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CANADIAN

# ELECTRICAL NEWS

STEAM ENGINEERING JOURNAL

OLD SERIES, VOL. XV.—No. 4.  
NEW SERIES, VOL. I.—No. 9.

TORONTO AND MONTREAL, CANADA, SEPTEMBER, 1891.

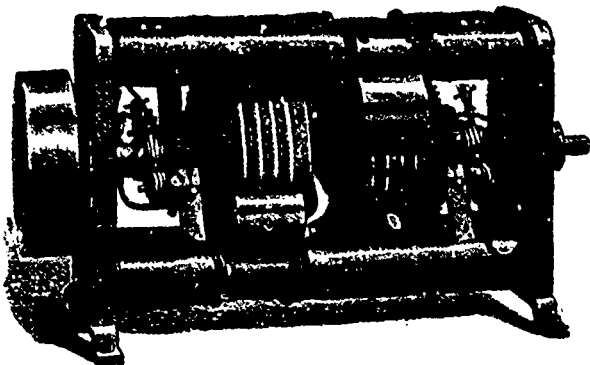
PRICE, 10 CENTS  
\$1.00 PER YEAR.

## THE BALL ELECTRIC LIGHT COMPANY, LIMITED.

INCORPORATED 1882.

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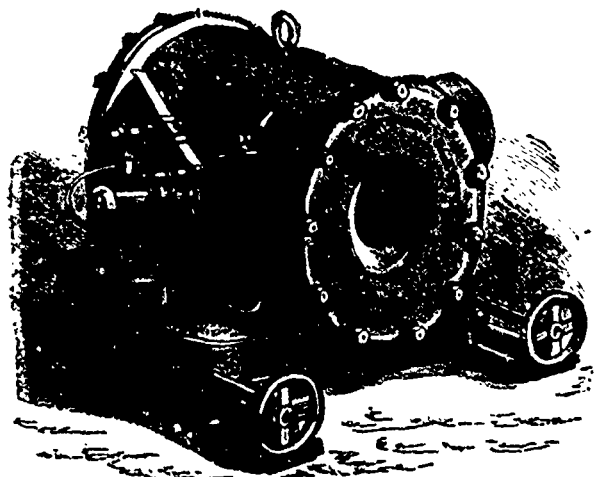
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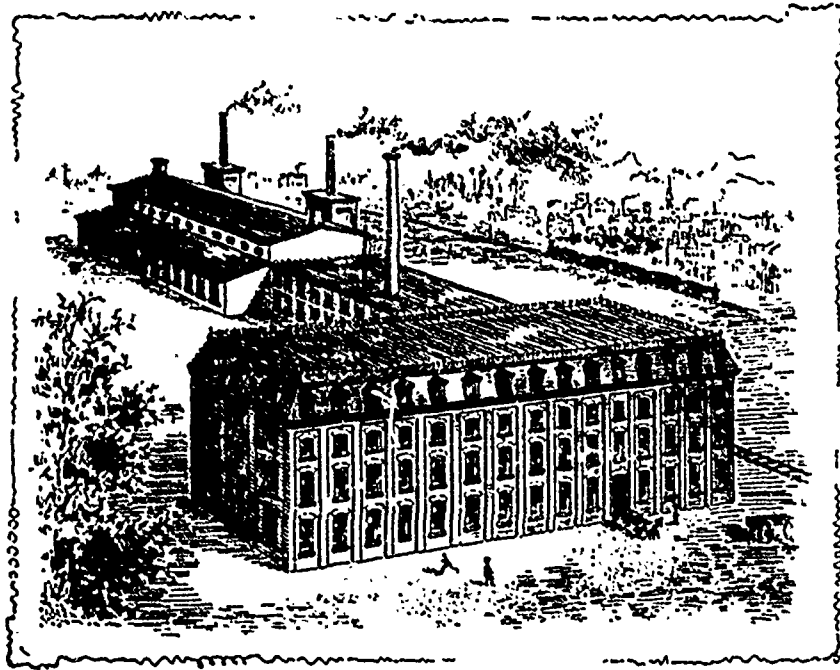
Chas. W. Hagar, *Gen.-Manager.*

Fred. Thomson, *Chief Electrician.*

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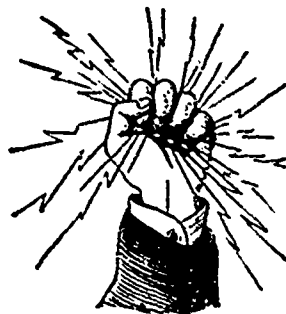
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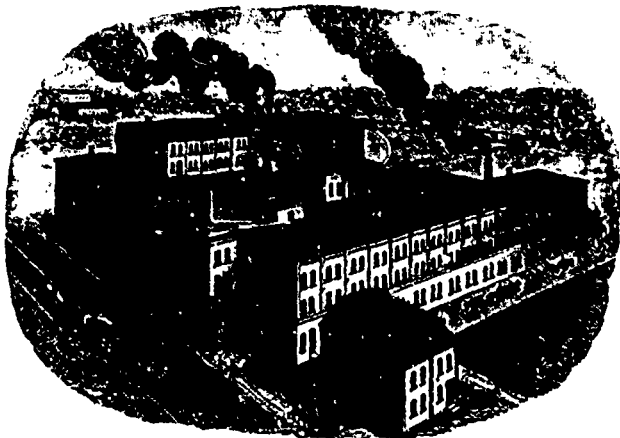
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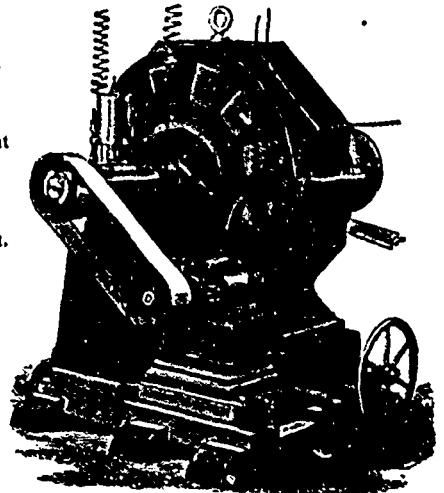
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 Electric Light & Power Co., Port Hope, Ont.  
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**OVER 100**  
 IN OPERATION,  
 From 10 inches by 3 inches  
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 Giving perfect satisfaction.

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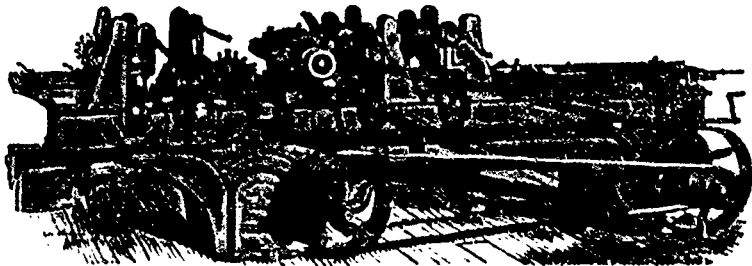
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## TORONTO

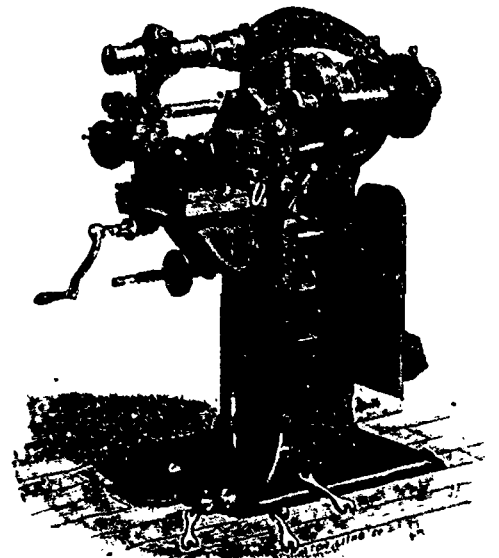
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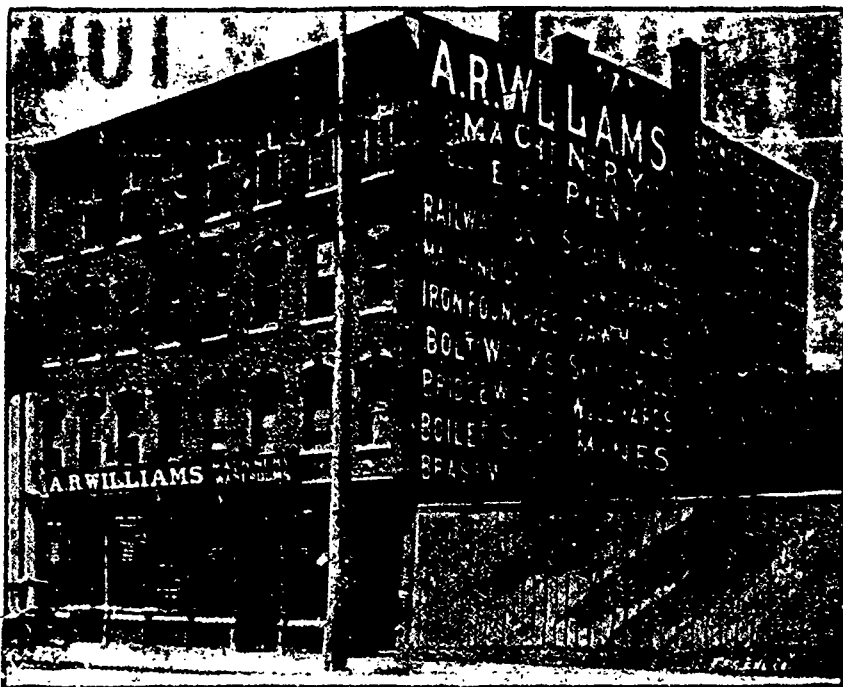


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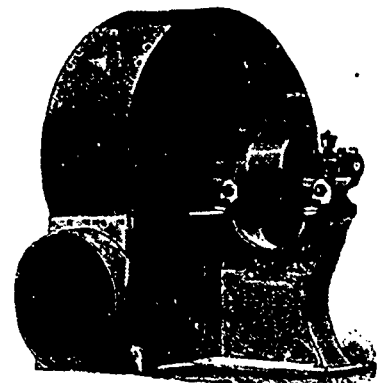


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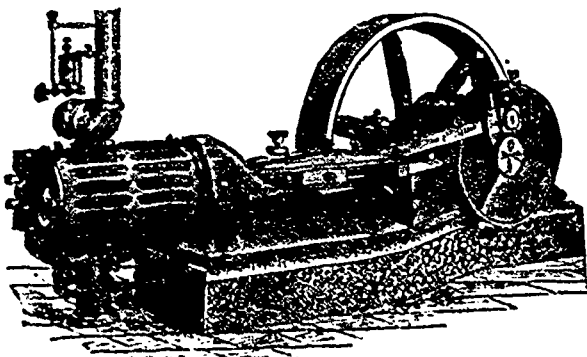
*I will be pleased to have a call from Engineers, Electricians and Visitors, at the Montreal Warerooms, during the Meeting of the Electrical Association.*



