidence of having been overheated sufficiently to cause it to lose its strength and collapse, being forced off all the stay bolts without even injuring the thread on the bolts. The crown sheet was forced right down into the ash-pit, and the inside plates of the furnace were torn down through the solid steel plate, and the contents of the boiler (which was a large one) were forcibly discharged into the ash-pit and through the furnace door, and the boiler itself was thrown forward several feet through a heavy wall. Some damage was done to surrounding property, though fortunately no lives were lost, nor was any person injured.

I also at one time examined a boiler of the ordinary horizontal cylindrical tubular type, which had become overheated along the side for a space of two or three square feet, just below the longitudinal seam, through an accumulation of scale, and had ruptured so quietly and gradually that the first intimation that the fireman had of anything being wrong was when he found hot water running out of the ash pit into the fire hole, yet when I examined this boiler there was a rupture 12 inches or 14 inches long through which I could easily put my hand in the centre.

This rupture had taken place so gradually and quietly at the start, that it had the same effect as the opening of a blow-off cock, and as the rest of the boiler was uniformly strong no other damage was done. I can understand the rupturing of a steam boiler through the weakening of a part of its surface by overheating, and the consequent discharging of its contents through the fracture (if large) with great violence, causing the destruction of life and property, but I have given the subject a good deal of thought, and am firmly convinced that the old and much resorted to story of "Red-hot boiler and feed-pump put to work," with a terrible explosion to finish up with, and the whole resulting

from the enormous and instantaneous generation of steam which the safety valve was incapable of handling, and the boiler unable to stand, is about played out. This old standby has certainly done duty, in being given as a cause for explosions more, probably, than all others combined, and even no later than a few weeks ago, when a steam boiler in a hotel in Denver exploded with terrific force, entirely demolishing the building and causing the death of twenty or more persons, the daily press came out with the startling announcement that the fireman had allowed the boiler to run short of water and become red hot, and as the papers said, that when he turned the cold water on the "red hot tubular machinery, the boiler instantly exploded, demolishing the entire building," and that a crowd were out hunting the fireman, with the avowed intention of lynching him. They omitted to state, however, how the fireman got out of the basement after turning the cold water on the red hot boiler, which caused the instantaneous destruction of boiler and building. The result in this case, as in many others, proved conclusively that there was plenty of water in the boiler, or if not, what was the source of the explosive energy which wrecked the entire building and caused the death of over twenty people.

I expect that some of the gentlemen present, who may still cling to the red-hot sheets and cold water theory as a cause for explosions, will not agree with me, but for their benefit I wish to make mention of some very practical tests which have been conducted by Mr. L. Fletcher, chief engineer of the Manchester Steam Users' Association in England, as early as 1867, when under his supervision, several steam-heating boilers were subjected to the test of being allowed to become red hot, when cold water was fed into them, with no more serious result than the springing of the joints and cracking of seams at the rivets from severe contraction.

A further test was conducted by the same gentleman, assisted by several engineers, in 1889 or 1890, during which test several large boilers (such as are used in mills and factories in England) under steam pressure were allowed to run short of water until the furnace crowns were red hot, when cold water was injected on the red-hot plates, without producing any explosion, or but even a very slight increase in pressure. As a matter of fact, however, the pressure in some cases decreased when the cold water was allowed to flow in on the red hot sheets. As these tests are of especial interest to us, and tend to dispel the generally accepted theory as to the cause of boiler explosions, I have embodied a summary of them in this paper.

Mr. Fletcher, in his report, says:—"Regarding the view to be erroneous, that an instantaneous and ungovernable amount of steam is generated by throwing cold water on the red-hot furnace crowns of a boiler, it was thought that it might be well, in the event of low water in a boiler, to turn on the feed, and thus reduce the pressure of steam, cool down the furnaces and arrest collapse."

While past experiments had proved that no injury would occur to the shell from the adoption of this course, the question was raised: What would be the effect on the furnace crowns?

This question was submitted to several engineers of experience, but though they were all fully aware that the specific heat of iron, compared with water, was so low that no large volume of steam would be generated, they all hesitated to give an opinion as to what might be the behavior of the fur-

nace crown sheets under such treatment, and could suggest no other method of solving the problem than that of instituting a practical test. It was not an easy matter to make all the arrangements necessary for such a test, in the face of the predictions of the dire calamity which it was said by many would surely follow such an experiment, and, as might be expected, it was some time before a suitable site could be secured where the test could be carried out. At last a piece of open ground on the premises of the late Joseph Clayton, of Preston, and adjoining his boiler shop, appeared the most suitable, and that gentleman was good enough to consent to the tests being made there.

A boiler of the Lancashire type (internally fired), with plain furnace tubes, lap jointed and single riveted, was selected, and the furnace flues were not strengthened by either flanged seams or rings of any kind, as it was thought that furnace flues of this description would give a fuller test than a boiler of the more modern type of construction, in which the furnace tubes would be welded at longitudinal points and strengthened circumferentially with flanged seams or other similar means. The dimensions of boiler provided for this test were as follows, viz.: Length, 27 feet 9 inches; diameter, 7 feet; diameter of furnace tubes, 3 feet. The thickness of shell plates was $\frac{7}{16}$ inches, the heads were $\frac{9}{16}$ inches, and the furnace tubes $\frac{7}{16}$ inches. The material was of iron throughout. The heads were both stayed and strengthened by four gusset stays above the furnace tubes, while there were two of same stays at front end and one at back end below the furnace tubes. The fire grate was 6 feet by 3 feet, thus giving 18 square feet of grate surface in each furnace.

The boiler was set in the usual way and connected to a chimney and fitted with all the usual appliances, as if it were being laid down to run a mill, with the single exception that the feed-water pipe, instead of discharging the feed water between the furnace tube and the shell, as is usual, was carried immediately over the furnace crowns in order that there might be no doubt as to the cold water striking the furnace crowns when red hot. Everything was done to make a severe test, and, if possible, produce an explosion. All possible precaution was taken to prevent injury to those conducting the test, and a very strong barricade of heavy timber was built, into which were placed all the steam gauges, water gauges, feed-pumps, blow off cock, etc., and all other appliances necessary for the test. The steam gauges were fitted with a tell-tale finger which would leave no room for doubt as to the highest point reached by the pressure of steam in the boiler. From this barricade, the test could be carried on in safety, as I have no doubt but that it was placed well out of the line of danger in the event of the collapsing of the furnace tube.

Provision was also made for measuring the quantity of water pumped on the furnace crowns when hot. The manner of making the tests was as follows: At 5.42 p.m. both safety valves being open, and the water on a level with the furnace crowns, and the steam pressure at three pounds, the blow-off was opened full bore. At 5.54 p.m. the blow-off cock was shut, the water having been brought down sixteen inches below the top of furnace crowns, and only about two inches above the level of fire grates.

At 5.56 p.m., or 14 minutes after the water had commenced to leave the furnace crowns, both safety valves were closed, and the cold water feed turned on

the red-hot crown sheets full bore, the fires at the time being about 7 inches thick, clear and bright, and the dampers wide open. As soon as the feed was turned on, the pressure in the boiler began to rise. In three-quarters of a minute it rose from 6 lbs. to 27 lbs., after which it gradually fell. In $1\frac{3}{4}$ minutes the pressure was again reduced to 6 lbs., and in 20 minutes the water in the boiler was brought up again to the level of the furnace crowns, at which time the steam pressure had fallen to 4 lbs. per sq. inch.

The boiler was so thoroughly heated at this test that two blisters of large area were developed on the left hand furnace crown. On examining the furnace crowns afterwards, the plates were found to have been severely sprung at each of the ring seams over the fire, and on gauging the tubes it was found that the greatest distortion had occurred at the third ring seam over the fire in the right hand furnace tube.

The furnaces were not rent by sudden contraction on the injection of the feed water on the red-hot plates, nor was an ungovernable amount of steam generated. The shell of boiler was not injured at all, neither was there sufficient steam generated to cause the safety valves to blow off. The safety valves were loaded to 50 lbs. per sq. in., and the highest pressure reached during this test was 27 lbs.

A number of tests were made each with positively red-hot furnace crowns, and in near every case, immediately as the cold water came in contact with the red-hot furnace crowns, no great accumulation of pressure took place, but on the contrary it at once began to fall.

Several tests were made under different conditions and pressures, and in one or more of the tests the water was allowed to leave the furnace crowns by gradual evaporation, just as it would in actual work where a fireman might neglect his water feed, but even in that case, when the cold feed water was pumped in on the red hot furnace crowns, no great increase of pressure resulted, neither was the boiler injured any further than the furnace tube joints and plates were sprung. To prove that the furnace crowns had been well overheated it is only necessary to relate that a strip of lead laid across the right hand furnace tube and inside the boiler at a distance of 14 feet from the front of the boiler and 7 feet back of the fire bridge, was melted through, leaving no doubt therefore that the furnace tubes had been red hot.

These experiments (which must have cost the Manchester Steam Users' Association considerable money) have been the means of proving that the most commonly accepted cause for boiler explosions are erroneous and misleading, and have done a good deal toward dispelling the mystery which has been thought to shroud the explosions of steam boilers.

It is a well-known fact to the majority of intelligent and practical engineers, that there is nothing mysterious about the explosion of steam boilers; on the contrary it is generally conceded that it is no hard matter to arrive at fairly accurate and practical conclusions regarding the explosion of a steam boiler, in most cases, by a careful examination of the remains of the exploded boiler and its fittings, assisted by the evidence of such intelligent witnesses as may give evidence before a coroner's jury, which usually enquires into the cause of such accidents, and at times renders some most amusing verdicts.

In conclusion, it can fairly be said that with the present modern construction of steam boilers, as

adopted and carried out in our boiler shops, coupled with the large factor of safety which is used in determining the allowable working pressure to be carried, and the better class of engineers in charge, who are certainly better informed on the laws that govern the proper operation and preservation of steam plants than they were 20 or 30 years ago, boiler explosions should be a thing of the past.

But as there are a large number of old worn-out boilers in the country, which, though they be, so to speak, patient and long suffering, yet one by one they let go in disgust, as it were, by the time one batch has all gone up there is another batch coming on slowly but surely, and these are augmented each year by steam users who are satisfied to employ any man who happens along, in the capacity of engineer, and who could not be persuaded that it would be to their advantage to have their boilers regularly inspected by a competent person, and have the little things attended to in their infancy before they become serious, as they certainly will if left to themselves.

And I presume it will be in order for us to look out for boiler explosions, as long as steam is used as a motive power, or, for that matter, used at all, and I am inclined to think that that will be for all time to come.

KEROSENE YACHTS.

BY J. H. KILLEY, HAMILTON.

Having given a great amount of attention for some time past to improvement in gas, kerosene and gasoline power motors and their uses, I still further trespass on your space for a short time to partially describe a beautiful new kerosene yacht or launch that has appeared on Hamilton Bay. This yacht and machinery were built at Grand Rapids, Michigan, by the Scintz Yacht and Motor Company; the hull is 16 feet by 4 feet, drawing 2 feet 6 inches of water; is built of cedar and elm, and finished throughout in the most elaborate manner, having polished brass guard rails fore and aft, the woodwork being smooth and varnished like cabinet work. Looking at her, you see no visible means of propulsion, there being a clear space fore and aft, except near the stern, where a small box-like motor stands level with rail-piece on top of the hull planks; this motor is an excellent piece of mechanical work, having improvements, in the writer's judgment, of the most important character, and such as he has not seen described about any other motor with which he has been made familiar. Nearly if not all the other motors have a power impulse at every other revolution only, while this one has an impulse every revolution, developing the same power with one cylinder as others do with two cylinders, and the consequent complication of parts. Not only is this so, but the machinery connected with it is of the very simplest character; the only parts in motion being the piston, connecting-rod and crank attached to the propeller shaft, and small pump worked from an eccentric, to pump bilge water or water from outside of boat to cool the power cylinder; there are no valves or valve motion in connection with the distribution of the vapor, etc., worked from the motor; the piston does the whole of this work in the most simple manner—one casting forms the cylinder and the close case in which the crank and connecting-rod works; these occupy no more room than is necessary for their motion. The vapor and air are introduced into this part, or rather drawn in by the upward motion of the piston on the down stroke; it is compressed to, perhaps, four

or five pounds above the atmospheric pressure; as the piston passes down, it uncovers a port above it and lets a portion of this mixed vapor above it into the upper part of the cylinder; this drives out the waste products of combustion left from the down or power stroke, but not the mixture introduced. The compression immediately closes the exhaust valve, while the compression of the vapor in the cylinder is still increased until the moment the crank turns the upper centre, when an electric spark from a simple primary battery explodes the vapor, and thus gives out its power. The motion of the eccentric working the pump brings about the electric contact, giving the spark at the proper moment of time. The oil tank is in the bow of the boat, not visible, the quantity required to run the boat per hour being about one pint, the speed being between 7 and 8 miles per hour. The motor handles with the greatest facility; can stop, start, go slow, go full speed. Momentarily, the boat can also be backed up with the greatest facility without stopping the motor. All the attention that is necessary in a clear course, is to steer the boat. The motor runs from 600 to 800 revolutions per minute, as near as could be ascertained. It also runs practically noiselessly and smoothly. There was no annoyance by odor from the oil. The exhaust passes out under the stern noiselessly also. The writer has seen, he believes, nearly every method of vessel propulsion, recollects the "Archimedes," the first commercial screw propeller, as also other forms of propulsion, but nothing previously seen interested him more than the performance of the machinery of this boat. It is the nearest to automatic action that has ever come before his notice. This boat is the property of Robert and John Moodie, Hamilton, and may be seen at Bastien's wharf. Boats on the same principle are built up to 60 feet long, with 10 or 12 feet beam, having cabins, etc., and furnished in the most luxurious manner. For long trips they carry oil for runs of 1,000 miles, and are safe in ordinary lake weather. It may not be long before much larger boats and motors are built, inasmuch as gas engines commenced with very small powers, and were considered only suitable for such for a number of years after their introduction. Now, however, they are made up to 500 h. p. and over. A gas engine, started lately on the River Wear, in the east of England, pumped out a large dry dock containing 10,500 gross tons of water in two hours, developing 250 h. p., at a cost of about one-third of the cost of steam power to do this work.

HORSELESS VEHICLE TEST.

There will be a competitive test of horseless vehicles between Milwaukee and Chicago, on 2nd of Nov. next, for the sum of \$5,000. Up to last week, sixty vehicles were entered for competition. When the offer was made some three months ago, it was feared that there would not be time to prepare the vehicles for the competition. So far, no European names have been registered as being in the competition, all being from the United States. There may, however, be German or French machines entered by United States firms. It is stated that the great majority of these inventors have already completed their vehicles, and are now making practical tests with the view of perfecting their machines.

Three months ago, the horseless carriage was practically unknown in the United States. France and Germany were in the field, and their constructors, encouraged by the success which attended the makers

of gas-driven carriages, went to work with a will and were in a fair way to monopolize the business. They had passed many patents through the American patent offices. Had American manufacturers longer remained idle they would soon have found that foreign mechanics had monopolized the whole business. In the last ninety days 150 patent applications have been made at Washington for inventions pertaining to motor vehicles. This activity will be felt in other directions besides that of motor vehicles, as a great deal of the attention of ingenious mechanics will be directed to the question of securing power for other purposes from light and inexpensive machines. The invention of flying machines has been kept back by the weight of the power machinery; this bids fair soon to be changed, as the new oil motors are the most powerful for their weight and fuel consumption yet brought into notice. The progress made in this particular in gas, oil, and gasoline engines almost amounts to a revolution. The Paris and Bourdeaux vehicles in the competition tests, as shown in illustrations, looked heavy and unwieldy, as does all vehicle work in Europe in contrast with the American. It is stated that the vehicles in use in Paris and Germany do not compare in lightness and strength with most of those prepared for the Chicago competition. The motors that gained the prizes in Paris are not entered for competition, nor machines built on their system.

There will, however, be a vehicle equipped with an aluminum bronze oil engine of 6 horse-power, weighing complete on the carriage 140 lbs. There are small motors weighing from 40 to 65 lbs., which it is claimed have indicated from 4 to 5 horse-power. If these statements are found to be correct or the best, there is no knowing what the effect will ultimately be, not only in vehicles, yachts, etc., but in all businesses where a cheap and powerful motor will be found of service.

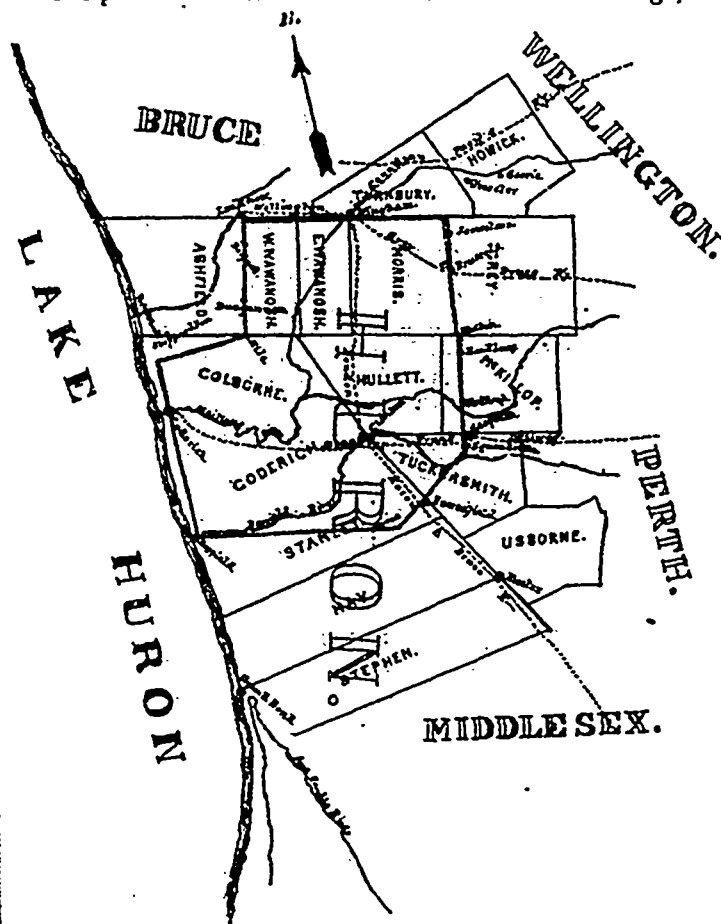
The result of this competition may lead to an entire change in the near future in locomotion on streets and common roads, as also on tramways; in fact, what the future may be cannot be guessed at. It is quite certain that this competition will lead to great improvements on the Old Country machines. It would, therefore, be advisable for Canadians who think of going into the business of building or importing these machines, to make it their business to go to Chicago and see the test and machines for themselves, or not having mechanical knowledge, to take a person that has along with them. One large engineering firm in Ontario has two experts already employed in looking into the machines by way of building them for all purposes, including horseless carriages.

PROPOSED COUNTY OF HURON BELT LINE.

A committee of public-spirited citizens of Goderich contemplate the formation of a company to build a belt line of electric railway through the county of Huron, with the town of Goderich as the chief centre of traffic.

The route suggested by the committee is as follows: Taking Goderich as a starting point, a radial line running through Nile, Dungannon, Lucknow, Wingham, Brussels, Seaforth, Egmondsville, Brucefield, Varna, and thence returning *via* Bayfield to Goderich, a total distance of from eighty-five to ninety miles. To make the matter clearer we give herewith a map of the county showing the route of the proposed line. The total population of the villages tributary to such a line would be about 20,000, and the population of the county

itself about 80,000. The line would give connection with the C.P.R. at Wingham, and with the G.T.R. at the points indicated on the map. By these connections considerable business in freight and express goods would be secured to outside points, with the carriage of the mails along the route of the belt itself. The regular local freight and passenger traffic to such places as Bayfield, Dungannon, Varna and other villages not now on any line of railway, would be an item in the traffic returns; while the light freight from Goderich to the tributary towns in fruit, eggs, butter and produce in such a fertile district would be large,



basing calculations on what has been done in the case of similar roads in other parts of Canada. The organ factory, the bicycle factory and other industries of Goderich will contribute their quota. The summer excursion traffic in a place like Goderich is an important item. On this subject one of the members of the committee says:—

"Country excursions to Goderich during the summer months would be very large and of daily occurrence, and from all points the Saturday passenger traffic to Goderich, to remain over to Monday, would be specially heavy. We are providing for accommodation to a large extent over former years for Americans and others frequenting our town as a summer resort, as we find the demand for such is increasing enormously. Speaking moderately, such a road as we contemplate would need to run trains both ways out of Goderich at least every hour during summer, and it would require two passenger coaches and one freight at least upon every train to carry the traffic.

"Steamers on Lake Huron would feed the road, especially in passenger traffic, and hundreds of visitors would take daily advantage of the "round trip," which would pass through the finest agricultural county in Ontario. Goderich being the county town, there would be a steady traffic to and from it the year over for business purposes, and the connections would easily be such

with all points that people could come, transact their business and return home same day, which can now only be done from two or three points. With regard to fruits, in a good season we can easily ship basket fruits by the car load, and now that the young orchard area coming into fruit is larger than in almost any other county, it is reasonable to calculate upon largely increased trade. Besides all this, the fact that Goderich is a solid town and one of the few growing rapidly, with an assurance of yearly increased population and accommodation for summer visitors, and fast becoming an important manufacturing point, prospects of increasing trade are assured."

Considering these many advantages and the fact that good water power can be had at five different points on the line, the proposed Goderich belt line should yield a good return to street railway investors. A. McD. Allan, of Goderich, is chairman of the committee having the enterprise in hand.

ELECTRICAL STATISTICS OF CANADA.

THE CANADIAN ENGINEER is indebted to George Johnson, the Statistician of the Dominion Government, for some interesting data regarding the progress and present status of the electric railways, telegraphs, etc., of Canada. The present value of the electric railways, telegraphs, etc., of the Dominion is given by Mr. Johnson as follows:—

Telegraphs and cables	\$7,000,000
Railways	13,000,000
Telephones	1,000,000
Electric Light Works	6,000,000
	\$27,000,000

The first cable laid in Canada was between P. E. I. and the main land, and was laid in 1852. The cable between Cape Breton and Newfoundland was laid in 1856. The telephones of Canada have 44,000 miles of wire, and 35,000 instruments. The Dominion Government own 238 miles of telegraph cable line, the total miles of their land lines being 2,500. There were in 1891, eighty electric light works in Canada, with a capital of \$4,113,771, employing 763 hands, and paying annual wages of \$297,700. The annual value of output was \$1,154,150. The previous census of 1881 showed only two hands as being employed in electric works.

There were at the end of 1894, 368 miles of electric railway in Canada, making 73 miles to each million of people. There were 658 motor cars, 341 trailers, 39 snow sweepers, and 891 motors. In 1894 the number of miles run was 15,587,226, and the passengers carried 55,348,612. The different electric railway companies had 2,614 employes and a paid-up capital of \$13,035,263. In 1893 there were only 256 miles of electric railway, the increase for the year being 112 miles. Every province now has electric railways except P.E.I. To show the progress and present position of electric railways in Canada as compared with other countries, the following table is given:

In all Europe.....	434 miles in operation and	1,236 cars.
" Germany	227 " " "	632 "
" France	60 " " "	152 "
" Austria-Hungary..	28 " " "	129 "
" England	42 " " "	125 "

The steam railways of Canada carried in 1894 14,500,000 passengers, or only about one-fourth the number of the electric railways. If the patronage of electric roads had been equally distributed each person in Canada would have been carried twelve times by electricity.

WITH regard to the article in last issue on "Concrete Superstructures," Mr. Warner wishes it understood that he is indebted for his information to the U. S. Engineer's official reports.

THE officers and members of the Canadian Electrical Association must be congratulated on the success of their convention last month at Ottawa. While the Ottawa convention was not equal to that of last year held in Montreal in point of numbers, it was quite equal in the character of the papers read, and certainly ahead of any previous convention in the business-like smoothness and completeness with which the programme was carried out. It savored of the silent, yet rapid, work of electrical men, and the local committee did themselves infinite credit. There was no hitch from beginning to end, and the visitors went away with the impression that it will be hard for any city to beat the Ottawa electrical men in handling a convention.

WE are indebted to Topley Bros., photographers, Ottawa, for one of the best samples we have seen of the photographic reproduction of a stroke of lightning. Mr. W. J. Topley placed a camera in position during the progress of a thunderstorm which passed over Ottawa about nine o'clock on the evening of Sept. 11th, and the result is reproduced herewith, from the photo, showing the Dominion Methodist Church in the foreground. The vivid flash here shown happened to be of a violet hue, and violet being the most actinic (that is, the most capable of impressing the sensitive plate) of all the colors of the spectrum, the effect was unusually good. Had the bolt shown a yellowish,



orange or reddish tint, as usually happens, the plate might have been only faintly, if at all, impressed. Of the hundreds who have called on Mr. Topley, to see and enquire about this photograph, nine out of ten are under the impression that he took it by watching for the favorable time and getting a "snap-shot" the moment the flash appears in the sky. Lightning is not photographed this way, however, for all the photographer has to do is to open the cap while the sky is black and the bolt of light photographs itself. The tint of the lightning will determine whether the photograph is likely to be good.

THE plant of the Canada Cutlery Co., of St. Henri, Que., has been purchased by the Ontario Silver Plate Co., of Humberstone, Ont.

THE Fredericton, N.B., Board of Trade were addressed, at a recent meeting, by F. Schilde, a German expert in the manufacture of pulp. Mr. Schilde pointed out the special advantages Fredericton possessed for the establishment of a pulp industry. A company will probably be formed.



C. R. POWELL, VICE-PRESIDENT CAN. ELECTRICAL ASSOCIATION.

C. BERKELEY POWELL was born at Port Dover, Ontario, August 19th, 1858; was educated at McGill University, and served his apprenticeship to the mechanic's trade in the shops of the Grand Trunk Railway at Point St. Charles. In 1882 he was appointed mechanical superintendent of the California Southern Railway, and two years later accepted a better position on the Old Colony Railway, with headquarters at Boston. In 1886 he resigned his position on the Old Colony Railway to go into partnership in the lumber firm of Perley & Pattee, who have sawmills at Ottawa. In 1891 he organized the Standard Electric Company of Ottawa, and was the general manager of this prosperous company until it amalgamated with the Ottawa Electric Company. At present Mr. Powell is a member of the firm of Perley & Pattee, is president of the Eclipse Office Furniture Company of Ottawa; is a director of the Ottawa Electric Company, and a director of the Upper Ottawa Improvement Company.

Personal

W. J. SUTTON, the well-known Winnipeg geologist, has been appointed assistant professor of mineralogy, petrography and geology at the Michigan school of mines, Houghton, Mich.

W. NICOL, Professor of Mineralogy in Queen's University, Kingston, has just returned from an exploration trip in the region north of Kingston. The professor has secured some excellent mineral specimens for the University.

PROF. GALBRAITH, principal of the school of Practical Science at Toronto, has been elected secretary of the Mechanical Science and Engineering section of the Springfield, Mass., Association for the Advancement of Science.

ST. JOHN, N.B., papers announce the sudden death in that city last month of William Campbell, from cholera morbus. The deceased was 60 years old and was a prominent manufacturer, having worked at the edge tool business for the past forty years. He served his time with W. Broad, and was for a number of years a member of the well known firm of Campbell & Fowler. He retired from this firm in 1879, and in 1880 he built and started for himself on Smythe street. In 1890 his sons took charge of the business and have been carrying it on up to the present under the name of Campbell Bros., with their father as superintendent. Mr. Campbell was well respected by all who knew him. Deceased leaves a wife, three sons and two daughters.

ALL members of the Canadian Association of Stationary Engineers will be very sorry to hear that Duncan Robertson, the newly re-elected treasurer of the association, was stricken with paralysis at the Windsor Hotel, Ottawa, where he now lies. He had remained at Ottawa to do some business, and on the morning of the 3rd was found in his room with one side paralyzed from head to foot, and unable to speak a word. A friend left him the previous evening in the best spirits. Mr. Robertson is much respected by all the engineers in and out of the association. Since the above was written he has been removed to his home, and we are glad to hear he is now recovering. He had only recently started in business for himself in Hamilton in engineers' specialties.

ENGINEERS are going over the route surveyed by the Canadian Pacific Railway for a branch line from Lachino bridge westward. This is regarded as a bluff to compel the Grand Trunk to sell its road between Valleyfield and Beauharnois.

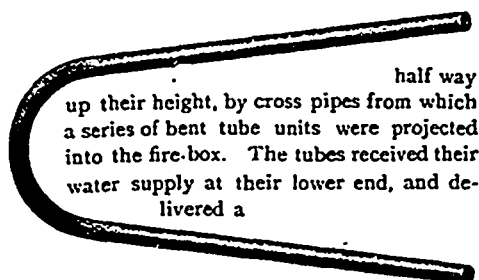
The Bent Tube

THE BENT TUBE, ITS ENDS CONNECTED WITH STEAM AND WATER SPACE

Continuation of "Facts about Boilers" from last issue.

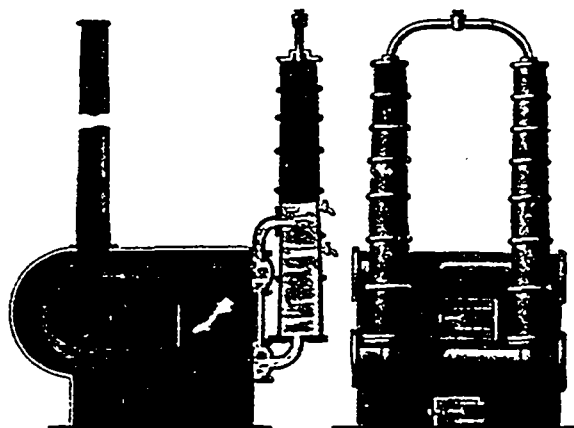
This embraces all forms short of circular or box coils, the particular form given it by various inventors being simply a matter of degree. All are inaccessible for cleaning.

GOLDSWORTHY GURNEY, an English inventor, was the originator of this unit, using it in the boiler of a steam road carriage in 1826. A pair of vertical steam and water reservoirs were connected at their bottom, and about

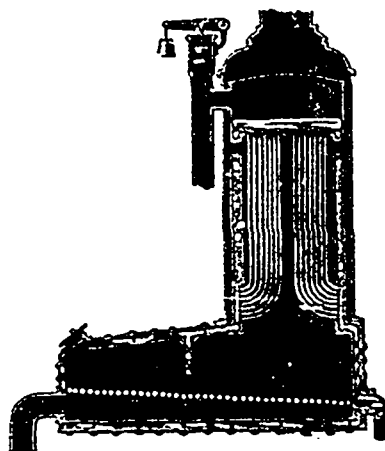


half way up their height, by cross pipes from which a series of bent tube units were projected into the fire-box. The tubes received their water supply at their lower end, and delivered a

mixed current of steam and water at about the water line, in a continuous round of circulation. The lower row of tubes served as grates.

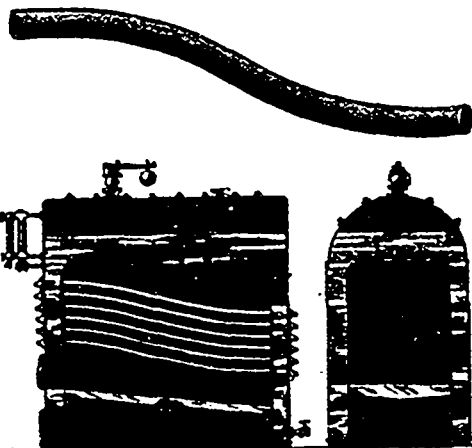


NO. 17. 1826.—LUKE HEBERT'S CYCLOPEDIA, LONDON, 1828.



NO. 18. 1832—LONDON "ENGINEER,"
AUG. 17TH, 1894.

STEPHEN WILCOX was the first person to use inclined tubes connecting water spaces, front and rear, with an overhead steam and water reservoir. The tubes were bent at a slightly reversed curve, extending over nearly the whole length of the tube, but were inaccessible for cleaning.



NO. 19. 1856.—"STEAM," 1889.

ROWAN introduced a boiler made up of a series of units placed side by side, each unit consisting of an upper and a lower horizontal drum connected by a series of bent-ended heating tubes, and at their ends outside the setting, with down-take pipes of large diameter.



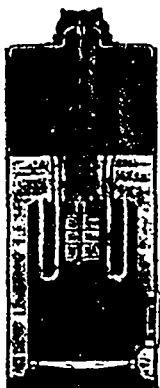
CHURCH built a boiler for a road carriage, with a locomotive fire box having a vertical cylindrical extension at one end, filled with bent tubes, connecting the sides of the fire-box with the crown sheet, and with side openings in the shape of fire-tubes extending through the shell at the top, for taking off the gases.



NO. 20. 1865—BRITISH PATENT, 1865.

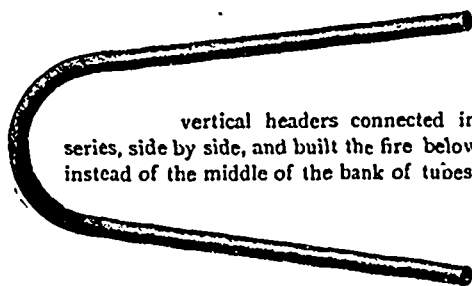


WILSON dropped a series of U-tubes from the crown sheet of a vertical fire-box boiler, one end of the U passing through and considerably above the line of the crown sheet.



NO. 21. 1865.—BRITISH PATENT, 1865.

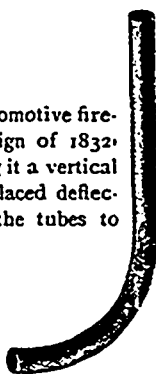
ALLEN used Gurney's U tubes, in



vertical headers connected in series, side by side, and built the fire below instead of the middle of the bank of tubes.