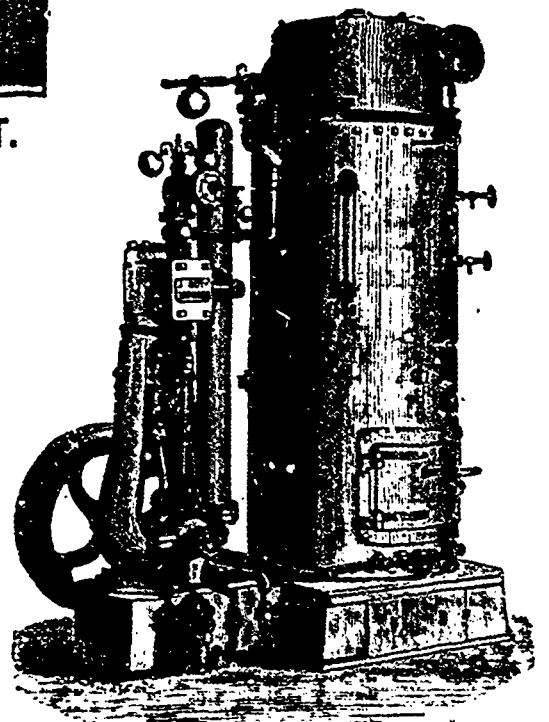
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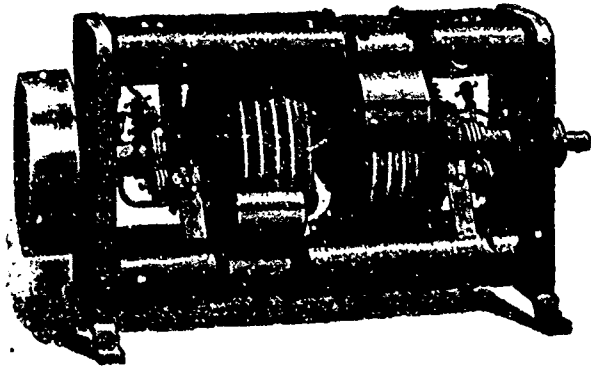
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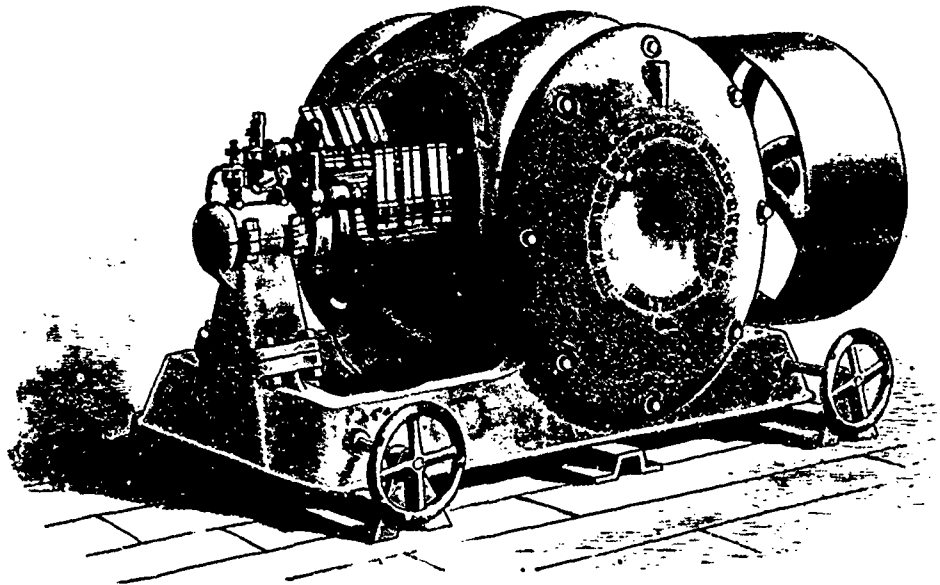
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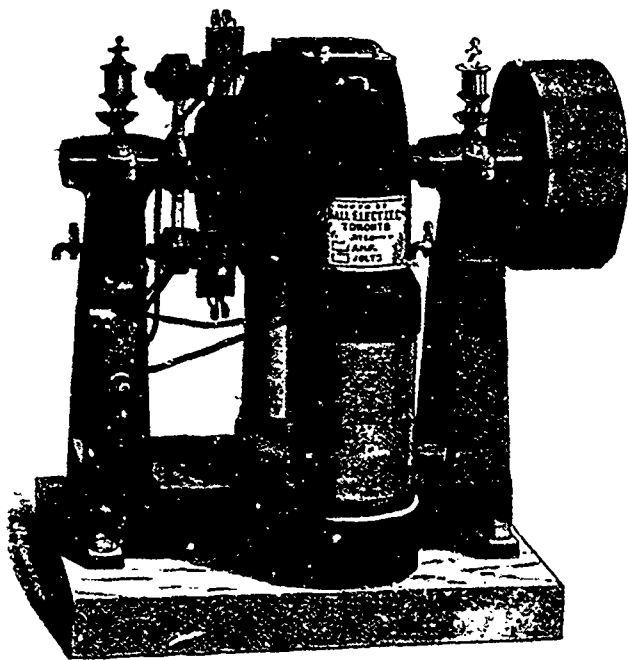
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**INCANDESCENT SYSTEMS**

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Arc Dynamos and Lamps,

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*No other company can furnish the Thomson-Houston system of Alternating Current or Direct Current Incandescent Lighting, representations to the contrary notwithstanding.*

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*180 Summer Street,*

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Having acquired by purchase **ALL PATENTS** granted in the Dominion of Canada, on

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**ALTERNATING CURRENT INCANDESCENT DYNAMOS,  
TRANSFORMERS OF HIGHEST EFFICIENCY,  
ELECTRIC MOTORS AND ELECTRIC GENERATORS**

*For all description of power, light, etc.*

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No other company can furnish any of the above patented apparatus which has been manufactured and sold by this Company by virtue of the purchase by them of ALL THOMSON-HOUSTON PATENTS granted in Canada, representations to the contrary notwithstanding.



**Edison****General****Electric Co.**

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BROAD STREET,  
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**Announcement!****WE ARE NOW FURNISHING:****INCANDESCENT LAMPS**

Of any Voltage to Fit any Socket.

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Embracing many New and Valuable Features, notably Lamps that will Burn 7 or 14 Hours.

**SLOW SPEED MOTORS,**

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**FIXTURES, ELECTRIC AND COMBINATION GAS,**

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Both Single and Double Reduction Motors.

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Percussion Drill, Diamond Drills, Locomotives, Pumps, Fans and Coal Cutters.

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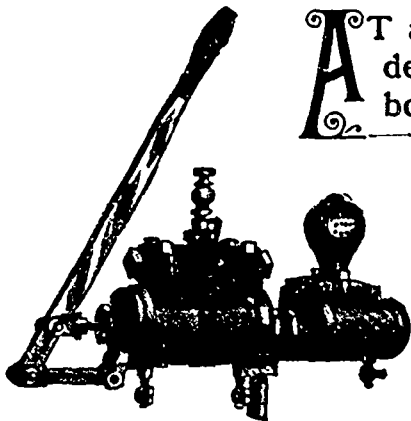
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FOR STATIONARY, PORTABLE AND MARINE BOILERS.

OVER 2,000 MARSH PUMPS SOLD IN THE UNITED STATES DURING 1890



THIS CUT SHOWS SMALLEST SIZE MARSH PUMP, WITH HAND LEVER.

AT a recent test by Prof Cooley, of Michigan University, 48 degrees of temperature was added between condenser and boiler in passing through pump.

*Absolute Actuation and Regulation without the use of Tappets, Levers, or other Mechanical Construction.*

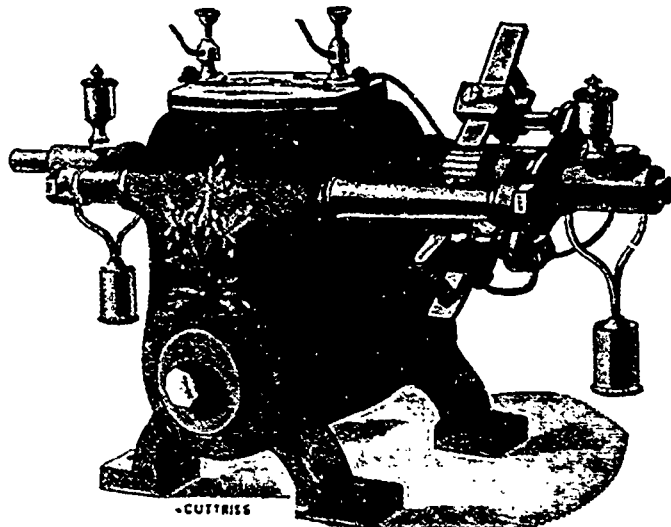
As the exhaust mingles with feed water and returns to boiler, there is no loss of heat, hence it is the most economical pump in use. For hot or cold water or liquids, with or without Hand Pumping Attachment, NO PUMP EVER MADE THE RECORD OR BECAME SO POPULAR AS THE "MARSH."

Patented in Canada 7th February, 1889.

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For Arc and Incandescent Lighting.

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FOR SALE CHEAP.

HAVING a large assortment of the well known "Lahmeyer" Direct Current Incandescent Dynamos, Compound Wound, on hand, which we want to reduce, we will sell same at greatly reduced prices for a short time.

These Dynamos are equal, and in some respects superior, to any made. They are thoroughly well made both electrically and mechanically, of best materials and finish, and are the only Dynamos in the world which are cast in one piece.

They are especially adapted for factory and private use on account of their simplicity and minimum care required; the field magnets being inside of frame are protected from external injury. They are all compound wound, and owing to the large wire in the fields will not burn out.

The first "Lahmeyer" Dynamo started in Canada, over two years ago, has been working constantly ever since without costing the owners, Hender son & Potts, Halifax, one cent for repairs of any kind or giving a moment's trouble, notwithstanding the fact that it has been working on 80% overload, viz., 30 light machine running 55 lights.

EVERY MACHINE GUARANTEED.

Illustrated Circular and Price List sent on application to

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HALIFAX, N. S.

Now is the time to equip your factory preparatory to the fall and winter months.

CANADIAN  
**ELECTRICAL NEWS**  
AND  
**STEAM ENGINEERING JOURNAL.**

VOL. I.

TORONTO AND MONTREAL, CANADA, SEPTEMBER, 1891.

No. 9.

**METROPOLITAN STREET RAILWAY.**

THE Metropolitan Street Railway Company is the first that has been successful in substituting electrical for animal power for the propulsion of street cars in Toronto. It has accordingly met with the favor and patronage of the public.

The company commenced electrical operations on the first of September, 1890, under the following management:—Chas. D. Warren, President; R. C. Warren, Secretary and Superintendent.

The head office and power house is a neat structure of brick

and stone. Upon this great wheel is a perforated belt 83 feet long and 28 inches wide for transmitting the power to the shafting, which is built upon five stone pillars projecting up through the floor. Provision has been made for an additional engine of a similar description, and it will not be long before this is taken advantage of. Alongside the engine is a Thomson-Houston 500 volt dynamo, the armature of which runs at a speed of 900 revolutions per minute, provision also having been made for further generator power. At the west end of the room is a



POWER HOUSE, METROPOLITAN STREET RAILWAY, TORONTO.

and stone, situated on the west side of Yonge street, about five minutes ride from the railway crossing at North Toronto.

The boiler house is a lofty, solid brick building, 35 feet by 25 feet, and contains two boilers each measuring 66 feet by 14 feet, both carrying 20 square feet of grating surface, having a working pressure of 125 lbs. each. They were built by Messrs. Goldie & McCulloch, of Galt, and are fed by a No. 6 Northey feed pump. Sufficient room has here been reserved for the addition of another boiler of the same size and capacity.

The company have obtained permission to extend their track north as far as Richmond Hill. This extension will be commenced early in the spring, and when completed the length of the line will be 16 miles.

The engine room, which is on the south side of the boiler house, is 39 feet in width by 58 feet in depth, and is a model power house. Here is located a Wheelock compound condensing engine, with high pressure 13" cylinder, low pressure 23" cylinder, 30" stroke, 100 h. p., the driving wheel of which measures 15 feet in diameter and 38 inches across the face, and runs at the rate of 95

switch board containing voltmeter, ammeter, rheostat, circuit breaker, main line switch and apparatus for taking potential of circuit. On the north side are the steam and vacuum gauges; in front, on the north side of the entrance, the offices and lavatory; and on the south side, a cosily furnished waiting-room. Over these offices Engineer Outhwaite has a well arranged suite of rooms, with every modern household convenience, including bathroom, heating apparatus, incandescent lights and lavatory, with hot and cold water arrangements.

Beneath the engine house is the condensing machinery, hot water well and pumps, the supply of water being taken from running springs at the back of the premises.

The car shed is located at the rear of the main buildings. As the cars come in, they are run on a transfer car and placed side by side. Hydrants have been placed in different parts of the building and every provision made in case of fire. The whole of the inside electrical plant was built by the Thomson-Houston Co. The machinery is of the latest pattern, and is arranged with a view to obtaining the best results. The premises and cars are

lighted by electricity. There are at present two cars running at intervals of 20 minutes, commencing at 6 a.m. and continuing until 1:40 p.m. each day (Sunday excepted). The cars used were manufactured by Jones Bros., of West Troy, N. Y., at a cost of \$8,000 each, and are simpler than the ordinary street car in appearance, and in winter are provided with a small coal stove encased in mahogany and brass, occupying the space of one passenger, and the current passing outside the buildings along the trolley wire, and by the trolley down through the car to the motors, and from thence to the rails by the wheels. A large underground cable is laid in the bed of the tracks, to which pieces of wire are attached and extended to every junction of the rails, and so completing the return current. The motors are placed inside the floor of the cars and do their work without any noise or discomfort of any kind to the passengers.

The cars are fitted up with every modern improvement, including incandescent lights and electric bells, and have gates on the platform for the safety of passengers. The capacity for obtaining a high speed whenever necessary, and the light, noiseless, easy-running, commend them to the public as a good substitute for the noisy horse cars. This is demonstrated by the traffic having already increased so as to necessitate two additional motor cars, which are now under way.

The great weight of the motors in the cars demand a heavier rail, especially in snowy weather, and the company have put down a 50 lb. T rail. This being done, a perfect degree of safety has been obtained, the running is smoother, and a great reduction of time has been made possible on each trip. The points of the track open and close as the cars pass over them, and the conductor is not required to alight from the car except to reverse the trolley pole on the overhead line at end of his journey.

The distance covered by the company is about 2 1/4 miles, which is run in twenty minutes, including stops, but it is expected they will be able to reduce this to about fifteen minutes.

#### PROF. BOVEY.

It would be difficult to overestimate the value of the service rendered by Prof. Bovey, of McGill University, on behalf of the approaching Electrical Convention in Montreal. From the moment, months since, when he consented to act as one of the representatives of the city of Montreal, he has been untiring in his efforts to provide for the pleasure and instruction of the visitors. We doubt not, therefore, that the accompanying portrait and brief outline of his career, will have an interest for many of our readers:

Prof. Henry Taylor Bovey was educated at a private school in England, and at Cambridge University. On entering the University he competed for and obtained an open scholarship. On graduation he took a high place in the mathematical tripos, and shortly after was made a fellow of Queen's College. Having decided to adopt the profession of engineering, he joined the staff of the Mersey Docks and Harbour Works. He was shortly appointed one of the assistant engineers on this work, and in this capacity had charge of some of the important works then in progress.