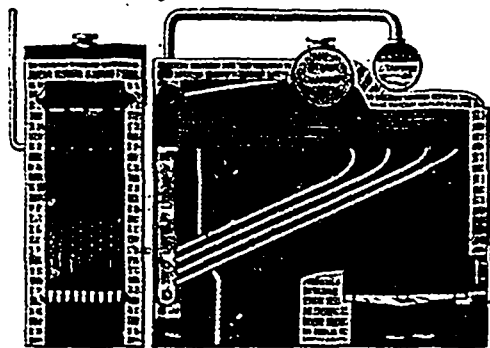


PAXMAN cut off the locomotive fire-box from Church's design of 1832, and put in grates, leaving it a vertical cylindrical boiler. He placed deflectors above the ends of the tubes to prevent geyser action.

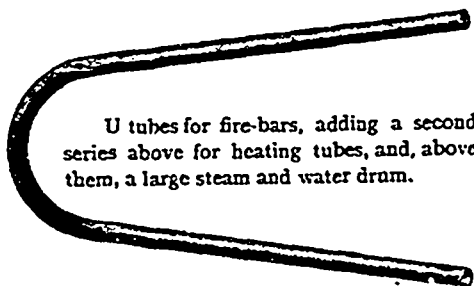


NO. 22. 1870.—BURGH ON BOILERS, p. 94.

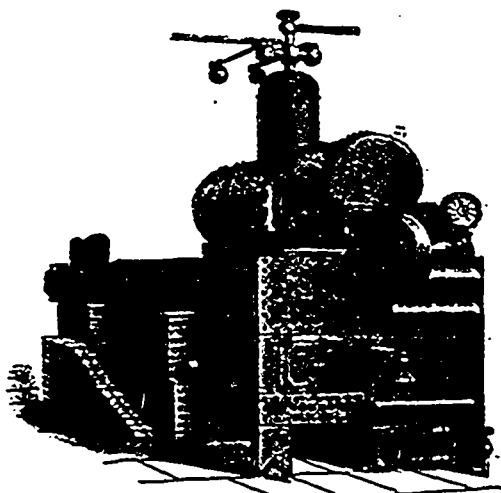
PHLEGER used Gurney's 1826



NO. 24. 1872.—BRITISH PATENT. 1872.

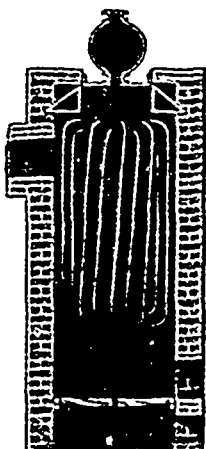


U tubes for fire-bars, adding a second series above for heating tubes, and, above them, a large steam and water drum.

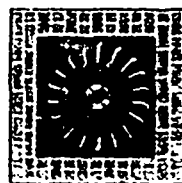


NO. 23. 1871.—AM. INST. EXHIBITION TESTS, 1871.

ROGERS & BLACK placed a series of U tubes on the outside of



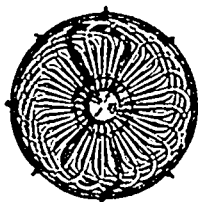
a vertical shell, surrounded it with a brick setting and placed grates beneath it.



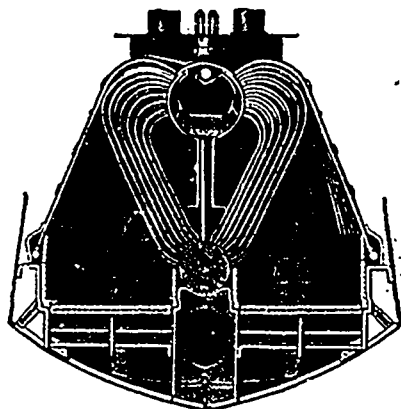
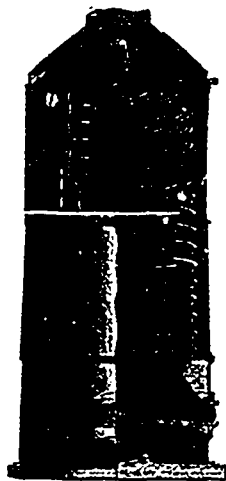
NO. 25. 1876.
JUDGES' REPORT CEN-
TENNIAL EXHIBITION.

T. MORRIN designed the "Climax" boiler, using a vertical cylinder punched full of holes (similar to Hazleton's 1881), expanding into them the ends of a series of crooked loops of pipe (an exaggeration of Rogers & Black's 1876) placed

at a slight inclination from the horizontal. The upper pipes were used to dry the steam made by the lower ones.



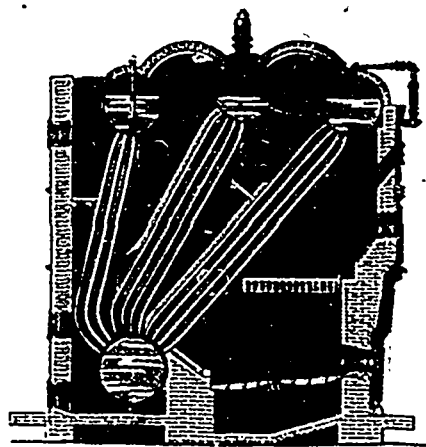
NO 26. 1883.—U. S. PATENT NO. 309,727.



NO. 28. 1894.—"DARING" TYPE.

His 1894, "Daring" type of boiler reverts more nearly to Rowan's original units.

ALLAN STIRLING, who used the closed end unit in 1887, adapted the unit designed by Rowan in 1865 to a new construction, leaving out the opportunity for definite circulation given by the balance pipes used by the previous inventor, which secured a definite water level, retaining his original idea of a wrought metal mud drum exposed to exterior corrosion.



NO. 29. 1888.—TRADE CIRCULAR.

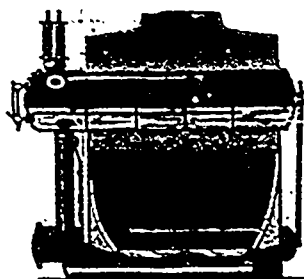
COWLES followed Thornycroft's 1887 design very closely, adding a mass of tubes at the rear of the grate.

His design, however, does not allow as large a proportion of grate surface to room occupied as Thornycroft's.

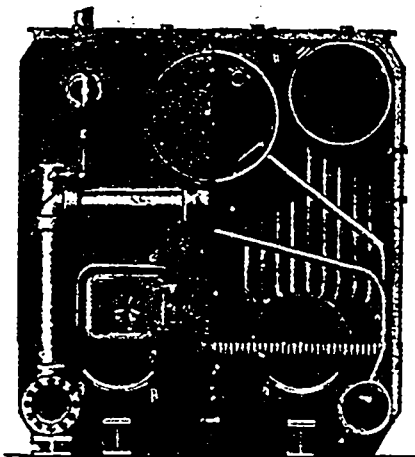


NO. 27. 1887.—"ENGINEERING," JULY 22, 1887.

THORNYCROFT modified Rowan's 1865 design by using two cylinders at the bottom instead of one, placed the grates between them and put several extra bends in the

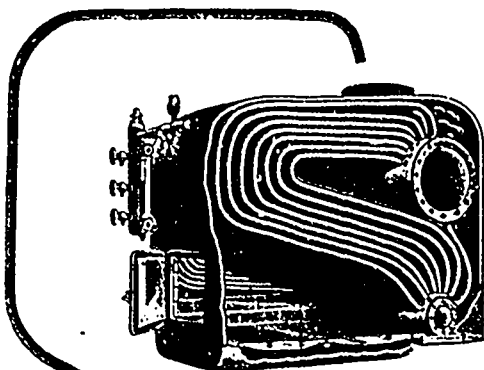


tubes to increase the amount of tube surface between the points of fastening, delivering the up-current above the water line. He retained the down-take tube outside the furnace.

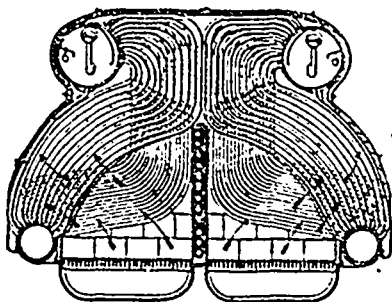


NO. 30. 1889.—U. S. PATENT NO. 396,545.

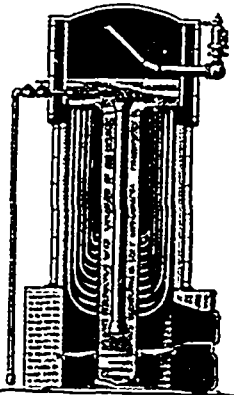
MOSHER used two drums, placed one below the other, bent the upper ends of Thornycroft's 1887 tubes in a reverse position, and on larger sizes was afflicted with Siamese twins.



NO. 31 1890 - SINGLE BOILER.



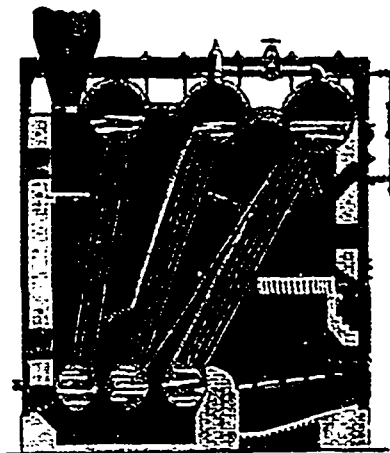
NO. 32. 1890. - DOUBLE BOILER, REPORT INTERNATIONAL ENG. CONGRESS, 1894.



NO. 33. 1893. - TRADE CIRCULAR.

HYDR either turned Paxman's 1870 design inside out, or cut off the top and put a head on Rogers' & Black's boiler of 1876. Mr. Smith also invented and christened it with his family name.

PIERPONT added two more cylinders to the bottom of Stirling's design (?), and altered the name. If one wrought metal mud drum exposed to exterior corrosion is good, three must be better.



NO. 34. 1893. - TRADE CIRCULAR.

(And with all these examples people are still trying to bend tubes into new forms, so as to "make a boiler.")

A FEW IDEAS AS TO CLEANING.

Strange to relate, the originator of this bent-pipe unit—Gurney, in 1826—recognized the necessity of removing the scale left by the evaporation of water, he not having attained to either of the theories of keeping it clean by the force of circulation or by evaporating salts of lime into steam. In one of his publications he recommended, "for a boiler made of iron tubes, the use of one part of muriatic acid to one hundred parts of water, to be left in the boiler a sufficient length of time to dissolve the incrustation, and for a boiler made of copper tubes, one pound of salt, half a pound of sulphuric acid, and four gallons of water. When dissolved, a small fire was to be started, and the boiler blown out under pressure."

Later exploiters in this line, more versed in "commercial engineering," have generally advocated the rapid-circulation theory as an efficient cleaning medium.

One notable maker recommended the introduction of a couple of buckets of sharp sand into the boiler, claiming that the circulation would carry it around and scour the scale from the tubes. Whether or not he furnished a particular quality of sand that would just wear out at the point when the scale was removed, and so save wear on the boiler, we are not posted.

Another maker strung a tube scraper on a chain, like an old-fashioned chain-pump. The man in the top drum let this down through one of the tubes (if the scale had not closed it up too much) to a man in the bottom drum, and these unfortunate specimens of humanity were supposed to sit like two half-closed jack knives, see-sawing the scraper back and forth, until either the scale, their muscles, or the seats of their breeches were worn out.

The early designs were creditable attempts to carry high pressures safely, with the means then available. The later ones are all based on crowding the greatest possible amount of heating surface into a given space, at the least prime cost for material and labor irrespective of either economy, durability, or good engineering.

In the majority of these designs it is impossible to clean a tube, to tell which tube leaked, or to replace a defective tube without removing several good ones.

Boilers of such units should come under the generic name of either the "macaroni" or "vermicelli" class. Look at the elements as they come to the scrap heap.



A SMELTER of fifty tons capacity is to be built at Midway, B.C., by a syndicate of American capitalists.

THE shipments of ore and bullion from West Kootenay, B.C., from Jan 1 to Sept, 1895, are estimated at 17,403½ tons, valued at \$1,519,846.

PROF. MILLER, of the Kingston Mining School, is in charge of the mining school prospecting party who have recently inspected and analyzed silver deposits in the township of Barrie, Ont. Other mining properties in that district have also been examined and very satisfactory results obtained.

SIR JOHN SCHULTZ, in an interview with a Winnipeg reporter, says that north of Edmonton there are oil deposits of larger area probably than the deposits in any other part of the world, and in the future, through the development of these fields, Edmonton will be one of the most important cities of Canada.

P. PICHETTE, of St. Pierre, Island of Orleans, Que., has discovered on his farm a rich seam of anthracite coal. The seam is only six or seven inches broad at the surface, but increases as it goes down perpendicularly. Mr. Globensky, Provincial Inspector of Minerals, has made an inspection of the discovery, and is sure that the vein is a valuable one.



From a Photo. by E. REARDON, Ottawa.

CANADIAN ASSOCIATION OF STATIONARY ENGINEERS.

CONVENTION OF 1895—OTTAWA CITY HALL.

1. John H. Thompson	8. F. G. Mitchell	15. Albert Shaver	22. Wm. Bell	29. Mayor Borthwick	36. A. M. Wickens
2. W. G. Blackgrove	9. F. G. Johnson	16. Harry Nuttall	23. James Huggett	30. A. E. Edkins	37. A. M. Schofield
3. W. G. Blackgrove	10. Geo. Hunt	17. Napoleon Daoust	24. Thos. Wensley	31. John Fox	38. W. F. Chapman
4. E. B. Biggar	11. S. M. Sager	18. J. R. Uttley	25. Wm. Lewis	32. John J. York	39. John Murphy
5. E. B. Biggar	12. J. F. Cody	19. Frank Robert	26. O. E. Granberg	33. S. Donnelly	40. James Tuck
6. Duncan Robertson	13. Thomas Ryan	20. B. A. York	27. Wm. Hill	34. Arthur Ames	41. E. Valliquet
7. James Devlin	14. F. W. Donaldson	21. E. J. Philip	28. Wm. Smyth	35. H. Hoppins	42. J. H. Walker

CANADIAN ASSOCIATION OF STATIONARY ENGINEERS.

THE SIXTH ANNUAL CONVENTION, WEDNESDAY, 25TH SEPT.

The sixth annual convention of the Canadian Association of Stationary Engineers was held in the city hall at Ottawa, on the 25th, 26th and 27th Sept., President John J. York in the chair.

There were present during the convention the following delegates and visiting members: John J. York, Montreal; Walter G. Blackgrove, Toronto; James Devlin, Kingston; Duncan Robertson, Hamilton; John H. Thompson, Ottawa; A. M. Wickens, Toronto; Geo. Hunt, Montreal; Thomas Ryan, Montreal; Frank Robert, Ottawa; J. F. Cody (delegate for Warton), London; A. E. Edkins, Toronto; O. E. Granberg, Montreal; F. G. Mitchell, London; F. B. Robb, Amherst, N.S.; Wm. McKay, Seaforth; Eph. Valliquet, Montreal; Wm. Lewis, Toronto; W. F. Chapman, Brockville; Wm. Bell, Toronto; Jas. Tuck, Guelph; John R. Uttley, (delegate of Berlin), Waterloo; Joseph H. Walker, Kincardine; A. M. Schofield, Carleton Place; H. Hoppins, Kingston; E. A. Clark, Ottawa; S. Donnelly, Kingston; F. G. Johnson, Ottawa; S. M. Sager, Dresden; Jas. Hugget, Toronto; John Fox, Toronto; Robt. C. Pettigrew, Hamilton; Arthur Ames, Brantford; F. W. Donaldson, Ottawa; John F. Peter, Ottawa; Frank Merrill, Ottawa; Wm. Smyth, Montreal; John Morencey, Ottawa; John Murphy, Montreal; Napoleon Daoust, Ottawa; Harry Nuttall, Montreal; Albert Shaver, Ottawa; B. A. York, Montreal; E. J. Philip, Toronto; Robert Mackie, Hamilton; W. J. Campbell, Ottawa; E. B. Biggar, CANADIAN ENGINEER

On behalf of Ottawa Branch No. 7, Bro. Thos. Wensley introduced His Worship Mayor Borthwick and Alderman Robert Stewart.

Mayor Borthwick then addressed the convention as follows.—
Mr. President and Delegates to the Executive Council of the Canadian Association of Stationary Engineers:

Only a very short time has elapsed since I had the pleasure of welcoming to Ottawa the representatives of the Canadian Electrical Association, and to-day it devolves upon me, on behalf of the citizens of Ottawa, to welcome you to our midst, and I assure you that it is with the highest degree of pleasure that I perform this

function, for it must be extremely gratifying to the people of Ottawa to have assembled here a body of gentlemen whose object is to promote the principles of safety, reliability, economy and intelligence. The furtherance of such principles as these, gentlemen, must truly lead to a better condition of things in the community and happiness to every one under the guidance of your association.

I see by the preamble of your constitution that it expressly stipulates that the association shall not be used for the encouragement of strikes or interference in any way between its members and their employers in regard to wages. This is a matter for congratulation. It proves that you have at heart the interests of your masters, as well as those of your own, and whatever good may be derived from your deliberations—and good there must be when men of experience meet and exchange ideas—will be shared in by employer and employé alike.

The conclusions which you will arrive at in regard to the various subjects that will come up for discussion at your convention, will, no doubt, bear with them a high degree of importance, coming as they do from men possessing a thorough practical knowledge of engineering. The furtherance of the principle of safety alone is something that is well deserving the attention of any body of men, and whatever you may accomplish in this direction will certainly bring credit and honor to your association. And as to the other principles you are called upon to uphold as delegates to this convention, there can be no higher, nor nobler, nor none better calculated to avert calamities that too frequently happen through the lack of reliability and intelligence.

Once more, I extend to you a hearty welcome and trust that you will carry away with you pleasant remembrances of the capital and its people.

In replying on behalf of the association, President York said. It is with deep feelings of pride and pleasure that I shall endeavor to thank Your Worship for the very hearty and kind reception you have just accorded this association, although it is really not more than we expected, for it goes without saying that the hospitality of the mayor and citizens of Ottawa is known throughout the land. It is but a day since the members of the Electrical Convention (I might call them our partners) went home loud in their praises of the treatment received at your hands, sir, and now we can carry home even more grateful remembrances.

We have not come to Ottawa to teach your engineers; we have come to be instructed, and I see no reason why we should not be. Your chief industry, the lumber trade, is entirely new to many of us from the large cities; and when we look around and see the many great mills in this vicinity, using as they do thousands of horse power, we are forced to the conclusion that the sawmill engineer is somebody after all, notwithstanding the views of some writers to the contrary. Some of us who have come from distant parts will find a certain pride in saying, "I have been to the capital of the Dominion," and when we read the conflicting stories in our daily papers of the doings in the Big House over yonder, it will be with perhaps keener interest that we shall try and solve some of the problems of the day for our own satisfaction, for we all know that this is the place where white is called black, and black is called white, according to the end in view. We are pleased to see the beautiful city—beautiful because of your trees, your parks, your streets, your many private gardens, your luxurious dwellings, your grand public buildings, etc.

We have come here, I must say, not for pleasure, but for the advancement of the science of steam engineering, and it may not be long ere you see us again, as we intend shortly to ask for an Act of incorporation, giving us the right to hold property and establish schools of engineering throughout the whole Dominion. Our only aim is mutual education, and I can assure you, sir, that the country, province or city possessing the most highly educated engineers will certainly be the most prosperous. I shall not further detain you, but will again thank you a thousand times on behalf of the C.A.S.E.

Bro Thomas Wensley, on behalf of Ottawa Branch No. 7, then presented the following address of welcome:

Mr. President and Brethren:

In the name of Ottawa No. 7, I extend to you a most cordial welcome on this the occasion of the first convention of the Executive of the Canadian Association of Stationary Engineers held in the capital city of Canada, and it gives us great pleasure to extend fraternal greetings to the representatives of the association who have come from all parts of the Dominion, and we trust that a spirit of wisdom will bless your deliberations.

It is our heartfelt wish that your labors will be carried on in harmony and good-fellowship, and that whatever subjects are brought forward for discussion will be discussed with calmness and with a view to the advancement of the principles of our association, which are purely educational in their aims, and to my mind there can be nothing grander or more noble than the giving of our time and talents for the improvement and elevation of our fellow-workmen. May the exchange of thought which takes place in the several meetings of this convention, both in theoretical and practical subjects, be of such a nature that all who may have the pleasure of attending the same will go away with the knowledge that they have obtained some useful information, which, if carried into practice in their daily rounds of duty, will be of lasting benefit to them.

There are many engineers who think that theory is valueless; that may be true to a certain extent, but the engineer who possesses a good theoretical knowledge of his profession, and combines it with a good practical knowledge of the same, has a great advantage over his fellow craftsman who is satisfied to do everything by the rule of thumb, and he is the man that in time will get to the topmost round of the ladder in his chosen calling.

In these days of high pressure steam, with our compound, triple and quadruple expansion engines, the engineer must be a well informed and progressive man, not merely a starter and stopper. he cannot exist on a reputation gained years ago, but must keep himself abreast of the age, by the acquiring of greater knowledge, although it may be acquired with difficulty, and principally through his own exertions. The object of the Canadian Association of Stationary Engineers, as I understand it, is to mutually assist each other in the acquirement of this knowledge by the interchange of thought on the different matters that come within their calling, and it is our wish that its efforts in this direction may be crowned with success which it certainly will be if its members are true to themselves and true to the association and its principles as laid down in our constitution.

Mr. President and brethren, I will again extend to you a hearty welcome and it is our earnest wish that your sojourn among us will be pleasant to you, and of great advantage to the Order, and that when the convention breaks up, and you depart to your several homes, you will carry with you pleasant memories of your visit to Ottawa, the capital city of this great Dominion.

President York, in reply, expressed his pleasure at receiving such a welcome. As far as he could see the association made no mistake when they decided to hold their convention in this city. It

had been the rule to hold the convention in a different city each year, and he was glad the choice fell now upon Ottawa. They wished to inspire enthusiasm in the Ottawa branch, for they had always looked upon Ottawa No. 7 as among the most loyal branches of the association. (Cheers.)

Ald. Stewart, being asked to speak a few words, said he was glad to have such a body of men visiting the city, and his only regret was that the visit was not at a time when more attention could have been paid, as the exhibition interfered with the council's opportunities of entertaining visitors. Ottawa was proud of its street railway, and he regretted that its directors were prevented by the crush of exhibition visitors from showing what it was like. Ottawa was making rapid progress—as rapid, perhaps, as any city in the Dominion. He hoped the deliberations of the convention would be profitable and their visit pleasant.

Ald. Campbell, of W. J. Campbell & Co., was then called upon and added his regret that exhibition work prevented him and other members of the council from showing the attention to the association which they would like. He felt much satisfaction in saying that he himself was a member of the association, and had great pleasure in meeting its members here. He would do all in his power to render their visit a pleasant one.

The mayor then invited the members of the association to visit the Ottawa fair in the afternoon, and said that cabs would be waiting at the city hall to convey all who wished to go. The mayor and aldermen then withdrew amidst the cheers of the members.



W. G. BLACKGROVE, PRESIDENT CANADIAN ASSOCIATION STATIONARY ENGINEERS.

The president appointed Bros. Granberg and Philip to be a committee on credentials, and the committee shortly after reported the names of the duly accredited delegates.

PRESIDENT'S ADDRESS.

President York then read his address as follows:—

It is with much gratification that we meet for the sixth time to discuss matters for the advancement of our beloved order. It is pleasant to see so many old friends among the representatives from the branches. When we see you sent back to the convention year after year, it goes to show that you have done your duty towards them with zeal and integrity. It is also a great advantage to me that you are here, for with your experienced assistance I shall feel better able to preside over the deliberations of this convention. To those of you who are here for the first time, I can assure you that you will go home firmly convinced that this association is doing more good for the engineers of Canada than most people are aware of.

Gentlemen, there will be placed before you a very large amount of work, I think more than last year. There is some talk of meeting only once in two years. There are several changes in the by-laws to be laid before you. There is the idea of granting a certificate of membership, so that all who see it may know that you belong to the best educational society in the country. There is the question of finances, which must be thoroughly gone into. You will bear in mind the fact that the increase in revenue is not in proportion to the increased cost of maintaining this council. I am proud to tell you there have been some new branches added to our numbers during the past year, and from what I hear, they are valuable additions to our order. Your district deputies' reports will give you more details than I can at present. On the other hand, we have lost one branch in Quebec. This has not been a matter of very serious regret to this council, although we would like them to remain. Full details of this will also be laid before you. There will be read before you several papers, the subjects of some of which are very old, but I assure you they have been treated in an entirely new manner, and will surely evoke considerable discussion, which will result in much profit to those who are fortunate enough to be present. There is another matter which will occupy your attention for a portion of the time, and one which I trust every member of

this convention will interest himself in, for if you do not, you will miss the leading feature of all up-to-date conventions. I allude to the programme laid out for your entertainment, for it is well known that the members of Ottawa No. 7, and especially the entertainment committee, have left nothing undone that they could possibly do, that you might have an enjoyable time. I can certainly see much gain in knowledge from the pleasure of visiting the great mills in and around this the capital of Canada.

Before closing, I wish to ask a few favors from you—do all you can to advance the business of this convention, avoiding useless discussion and personalities; uphold your obligation by using towards each other brotherly love and kindness. I also wish to thank you most sincerely for the very great honor you have done me in placing me, a young member of the order, in the highest office at your disposal. I can assure you, gentlemen, I have done what I could, although that is not very much, during the year just closed. However, your treatment of me should certainly encourage all members to push on and upward, and some day they will find themselves in this honorable position. I wish also to thank all the officers of this council for their ever ready and hearty co-operation at all times. In conclusion, I will say, remember all the work that lies before you, and I also hope that you will support this chair as loyally in the future as you have done in the past.

The secretary, Bro. Jas. Devlin, Kingston, then read the minutes of the last annual meeting, which, on motion of Bro. Hunt, seconded by Bro. Wickens, were confirmed.

SECRETARY'S REPORT.

The following report was submitted by the executive secretary:

Mr. Executive President, Fellow Officers and Brethren—

It affords me unusual and peculiar pleasure in presenting to you a review of the work done by me as your chief secretary during the year just closed, and before going into the matter further, I wish to thank the secretaries of the different branches for the untiring assistance given by them to me throughout the year, and I assure you it has always been a pleasure for me to discharge my duties, owing largely to the cheerful and pleasant manner in which they always co-operated with me. I wish also to thank Bro. York as well as the other members of the executive council, for their kindness to me throughout my term.

I am more than pleased with the work we are doing, though it must be remembered that we are yet in our infancy. The Canadian Association of Stationary Engineers is an institution for educational training, and training in our particular branch is as essential as a training in any other profession. It is our college—and the college commencement is the finest flower of Canadian civilization. Diplomas wave like flags and graduation orations ring out like cathedral bells. The university is the rock of national liberty. The educational institutions should be the pride of our nation. It is a great blessing to be young now. Better to be alive now than to have been a king and be to-day a mummy in the museum. The world has changed. Not long ago our ancestors were slaves. Not long ago it was a crime to own books. Printing presses were crushed by acts of kings. To read made men think. To think made men free. Not many years ago Bibles were more unlawful than murderers, and to read the Gospel was a crime for which men were tortured, and put to death. Then public schools were as dangerous as dynamite, and the thought of educating the masses was worthy only of burial. How changed now. The great thoughts of liberty, brotherhood and God are the granite cliffs against which the old tyranny and superstition has been beaten into spray. How the student's pen has taken the place of the Indian's arrow. The schoolmaster's ruler is beating away the old fetters, and is pointing to the vaster liberties in life. We live in an age of far-reaching opportunity. When Socrates in his flight would journey, he went afoot. The Saviour never went faster than on a donkey or camel back. But now when we travel we ride in a coach as luxurious as a palace, and rush across the continent with our team of lightning and thunder. The Rothschilds made their fortune by galloping to London after the battle of Waterloo and buying bonds before the news of Wellington's victory reached the city. No more fortunes will be made that way. Is there a battle, the whole story is flashed to the city before the smoke leaves the cannon's mouth—it is printed in the afternoon paper—read by the continent, and the paper is used to kindle the fire the same day. Did it ever strike you what an important part has been played by engineers in all these advancements? Do you ever stop to consider the importance of your calling, and the unbounded opportunities before you? I predict great things for the future, and not very distant either. We are just entering, you might say, on the electric age. I would not be surprised if, in a few years, the present electrical appliances for all purposes will be looked upon as huge curiosities, as the first steam

locomotive engine now is, etc. Late in the last century (1787) a certain philosopher, Dr. Elliott, was being tried for murder in England. Certain writings of his on the inhibition of the sun were put as evidence by his friends to prove his insanity. How changed now. The conceptions of a madman are in the present day generally adopted on this scientific question.

This is really a progressive age. We have a magnificent heritage of country, which also adds to our blessings. Look at our country—into it you might throw the inhabitants of Europe, and they could hardly find each other. Our country is great and good. In Quebec and Nova Scotia, where they do not raise beaux, they raise brains. And after all, brains are our great products. In Canada we have room for all. The Swede may live here, and dream of Gustavus Adolphus. The Quaker may go round as broad in his mind as he is in his hat. Here the negro may live on his own farm and twine the flowers of freedom about his portal, and think not of auction block or slave pen. And yet while in Canada we have room for all people, yet in Canada we have air enough only to stir one flag. But, brethren, don't think that all the questions are solved. The great social struggle is on, whilst it has not been so noticeable in Canada as in the United States, yet beneath our great industries are heard rumblings and voices which filled France before the revolution. We are to feel thankful, however, that the atmosphere has so considerably cleared, and the financial crisis which threatened us passed. Times are brighter in the United States. We should feel thankful for this, for what is prosperity to them is sure to redound to our advantage. I say we have large interests in the commercial welfare of our friends to the south.

The affairs of our cherished association during the past year have been without event. Perhaps there has been laxity somewhere. But all the branches have been active and appear to recognize the objects for which they are in existence. Enthusiasm will have to be instilled into the members. They must be made to understand that our future success depends upon their individual support.

During the year there were organized and put into working order two branches, namely, No. 15, situate at Brockville, and No. 16 at Carleton Place. Both are very active and display great interest in the general welfare of the association.

There are a great many matters affecting our interests which must come up for consideration sooner or later, amongst the most important, and one that occurs to me as being of vital significance to the members, is that of arranging some cheap but safe method of life insurance. I am not going to suggest any particular plan, but would strongly recommend the appointment of a committee to enquire into the matter and report at some future time. Besides the advantages to be derived from the insurance itself, it would have a tendency I think to build together more closely the members, to realize more that they are the members of an important brotherhood, to feel that they had a personal interest in each other's welfare.

I will not speak of the financial affairs of the association further than to state that all moneys that have come into my hands have been duly handed over to the treasurer, who will report as to our standing. I have made it a practice to remit to the treasurer twice during the year, namely, after each payment of the per capita tax had been collected in full, and at the same time furnished him with a complete statement of receipts and expenditures, with items and all other data in my power. I think it quite uncalled for to report oftener than twice a year, viz., at the times mentioned, to the treasurer, as it would add much to the work connected with the secretary's duties, at any rate until such times as we grow to such an extent as to be able to attach some remuneration to the secretary for his trouble.

I have had during the year some correspondence with Bro. Charles E. Robertson and others, with the view to opening a branch at Port Arthur, but as yet no active steps have been taken. I am sanguine that if efforts were put forth, a great number of new branches could be organized.

I cannot let pass this opportunity without calling to your attention the very loose manner in which the books pertaining to the branches have been kept, and I would strongly urge the appointment of a committee to investigate the matter and to arrange some form or system and report. I think also, that the system of the executive department could be much improved by having a regular set of books gotten up especially on a form arranged by the same committee. Under the present system, it is almost impossible for me to present to you a complete statement of the affairs of the whole association; but, gentlemen, my books are all here, and also every letter, report, or other thing connected with the office, and I earnestly invite your perusal of the same, and I shall do all in my power to give you what information I can.

I would like to dwell with you for a time on the subject of legislation making it compulsory for engineers to pass examinations, and the manner in which we pressed the matter before the Ontario Legislature last session, but knowing that the subject will be up in convention, I shall refrain from saying anything further on it at present.

It has occurred to me that the time is opportune to change the name of the association and drop the word "Stationary" for that of "Steam." It would still have our original initials, and I think the change would lead to increased membership.

I propose reading a communication from the International School of Mechanics, Scranton, by which it will be seen that very exceptional terms are offered to our members to take a course on any of the various subjects taught. I have no doubt the very liberal offer thus made will be taken advantage of.

I append herewith statistics showing the membership of our association, as compared with last year, and financial standing as far as could be ascertained by the reports sent in.

I thank you, gentlemen, for the patient hearing you have given me, and, in conclusion, wish to say that I appreciate the great honor you have done me in permitting me to act as your secretary during the year closed.

I have every confidence in the future of our beloved association, and sincerely trust that our next convention will bring forth more encouraging reports.

JAMES DEVLIN, Executive Secretary.

The detailed statistics compiled by the secretary were not included in the report, but it appeared that the Hamilton, Brockville and Montreal branches were the only ones which showed an increase during the year.

STANDING COMMITTEES.

The standing committees were then appointed as follows:—

Committee on By-Laws and Constitution—Bros. Robertson (chairman), Wickens, Donaldson, Hoppins, Schofield and Tuck.

Committee on Good of the Order—Bros. Ryan (chairman), Ames, Mackie, Huggett and Chapman.

Committee on Mileage—Bros. Fox (chairman), Sager, Walker, Uttley and Valiquet.

Auditing Committee—Bros. Mitchell (chairman), Johnson, Donnelly, Cody and Pettigrew.



E. J. PHILIP, SECRETARY CAN. ASSOCIATION STATIONARY ENGINEERS.

At the afternoon session Bro. A. E. Edkins, District Deputy for Ontario, presented his report, as follows:—

REPORT OF DISTRICT DEPUTY FOR ONTARIO.

In presenting my report of the work done by the different associations, and the organization of new associations in my district (during the past year), I regret exceedingly to have to inform you that the growth of the association in membership has been far from what it ought to be. No doubt, the general business depression which has been felt more or less all over the world, has done its share in retarding the progress of our association; especially I believe this to be true in regard to the formation of new associations.

Not for years has there been so many mills and factories closed down, or running on short time, and this has resulted in throwing many engineers out of work; consequently it has been very hard to get engineers interested enough in the work of the association to enable us to form many new branches but we are all pleased to see signs (even if very slight) of returning prosperity, and if (as we all hope) business is more prosperous next year, I have no doubt but that the progress of the association will be more marked.