In 1877 he was appointed Professor of Civil Engineering and Applied Mechanics in McGill University. The engineering courses in the University were at that time managed as a department of the Faculty of Arts, and were without buildings or equipment. In 1878, however, a department of Applied Science was constituted, and Prof. Bovey was elected its Dean. The magnificent endowment of the late Mr. Thomas Workman

and Mr. W. C. McDonald have afforded Dean Bovey an opportunity for the display of his great executive ability and untiring energy.

Much of the success of the Canadian Society of Engineers is without doubt due to Prof. Bovey's labours as its Secretary, which position he occupied continuously from the foundation of the society until within the past few months, when increasing college duties compelled him to resign the office. Prof. Bovey is a Fellow of the Royal Society of Canada, a member of the Institution of Civil Engineers, as well as of several other engineering societies.

#### LIST OF COMMITTEES.

The following is a list of the gentlemen comprising the various Committees, under whose direction the programme of the Montreal Convention will be carried out:

**CITIZENS EXECUTIVE COMMITTEE.** Prof. Bovey, president; John Kennedy, vice-president, P. W. St George, 2nd vice president, F. R. Redpath, 3rd vice president, R. White, treasurer, F. Fairman, acting treasurer, Prof. John Cox, John Carroll, hon. secretaries, Prof. Nicholson, Prof. McLeod, L. B. McFarlane, W. H. Laurie, W. E. Christie, J. S. Sherer, James Kent, H. M. Linnell, D. W. McLaren, J. A. U. Beaudry, C. F. Sose, A. J. Corriveau, H. Beaugrand, E. C. Arnoldi, Geo. W. Sadler, M. Perrault, L. W. Toms, S. C. Stevenson, James Harper, Phelps Johnson

**SUB-COMMITTEE OF EXHIBITION COMMITTEE.** Frank R. Redpath, chairman; John Carroll, secretary; Prof. John Cox, Prof. Bovey, John Kennedy, Frederic Nicholls, A. J. Corriveau, S. C. Stevenson

**SUB-COMMITTEE ON FINANCE.** F. Fairman, chairman; J. A. Beaudry, John Carroll, A. J. Corriveau, H. R. Ives, H. H. Beaugrand, J. Cooper, J. H. Burland, F. R. Redpath, R. White, Dugald Graham

**LADIES' ENTERTAINMENT COMMITTEE.** John Carroll, chairman; Prof. John Cox, A. J. Corriveau, S. C. Stevenson, E. C. Arnoldi, W. E. Christie

**COMMITTEE ON EXCURSION DOWN LACHINE RAPIDS.** John Kennedy, chairman; Prof. H. T. Bovey

**BANQUET COMMITTEE.** John Carroll, chairman; John Kennedy, S. C. Stevenson, A. J. Corriveau, F. Fairman, W. E. Christie, L. B. McFarlane

**GARDEN PARTIES COMMITTEE.**—Prof. Bovey, chairman; John Kennedy, F. R. Redpath

**PROMENADE CONCERT COMMITTEE, (at Sohmer Park)**—L. W. Toms, chairman; S. C. Stevenson, H. Beaugrand

**CONVERSAZIONE COMMITTEE.**—Prof. McLeod, chairman; Prof. Nicholson, H. M. Linnell, L. W. Toms, John Carroll

**FIRE DEPARTMENT DISPLAY COMMITTEE.**—S. C. Stevenson, chairman; E. C. Arnoldi, G. W. Sadler

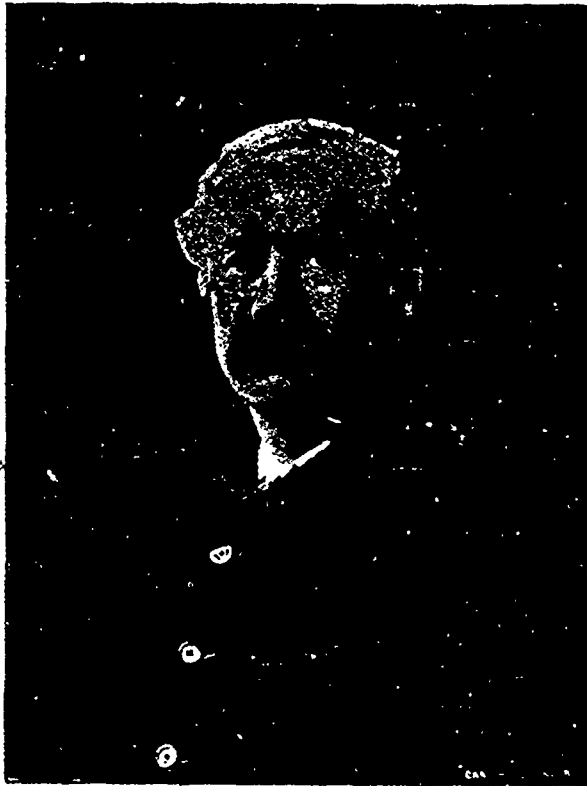
**COMMITTEE ON HACKS.**—L. W. Toms, chairman, A. J. Corriveau, E. C. Arnoldi

**COMMITTEE TO ARRANGE REDUCED RATES TO IBERVILLE.** A. J. Corriveau, chairman; H. M. Linnell, S. C. Stevenson, John Carroll

**LACROSSE COMMITTEE.**—W. E. Christie, chairman; E. C. Arnoldi

#### IMPORTANT NOTICE.

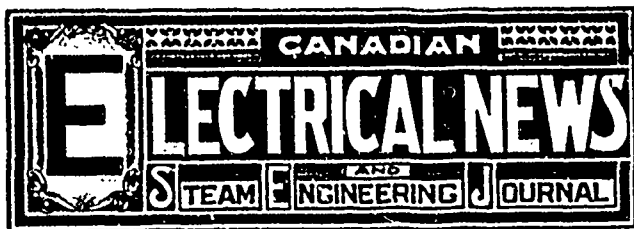
A meeting to informally consider the advisability of organizing a Canadian Electrical Association, will be held on Thursday, the 17th Sept., inst., at the hour of 2:30 o'clock p. m., in the offices of the Industrial Exhibition Association, Exhibition Grounds, Toronto. A cordial invitation is given to persons in any way interested in the electrical industry in Canada to be present.



PROF. BOVEY.



THE CITY OF QUEBEC



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#### ADVERTISEMENTS.

Advertising rates sent promptly on application. Orders for advertising should reach the office of publication not later than the 25th day of the month immediately preceding date of issue. Changes in advertisements will be made whenever desired, without cost to the advertiser, but to insure proper compliance with the instructions of the advertiser, requests for change should reach the office as early as the 22nd day of the month.

#### SUBSCRIPTIONS.

The ELECTRICAL NEWS will be mailed to subscribers in the Dominion, or the United States, post free, for \$1.00 per annum, 50 cents for six months. The price of subscription may be remitted by currency, in registered letter, or by postal order payable to C. H. Mortimer. Please do not send cheques on local banks unless 25 cents is added for cost of discount. Money sent in unregistered letters must be at sender's risk. Subscriptions from foreign countries embraced in the General Postal Union, \$1.50 per annum. Subscriptions are payable in advance. The paper will be discontinued at expiration of term paid for if so stipulated by the subscriber, but where no such understanding exists, will be continued until instructions to discontinue are received and all arrearages paid.

Subscribers may have the mailing address changed as often as desired. *When ordering change, always give the old as well as the new address.*

The Publisher should be notified of the failure of subscribers to receive their papers promptly and regularly.

#### EDITOR'S ANNOUNCEMENTS.

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

#### WELCOME.

It has become our pleasant duty in this issue to offer words of welcome to our brethren the members of the National Electric Light Association of the United States. As Canadians, we feel honored by the selection of one of our principal cities as the meeting place of such an illustrious assemblage, and we trust that the visit will not be without pleasure and ultimate profit to the dispensers of illumination, their confederates the fabricators of mechanism, and above all, to the men of mighty brain who have been most instrumental in developing the revolutionary force of electricity. Welcome one and all to the land of the beaver and the maple leaf! May your lights be never dimmed or your shadows grow less. We welcome you, from whatever part of the great Republic you come from the sunny south or the wild and woolly west, from the land of the wooden nutmeg and the basswood ham, from New York or the sylvan state of William Penn. We are prepared to do homage to the smartest nation on the face of the earth. The effete monarchies of the old world are nowhere. In the early development of the science, the European discoverer was content to rub his coat sleeve with a chunk of sealing wax, but your Franklin had the nerve to gather his electricity from the raging thunder storm. It served Galvani's turn to tickle frogs' legs with mild electric currents, but you are satisfied with nothing less than humanity itself to practice alternating currents on. From touching up the stern of a bull-frog to electric execution is a fairly long stride, but you have made it. All hail!

Since Franklin's brilliant but cheeky experiment with a flash of lightning, the principles of the science have been discovered by men of other lands; but for the development and practical commercial applications of such discoveries, your country stands pre-eminent. Pacinotti, for instance, may have thought about a certain form of ring, but Brush made electric lights with it, and what is more, he sold them to good advantage, too. His success financially was well deserved, though it does not always fall to the lot of inventors to be rewarded in this world. Wilde and Ladd and Sawyer died poor as rats, but Thomson and Houston and Edison have succeeded in piling up on their grave-stones a couple of syndicates that will presently be reaching for heaven after using up all the earth available.

Truly, yours is a great country, and as its representatives and the exploiters of a great and growing industry, we are proud to have you in our midst, and extend to you the right hand and hearty grasp of good fellowship. The Star Spangled Banner shall be entwined with our own Union Jack, and may the sentiment of every loyal American and Canadian be: "Long may they wave!"

ACTIVE preparations are being made for the International Exhibition to be held at St. John, N. B. from Sept. 23rd to Oct. 3rd. This exhibition, it will be remembered, was a most successful affair last year, and the energy which is being evinced by the management will no doubt succeed in improving upon the results then achieved.

We desire to acknowledge our indebtedness and tender thanks to the management of the Grand Trunk Railway Co at Montreal, for having kindly placed at our disposal the plates from which the beautiful illustrations of the cities of Montreal, Quebec and Kingston and other Canadian scenes appearing in this paper, were printed.

AFTER having congratulated intending visitors to the Montreal convention upon the added comfort which the postponement of the meeting from August to September would afford them, it is discouraging to be told by the weather prognosticators that September will be the hottest month in the year. However, there is still a gleam of comfort to be found in remembrance of the fact that on one or two occasions weather predictions have been known to fail.

SOME time ago we had occasion to refer to the questionable method adopted by some manufacturers of electric lighting apparatus in tendering for lights in small towns at ridiculously low rates, and then on the strength of a municipal contract thus obtained unloading the plant on some unsuspecting purchaser, the sale usually being facilitated by representations of profits that can never be realized. Listowel is a case in point, with the difference that the wide-awake people there were not to be taken in. The lights were contracted for at 12 cents per night—fifteen being the number. When the company found they could not unload upon the citizens, they pulled up stakes and took their plant out of town. They were not inclined themselves to take the dose they had prepared for the people of that enterprising place, and evidently thought that the fabulous profits that were to be made out of fifteen lights at 12 cents per night were not likely to materialize. We are sorry to see such a depreciation of values by the very people whose interest it should be to maintain a price that should pay at least a reasonable interest on the investment. Where a municipal contract is to be renewed these bogus prices are quoted as actual facts, and are believed by many who have no knowledge of the true state of the case. The result is a demoralization in the business that it should be the interest of manufacturers to foster. We cannot refrain from expressing a lively hope that these brigands of the industry will profit by the lesson so hardly learned in Listowel.

THE storage battery that was promised in a week or two some months ago, to run a street car in Toronto, has, up to the present time, not materialized. We offered at the time to publish the results of a test, even though those results would compel us to eat our own words and take a back seat for ever more as a critic on things electrical. The ownership of the fundamental patent on the storage battery has been awarded to C. F. Brush after considerable litigation in the United States, but that is a matter of small concern, as it would be difficult indeed for Mr. Brush or anyone else to prove that much money had ever been made out of a storage battery. The accounting of profits need worry no one. The decision in favor of Brush may have the effect of stimulating invention on new lines, such as we have before hinted at. Before a storage battery will even be much use for locomotion it must be reduced in weight. The miserable sloppy, corroding blind electrolyte must be done away with, and a solidity and permanence given to the whole thing to which it is now a stranger. The successful storage battery is the dream of street railway men, and while once or thrice they have thought they were on the eve of realization, it has disappeared "like the baseless fabric of a vision," but it has, at the same time, in most cases, left considerable of a wreck behind. The storage battery is the ideal motive power for a street car, but it will never be attained by a rehash of the well-thumbed discovery of Faure. The inventor must strike out a new line entirely if he would succeed; and genuine success in this matter means both wealth and fame to the men who are fortunate enough to be "in it."