I believe in presenting both sides of a question; even though one side be rather dark, it is best, rather than to paint it in glowing colors that are only calculated to deceive.

If the association in my district had not gained at all in mem-

bership during the past year, I can assure you that the good work done in the education of its membership in steam engineering would, of itself, be a sufficient reward to the many members who have spent their time and energy in carrying on the work.

During the year, two new associations have been organized, the first being at Carleton Place, where, on Nov. 6th last, I had the pleasure of organizing Carleton Place, No. 16, in which I was assisted by Bro. President Frank Robert, with several members of Ottawa, No. 7. This association has proved to be a good live organization, and has been a benefit to the engineers of Carleton Place.

The other organization took place in Brockville, where on Nov. 8th, and with the assistance of Executive President York, we had the pleasure of organizing Brockville Branch, No. 15, which has proved itself the banner association of the district.

The organization of Brockville association was mainly due to the energetic and persistent work of Bro. President Chapman, of Brockville; and to his untiring and unceasing work, coupled with the loyal support which the members have given him, can be attributed the success which No. 15 has achieved. This association has a room of their own, which is open three nights a week during the winter months, and one or two nights during summer, where can be found all the mechanical papers, writing materials, etc., for the use of its members. On a recent visit which I paid to No. 15 (it happened to be educational night), I saw members get up to the blackboard and figure out the heating surface of a boiler, the horsepower of engines and other problems, who, when they joined the association, barely knew the multiplication table. I am proud of the Brockville association, and of the work they are doing. The members have confidence in each other, and unlike too many engineers, they do not appear to dread letting their brother engineers know that they lack knowledge on any point; but rather seek to make known their deficiency, and obtain the desired information from those who may be fortunate enough to possess it.

During the year I have had correspondence with engineers in Woodstock, Galt, Pembrooke, St. Thomas, Bracebridge, and other places, with a view to establishing branches, but have been unable to consummate organization. I shall be pleased to hand over to my successor in office any letters, etc., which may assist him in pushing association work in the aforesaid towns.

I have also made a move toward reorganizing No. 3, of Stratford, and though nothing has come of it yet, still, from the tone of a letter which I have lately received from Bro. Hoy, of Stratford (in which he informs me that he is doing some missionary work), I am inclined to think that we shall soon have Progress No. 3 in working order again.

Toronto No. 1 is progressing very favorably, and as the pioneer association of the order, is still keeping the lead, both in membership and the excellency of her work in the educational line. The meetings are well attended, and I feel safe in assuring you that there is no organization in the city of Toronto, or elsewhere, that has such a good attendance, of course taking into consideration the total membership.

I had the pleasure, during the year, of visiting Hamilton No. 2, and found they were still doing excellent work, and having good meetings, full of interest to the members.

Brantford No. 4, though small in numbers, own their own furnished room, which is well fitted up, and very comfortable. They have a good average attendance, and are fully alive to the interests of the order.

London No. 5.—With regard to this branch, I am sorry to say that I cannot give as good a report as I would wish, as their membership has decreased a good deal, and meetings are not attended as they should be; and, in fact, the engineers of London do not seem to appreciate the benefits to be derived from a properly-conducted branch of the C.A.S.E.

Guelph No. 6.—This association has also fallen back during the last year, and for some time no meetings were held at all, but as they have now elected new officers, and have an energetic president, we confidently expect No. 6 to again come to the front as it did in the time of our late good Bro. Angell.

Ottawa No. 7.—With regard to Ottawa No. 7, I can only say that it is very much in evidence these days and speaks for itself.

Dresden No. 8.—I have been unable to get any news as to the progress of this association, though I have written to them several times, but up to time of making out my report have received no reply. [Poor meetings since warm weather set in, but expect to go ahead now for winter months.]

Berlin Branch No. 9.—I am sorry to say that this branch is not doing as good work as it should do. I have been in Berlin on several occasions during the year, and found that the association was not progressing as well as it should. Possibly a change of

officers, which has no doubt taken place at last election, will have the desired effect of stimulating the membership to greater interest and activity.

Kingston No. 10.—This association had a big boom when first organized and increased wonderfully in membership, in a manner known as mushroom growth, and the result has been a decline in membership of late. Many members joined this association who should never have been admitted, and the consequence is that these members gradually fell away until they now number about 50. I had the pleasure of attending this association at the last election of officers, when some of the members seemed inclined to be despondent owing to the small number of members who turned out, but I drew their attention to the fact that an association composed of but a dozen engineers who were devoted to their work and to the association was far preferable to a large association whose membership were indifferent. If Kingston No. 10 can keep an association of 20 to 25 good members, the interests of the C.A.S.E. in that town will be well looked after.

Kincardine No. 12.—This association is not progressing at all favorably, as I find there are only five or six members who attend the meetings, but Bro. A. Scott, the secretary, gives me some hope that things will be better in the future.

Warton No. 15.—This association also is not in a very good position at the present time, and some of the members are considering the advisability of winding up the association and joining one of the larger associations, but I have advised them that if but 8 or 10 good members can be kept together, it would be better for them to retain the charter and keep the association up.

Peterborough No. 14.—I am pleased to be able to report that this association is still doing well, though it has sustained a loss by reason of Bro. S. Potter, who was president, leaving the town. I am pleased to be able to report to this convention that the work of the association is becoming more widely known and appreciated by the manufacturers and steam users, and I have known of many instances during the past year where an engineer received an appointment because he was a member of the association.

I regret to say, Mr. President, that the secretaries of some of the associations do not appear to take sufficient interest in their work to keep the mechanical papers posted as to the matters of interest coming up before their association, and to give reports of meetings to the press. This is a serious mistake, as the more we make use of the press and mechanical papers, the more will our association become known and our principles appreciated. Subordinate associations should see to it that they elect wide-awake and energetic members to fill the office of secretary, who will not begrudge a few hours work each month for the good of the order.

There was some talk of forming a second association in the city of Toronto at one time, but so far no move has been made in that direction, though I am of the opinion that Toronto is sufficiently large and has the necessary materials to support two good associations if some members who are interested would take the matter up. The membership of the C.A.S.E. is as follows in the Province of Ontario:

Toronto,	No. 1..	115	Meetings well attended.
Hamilton,	" 2..	37	" " "
Stratford,	" 3..		Disbanded, but trying to re-organize.
Brantford,	" 4..	15	Meetings well attended.
London,	" 5..	10	Meetings poorly attended.
Guelph,	" 6..	14	Meetings getting better again.
Ottawa,	" 7..	35	Meetings well attended.
Dresden,	" 8..	16	Meetings fair.
Berlin,	" 9..	17	Not well attended.
Kingston,	" 10..	53	Not so well attended as ought to be.
Kincardine,	" 12..	7	Poor.
Warton,	" 13..	15	Poor.
Peterborough,	" 14..	12	Poor. (Many engineers left town).
Brockville,	" 15..	24	Meetings well attended.
Carleton Place,	" 16..	19	" " "

Total 389

During last year, the N.A.S.E. instituted fifteen new associations, and the C.A.S.E. added two new associations.

Taking into consideration the large territory and abundance of material which the former organization has to work on, we can, I think, congratulate ourselves on having added our two new associations during the year.

I trust that the coming year may bring us a largely increased membership, and that the good work of the association may be vigorously pushed by all the branch associations, so that the general public, and especially the manufacturers, may be made

aware of the fact that the C.A.S.E. is an organization worthy of their support.

On motion of Bro. Hoppins, seconded by Bro. Chapman, the report was adopted.

Bro. Schofield moved, seconded by Bro. Valiquet, that the thanks of the convention be tendered Bro. Edkins for his valuable report. Carried.

REPORT OF DISTRICT DEPUTY FOR QUEBEC.

Bro. O. E. Granberg, District Deputy for Quebec, then read his report as follows:

In submitting my report as Deputy for the Province of Quebec, I regret to say the order has not made the progress we could wish. No new associations have been formed during the past year. This is on account of there being so few places that contain a sufficient number of engineers to form an association. I had partly succeeded in forming a branch at Quebec city, but owing to St. Lawrence No. 2 withdrawing from our Order and forming a new association, Quebec fell into line with them.

Shortly after the last convention at Toronto, a dissension arose among the members of St. Lawrence No. 2, which was composed of French speaking members wholly. A large majority of them failed to see any benefits to be derived from the executive council, and consequently they decided to withdraw and form an association to their liking, under the name of the "Mutual Benefit Society of Mechanical Engineers of the Province of Quebec." This title may be somewhat misleading, as there may be but few mechanical engineers among them, although they may all be engineers of steam engines. Your president and myself did all we could to keep them with us, but to no purpose. The dissenting members numbered about 65; 8 members remained loyal to us, and kept the branch open all winter. In the spring they decided to give up for a time and join Montreal No. 1, under an agreement with the executive president, who, I have no doubt, will explain during this convention. I do not know all the causes that led to 65 members of St. Lawrence No. 2 leaving our order and forming a new order, but as the first vice-president of the new order is with us as a delegate from Montreal No. 1, he will be better able to explain the cause to you than I can.

As regards Montreal No. 1, I may say that although there has been but little increase in numbers, the quality has decidedly improved. I am pleased to note that as soon as a member loses interest or thinks he knows it all, he is soon dropped; and if a member is found guilty of drunkenness or bad conduct, he is promptly expelled. I also note that Montreal No. 1 is making good progress in securing a library, several hundred dollars having been secured for that purpose. All these are good signs in engineering; quality is better than quantity.

On motion of Bro. Edkins, seconded by Bro. Huggett, the report was received, and the thanks of the convention tendered Bro. Granberg.

President York said that as president of Montreal No. 1, he had a few words to add to Bro. Granberg's remarks concerning the defection in Montreal No. 2. When discontent began to show itself in that branch they made a great struggle to allay it, and to keep the branch under the jurisdiction of this council. The remnant who remained faithful and kept the branch open did so under extraordinary difficulties. They were under a heavy rent for their hall, and under the pressure of this and other financial obligations some of them came to him and asked to surrender their charter. He told them that this would be the ordinary course when an association was no longer able to meet its obligations to the council and others; but that under the circumstances he would advise them to retain their charter for the current half year, while holding their meetings in with No. 1 to save expense, and be practically members of No. 1 in the meanwhile, till their case could be brought before this convention. Strictly speaking, the charter should be called in, and when they were ready to form a new association among the French Canadian engineers—who composed No. 2 almost exclusively—there would be no trouble in getting another charter.

Bro. Edkins thought that if they were likely to be in a position to maintain a separate branch soon, it would be better to leave the charter with the few members who now comprise it, and thus save the expense of obtaining a new charter. After Montreal No. 1 had gone to so much trouble on their behalf, it would be a pity to have the charter now lapse.

Bro. Valiquet said he was a member of Montreal No. 2, whose troubles were before the council. He was glad to tell the convention that there was now a strong hope that the members who left Montreal No. 2 would return. The great majority of them had gone out of the association under a misapprehension, and now that they were beginning to understand the situation better, and to

see the disadvantages of disunion and division, they were disposed to retrace their steps. There was a certain loss of confidence in the leaders of the new organization among its French-Canadian members, and now that it is proposed to institute an insurance scheme for the C A S E (the lack of which was the pretext of the former rupture) there was every reason to look forward to a return of the old members of Montreal No. 2, and to a restoration of that good feeling and unity which should exist between the various branches and among all who are working for the intellectual improvement of the engineer (hear hear). He pleaded for the sympathy of the convention with the members who had separated themselves and were likely to return.

Bro. Walker said that, according to the constitution, if five members remained in any branch, they were entitled to maintain the charter.

After further discussion, in which the majority agreed with the views of Bro. Valiquet, it was decided, on his motion, to leave the charter in the hands of the members of Montreal No. 2 for another twelve months.

The auditors having reported that they had examined the accounts and found them correct, the treasurer's report was then presented as below:—

TREASURER'S REPORT

Your treasurer begs leave to submit the following report for the year ending June 30th, 1895

Receipts.

Sept. 4th, 1894—Balance	\$282 14
June 28th, 1895—Cash per secretary .. .	236 40
Sept. 24th, 1895 — " .. .	145 60

\$664 14

Expenditure.

Sept. 7th, 1894.—Mileage to delegates .. .	\$175 25
" " Expenses to Niagara .. .	38 70
" " Brother W. G. Blackgrove— postage .. .	0 75
" " Rent of hall .. .	20 00
" " Bro. A. E. Edkins—postage.. .	3 75
" " Past president's jewel.. .	25 00
June 28th, 1895.—Secretary's expenses .. .	57 46
Sept. 24th, 1895.—" .. .	8 11

Balance in hand .. .

335 12

\$664 14

Respectfully submitted,

DUNCAN ROBERTSON, Treasurer.

The report was adopted and the treasurer congratulated on the clearness of his report and the completeness with which the outstanding accounts had been got in, only \$4 or \$5 of dues being now in arrears.

The secretary here announced that \$13 had just been received from the Winnipeg branch for per capita tax. He commented on the unsatisfactory state of the correspondence with this branch. It seemed almost impossible to get an answer to a letter, no matter what its urgency. He hoped there would be an improvement during the coming year.

The convention then adjourned till afternoon.

After adjournment and lunch the members met the mayor, and Aldermen Campbell and Stewart, and others, at the city hall, and the party drove to the Exhibition, where they were shown over the grounds and greatly admired the numerous exhibits.

At the evening session Bro. Thos. Wensley read a paper on "Combustion," which will appear in a future number of THE CANADIAN ENGINEER.

In congratulating the author of the paper on his work, Bro. Wickens said it was a great pity such papers were not printed beforehand, so that the members could intelligently discuss them. It was impossible to grasp the points in a paper of such length as it was being read, but if it were printed and placed before each member, all could follow the reader and join in the discussion. There were some points in the paper, however, which were obvious to all. One of these points was this: if, as the author says, 12 lbs. of air should furnish oxygen for one pound of coal, but that in actual practice it takes about 24 lbs. of air to perform this service, why should this wide divergence between theory and practice exist? It should be the object of engineers to see how this defect can be overcome. Why should we go on with appliances that make it necessary to provide 24 lbs. of air to one pound of coal, when 12 lbs. can do the work? It must be remembered, in facing this problem, that this extra 12 lbs. of air is not merely a waste of air, which may in this case be counted valueless, but it is cooling off the air in the furnace

to that extent and so diminishing the effect of the other 12 lbs. Let us endeavor to learn why this is and what methods we can adopt to get the full heating value of every pound of coal. Bro. Wensley tells us there is no such thing as a horse-power when applied to a boiler. This is true, but it is necessary to have something to go by when indicating the capacity of a boiler for supplying power to the engine, though, as he says, that something is very indefinite. Bro. Wensley shows that while it is possible theoretically to obtain the evaporation of 15.1 lbs. of water with 1 lb. coal per hour, the highest value obtained in practice is 11.5 lbs. of water per lb. of coal, and the actual results generally obtained are 7 or 8 lbs. There is thus a wide difference between the actual and the possible, and engineers should do all in their power to get the best results from their furnaces. That was why we were all here. He agreed that thick fires were not necessarily the best means of getting good economy in furnaces, but everything depended upon the circumstances. Just here was where the value of an intelligent fireman came in for the operation of a large plant. A good fireman could save his wages and much more. As to the Hawley down-draft furnace alluded to in this paper, it had its enemies and its friends. One engineer he had met claimed that it saved 30 per cent. in fuel; but he saw one test made in which the results claimed were not obtained. It was wise, however, to investigate every new improvement thoroughly and without prejudice.

Bro. Edkins said he had enjoyed Bro. Wensley's valuable paper immensely, and moved that a hearty vote of thanks be tendered its writer. This was seconded by Bro. Huggett and carried amidst applause.

Capt. James Wright was then introduced to the convention by President York, who said that Capt. Wright was not only a consulting engineer of great ability and wide experience, but had invented a reducing motion for indicator use, which was considered the best yet put on the market.

Capt. Wright, who was received with cheers, said the subject of his paper was "The Safety Valve." In presenting it, he explained that it had been written for THE CANADIAN ENGINEER. Not having ready another paper he had in mind, and not being posted on editorial ethics, he called at the office of THE ENGINEER to ascertain if there would be any objection to using this paper at the convention first. The publishers at once, and freely, gave their consent, and he was now able to present some of the principles of the safety valve, which it would pay all engineers to master, but which were not generally known, and were obscurely treated in engineering works.

Capt. Wright then read his paper, which will shortly appear in full in this journal, and which was received with great favor by the convention.

Bro. Edkins said Capt. Wright's paper was one calculated to do engineers a great deal of good. It gave them easily understood principles to work upon, and this was what the majority of engineers lacked. It often occurred in his own experience, that while an engineer could give the pressure for a safety valve when he had his own familiar figures to deal with, the moment you give him a new case and varied the proportions, he was at sea. If we had more of such papers as Capt. Wright's, we should be better grounded in our work.

On motion of Bro. Huggett, seconded by Bro. Valiquet, a hearty vote of thanks was tendered to Capt. Wright for his paper.

The convention adjourned at 10.45 p.m.

THURSDAY, 26TH SEPT.

The first business of the day was the reception of reports of standing committees.

The report of the committee on "Good of the Order" made several recommendations, which, on motion of Bro. Pettigrew, seconded by Bro. Walker, it was decided to take up clause by clause.

The first clause recommended that the mileage allowance in future be 5 cents per mile one way, with a maintenance allowance of \$2 per day while in convention.

Bro. Mackie moved in amendment, seconded by Bro. Philip, that the allowance be 6 cents per mile one way, and \$3 per day while in convention.

After some discussion the amendment was defeated and the clause adopted.

The second recommendation of the committee was that the title of the association be changed by dropping the word "stationary."

Bro. Wickens moved, seconded by Bro. Robertson, that the recommendation be approved, but that the word "steam" be substituted for the word "stationary."

Bro. Edkins said that many locomotive and marine engineers

were disposed to join, but refrained under the impression that only stationary engineers were admitted.

Bro. Wickens pointed out that there were some difficulties in the way of such a change. In Ontario the association was incorporated, and he believed the Montreal branch was incorporated under the laws of that province. To change the title they would have to obtain a new act for that purpose, and this would involve considerable expense. At the same time he agreed that it would be better if the word "stationary" were off the charter. The word "steam" was more comprehensive, and would reach out far enough to include all branches of the engineering business. This could be done without changing the initials, which was a point to be considered.

Bro. Donnelly said that in Kingston an effort was made to form a marine engineers' association, but it fell through. Then the members of the C.A.S.E. there wanted the marine men to throw in their lot with this association, but they hesitated about doing so, for the reasons already mentioned. If the word "stationary" were dropped there would be a greater disposition among marine and locomotive engineers to join.

Bro. Huggett said he knew of more than one locomotive engineer who would join if the association were made to include them in its scope.

Bro. Mackie said that when the previous clause was being discussed they talked about the association being poor, yet now they proposed to go to the great expense of getting their charter altered, reprinting all the stationery, making new engravings for the letter heads, etc., to carry out this fad. A member of this association, as such, was not allowed by law to fill a position as marine engineer. He had been an advocate for going in with the National Association of Stationary Engineers of the United States, and he was surprised that Bro. Wickens, after being one of the delegation to the N.A.S.E. some years ago, should now take the stand he did.

Bro. Hunt said he found that while various associations with very broad and high sounding titles in the United States were springing up and dying out again, the N.A.S.E. was steadily increasing in membership, and therefore the title did not affect them adversely. Considering the great expense of such a change, he did not see the advantage.

Bro. Fox moved that the question be laid over for one year.

This was seconded by Bro. Philip, who said that lots of marine engineers in that city would join, but many did not care to pass the examination required under the Ontario Association. The difficulty with railway men was that they were so frequently away from the city. He thought this a subject important enough to be taken up in the various branches and discussed there before anything was decided on here.

Bro. Ryan hoped that the word "steam" would not be put in as a necessary part of the title. It should be broad enough to include all kinds of engineers. For instance, there were waterworks engineers, who had nothing whatever to do with steam, and yet we could not have a more desirable class of men in our ranks than they would be.

Bro. Devlin moved in amendment to the amendment, seconded by Bro. Walker, that both the words "steam" and "stationary" be dropped, and that the title stand "Canadian Association of Engineers."

Bro. Hunt held that such a question should be submitted to the different branches, and their opinions sought before any action was taken. This was a matter that had not been submitted to them; but upon which they had a right to pronounce, and if action were taken without consulting them there would be trouble.

Bro. Wickens explained with regard to Bro. Mackie's observations on the proposal to join the N.A.S.E., that the difficulty there was not the cost to the C.A.S.E. in making the proposed amalgamation, but the cost to the N.A.S.E., as that institution, by their rules, had to provide the seals, etc., for each branch joining them. In the light of the present discussion he would withdraw his motion.

Bro. Robertson said wise legislation often came from a prolonged consideration, and he would favor deferring action till the branch associations could express their opinion.

President York said it would be understood that each branch would talk the question over, and be prepared with their opinion before the next convention.

The third recommendation of the committee was that a certificate of membership be granted by the executive to each and every member of the C.A.S.E., in such a manner that a revenue may be derived from the same, the certificate to remain the property of the executive and be valid for one year only.

The adoption of this was moved by Bro. Hunt, seconded by Bro. Mackie, and an animated discussion followed.

Bro. Edkins moved, seconded by Bro. Pettigrew, that the question stand over for one year, on the ground that if the name of the association were to be changed, the certificates and the forms used in printing them would all have to be changed, and a needless expense gone to.

Bro. Ryan said he would guarantee that the revenue from these certificates would more than cover all expenses, as it was proposed to charge a fee of twenty-five cents for each certificate.

Bro. Mackie said that employers engaging an engineer often asked if the applicant was a member of the association, and sometimes required a letter from the association to that effect, so that such a certificate would be of practical service.

Bro. Philip said this question had been discussed time and time again in the branch associations and while he was not personally in favor of the scheme, the possibility of deriving a revenue from it put it in a different light.

President York said he claimed to be the father of this idea in his association. He, for one, was proud of his membership and would hang up such a certificate in his office or engine-room. So would almost every member, and it would be of great advantage to the holder to have such a document displayed in that way. He felt strongly that many new members would be obtained if this scheme were adopted. When the branch associations paid the per capita tax on the 1st July each year the fees for these certificates could be included by a remittance of 50 cents per head, instead of 25 cents as formerly. On receipt of the total amount the executive could forward the certificates all filled in, and if any member did not pay his full 50 cents he would forfeit his membership in the association.

Bro. Edkins believed that as a rule the associations in the West did not want the certificate.

Bro. Valiquet said this was not the case in the East. In various parts of Quebec the factory inspectors were advised to accept a certificate of membership as an evidence of competency, so that the possession of such a certificate would be of great advantage to any member.

Bro. Robertson said there was a principle involved in this question. How about the violation of this certificate within the year? Supposing a member misbehaved himself or otherwise forfeited his standing in the association, how were they going to deal with him? They could not, according to this method, take back his certificate till the year expired; and if he went to the United States, for instance, he could trade upon that certificate for years, as he would not be supposed to have an opportunity of getting it renewed. The objects of this association were the improvement and education of its members, and this move was going too far afield.

Bro. Wickens thought that as long as the system was voluntary it would be all right, but if it were made compulsory, it would be a detriment to the cause of the association.

After further discussion the yeas and nays were called for and the amendment was carried by 15 to 13.

Upon adjournment at noon the members and their lady friends went by invitation to visit the pulp mills of the E. B. Eddy Co. at Hull, where they were shown the various processes of paper and pulp making by the courteous superintendent, Geo. Millen. After this the party took the electric cars to Rockcliffe Park, where, under the primeval pines and hemlocks, with the broad Ottawa River in sight, a substantial luncheon was eaten with the keenest relish the members had felt since they left their homes. This excellent treat was provided by Ottawa No. 7, and Bro. Wensley presided with that sense of satisfaction which so well became his benevolent countenance. After luncheon a vote of thanks to Ottawa No. 7, proposed by Ald. Stewart, was carried amid cheers that woke the echoes of all Rockcliffe. With the singing of "They are jolly good fellows," the party returned to the city. In this connection it should be stated that the members of the convention had been presented each with a handsome Russia leather ticket holder by the Rogers & Morris Oil Co. of Ottawa, in each holder being half a dozen car tickets sent by the Ottawa Electric Railway Co.

On reassembling for the afternoon session Bro. Edkins moved, seconded by Bro. Pettigrew, that the clause in the report of the committee on good of the order relating to the issue of certificates be reconsidered. After some discussion this was carried by a vote of 14 to 5.

The following resolution, moved by Bro. Edkins, seconded by Bro. Huggett, was then carried by a majority of 15 to 2: "That the executive be authorized to issue certificates of membership to all members of subordinate associations desiring them, and to

charge therefor the sum of 50c. for each certificate so issued, said certificate to be good for one year and to remain the property of the executive council."

Another recommendation of the committee to the effect that the executive issue to subordinate associations an official travelling card signed by the president and secretary, was withdrawn, as it was found that this was already provided for.

Two or three other recommendations were referred to the committee on by-laws, and will be found embodied in the revised by-laws elsewhere.

Another recommendation was that the date of future annual conventions be fixed for the first week in September.

It was moved in amendment by Bro. Edkins, seconded by Bro. Mitchell, that hereafter this convention shall meet on the first Tuesday after the 15th August each year, and that the sessions shall last for three days only, unless it shall be found absolutely necessary to prolong or shorten the time of session one day, for the business of the convention only, which may be done only by motion. Carried.

In discussing the above question, it was the general opinion that the actual work of the convention could be done in two days, but it was thought advisable to provide for an extra day, to cover any arrangements which the local entertainment committees might make, especially when such arrangements might unavoidably break in upon portions of the time set apart for convention work.

The secretary read a letter from the city clerk, granting the use of the council chamber for the convention meetings, and it was resolved that the kind offer be suitably acknowledged with thanks.

On motion of Bro. Ryan, seconded by Bro. Mackie, a vote of thanks was passed to George Millen, superintendent of the Eddy pulp mills, for his courtesies to the members of this convention on the occasion of their visit this day.

On the subject of a benefit or insurance scheme being brought up, it was moved by Bro. Philip, seconded by Bro. Blackgrove, that the question of insurance be left to the executive council to deal with, and that they be empowered to write and obtain all requisite information from first-class insurance companies, the rates for which they will insure our members on the semi-accident plan, etc., and that said executive council be empowered to ask for tenders from some good Canadian company, and that they advertise in a newspaper in Montreal and Toronto, inviting tenders for the business, the council to meet inside of three months and accept the lowest and best tender, the expenses of said meeting to be paid either by the successful company or by the executive council. Carried by a vote of 16 to 4.

At the open meeting of the evening session, Bro. Edkins read a paper on "Boiler Explosions," which will be found in another part of this paper.

On the conclusion of the paper, which was received with applause, Bro. Granberg said he could substantiate a part of what Bro. Edkins had said in his paper. He mentioned a case in which he had been called to see a boiler, and the first indication the engineer had that anything was wrong was when the water was found pouring down into the furnace and the ash-pit. The plates of the boiler were found bulged all along, and on looking in he could see the rivets all the way through, while there was that glazy vitrified scale that showed the boiler to have been heated to a white heat, yet there was no explosion.

Bro. York referred to a case in his own experience. The boiler was one of a battery of five, and when it was disconnected, and the trouble was sought, it was found that the babbitt metal in the seats of the Chapman valves was completely melted out.

Bro. Granberg mentioned the case of the boiler explosion at Three Rivers (described and illustrated in THE CANADIAN ENGINEER, October, 1894), the peculiar feature of which was that both heads of the boiler were blown out in a solid piece, leaving the shell only a foot or two out of its place, and perfectly round and intact.

Bro. Wensley said that experiments made in England during this year showed that boiler explosions were not due to low water in the boilers.

Bro. Mitchell could say, as regards the steam gauge and safety valve part of Bro. Edkins' paper, that it was quite a common case to meet safety valves loaded to carry 20 to 25 pounds more pressure than required. A pressure of 60 pounds would be ample for the work to be done. Pressure should not be allowed to go above that, and in such a case the safety valve would be set to relieve the boiler at 80 or 85 pounds. Now, if all goes well, the safety valve is never allowed to exercise itself, and in time gets stuck fast to its seat with disastrous results. Further, it is quite a common thing to see a safety valve on a boiler with an escape pipe about

one-quarter the area of the valve itself, and securely fastened to the bonnet over the valve. As to steam gauges which are not regularly adjusted and oiled, it is common to see them with the link-joints corroded. In one case he met the other day, one of the pins in the joints was so badly corroded that only the friction of the toggle-joint operated the needle.

Bro. Edkins said that though the idea of low water and hot plates causing boiler explosions was a mistaken one, it at least operated for good in frightening men to take more care. In case there were still some who were skeptical on these points, he read from Prof. Thurston, showing that a red-hot plate could not of itself cause an explosion, because the injection of a large quantity of water on plates so thin would in almost every case immediately reduce the temperature of the plates below that point where the generation of steam would continue in sufficient volume to make an explosion.

On motion of Bro. Ryan, seconded by Bro. Chapman, the thanks of the convention were tendered to the author of the paper.

The president called the attention of the convention to the arrival of Bros. Nuttall, York, Bell and McKay, upon which cries arose for a speech from the "only and inimitable Harry Nuttall."

Bro. Nuttall said when he was asked to come he felt like the one in doubt as to whether to follow the ass or the mule. He was not sure whether he had been led by the ass or the mule, but here he was, and he was glad he had come. If he had not come, he should have died (laughter), and if he had died there would have been a great funeral in Montreal.

Bro. Bell was also called on and expressed the pleasure he took in being at the convention. He would do all in his power to further the interests of the order, which had already done a great deal of good to the engineers of Canada.

Bros. McKay and B. A. York also spoke, saying they had derived much benefit from being here, and thanking the members for the kind reception accorded them.

President York said it was most gratifying to see men coming so far at their own expense, without the inducement of a vote or a voice in the deliberations, but simply to be with the members and show their interest in the reunion.

The convention adjourned at 9 p.m., and a considerable number availed themselves of an invitation to visit the power-house of the Ottawa Electric Co.

FRIDAY, 27TH SEPTEMBER.

The Mileage Committee presented their report this morning, giving the names of those entitled to mileage allowance and the amounts, which made a total of over \$360.

On motion of Bro. Donnelly, seconded by Bro. Granberg, the report was adopted.

The question of having models of engines and machinery for the instruction of members was then taken up, and after some discussion it was decided, on motion of Bro. Donnelly, seconded by Bro. Granberg, to make known to manufacturers of engines, pumps, valves and other machinery that the association would be willing to receive models of their work, such models to be sent round from one branch to another during the year, so as to accomplish all the good possible to the members of every branch. It was understood that any branch asking for these models would pay the freight or expressage to their town. In this way one set of models would be sufficient for the various branches, and could be kept going around from branch to branch where needed.

On motion of Bro. Mackie, seconded by Bro. Fox, it was resolved to refund to Capt. Wright his expenses to this convention.

Bro. Cody said he would take pleasure in returning his mileage allowances into the treasury of the association, and on motion of Bro. Smyth, seconded by Bro. Valiquet, this offer was accepted with thanks.

President York called upon Bro. Lewis, president of Toronto No. 1, to address the convention.

Bro. Lewis said that, though not a delegate, his association wished him to be present, and sent him here, paying his expenses. He had not only enjoyed himself, but had been much profited by being here. The educational features of the association were a great benefit—in fact it was the essential element of the progress of the society. Take away its educational features and there would be nothing left worthy of holding men together. If they found a brother who needed light on any point—and there were none who could not be enlightened in some ways—it was their duty to give him the benefit of their knowledge. It was a kind of gift from which the giver derived advantage as well as the receiver.

The Committee on By-Laws and Constitution presented their report, recommending a number of changes in the constitution.

Their recommendations amounted to a general revision of the constitution.

Bro. Robertson explained the scope of the committee's work, and on his motion, seconded by Bro. Edkins, the report was adopted.

On motion of Bro. Edkins, a vote of thanks was passed to this committee for the thoroughness and care with which they had done their work.

The constitution, as now revised, will appear in next issue.

On motion of Bro. Wickens, seconded by Bro. Schofield, it was determined that 7 should form a quorum of the executive council and 5 in the case of subordinate associations.

Revised forms of installation were read by Bro. Robertson, and approved.

Bro. Hunt moved that past-presidents be allowed to speak and vote in future conventions.

It was thought by some members that this might give too preponderating an influence to some of the large branches, and the motion was lost.

It was then moved by Bro. Edkins, seconded by Bro. Sager, that past presidents be allowed to speak in convention but not to vote, and no allowance for travelling expenses be made to them. Carried.

President York being asked to retire, a subscription was made to defray the cost of a past-president's jewel, which had already been made. The collection made exceeded the required amount by \$5, and it was decided, on motion of Bro. Johnson, seconded by Bro. Devlin, to present the surplus to the caretaker of the building.

A vote of thanks, moved by Bro. Ryan, seconded by Bro. Philip, was passed to President York for his faithful services in the chair, and on his being called in, the mayor of Ottawa stepped forward and pinned the jewel on President York's breast, amid hearty cheers.

President York, who was visibly affected, could only thank the members for the magnificent gift. Though he did not deserve it, he assured them it would be fully appreciated and gratefully remembered.

Bros Bell, Lewis, Robert, Nuttall, and B. A. York were appointed scrutineers for the election of officers, which was then proceeded with, and resulted as below.

OFFICERS FOR 1895-'96.

President.....W. G. Blackgrove, Toronto.
Vice President.....James Devlin, Kingston.
Secretary.....E. J. Philip, Toronto.
Treasurer.....Duncan Robertson, Hamilton.
Conductor.....W. F. Chapman, Brockville.
Doorkeeper.....F. G. Johnson, Ottawa.

The election of the president, vice-president and treasurer was by acclamation.

The president elect then appointed Bros. J. F. Cody, F. W. Donaldson and James Huggett as District Deputies for Ontario, and Bros. Thomas Ryan and O. E. Granberg as District Deputies for Quebec, Bro. Donaldson to be the "Provincial" for Ontario and Bro. Granberg for Quebec.