THE introduction of the electric motor is quickly but rapidly making headway in manufacturing establishments. The advantages of this form of power are so evident that the business man who studies his own interests cannot afford to overlook its merits. The absence of fire, smoke, noise and dirt, that are inseparable from a steam engine, and its adaptability to every position or purpose for which it may be required, are great points in its favor. It is always ready at the turning of a button and may be stopped as easily. There is no fire to put out or boiler to fill up together with the attendant risk of locking up a building and leaving it in a more or less doubtful condition of latent combustibility. The insurance underwriters recognize its desirability in this respect, and where it is in use make it a consideration in their rate on account of it. The electric motor will supersede the gas engine on account of its smoothness of motion and uniform

action, besides being free from the intolerable heat and smell and explosion of the jerky gas machine. For small powers it will be cheaper than steam, and even for larger ones the advantages enumerated above will counterbalance a slight increase in the expense. A notable field for its use will be in driving freight and passenger elevators. Its first cost will be less than for a similar power of hydraulic elevator, and its many expenses afterwards very much less. The cost of repairs to hydraulic apparatus in this city during the past year on account of sand and grit have been large, besides the risk of stoppage during the dry months on account of a shortage of water in the city reservoir. Altogether, the electric motor has a large field before it, and its merits are such that before long we may expect its use to be all but universal.

HERE will shortly be a fine chance for electrical men to show what can be done by electricity on a city street railroad. Up to the present time electric roads in Canada have been confined to one or two short lengths of suburban railway. In fact, taking the continent all over, with the exception of Boston, electric roads, though many in number, have been principally operated in the smaller cities. Large centres of population are, however, rapidly coming into line, Cleveland and Buffalo being the latest additions to the list. There is no question but that the electric car is the ideal of urban transit. Its cleanliness—the number of horses used on the streets being reduced by thousands—the decrease in wear and tear of the road, its rapidity of motion and docility—if such a word may be permitted—to the ease with which it may be handled, stopped, started and reversed in a crowded thoroughfare—are but a few of its many advantages, and for the sake of these the citizens may well afford to put up with the necessary additions to the overhead system of wires that it will entail. The conversion of the present street railroads of Toronto, which must be done in the near future, to an electric system, will involve the construction of immense steam and electric works in the city. In the first place, steam power to the extent of between three and four thousand horse power will be needed. This will require buildings, engines, boilers, pumps, immense smoke stacks and foundations. Then there will be the electric generators, which will no doubt conform to the most recent practice of large power machines driven by interchangeable mechanism to allow of each being stopped and started independently of the others. The overhead construction will require a large amount of copper and line material, and the roadbeds will require relaying with the most approved form of rails. The cars and electric motors will not be the least part of the undertaking, and if built and equipped in the city will be equivalent to the introduction of a new industry amongst us. The power plant will have to be centrally located to avoid loss in transmission and unnecessary wires, and of course will be arranged with a view to economical fuel supply. The combined and finished work will be an extensive undertaking, and will give our electrical men a fine opportunity to show what can be done in city street railway work, besides being to the successful contractors a source of profit. If this work is commenced at once—as there is every probability—together with the meeting of electricians and manufacturers in convention in Montreal, it should give an impetus to electrical matters in the Dominion which we hope may redound to the honor and profit of all concerned.

AT a recent meeting of one of the English engineering societies, a paper was read giving a description of an experimental engine which had been constructed for the use of a Professor of Engineering in one of the technical schools. It was so arranged that work up to 150 horse power could be taken out of it, and steam of any pressure up to about 200 lbs. could be used. Different styles of valve gear could be attached, and it was believed to be the most complete and comprehensive engine ever built. In the discussion which followed, one member threw out a very valuable suggestion. It was to the effect that if he had a class to teach in the use of the steam engine, he would have an engine in which the valves would be wrongly set and the bearings loose and working badly, and then he would set the class to work with the indicator to find out what was wrong and to remedy the defect. Could not our own local Society of Stationary Engineers act upon this idea? It has been often said that every steam engineer should study indicator diagrams. The study of a diagram will not do much good, however, unless one knows something of the engine from which it was taken, and how the diagram was obtained. During the coming winter could not a class be formed to try experiments on actual steam engines? Owners of engines could be found who would be willing to allow them to be used for so good a purpose, if used under the directions of some one competent to advise and instruct the class. For example, an engine with a common slide valve might first be examined and measured, after working hours, by the class, and then put together for next day's work. During next two or three days the pressure of steam carried and coal used should be carefully noted by the engineer in charge. During those days the teacher should apply the indicator and obtain some diagrams. At the next meeting these results should be reported and studied. The setting of the valve should then be changed to whatever the majority of the class might decide would improve the engine, and for another few

days the coal should be weighed and the effects of the changes noted. When a common slide valve engine had been thus studied, a Corliss and a Brown could be obtained, and the methods of testing and adjusting these valve gears practically studied. There should not be too many in a class probably seven or eight will be found quite large enough but the Association might form more than one class. This method of studying the steam engine would prove of immense advantage to the students, and so profitable to owners that there should be no difficulty about getting engines to experiment upon. In some cases it might be possible to get the members of the class together in the engine room while the engine was being run with a load on. In such a case, the members themselves could take the diagrams under the teacher's directions, and so obtain practical knowledge of the use of the indicator in the taking of diagrams. A class of this kind under a good teacher would do more for its members in a single winter than could be got by three times the time spent in merely studying diagrams in books on the steam engine.

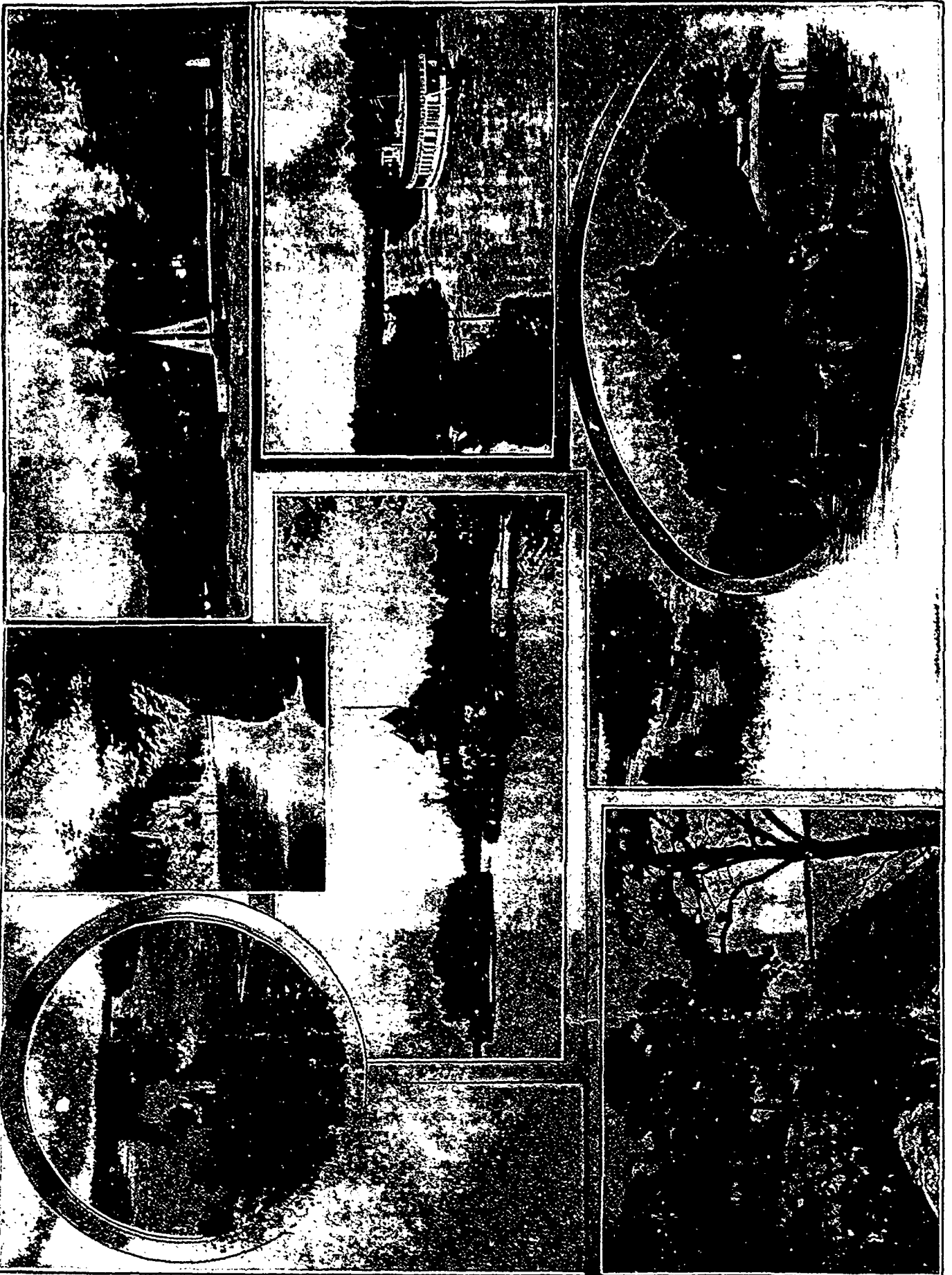
WE must protest against the manner in which some parties interested in, or desiring to be interested in, the electrical business, are working to injure not only the entire electrical business, but more especially the business of certain parties who have invested large amounts in the business expecting that they would have a few years quiet in which to reap some results from their investments. We refer more particularly to the conduct of some so-called agents in going into a town where a reliable electric light company are doing business, making a canvass of the customers and would-be customers, and offering them all sorts of inducements to take lights at a lower figure than they have been in the habit of paying. Especially is this the case in certain districts of cities or towns that the local company may not have been in a position to reach yet. The mode usually adopted by these agents is to forestall the company and endeavor if possible to get a number of contracts signed at a lower price than the company have intended to offer at. Their next step is to call upon the management of the local company and offer them these contracts for a certain sum, threatening that if they do not meet their demands, they will establish an opposition plant. Not only has this mode of procedure been adopted by men of no standing, but, we are sorry to relate, companies who are doing a fairly good and legitimate business have sanctioned the actions of their own representatives in trying to force a local company into meeting their demands. This is not a legitimate way of doing business, for in ninety nine cases out of a hundred the companies using this sort of blackmail have no intention whatever of putting in a plant. The fact is, it would not pay to do so, but simply for the sake of either selling their goods or of benefiting an agent by levying blackmail upon the local company, they resort to such tactics, which not only have the effect of injuring the reputation of the local company, but injure the entire electric lighting business. Whilst we believe that good healthy competition is the life of trade, when two companies oppose each other might and main and reduce the price to a basis on which no money can be made, the result will be felt more by the manufacturers of electrical apparatus than by anyone else. This sort of thing has been going on for some time, and the sooner it is stopped and the demands of these unprincipled parties refused point blank by local companies, the more universal will the use of electric lighting become. We could understand a company who intended doing simply a constructing and operating business, indulging in a little of this sort of thing, but not running the business into the ground. This unprincipled way of doing business has been decried in the United States, and it is time that something was done in Canada to stop it before it goes too far. We believe that if local companies would stand together in such matters, the scheme would soon die out. Intending users of electricity should be very careful with whom they sign contracts. They should know positively beforehand that the parties canvassing them for their lights are responsible and reliable, and not working a scheme whereby they can levy blackmail on legitimate business. We venture to make the assertion that not 2% of the contracts for lights taken in this way within the last year have been carried out. They are simply held by the unprincipled parties who obtain them as a club over the heads of those who already have plants. We trust our readers will assist by every means in their power to cry down this unprincipled mode of doing business, and protect the parties who have invested large sums of money in electrical enterprises.

The offer of the local electric light company of Owen Sound to supply 30 or more lights for five years from October next has been accepted.

The annual convention of the Association of the Edison Illuminating Companies was held a fortnight ago in the city of New York. The convention lasted three days, and was most interesting and profitable.

The plant which is being erected by the Standard Electric Co., for supplying light and power to the citizens of Ottawa, Ont., is of an extensive character, and will be operated by three 66 inch turbine water wheels, developing 100 h. p. The shafts from the water wheels are of steel 7 1/2 inches in diameter, each fitted with a mortise bevel gear wheel, 8 feet in diameter, with teeth 20 inches long. The iron pinions which work in these wheels are nearly 4 feet in diameter. The three main shafts are also of steel, 7 inches in diameter, and have on them the three main driving pulleys, which are 10 feet in diameter, and 52 inches wide. The shafting, gearing and pulleys are carried on nine massive iron bridge trees.