On the ballot to decide the next place of meeting, the choice fell upon Kingston by a large majority.

The new officers having been duly installed, each incumbent delivered a short address and the business of the convention was declared at an end.

THE DINNER.

The convention was pleasantly brought to a close by a dinner given to the members by Ottawa No. 7, at the Windsor Hotel.

Bro. Thos. Wensley, as president of the Ottawa branch, occupied the chair, and on his right sat Mayor Borthwick and president elect Blackgrove, while on his left was past-president York. The dining hall was gaily decorated and an orchestra provided music for the guests. After a good dinner the toast list was taken up, and a very happy evening was spent.

The local committee of management was composed of the following members of the Ottawa branch: J. H. Thompson (chairman), Frank Robert (secretary), Thos. Wensley, F. G. Johnson, Frank Merrill, John Cowan, William Hill, Albert Gault, Napoleon Daoust, and Chas. Schofield, and this committee may congratulate themselves upon the fact that the Ottawa meeting proved to be, all things considered, the best convention yet held.

The *Quebec Telegram* says that John Inkster, of Winnipeg, recently purchased a gold mine at Rat Portage, paying therefor \$500,000. Then he set sail for England, and a week or two ago a cable was received that he had sold the mine for an even half million dollars.

ABOUT BOILER EXPLOSIONS.

Editor CANADIAN ENGINEER:

SIR,—While reading the daily papers the other day, I was wondering how many more red-hot boiler sheets would have to be despatched by the water method before a law would be passed compelling those in charge of steam boilers to pass some kind of an examination—one that would convince the remaining public that the man in the hole under the sidewalk at least knew what takes place when water comes in contact with red-hot boiler sheets. True, we would have accidents if all were examined, yet there is no disputing the fact that nine-tenths of the boiler explosions can be traced to ignorance, and to a class of so-called engineers who have little or no knowledge of the profession which the word implies.

There is, however, one peculiarity in reference to these fellows. They don't seem to go with the red-hot sheet, but either skip to avoid being lynched, after escaping, or from natural instinct seem to know that it is best to take a walk about a minute before she goes off. It is a pity that so many lives should be lost before such a law will be considered a necessity.

J. G. BAIN.

Bracebridge, Aug. 24th, 1895.

HORSELESS CARRIAGES.

Editor CANADIAN ENGINEER.

SIR,—Doubtless your readers will be much interested in the article on above subject in your September number. I have just returned from a visit to Paris, and being much interested in motors for launches and carriages, I made it a point to give several days to these, during which time I rode on three carriages. Two of these were made by the winners of the 1st, 2nd and 3rd prizes at the recent race from Paris to Bordeaux. In one of the carriages I travelled at the rate of 16 or 17 miles per hour, and there were four full grown persons in the carriage. The driver has perfect control over the carriage, in fact very much more than with any horse. The horses took no notice of us as we passed or met them on the road. All the carriages I saw were actuated by petroleum essence or some spirit, and this in my opinion is the only drawback on account of the cost and the volatile nature of the spirit. There is a firm in this town, the Britannia Co., who have commenced the manufacture of an engine to run with ordinary petroleum oil. This will be the lightest and occupy the least room of any yet introduced, and will be equally well adapted for carriages or for boats. They also make them in larger sizes for heavy wagons and cargo barges.

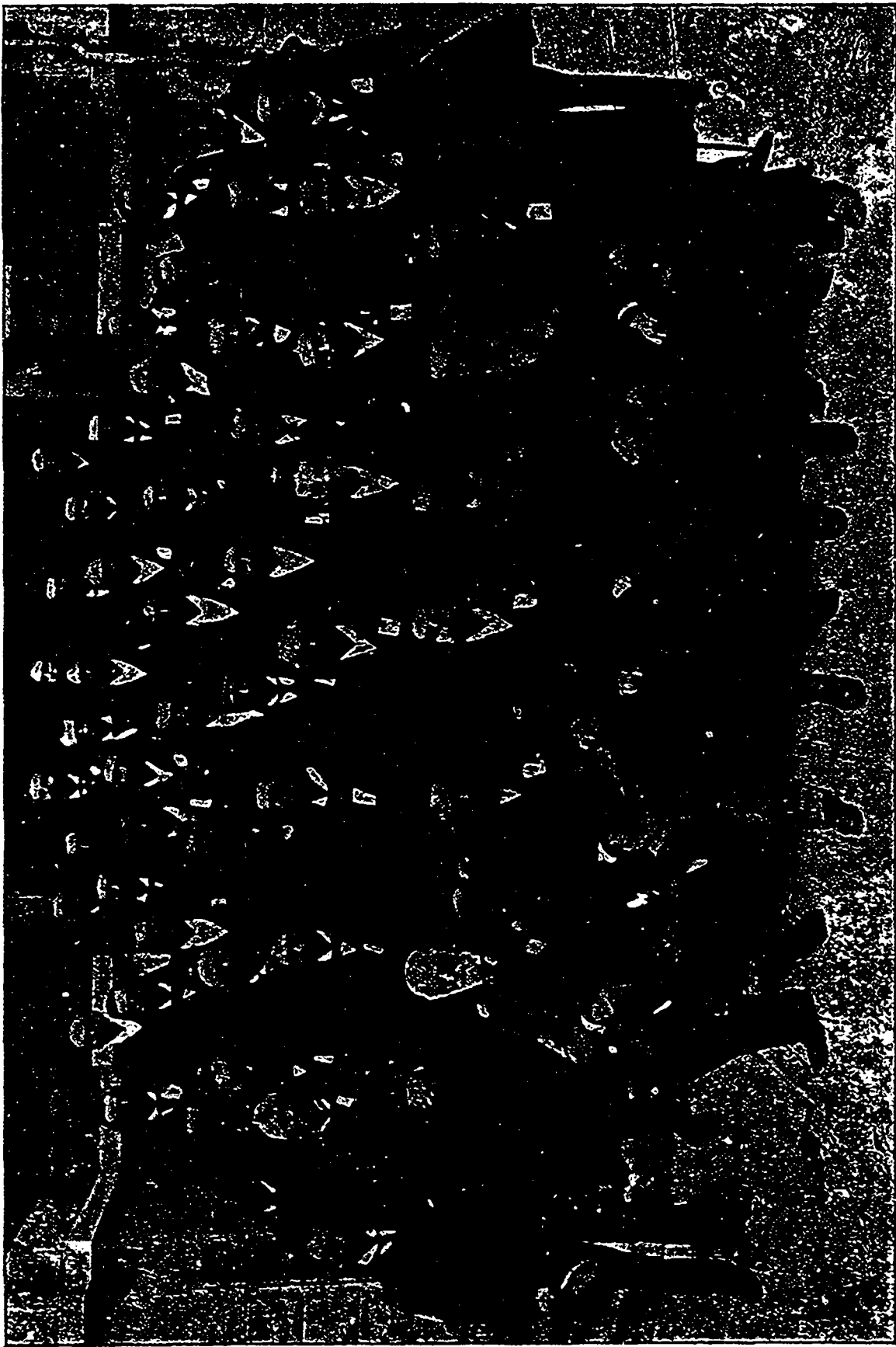
Yours truly,

THOS. M. BEAR.

Wellesley House, Colchester, Eng., Sept. 27th, 1895.

C. N. ARMSTRONG is still engaged on matters concerning the Atlantic and Lake Superior Railway, from Sault Ste. Marie to Paspebiac. He says that owing to the false rumors set in circulation by enemies of the project the work was delayed, but that he has succeeded in forming an English and American syndicate to undertake the work.

A LETTER received from Chief Engineer Wheaton, by C. Nunn, Toronto, reports progress on the Coast Railway, of Nova Scotia, as follows:—"We have about twenty-five miles graded, and the clearing of the right of way completed to the Shelburne county line, thirty-five miles. The whole is located to Lockport, with the exception of a piece of about ten miles near Shelburne over difficult ground, on which we shall make an alternative survey. We have over 150 men and teams at work grading. Townsend & Co., of New Glasgow, who have the contract for masonry on the first thirty miles, have completed all the first ten miles except a small portion of the Salmon and Tusket river bridges, which is rapidly nearing completion. Over 7,000 ties have been delivered here for us, and have been distributed on the right of way ready for track-laying. Two schooners are now loading at Moncton with more ties for us, and the sleeper contracts will all be filled this fall. The steamer Loughrigg Holme cleared from Maryport, Great Britain, on Saturday, 14th September, with our first order of rails. When she arrives, track-laying will be immediately commenced. Townsend & Co. have the contract for track-laying and ballasting. We are now receiving tenders for fencing. These tenders will apply to all stations, except Yarmouth station, which will not be commenced till next spring, as we have made arrangements with the Dominion Atlantic Railway to use their terminals at Yarmouth till next June."



From a Photo. by PITTAWAY & Co. S

CANADIAN ELECTRICAL ASSOCIATION--CONVENTION AT OTTAWA, 1895.

CANADIAN ELECTRICAL ASSOCIATION.

FIFTH ANNUAL CONVENTION.

The fifth annual convention of this association was held at Ottawa on the 17th, 18th and 19th September, the president, K. J. Dunstan, in the chair. The registered attendance was as follows:

J. J. Wright, A. M. Wickens, F. C. Armstrong, Jas. A. Baylis, Wm. B. Jackson, T. F. Dryden, J. F. H. Wyse, John C. Gardner, F. C. Maw, A. B. Smith, K. J. Dunstan, J. A. Kammerer, C. H. Mortimer, H. P. Dwight, Chas. P. Dwight, Joseph Wright, E. B. Biggar, Toronto; Wm. T. Bonner, L. B. McFarlane, D. A. Starr, H. O. Edwards, James A. Burnett, D. W. McLaren, P. W. Atkinson, John Carroll, Montreal, John Murphy, J. W. Thompson, H. G. Roche, A. A. Dion, Mayor Borthwick, O. Higman, G. F. MacDonald, C. Routh, H. Bott, D. C. Dewar, J. W. Taylor, Warren Y. Soper, C. Berkeley Powell, D. R. Street, Ottawa, F. W. Harrington, John H. Dale, W. R. McLaughlin, New York, U.S.A.; H. O. Fisk, J. Knapman, Peterboro; W. A. Mackay, C. H. Wright, A. A. Wright, Renfrew; George Black, Hamilton; J. A. McCrossan, Rat Portage; V. B. Coleman, Port Hope; J. E. Brown, Aylmer; W. J. Gilmour, Brockville; E. Carl Breithaupt, Berlin; R. G. Moles, Arnprior, F. H. Badger, jr., Quebec; A. F. Simpson, Sherbrooke

MAYOR'S ADDRESS.

The proceedings were opened by Mayor Borthwick, who welcomed the association with the following address.

It affords me a great deal of pleasure in having the opportunity of welcoming a body of gentlemen interested in such an important industry to the City of Ottawa.

We claim to be living in a progressive age, and when we contemplate the rapid strides that have been made in every department that affects the human race, and I think there are few who will dispute our claim, and while you, gentlemen, who are occupied in the study and development of electricity are prepared to give all credit and honor to those who are occupied in the development of other branches of knowledge, yet I feel that you will be justified in claiming that you have outstripped all the others in the marvellous achievements that you have made in your own branch during the last few years.

It is in the memory of most of us when the use of electricity was practically unknown, and when first discoveries began to be made, the world wondered, but the new discoveries have been so rapid and so great that we have almost ceased to wonder, and content ourselves by asking in a placid manner, "what next?"

If we had been told a few years ago that we would have the lightning chained down so that we would use it as the motive power to transport us from one part of the city to another, or from one part of the country to another, or if we had been told that we would be able to sit in our own homes and hear the voices of absent ones in distant cities, or many of the other things that can be accomplished by the use of electricity, we might have expressed ourselves by saying, "Eye hath not seen, neither hath it entered into the heart of man the marvellous things that are in store for those who live twenty years hence."

Now, there is a feeling here that some of the citizens of Ottawa have contributed something in the way of assisting in the development of this great science, and we claim as a city to be keeping fairly abreast of the times. Whether such is the case or not, it is for you to judge, but if we are not up to the mark in electrical appliances, I know that you will find the gentlemen who are associated in this line large-hearted and generous, and our citizens know how to entertain strangers, and if we cannot teach you any thing in electricity, we are progressive enough to learn, and I sincerely hope that you will be so electrified by your visit that you will all be pleased to pay us another at an early date. I therefore on behalf of the citizens extend to you a very cordial welcome. (Applause.)

The Mayor then invited the association to hold its business sessions in the city hall.

The President thanked the Mayor for the kind reception given them, and the members were then shown through the Parliament Buildings.

The business of the convention was opened in the afternoon by

THE PRESIDENT'S ADDRESS

"It has been wisely said," remarked President Dunstan in opening his address, "that the utilization of energy is a fair test of the progress and civilization of a country, and realizing as we must to what great extent the future industrial progress is bound up with and dependent upon the growth and development of electricity in all its various branches, we, as an association, have the right to feel that in endeavoring to foster and encourage this indus-

try we are working not only in our own interests, but also for the general advancement of the country."

Notable electrical works and improvements during the year were also referred to by President Dunstan. One of the most important electric railways opened for traffic during the past year, said he, was that known as the Hamilton, Grimsby and Beamsville railway, running from the city of Hamilton to Grimsby, a distance of about 18 miles. It was not only the longest road of the kind in Canada, but was exceptional on account of the large amount of freight which it handled. He was informed that during June, July and August it carried 97,164 passengers and 559 tons of freight, in addition to 2,917 cans of milk and a large quantity of fruit. A large fruit market had been established in Hamilton in connection with this railway. The advantages such a road afforded to farmers and fruit growers, and the value to Hamilton in being made the headquarters of the great fruit trade of a large section of the Niagara peninsula, were apparent.

As a result they now found similar electric roads projected or under construction in all parts of the country. These railways, he believed, would go far to break down that isolation which made country life so distasteful to the younger members of the community, and may have a far-reaching effect upon the great problem of how to attach the people to the soil.

In the telephone field the event of most moment had been the opening of the new main exchange belonging to the Bell Telephone Company in Toronto. The switch board was of the most modern type, complete in every detail, and known technically as a branch terminal board. It had all the novel features, including self-restoring, incandescent pilot lamps, automatic disconnect signals, etc. This switch was not only a sample of the most modern type of the multiple board, but is the largest installation of the kind in the world.

After referring to the defeat of the by-law for municipal control of city lighting in Toronto, President Dunstan continued.—

Last year the Welsbach burner formed a slight unsettling element in the lighting business, there being those who felt that the greater efficiency of the burner would, by cutting down the cost of gas, injuriously affect electric lighting interests. These fears have proved to a very great extent groundless, but we find this year a new disturbing feature, in the form of acetylene gas, but to what extent it will become a live issue yet remains to be seen, as it is too early to predict the commercial outcome of Mr. Willson's cheapened method of production. The gas has defects which may prevent it ever coming into general use, but on the other hand it is possible it may become an important factor. Whatever the outcome, electric light men must face the fact that prices, from competition or other causes, have a downward tendency and this tendency must be met with improved methods of production."

"They must prepare," he continued, "for every eventuality of their business and their annual conventions, where there was interchange of thought and experience, tended towards the systematizing of methods and towards placing the conduct of business upon a higher, more scientific and more economical plane."

Indications pointed strongly to their being on the verge of a "horseless age," an age when tricycles, carriages and a large proportion of vehicles in general will be self propelled. Tests so far had resulted greatly in favor of petroleum, but electricity had so many advantages due to freedom from dirt, smell and risk of explosion, that the discovery of a lighter and more economical form of storage battery would enable electricity to control a trade the magnitude of which was difficult to even estimate. The person who made this discovery would reap the greatest reward of the age.

The minutes of the last meeting being confirmed, the secretary's report was read, being in substance as follows.—

THE SECRETARY-TREASURER'S REPORT.

At the date of last report, Sept. 19th, 1894, there were enrolled on the books 99 active and 38 associate members. This number has increased to 169 active members and 41 associates, a total gain of 71. With this membership, and at the present reduced fees, the association should have a yearly income of \$589, while the annual expenses amount to only about \$400. Unfortunately, the arrears of fees outstanding on the 31st of May last amounted to \$321. The secretary-treasurer has more than once issued accounts to members in arrears, accompanied by special requests for payment, and the executive committee still have under consideration the question of what action should be taken as regards members in arrears for fees who have failed to respond.

Following is a statement of receipts and disbursements for the year ending 31st May, 1895, showing also the condition of the finances of the association brought up to the present date

Receipts.

Cash on hand June 1st, 1894 ..	\$ 23 30
Cash in bank " " " ..	250 18
14 active members' fees at old rate, \$5 ..	70 00
71 active members' fees at new rate, \$3 ..	213 00
14 associate members' fees at \$2 ..	28 00
Captain Carter ..	2 50
Increased amount paid by associate members to become active ..	2 00
Exchange on cheque ..	10
	<u>\$589 08</u>

Disbursements.