PHOTOGRAPHS BY J. H. BROWN

### SCHOOL OF PRACTICAL SCIENCE, TORONTO.

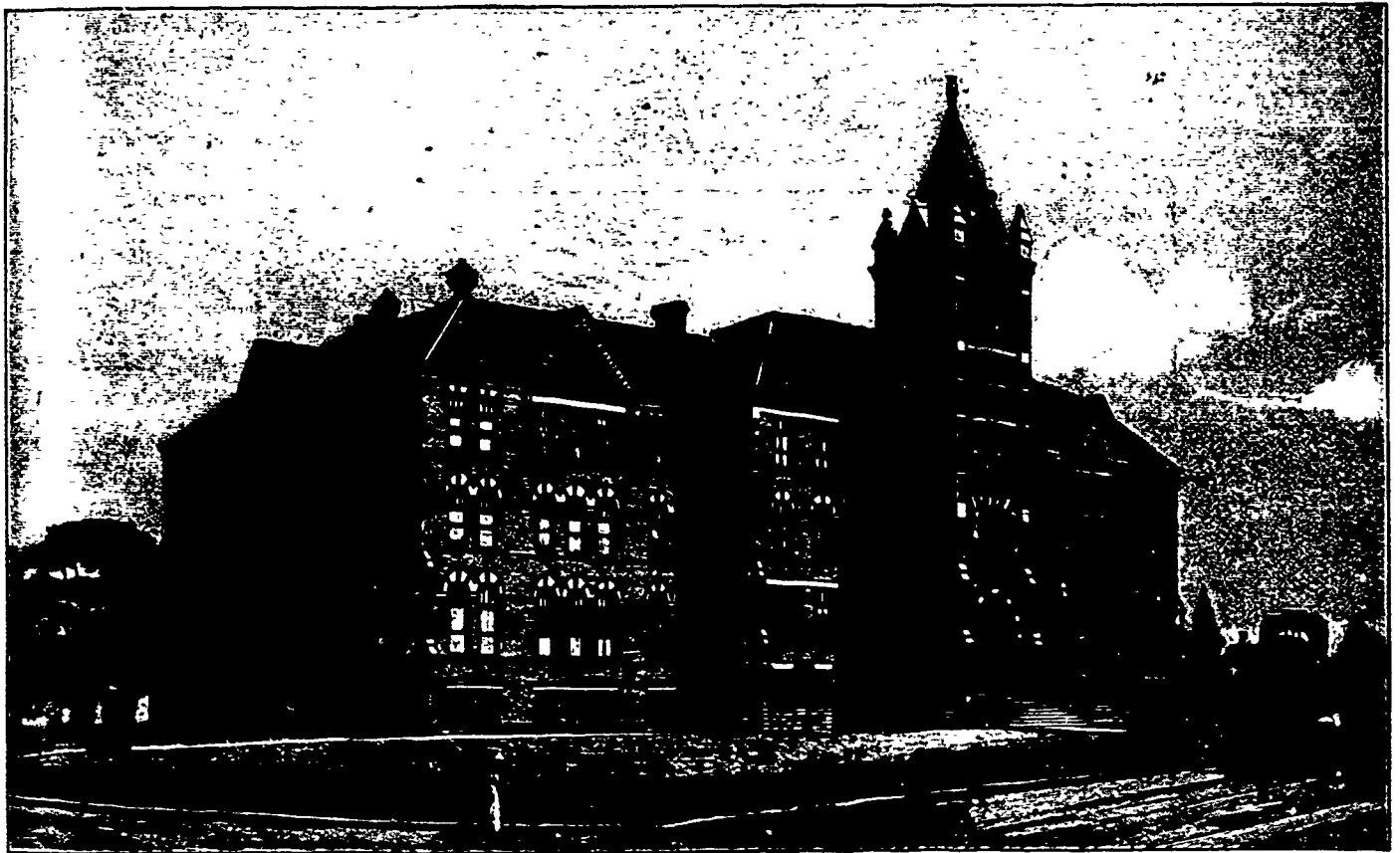
WITH the accompanying illustrations of the School of Practical Science, Toronto, are presented a few facts concerning the history and work of the institution, which should have an interest for most of our readers, more particularly young men who are considering the subject of acquiring a technical education which will qualify them for positions in the mechanical world.

In the session of 1877 the Legislative Assembly gave its sanction to the establishment of a School of Practical Science on the basis proposed in a memorandum of the Minister of Education.

By the scheme thus approved of, the government effected an arrangement with the Council of University College whereby the students of the School of Practical Science enjoyed full advantage of the instruction given by its professors and lecturers in all the departments of science which were embraced in the work of the School. This arrangement was brought to an end in 1889 by the transfer of the departments in science above referred to, from University College to the University of Toronto under the operation of the University Federation Act.

There are five regular departments of instruction, in each of which diplomas are granted, viz.: Civil Engineering (including Mining Engineering); Mechanical and Electrical Engineering; Architecture; Analytical and Applied Chemistry; Assaying and Mining Geology. The instruction given in each of these departments is designed to give the student a thorough knowledge of the scientific principles underlying the practice in the several professions, and also to give him such a training as will make him immediately useful when he enters into active professional work.

The facilities possessed by the School for affording professional instruction are now being largely increased by additions to the building, equipment and teaching staff. An Engineering Laboratory is being formed which will be furnished with testing machines for testing the strength, elasticity and other qualities of materials of construction, and also with an experimental steam plant, consisting of engine, boiler, pumps, etc., for making experiments in the economical use of steam. The laboratory will be provided with pumps, tanks, turbines and other appliances necessary for conducting hydraulic experiments. It will be supplied with all necessary standard gauges, scales and



SCHOOL OF PRACTICAL SCIENCE, TORONTO.

In order that the students of the School might continue to enjoy the advantage of the instruction in the above departments, the Senate of the University of Toronto passed a Statute in October, 1889, affiliating the School to the University, which Statute was confirmed by the Lieutenant-Governor in Council on the 30th day of October, 1889.

By an Order in Council, approved by the Lieutenant-Governor, on the 6th day of November, 1889, a Principal was appointed, and the management of the School was entrusted to a council composed of the Principal as chairman, and the Professors, Lecturers and Demonstrators appointed on the Teaching Faculty of the School.

The Faculty of the School is composed as follows: J. Galbraith, M.A., Assoc. M. Inst. C. E., Principal. Members of the Council:—J. Galbraith, M. A., Assoc. M. Inst. C. E., Professor of Engineering, (Chairman); W. H. Ellis, M.A., M.B., Professor of Applied Chemistry; L. B. Stewart, P.L.S., D.T.S., Lecturer in Surveying (Secretary); C. H. C. Wright, Grad. S.P.S., Lecturer in Architecture; T. R. Rosebrugh, B.A., Grad. S. P. S., Lecturer in Electrical Engineering; Cesare J. Marini, Grad. S.P.S., Lecturer in Sanitary Engineering. Assistant instructor:—W. Ross, B.A., Fellow in Applied Chemistry.

measuring instruments. There will also be a full equipment of dynamos, motors, accumulators, electric lamps, measuring apparatus, etc., for the purpose of instruction in electrical engineering. There will be in connection with the laboratory a machine shop for the purpose of preparing specimens to be tested, making repairs, etc.

The Department of Mechanical and Electrical Engineering is intended to afford the necessary preliminary preparation to students intending to become mechanical and electrical engineers. The subjects of the first year are: Mathematics—Euclid, Algebra, Plane Trigonometry; Analytical Plane Geometry. Mechanics—Statics and Dynamics (with special reference to structures and machines). Experimental Physics—Light: Use of the Heliostat and Spectroscope, Experiments with Lenses and Mirrors, Theory of the Microscope and of Reflecting instruments. Drawing—Copying from the Flat, Lettering; Graphics; Descriptive Geometry in its application to plane sided solids; Orthographic (including Isometric) and Oblique Projection. Surveying—(Lectures only, applications of Trigonometry and Principles of Measurement). Chemistry—Elementary Chemistry with Laboratory Practice. The subjects of the second year are: Mathematics—Differential and Integral

Calculus, Spherical Trigonometry; Physics Hydrostatics, Optics, Magnetism, Electricity; Experimental Physics Heat. Use of the Cathetometer, Dividing Engine, and Spherometer, Thermometry and Calorimetry; Drawing Subjects of the first year continued, Coloring and Shading applied in construction drawing, Descriptive Geometry in its application to solids bounded by curved surfaces, the various projections of the sphere, Machines and Structures, (Drawings made from both copies and original notes; Engineering—Statics and Dynamics, (Pure and Applied), Theory of Mechanism, Strength and Elasticity of Materials, Materials of Construction, Methods and Processes, Experimental work in Engineering Laboratory; Chemistry Theoretical Chemistry, Practical Chemistry, Applied Chemistry, Combustion, Fuel and Furnaces, Metallurgy of Iron and Steel. The subjects of the third year are: Experimental Physics Acoustics, Electrical Measurements and Testing, Drawing—Subjects of the previous years continued, Descriptive Geometry. Shades and Shadows, Stone Cutting, Perspective Projection, Original Designs Engine and Machine Design, Engineering—Subjects of previous years continued, Applied Mechanics. Mechanics of Machinery, Machine Design, Thermodynamics and Theory of the Steam Engine, Hydraulics, Electricity—Dynamometers and Motors, Application of Principles to Practical Problems connected with the design, construction and testing of various Prime Motors and Machines, Experimental work in Engineering Laboratory, Chemistry (Applied) Artificial Lighting, Photography, Explosives, Preservation of Wood, Iron and Stone, Metallurgy.

In addition to taking the course of instruction in the school and passing the requisite examinations, a candidate for the diploma in Mechanical Engineering will be required to present satisfactory evidence of having had at least one year's good practical experience in one of the principal occupations connected with mechanical work, such as machinist, pattern-maker, moulder, steam engineer, etc. There is no restriction as to the place where the candidate may have gained such practical experience.

In order to provide advanced work in the various departments and also to enable students to carry on experimental work in the laboratories with less interruption from attendance at lectures and other causes than is possible in the ordinary three years' course, it has been decided to establish a sessional course of instruction in each department to be known as the Fourth Year.

The subjects of study in the fourth year in the Department of Mechanical and Electrical Engineering are: Method of Least Squares, Theory of Observations, Strength and Elasticity of Materials, Hydraulics, Thermodynamics, Electricity, Engine and Machine Design. A great part of the work in connection with these subjects will be done in the engineering laboratory. The time of the candidates will be principally devoted to tests in connection with boilers, engines, dynamometers and electric motors.

The expenses of a regular course are approximately as follows:

Sessional Fees.....	\$120 00
Books, instruments, drawing materials, laboratory fees, etc., about as follows: 1st year, \$60.00; 2nd Year, \$40.00; 3rd Year, \$30.00	130 00
Total for Regular Course.....	\$250 00

Additions and improvements are in progress in connection with the institution. Many of them are now sufficiently advanced to enable a large amount of new work to be done next season.

#### DOMINION WIRE MFG. CO.

THE Dominion Wire Manufacturing Co., whose works are now situated at Lachine, and cover about 5 acres of ground, commenced operations under the style of the "Dominion Barb Wire Co." in 1880, in a small building on Foundling Street, Montreal. The business at that time amounted to only about \$28,000 per year, being for barbed wire only. Since that date by judicious advertising and pushing the business, they were obliged to increase their factory, and finally decided to remove to Lachine, where they could get plenty of room for their works. Accordingly, in 1884, the company erected large works at Lachine, and having decided to draw and galvanize their own wire, and also add other industries which consumed wire, they changed the name of the company to "The Dominion Wire Mfg. Co.," under which title it is known to-day.

The main building at Lachine is 300 ft. x 100 ft., with two wings 150 ft. x 60 ft., running to the north of the main building, and two wings to the south 100 ft. x 60 ft., two large rod sheds capable of holding from 3,000 to 4,000 tons of rods; one large warehouse to the west, 100 ft. x 50 ft.; also Hunt's automatic elevator, situated on the banks of the canal, which takes their coal and rods from the barge and delivers them where required at the works. Detached from this main building is the screw and wire rope factory. The building is 50 ft. x 150 ft., with one wing 60 ft. x 60 ft., and a warehouse 30 ft. x 40 ft. All these main buildings are built in the most substantial manner, of brick and stone foundations, and are virtually fire-proof. They have nine steam engines in operation; the largest is about 400 horse

power, compound condensing. The machinery throughout is of the latest and most improved design, most of the machinery and processes being covered by patents.

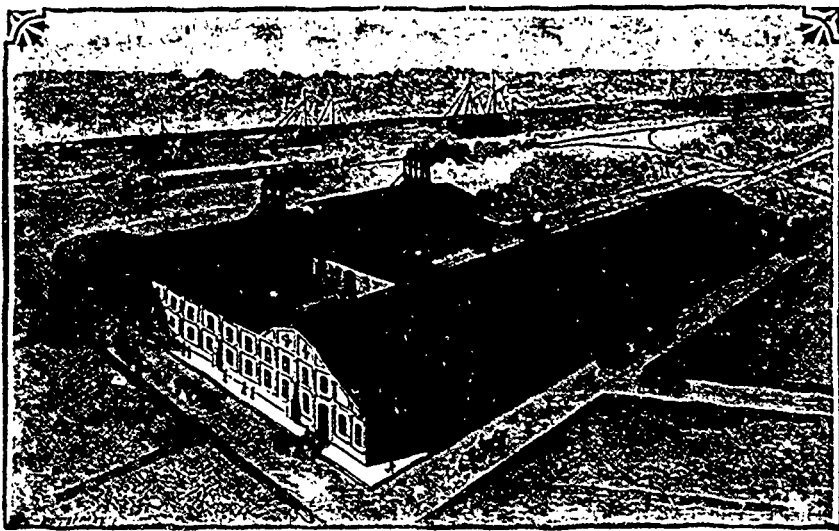
The company is now manufacturing all kinds of steel and iron wire, bright, annealed, oiled and annealed, galvanized, tinned, coppered, B B, and extra B B telephone and telegraph wire, nail and rivet wire, tinned mattress and broom wire. Their capacity

for iron and steel wire, as above mentioned, is about 50 tons per day. They also have a further capacity of about 10 tons per day for copper, both for commercial and electrical purposes, and brass. The company has recently gone into the manufacture of copper and brass, having put down a plant which cost them about \$35,000, and which is sufficiently large to cover all the increase in this trade that is likely to occur in the next ten years.

In addition to barbed wire, a capacity of about 10 tons per day, they have added to their manufacture wire nails, wood screws, hay-bale ties, and Jack-chain.

The present plant and machinery has cost the company over \$250,000, and if they were able to keep the works running full time could produce over \$1,000,000 worth of goods per year. No doubt, however, with the rapid development of our North West territories, in time they may be able to keep the works going steadily. They employ about 350 men, besides a large staff of office hands, the pay roll being about \$10,000 per month.

The specifications for the lighting of the city of Kingston by electricity stipulate that arc lights shall be supplied at from 1,000 to 2,000 candle power. The number of lamps required will be from 87 to 100, and a number equivalent if incandescents are adopted. It is also provided that should the corporation consider it necessary during the continuance of the contract, all or any portion of the wires shall be placed underground by the contractor. This work shall be done under the supervision of the city engineer. The cost will be decided by arbitration. At the termination of the contract the city will have the option of purchasing the plant at a price to be fixed by the arbitrators.



WORKS OF THE DOMINION WIRE MFG. CO., LACHINE, QUE.

# THE GOUBERT FEED WATER HEATER

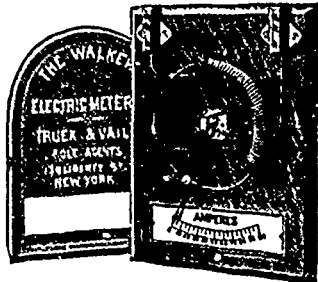
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Electrical Contractors and Dealers in Electrical Supplies.

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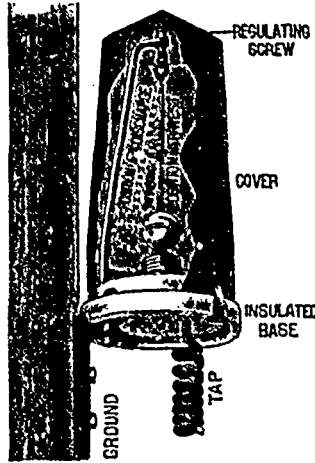
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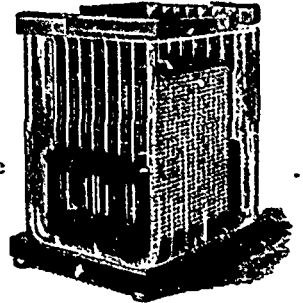
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Automatic  
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In capacity,  
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For Electric Lighting or Power.

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INSULATED  
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The standard high grade insulation for Telegraph, Telephone & Electric Light work.  
Aerial, Underground and Submarine Cables,  
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The most perfect acid, alkali and water-proof Coatings.

The Best Insulation.

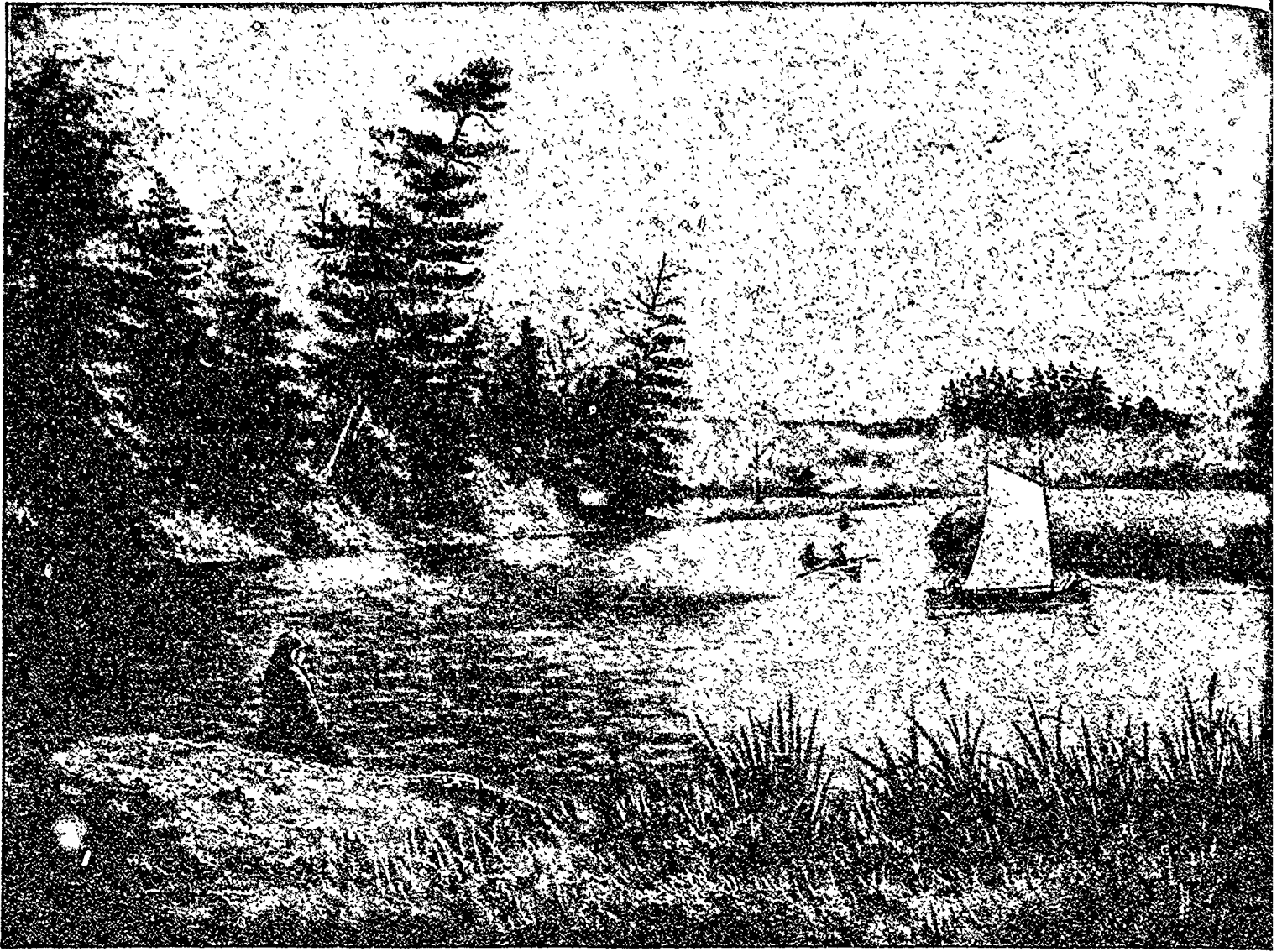
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### THE STANDARD PAINT CO.

2 Liberty Street,

**NEW YORK.**

For sale by supply houses in all parts of the United States, Canada and Great Britain.



ON THE HUMBER RIVER, NEAR TORONTO



ROUGH MOUNTAINS.

### A CANADIAN ELECTRICAL ASSOCIATION.

THE following letters have been received in response to a circular issued by the publisher of the *ELECTRICAL NEWS* asking for an expression of opinion regarding the desirability of forming an association to conserve electric interests in Canada, and suggesting September 17th, as the date for a meeting of those interested to formally discuss the subject:

Wm. Bathgate, Manager Winnipeg Electric Light Co.:—"Too far for us to go."

J. Telfer, Manager Blenheim E. L. Co., Blenheim, Ont.:—"I shall be happy to meet you on the 17th of Sept. as requested."

Palmerston Electric Light Co., Limited, Palmerston, Ont.:—"We will be pleased to accept your invitation to the meeting in question on Sept. 17th."

Guelph Gas Co., Guelph, Ont.:—"We are decidedly in favor of a Canadian Electrical Association, and will be represented at any meeting called for that purpose."

A. Groves, Fergus, Ont.:—"Replying to yours of 1st inst., I may say I shall, if possible, attend meeting on Sept. 17th to consider the formation of Electrical Association."

S. Henry, Kincardine Electric Light Co.:—"At present I cannot say whether I will be able to attend meeting to be held on the 17th of Sept. or not. If possible, I will do so."

Dominion Electrical Manufacturing Co., Toronto:—"We think as you do, that an Electrical Association for Canada is what we need, and will do all in our power to aid same."

C. A. Phillips, Midland Electric Light Co., Midland, Ont.:—"I will be pleased to see organized such an Association as you speak of, and will attend a meeting as proposed by you."

Bowman & Zinkan, Southampton, Ont.:—"We received your circular, re Canadian Electrical Association. We cannot be present on Sept. 17th, but we think such an association might be of some benefit."

F. N. Saylor, Strathroy, Ont.:—"In reply to yours of 1st inst., I cannot be in Toronto at that date. An Electrical Association would be a great benefit to the Canadian electrical industry, but I regret I cannot take part."

W. Moore & Sons, Meaford, Ont.:—"In answer to your inquiry with reference to a Canadian Electrical Association, we would be pleased to become a member of it, and could no doubt attend a meeting in Toronto during Exhibition week."

A. W. Brice & Co., Hamilton, Ont.:—"Yours of the 1st inst. to hand, and in reply we beg to express our approval of an Electrical Association being formed in Canada, and will, if possible, be represented at the proposed meeting on Sept. 17th."

D. McDonald, Manager Electric Light & Power Co., Orangeville, Ont.:—"In answer to your circular of the 1st inst., I will be most happy to attend the meeting you speak of, to be held in Toronto on Sept. 17th for the formation of a Canadian Electrical Association."

Roberts Storage Battery and Electrical Construction Co., Toronto:—"Concerning your letter of the 1st inst., we beg to say that we think the suggestion a good one, and anything that we can do to further the practical working out of the idea will be gladly done."

Manager Electric Light Co., Cannington, Ont.:—"In reply to yours re formation Electrical Association, I think such a move would be one in the right direction, and would be pleased to attend on date mentioned, if no unforeseen occurrence arises to prevent my doing so."

Yarmouth Gas Light Co., Limited, Yarmouth, N. S.:—"Your circular letter duly received, and contents carefully noted. I am pleased to know of the intended formation of an Electrical Association, and am fully in accord with your views, and will, if possible, attend your meeting."

New Glasgow Electric Light Co., New Glasgow, Nova Scotia:—"We heartily concur in your idea to have an Electrical Association formed. We can't say whether it will be possible for any of our staff to attend your meeting, but whether we get there or not, we wish you success."

I. J. Gould, Uxbridge Electric Light Co.:—"In reply to yours of the 1st inst., I think the proposition to form a Canadian Electrical Association is a good one, and should business en-

gagements permit, I will be pleased to attend a meeting on the date named in your letter."

W. J. Clarke, Trenton, Ont.:—"It would give me great pleasure to be present at the meeting on Sept. 17th next (if possible), and to take an active interest in the work of organization. Please notify me at Trenton a few days before the meeting so that I will not overlook it."

Aylmer Electric Light Co., Aylmer, Ont.:—"Received your circular in re meeting September 17th to discuss the advisability of forming a Canadian Electrical Association. We are not certain whether we will go down to Toronto at that time, but if we do will try and be present at the meeting."

A. A. Wright & Co., Renfrew, Ont.:—"Your circular of the 1st inst. re formation of a Canadian Electrical Association, is just to hand, and in reply would say that we are heartily in accord with the movement, and shall do our best to be present on the 17th of September as suggested in your circular."

Stormont Electric Light and Power Co., Cornwall, Ont.:—"In reply to your circular of July 1st, we would state that our company would be pleased to belong to such an association as you mention, but at present we are unable to say whether we could send anyone to attend the meeting at the date mentioned."

Paris Electric Light Co., Paris, Ont.:—"Your communication of July 1st received and contents noted. We approve of the idea of forming a Canadian Electrical Association, and will help it along as far as it may be possible for us to do so. Expect to be in Toronto during the Industrial Exhibition, and will make it a point to attend meeting."

Fredericton Gas Light Co., Fredericton, N.B.:—"Your circular letter of 1st inst. is before me. I regret very much that I will be unable to attend your proposed meeting of those interested in electrical matters, to be held at Toronto on Sept. 17th. I am too new to the business to offer any suggestions to those who I hope will attend your meeting."

Toronto Electrical Works, Toronto, Ont.:—"We have your note of July 1st at hand, in reference to the organization of a Canadian Electrical Association. We shall be very glad to meet with those who are interested in the formation of the proposed society, and to give it our support. Such a society to be a success in Canada, should be very broad in its character and scope."

St. Thomas Gas and Electric Light Co., H. Brown, Manager, St. Thomas, Ont.:—"Your circular, re Electrical Association, is before me, and in reply, beg to say that I am in favor of such organizations, for no doubt they are a great benefit to all concerned. As I am not a practical electrician, it would not be my business to take any part in the formation of such an association, but if allowed to do so afterwards, I should consider it a privilege to become a member."

M. D. Barr, District Manager, Edison General Electric Co., Toronto, Ont.:—"I have yours of July 1st regarding formation of society to be called the 'Canadian Electrical Association.' I understand that there is a society of this kind in Montreal. Would it not be well to correspond with them, and make some kind of a combination for a National Association. I shall be pleased to be at the meeting, and will do what I can to forward the interest of such a society."