Expenses of Convention at Montreal ..	\$278 76
By cash as per local committee's statement ..	\$106 50
By cash, stenographer ..	27 00
By cash, <i>Canadian Electrical News</i> , printing ..	92 15
By cash, Canadian Photo-Engraving Co. ..	52 41
By cash, express charges on books sent to and from convention ..	70
	<u>\$278 76</u>

Refund to members on account of reduction of fees ..	\$ 18 00
Postage ..	38 50
Stationery and printing, <i>Electrical News</i> ..	7 75
Grant to Secretary ..	25 00
Statistical Committee, expense account ..	25 00
Telegrams and messages ..	79
Exchange on cheques ..	1 15
Ribbon for badges ..	1 60
Envelopes ..	75
Macrea & Macrea, delivery of 21 copies convention report ..	11
Blackhall & Co., 50 certificate covers ..	4 00
Receipt forms ..	35
Express charges ..	55
	<u>\$402 31</u>

Cash in bank May 31st, 1895 ..	186 77
Cash on hand ..	
	<u>\$589 08</u>

Receipts since May 31st, 1895.

Refund by Statistical Committee for fees ..	\$ 23 62
Receipts for fees since May 31st, 1895 ..	173 00
	<u>196 62</u>

Expenditure since May 31st, 1895.

Postage ..	\$ 8 10
Exchange ..	75
Blackhall & Co. (covers) ..	4 00
	<u>\$ 12 85</u>
Cash in bank, Sept 17th, 1895 ..	84 12
Cash on hand Sept 17th, 1895 ..	99 65
	<u>\$196 62</u>

Total standing to credit of Association, \$370.54

C. H. MORTIMER,
Sec.-Treas.

A. B. SMITH, PRESIDENT CAN. ELECTRICAL ASSOCIATION.

REPORT OF COMMITTEE ON LEGISLATION.

Shortly after the last meeting of this association your Committee on Legislation was called upon to act in conjunction with the executive in an important crisis, which it was pointed out at its organization might arise, and in such case organized effort would prove one of the valuable functions of the association—legislation which, though not intended to be hostile, might, through lack of thorough knowledge of its promoters, result most disastrously to electrical interests.

During the last session of the Ontario Legislature a bill was introduced which, if it had become law, would most assuredly have worked an injustice to many, and would have been burdensome to all who have invested their capital in electrical enterprises, by laying a tax as personalty upon all street equipment of electrical companies.

Immediately upon the introduction of the bill your president called a meeting of the executive, when the following circular was drafted and sent by the secretary to all the electric light companies in Ontario:—

"TORONTO, March 19th, 1895.

"DEAR SIR, - As you are interested in an electrical light plant, I am instructed by the Executive Committee of the Canadian Electrical Association to call your attention to an amendment to the Assessment Act, which has recently been introduced in the Legislative Assembly of Ontario by Mr. German, and which is contained in Bill No. 91, the object of which is to make electric light poles and wires assessable.

"Such an addition to the expense of the electric light business would prove to be a serious burden, more especially in the smaller places where lighting plants are scarcely self-sustaining under present conditions. In such places the electric light has in most instances been established by public-spirited citizens for the public convenience and the welfare of the place, rather with a view to any profit from the invested capital. The business, as you are aware, is at present sustained only by the exercise of the closest economy, and is consequently not in a position to stand any additional burden.

"There is no public demand for the proposed legislation, and it is felt that the measure is one that should be opposed by those whose interests are at stake. I would, therefore, request you and the stockholders of your company to communicate immediately with the representative of your riding in the Legislature, and any others with whom you are acquainted, and ask them to oppose the bill as being detrimental to the prosperity and development of the electric lighting industry, and as certain to work serious injury and injustice to capital which was invested in the belief that it would continue to remain exempt from taxation. It should likewise be pointed out that even though it may not be possible to defeat the bill entirely, no increase in taxation should in any event be made until existing contracts with municipalities shall have expired.

"As the bill may come before the Committee of the House within a few days, immediate action in the direction indicated above is necessary.

"Very truly yours,

"C. H. MORTIMER, Secretary."

As a result of this circular we have reason to believe that a large number of the representatives who compose the House had information placed before them in the most effective way, that the proposed legislation would work an injustice, inasmuch as it would enable municipal councils to make a breach of the understanding on which nearly all the electrical companies of the province were organized; that in many cases where the business is barely self-sustaining under present conditions, such taxation would prove so burdensome that it would mean the practical confiscation of the plant; that instead of proving a benefit to the public, the result would be exactly the reverse, as many companies which were organized, not with a view to profit, but as a public convenience, would be compelled to suspend, thus not only causing a loss of the investment, but depriving the country of its advantage. But more important than all, it was clearly shown that the first result of such hostile legislation at the present experimental stage of the practical application of electricity to modern requirements, would prevent the investment in the business of capital, which is so important to the development of this great interest, and thus prove of incalculable injury to the commercial interests of the country.

So forcibly were the conditions presented to the legislators that a large majority were convinced of the injustice and inexpediency of the measure, and the mover of the bill himself voluntarily withdrew it at its first appearance in committee.

The matter of municipal assessment in many of its phases presents a difficult problem, but in no feature is this more apparent than in its application to electrical interests. Your committee would therefore urge, not only upon members of this association, but upon all who are interested in any way in electrical enterprises, a thorough consideration of the practical application of this question, and especially to see that their representatives in the legislature, who may be called upon at any time to legislate on this subject, have some knowledge of the interests involved, so that they may know the effect of ill-considered changes which may possibly be proposed.

JNO. YULE,
Chairman of Committee.

J. A. Kammerer presented the report of the Committee on By-Laws and Constitution, which amounted to a general revision of the constitution. The revised constitution will appear in next issue.

REPORT OF THE COMMITTEE ON STATISTICS.

Your committee beg to report as follows:—

The information which it was considered desirable to obtain was principally such relating to central stations for the supply of electric light and power and electric street railways. Detailed information from such stations regarding the original cost of installation, the cost of operation, the volume of the output, the prices realized, and any particular difficulties or extraordinary circumstances encountered, would doubtless be of great value to every person interested in these branches of electrical work. The members of the electrical fraternity have everything to gain and nothing to lose by a free interchange of ideas, and an open discussion of experiences met with, this object is, indeed, one of the principal motives for the formation of the Canadian Electrical Association. On the other hand, the data referred to, although they are not strictly business secrets, are not of such a nature as a company desires to publish openly. The previous committee on statistics had sent out blanks requesting data from central stations; on looking over their returns received, we found that only a small proportion of sheets sent out had come back, while on those which were returned the answers to the questions were incomplete and therefore of little value. It was thus evident that the compilation of the desired statistics would involve a considerable expense, and since the funds of the association did not warrant it, your committee did not proceed in this way.

During the past year, however, the Dominion Government has commenced to gather statistics relating to the electrical industries, and it was suggested that the committee should lend its assistance to this work. Mr. Higman was added to the committee as advisory member, and separate forms were drawn up by the committee, one to be sent to electric lighting and power companies, the other to electric railway companies. These returns being the property of the Government, are kept secret. The detailed information concerning each separate company can, therefore, not be presented, but the totals will be published and these will be of undoubted value because they will be complete. Mr. Johnston, the Dominion Statistician, assures us that in another year he will be in a position to give the association a large amount of information concerning these industries, all properly summarized and tabulated.

All of which is respectfully submitted.

E. CARL BREITHAUPT, Chairman.



L. B. MACFARLANE, 2ND VICE-PRESIDENT CAN. ELECTRICAL ASSOCIATION.

Mr. Dion's paper on the "Consolidation of Two Systems of Electric Supply," was then read, and will be found in our next issue.

The programme of papers, as outlined in last issue, was carried out, but we regret that some of these papers, with the discussion which followed their reading, cannot be dealt with in this issue for want of space. It was decided to hold the meetings hereafter in June, the exact days of the month to be fixed by the executive. Next year's convention will be held in Toronto. The following were the officers elected for the ensuing year:—

President—Alex. B. Smith, superintendent of construction, Great North Western Telegraph Company, Toronto.

First Vice-President—C. Berkeley Powell, Ottawa Electric Company, Ottawa.

Second Vice-President—L. B. Macfarlane, manager Eastern Department Bell Telephone Company, Montreal

Secretary-Treasurer—C. H. Mortimer, *Electrical News*, Toronto.

Executive, one year—Geo. Black, Hamilton; E. Carl Breithaupt, Berlin; O. Higman, Ottawa; J. A. Kammerer, Montreal; J. J. Wright, Toronto. Two years—F. H. Badger, Quebec; W. Y. Soper, Ottawa; A. M. Wickens, Toronto; K. J. Dunstan, Toronto; John Carroll, Montreal.

THE BANQUET.

The dinner held at the Russell House on the evening of the 18th may be recorded as unique in the history of public banquets in Canada. The following humorous *menu* disposed the guests to pleasantry, and prepared them to appreciate the electrical effects of the hall, which could only be taken in after study. Following is the *menu*:

"Oh, hour of all hours, the most blessed upon earth,
Blessed hour of our dinners."

MENU.

Clear Dynamo Soup with Dimpling Units.

Broiled Whitefish with Ampere Sauce.
Sliced Cucumbers and Grounded Potatoes.

Lamb Cutlets and Green Peas.
Chicken Souffle, Dunstan Style.
Fillets of Beef, Street Railway Sauce.

Roast Ribs of Beef, Ottawa Style.
Boiled Turkey, Polyphase Sauce.

Anchor Ice Sherbet.

"The game is up; every man to his taste."
Black Head Duck with Direct Current Jelly.
Lettuce Salad, Telephone Dressing.

English Plum Pudding with (low potential) Brandy Sauce
Greengage Tart. Wine Jelly.

Electric Ice Cream.
Cream Meringue. Fancy Cakes.

Fruits.

Cheese and Crackers. Coffee.
Sherry (Wattage of '95). Ale, Ginger Beer.
Ginger Ale.

Electrocution.

Novelties in electrical illumination were to be seen on every wall, but a few of the most striking were as follows: Monogram of the C.E.A. in incandescents at the end of the room, surrounded by a horseshoe of gold, with light shining through the nail holes. The word "Ottawa" in incandescent lights on one end and "1895" at the other; while over the centre of the main table was a Union Jack formed of lights of correct colors, and so closely set that they seemed from a side view to be continuous stripes of light. An arch of evergreens was over each lady's seat, with an incandescent in the apex of the arch. There were festoons of lamps hung from the ceilings, and miniature incandescents on the table amidst flowers. In the centre of the room was a pyramid of crystal lights with incandescents, and surmounted by a figure *a la* Statue of Liberty holding aloft a light, the whole pyramid revolving slowly. When the item of roast beef was reached, three stewards in white appeared at a table on a raised platform, and as they began to whet their knives electric sparks flew from the blades, amidst the plaudits of the assembled company. The waiters had miniature incandescent lamps in their shirt bosoms, supplied from a little storage battery in their pockets. Then the dessert pieces were made up in electrical forms, such as electric cars, dynamos, all complete, insulators, telegraph poles with cross arms, telephones, etc., in candy, jelly and cake. The toast list, though short, was well carried out; among the speakers, besides the president, who was in the chair, were Mayor Borthwick, Sir James Grant, George Johnson, the Dominion statistician, W. Y. Soper and others.

NINE miles of new steel rails are to be laid on the C.P.R. westward from Wabigoon station.

THE Grand Trunk Railway will move their car shops from Brantford to London, Ont., where they will employ 500 men.

THE Toronto, Hamilton and Buffalo Railway Company have purchased land near Welland, Ont., for the erection of a round house and repair shops.

THE excursion steamer "Columbian" was destroyed by fire at Bobcaygeon, Ont., last month. The steamer was owned by McManus & Co. and was insured.

A DELEGATION from the Canadian Inland Marine Association have interviewed the Government with a view to remedying the danger caused to navigation by the low water in the St. Lawrence.

AN engine and ten box cars, the property of the Brockville, Westport and Sault Ste. Marie Railway Company, were sold at Brockville a few days ago by order of the Dominion Government, to satisfy its claim for uncollected customs duties of \$1,000. The amount realized was \$910.

Electric Flashes.

HARTLAND, N.B., will probably have an electric light system installed this fall.

GUELPH electric street railway is now in operation, and good business is being done.

J. E. SAUCIER has been visiting Rossland, B.C., endeavoring to float an electric light and power project.

THE new electric power house at London, Ont., is rapidly approaching completion. The chimney will be 140 feet high.

THE electric light service at Knowlton, Que., has not yet been resumed. The water power is to be supplemented by steam.

THE new electric light system for the village of Eganville, Ont., will probably be installed by Messrs. McElligot and Dumas.

THE Niagara Falls, Wesley Park & Clifton Tramway Co. are about to lay new rails on their track, and make other repairs amounting to \$5,000 in cost.

WORK is being rapidly carried forward on the Toronto and Suburban Electric Railway, and it is expected that the road will be extended to Lambton Mills this fall.

THE Aylmer Electric Railway Company will be compelled to seek an extension of time for the construction of their line, as their charter will expire shortly.

W. J. GRAHAM, a Toronto motorman recently injured in a street car collision a few weeks ago, has entered suit against the Toronto Street Railway Company for \$10,000 damages.

J. LAMONGE, a French Canadian carpenter, was killed near Montreal by a Back River trolley car on Sept. 22. He was driving in a buggy, and got in front of the car. Lamonge was instantly killed.

WHILE assisting to extinguish a fire at Joliette, Que., on September 30, A. Lancelot caught hold of a live wire and was instantly killed. He leaves a widow and large family in destitute circumstances.

P. RANDALL, of the proposed electric line between Cobourg and Port Hope says that \$40,000 stock has already been subscribed, and he has a promise of \$10,000 from the township of Cavan if he runs a branch out there.

H. A. MASSEY, of the Massey Manufacturing Company, says that by this time next year he will have in working order an electric vehicle. He constructed the first reaper and the first mower manufactured in Canada.

AT the Canadian General Electric Works at Peterborough, J. Moore and R. Morgan were seriously injured a few days ago; the first by having his arm drawn into a machine, and the other by an armature falling on his hand.

IT is rumored that Mr. Forsyth and his associates have abandoned their scheme to build a steam railway from St. Catharines to Woodstock, and will stick to their original scheme, the construction of the radial railway from Hamilton.

THE value of suitable fenders on trolley cars was demonstrated several times during the last month in Toronto. On one occasion an old man who fell on the track was picked up and carried a good distance without serious injury.

THE Packard Electric Co., St. Catharines, manufacturers of the celebrated Packard lamps, have appointed John Starr, Son & Co., of Halifax, as their agents for the Maritime Provinces, and Ahearn & Soper as agents for the cities of Ottawa and Hull.

THE Thousand Island Electric Light Co. will have their plant running before Dec. 1st. Instead of using overhead wires for transmitting the current, the wires will be placed under ground. Several wealthy Americans of New York city have a large interest in the company.

THE Oshawa Electric Railway Co. has ordered two 150 horsepower tandem compound condensing engines from the Robb Engineering Co.

WORK of laying the tracks for the Quebec electric street railway system will begin at once. It is probable, however, that when lines come to be laid across the horse car company's track a writ of injunction will stop the work will be secured.

HAMILTON papers say that a contract has been entered into between the Hamilton Radial Electric Railway Company and the Niagara Power Company which makes the construction of an electric road between Hamilton and the Canadian Falls a certainty.

IT is just three years since Montreal saw the first electric street car. There were at that time only 45 miles of track in the city, now there are 74½. 80,000 passengers was the greatest number ever carried in one day. On one day this year 134,000 were carried and 38,800 transferred. The heaviest day's earnings three years ago were \$4,000, this year they almost reach \$6,000. There are at present in daily use 161 cars and 60 trailers.

A LEDGE of gold 14 miles in length is said to have been discovered at Donald, B.C.

A COMPANY is being incorporated in Vancouver, B.C., to build a dock and a marine railway.

A MICA mine of good promise has been discovered at Parry Sound, on T. Horn's property.

AT Vancouver a scheme is again on foot for the erection of a smelter. This will be done if the city can be induced to bonus it.

THE concentrator of the Slocan Star mine at Slocan, B.C., will be built in a few weeks. It will be connected with the mine by an 1,800 feet tramway.

OWNERS of the Washington mine at Slocan, B.C., are contemplating the construction of a concentrator, and are asking for estimates for the same.

AN English engineer will shortly make an examination of the projected bridge from Montreal to Longueuil, and if his report is favorable work will at once be begun.

THE Board of Education at Hamilton, Ont., have asked from the city a grant of \$50,000 to be used in the purchase of a site and the erection of a building for the Collegiate Institute and Ontario Normal College.

FEADOR BOAS, one of the proprietors of the asbestos mines at Danville, Que., says they will be able to manufacture a writing paper from a low grade of asbestos as cheap as linen paper. With an indestructible ink it will give a manuscript that will stand fire and last for all time.

MARINE ENGINEER, aged 38, first-class certificate Board of Trade, England, trained on the Clyde, with considerable experience on ocean-going steamers, wants a situation on shore or afloat. Has references. P.O. Box 408, St. John, New Brunswick.

CIVIL ENGINEER, age 37, with good experience in railroad and general engineering, wants position of any sort. Has instruments and first-class references. Box 195, Collingwood, Ont.

MICHIGAN MINING SCHOOL, Houghton, Mich. A high grade technical school. Practical work. Elective system. Summer courses. Gives degree of S. B., E. M. and Ph. D. Laboratories, shops, mill, etc., well equipped. For catalogues write to the secretary.
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