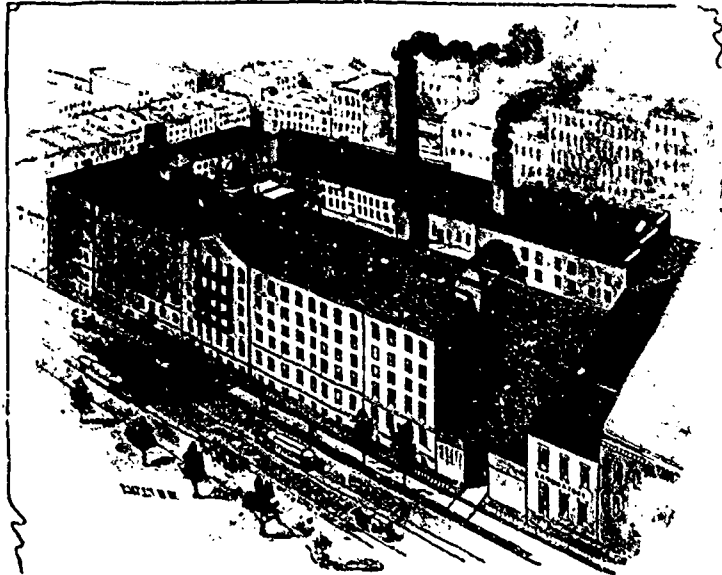
Louis Perrault, Manager Perrault Electric Light and Power Co., Montreal:—"I am in receipt of your favor of the 1st inst., and in my opinion I think the best thing to do is for Canadians to join the American Electrical Association, inasmuch as we have every thing to learn from our neighbors who are far ahead of us in that line. If I understand aright, the formation of such a society is for the promotion of electric interests in the country, and the organizing of exhibitions to instruct the people and make them acquainted with the progress of the industry, and as we have very little to boast of in our country, we had better join the existing one in the neighboring republic and be proud of being members of an important body in the advancement of science. I am sorry to say I will not be able to attend the proposed informal meeting to be held in Toronto on the 17th of September next, with a view of establishing such an association, owing to pressure of business here at that season, but will be glad to assist you in this city in my business capacity only, not being myself a practical electrician."

A new cable will be laid between Detroit and Windsor by the Bell Telephone Co. The old cable is badly damaged and part of it is caught on a wreck on the bottom of the river and cannot be released. One half of the cable has been cut away and the company think it more advisable to put in an entire new one than attempt to repair the present one. The new cable will be brought from Germany and will require about six weeks to get and put in working order.

# SAWYER-MAN ELECTRIC CO.

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## H. WARD LEONARD & CO.

*ELECTRICAL ENGINEERS,*

### GENERAL ELECTRICAL INTELLIGENCE BUSINESS.

**U**NDER the above heading we have considered a very important feature of our business which will be entirely unique and commendable. To any Isolated Plant we offer at a very moderate subscription price (\$25.00 a year) the privilege of corresponding upon any electrical subject of practical interest. Thus an isolated plant will be able to secure expert information as to its own plant, the best methods of operating it, and about any new electrical apparatus or methods and the principles underlying various devices and the prices thereof. For Central Station and Street Railway Companies, whose queries would go further into Steam Engineering and methods of distribution, and also would cover business questions as to relations with consumers, systems of accounts, etc., the annual subscription charge for this electrical intelligence will be \$50.00.

In case the expert judgment of the Company be desired as to comparative merit of various competing apparatus or methods, such expert judgment will be given by special arrangement, although the Company prefers to merely supply full information under the subscription arrangement and allows the purchaser to form his own conclusions.

#### SUBSCRIPTION CONTRACT.

H. WARD LEONARD & CO.

189

Gentlemen: Please enter the subscription of the undersigned for such electrical information as may be requested of you, subject to the following conditions:

**FIRST.** The subscriber shall have the privilege of calling for any information which he considers may be of practical value to him in the operation of his plant.

**SECOND** All queries shall be by correspondence only.

**THIRD.** H. Ward Leonard & Co. shall not be called upon under this yearly subscription to give its expert judgment on the comparative merit of various apparatus or systems, but shall furnish full descriptive information regarding the character, principles, methods, forms, catalogues, prices, etc., involved by the questions, as far as they are able to.

**FOURTH.** All information supplied to the subscriber shall be confidential and for his information only.

**FIFTH.** This subscription shall be for one year from date and at the rate of Twenty-Five Dollars per year.

Signed .....

The usual subscription is by the year. To enable subscribers to judge of the merits of such a plan, the Company will make the following special offer:

#### SPECIAL NOTICE.

To all parties signing the above subscription contract and returning same to the Company promptly, it will agree that the date of the expiration of the contract is December 31st, 1892.

To parties other than Isolated Plants and Central Stations, special quotations will be made for these services on application.

Address: *ELECTRICAL EXCHANGE BUILDING, NEW YORK.*

**THE VANCOUVER ELECTRIC RAILWAY AND LIGHT CO.**

The Vancouver Electric Railway & Light Co., Ltd., was formed less than two years ago by the consolidation of the Vancouver Electric Illuminating Co., and the Vancouver Street Railway Co., and at once began the construction of a plant for

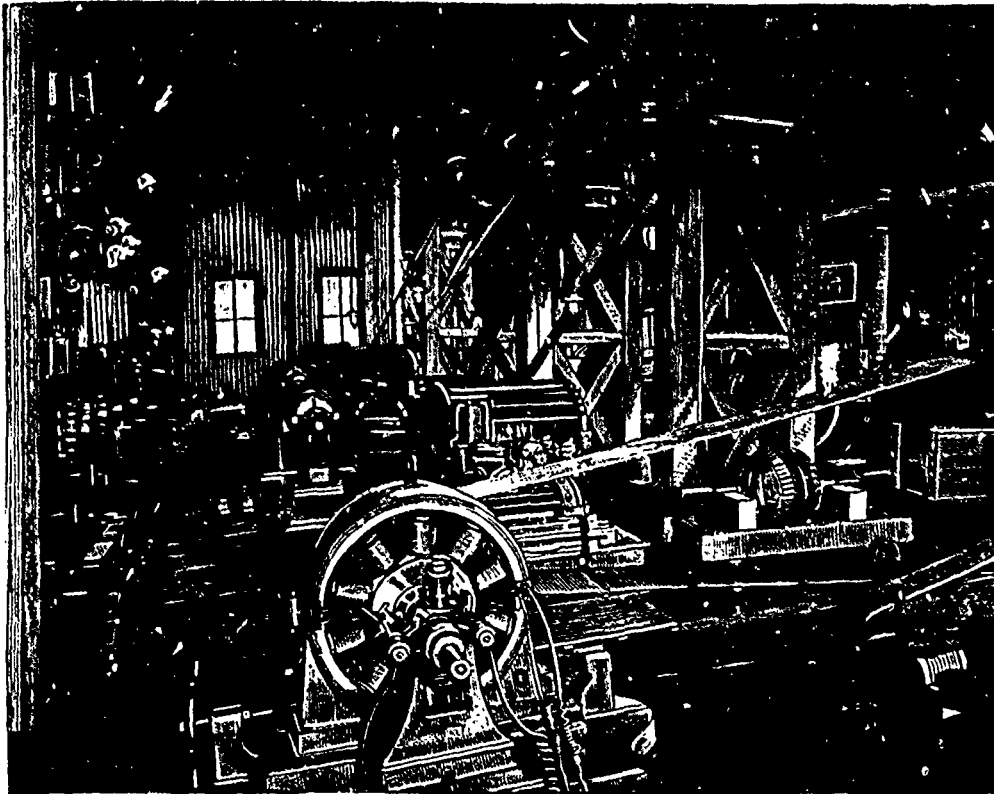
The car house has been doubled in size, and is now 45 x 120 feet. The company has 3½ miles of road in operation, and is now engaged in building about five more, which will be completed this fall. Twenty-five pound rails were used in the present track, but nothing less than 40 lb. rails will be used in future.

The gauge is standard, and the maximum grade five per cent. Six cars are now in use—four with two 10 h. p. motors each, and two with 15 h. p. motors. The cars were manufactured by the John Stephenson Co. and the motors by the Thomson-Houston Co. Four new cars by the same maker are being equipped with two 20 h. p. Westinghouse motors each, as some of the grades on the extension run as high as eight and nine per cent.

Both the arc and incandescent systems are loaded to their full capacity, and additions will be made to them at once. The plant is thoroughly equipped with testing instruments in all departments to assist in carrying out the company's policy of taking every precaution against the interruption of service.

Mr. F. L. Dame, formerly district engineer of the Westinghouse Co. at Portland, Ore., is superintendent. Collections

and miscellaneous business are looked after by Mr. W. E. Brown, who has the title of business manager. T. E. Barnett is chief engineer. Owing to the resignation of Mr. H. E. McKee, who has held the presidency since the organization of the company, that office is now vacant. The officers are: T. Dunn, vice-president; H. T. Ceperley, Sec.-Treas.; Directors—T. Dunn, J. W. Horne, M.P.P., C. D. Rand and Geo. Turner.



DYNAMO ROOM, VANCOUVER ELECTRIC RAILWAY AND LIGHT COMPANY.

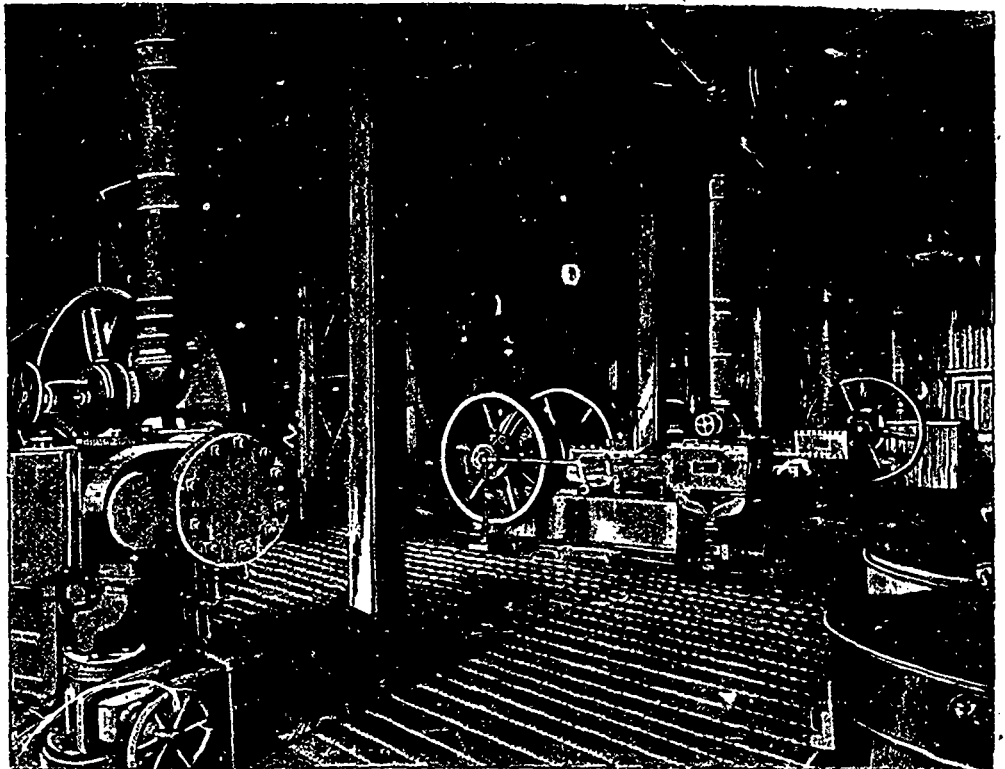
operating the street railway and arc and incandescent lighting systems.

One year ago last June it began actual operation with the apparatus shown in the accompanying photographs of engine and dynamo rooms.

The electrical machinery is comprised of three fifty light Thomson-Houston arc machines from the Royal Electric Co. of Montreal, two 750 light Westinghouse alternators with separate exciters, and two 80 h. p. Thomson-Houston railway generators from Lynn, Mass. The steam plant consists of one Westinghouse and three Armington & Sims engines of 100 h. p. each.

By means of the elevated countershaft almost any combination of dynamos and engines may be obtained, so that a serious interruption of service is very nearly impossible. The buildings are situated on Barnard Street, near Westminster Ave., and have a wharf frontage on False Creek of 180 feet, so that the company is able to bring coal direct from the mines on scows in large quantities.

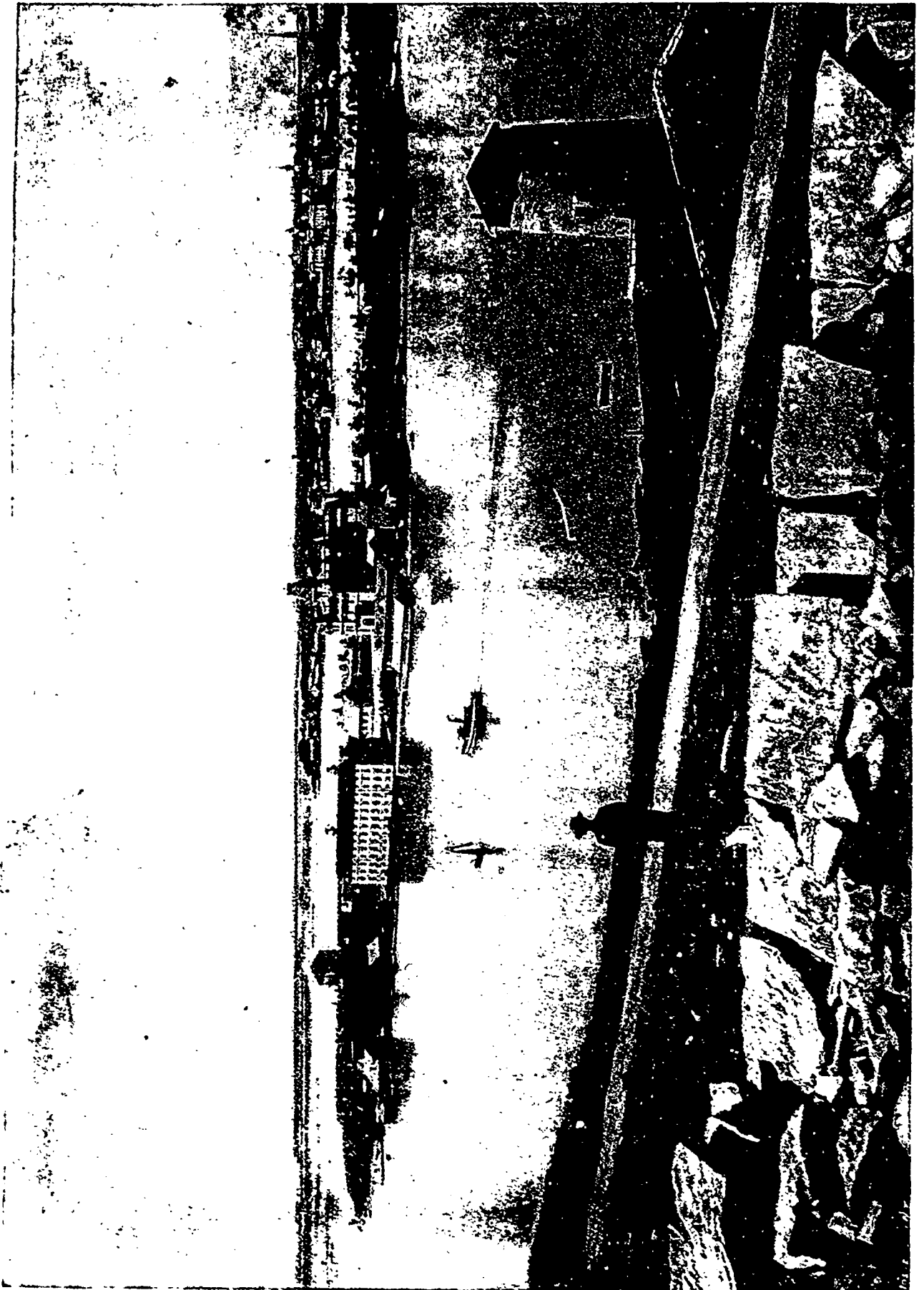
The power house is a brick veneered building one story in height and 70 x 85 feet on the ground. Early in the present year it became evident that the present buildings would furnish inadequate space for the coming winter, and a two story addition 50x85 feet has been added, making the whole building 85 x 120 feet. The addition to the engine room will contain a Westinghouse compound engine and three T.-H. generators, and leave the engines now in use for railway work available for lighting. The second story of the new building will be used for storerooms and offices.



ENGINE ROOM, VANCOUVER ELECTRIC RAILWAY AND LIGHT COMPANY.

While the gases of combustion from the thorough burning of one pound of coal would be from 276 to 533 cubic feet at 500 degrees Fahrenheit, they would at 62 degrees occupy only 150 to 290 cubic feet; and this agrees pretty closely with the 140 cubic feet of air at 62 degrees Fahrenheit required to completely burn one pound of coal.





CITY AND HARBOR OF KINGSTON, ONT.

### MCGILL UNIVERSITY.

The accompanying engravings will serve to illustrate the new W. C. McDonald Engineering Building and the Physical Building in connection with McGill University, Montreal. Some particulars are appended concerning the institution, the course of studies prescribed for students of electrical and mechanical engineering, and the facilities afforded the youth of Canada for acquiring a technical education.

The Faculty of Applied Science is composed as follows: Sir William Dawson, C.M.G., L.L.D., F.R.S., Principal; Henry J. Bovey, M.A., M. Inst. C. E., F.R.S.C., Dean of the Faculty; Professors B. J. Harrington, B.A., Ph.D., F.R.S.C., Greenlocks Professor of Chemistry and Mineralogy; Henry T. Bovey, M.A., M. Inst. C. E., William Scott Professor of Civil Engineering and Applied Mechanics, C. H. McLeod, M.A., Professor of Surveying and Geodesy, and Superintendent of the Observatory; G. H. Chandler, M.A., Professor of Practical Mathematics; Charles A. Carus-Wilson, M.A., A.M. Inst. C. E., A. Inst. E. E., W. C. McDonald Professor of Electrical Engineering; Associate Professors Sir William Dawson, L.L.D., F.R.S., Logan Professor of Geology, and Professor of Natural History; Pierre J. Dorey, M.A., B.C.L., L.L.D., Officier d'Académie, Professor of French Language and Literature; Charles E. Moyses, B.A., Molson Professor of English Language

and Literature; D. P. Penhallow, B.Sc., F.S.S.C., Professor of Botany; John Cox, M.A., W. C. McDonald Professor of Experimental Physics.—Associate Lecturers Paul T. Lafleur, M.A., Lecturer in English; P. Toews, M.A., Lecturer in German Language and Literature; Frank D. Adams, M.A.Sc., Lecturer in Geology.—Assistants—Andrew T. Taylor, F.R.I.B.A., Instructor in Freehand and Model Drawing; Percy Norton Evans, B.A.Sc., Assistant in Practical Chemistry.

The Professorship of Mechanical Engineering and the Lectureship in Mining are to be filled before the beginning of next session.

The instruction in this Faculty is designed to afford a complete preliminary training, of a practical as well as theoretical nature, to such students as are preparing to enter any of the various branches of the professions of Engineering and Surveying, or are destined to be engaged in Assaying, Practical Chemistry, and the higher forms of Manufacturing Art.

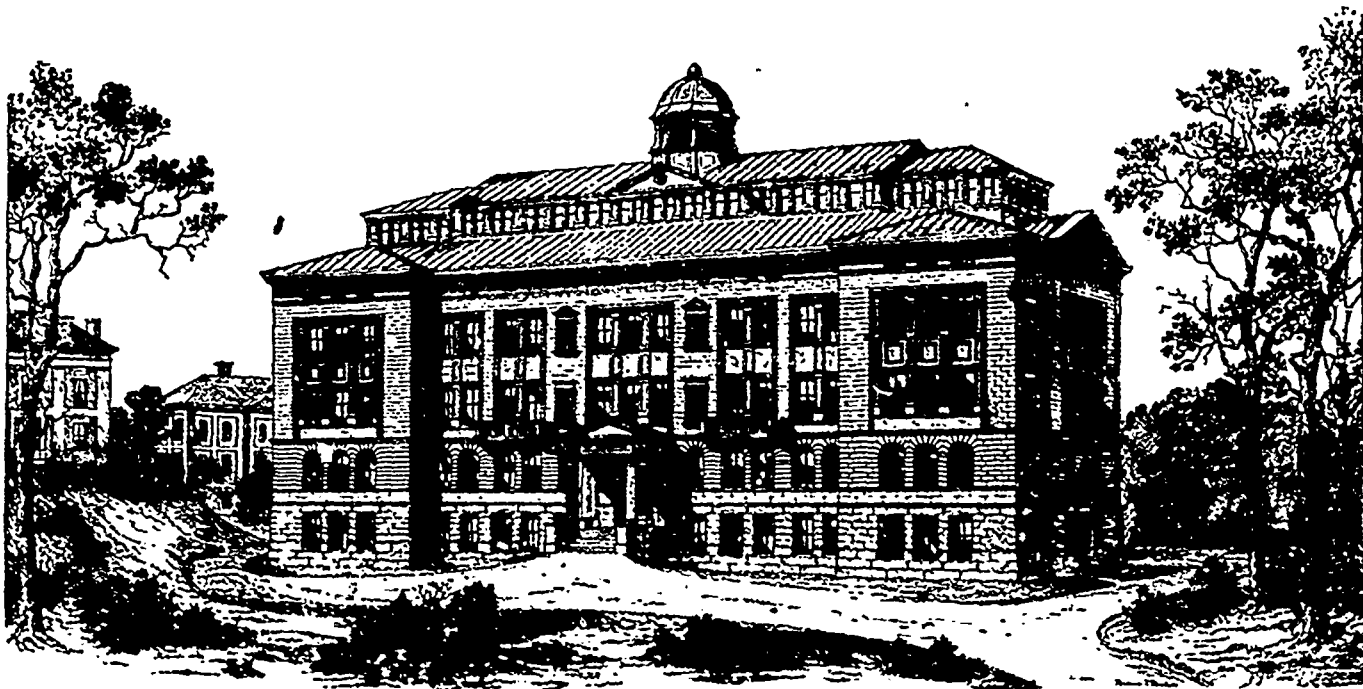
Five distinct Departments of study are established, viz:—Civil Engineering and Surveying; Electrical Engineering; Mechanical Engineering; Mining Engineering; Practical Chemistry. Each of these extends over four years, and is specially adapted to the prospective pursuits of the student.

The course in Electrical Engineering is based on a thorough training in mathematics and experimental physics gained during the first three years. In the fourth year the student will enter

the Electrical Engineering Laboratory, where the practical application of physical laws and methods is illustrated in the working of the apparatus with which the Laboratory is equipped.

The lectures and class work in the Department of Mechanical Engineering are devoted to a study of the principles of Kinematics and Dynamics of Machinery, and of Thermodynamics. Work is done in the Mechanical and Thermodynamic Laboratories, where the practical application of the theories discussed in the lecture room is illustrated. The student will also go through a course of Mechanical Drawing and of work-shop practice.

In the Laboratories the student will be instructed in the art of conducting experiments. The principal experiments carried out in these will relate to the elasticity and strength of materials, friction, the theory of structure, the accuracy of springs, gauges, dynamometer, etc., the efficiency of shafing, gearing, etc. The equipment will include a 100 ton Wicket and a 75 ton Emery machine for testing the tensile, compressive and transverse strength of materials. The Laboratories are also provided with an autographic torsion machine for testing the torsional strength of materials, machines for determining the effect of repeated stresses, oil testers, steam extensometers, etc., and a very complete supply of gauges, micrometers, and other apparatus for exact measurements.



McDONALD TECHNICAL BUILDING, MCGILL UNIVERSITY, MONTREAL.

The Laboratory of Mechanics is fully equipped with a variety of apparatus, such as chronographs for measuring small intervals of time, pendulums for determining the acceleration of gravity and other dynamical constants, machines for deducing the laws of falling bodies, etc.

The Thermodynamic Laboratory is furnished with an experimental steam engine of 80 I.H.P., specially designed for the investigation of the behaviour of steam under all possible conditions; there are four cylinders, which can be connected so as to allow of single, compound, triple or quadruple expansion, condensing or non-condensing, with or without jackets. The measurements of heat are made by large tanks, which receive the condensing water and the condensed steam. There are two hydraulic absorption brakes for measuring the mechanical power developed, and an alternative friction brake for the same purpose. The Laboratory is further equipped with a variety of apparatus for the investigation and illustration of the general principles of thermodynamics, including hot air and other engines, indicators, pyrometers, pressure gauges, etc.

The equipment of the Electrical Engineering Laboratory includes a high speed steam engine coupled direct to a dynamo for incandescent lighting; a slow speed steam engine for driving the experimental dynamos. These latter have been chosen to represent the best types now in general use, both of high tension and low tension direct current dynamos—with various methods

of winding, and also of alternating current dynamos of low tension, and of high tension for use with transformers.

Arrangements have been made for measuring mechanical power supplied to the dynamos and given out by the electromotors, of which there are several types; these arrangements comprise various forms of belt, rope and transmission dynamometers, with a very perfect form of hydraulic absorption dynamometer, with which the accuracy of the others can be checked by readings in absolute measure. The well-known form of cradle dynamometer, for dynamo testing, finds a place here, and special facilities are provided for varying the speed of the dynamos within any required limits.

The instruments for making the electrical measurements will enable measurements of current resistance, and difference of potential to be made with great accuracy, not only in the detached laboratories but in the dynamo room when the machinery is running. In separate rooms there are standard instruments with which the correctness of the working instruments can be readily checked. These include, amongst others, two of Sir William Thomson's electric balances. There are also a variety of instruments for special purposes connected with electrical

has any bearing whatever. My experience has been with salt water, and by observation I find that the hottest part of the boiler has the most scale deposited on it, irrespective of the place the feed water is inserted into the boiler. But I have observed that the circulation is affected by the induction of the feed, which, in my humble opinion, should be inserted where the current is strongest.

I cannot see how a spray in the boiler would be the means of holding the limes in solution either in fresh or salt water.

The above are my crude ideas. I would like if some of your more able readers would give me more light on the subject. Thanking you in anticipation for your kindness in publishing the above, I remain,

Yours truly,

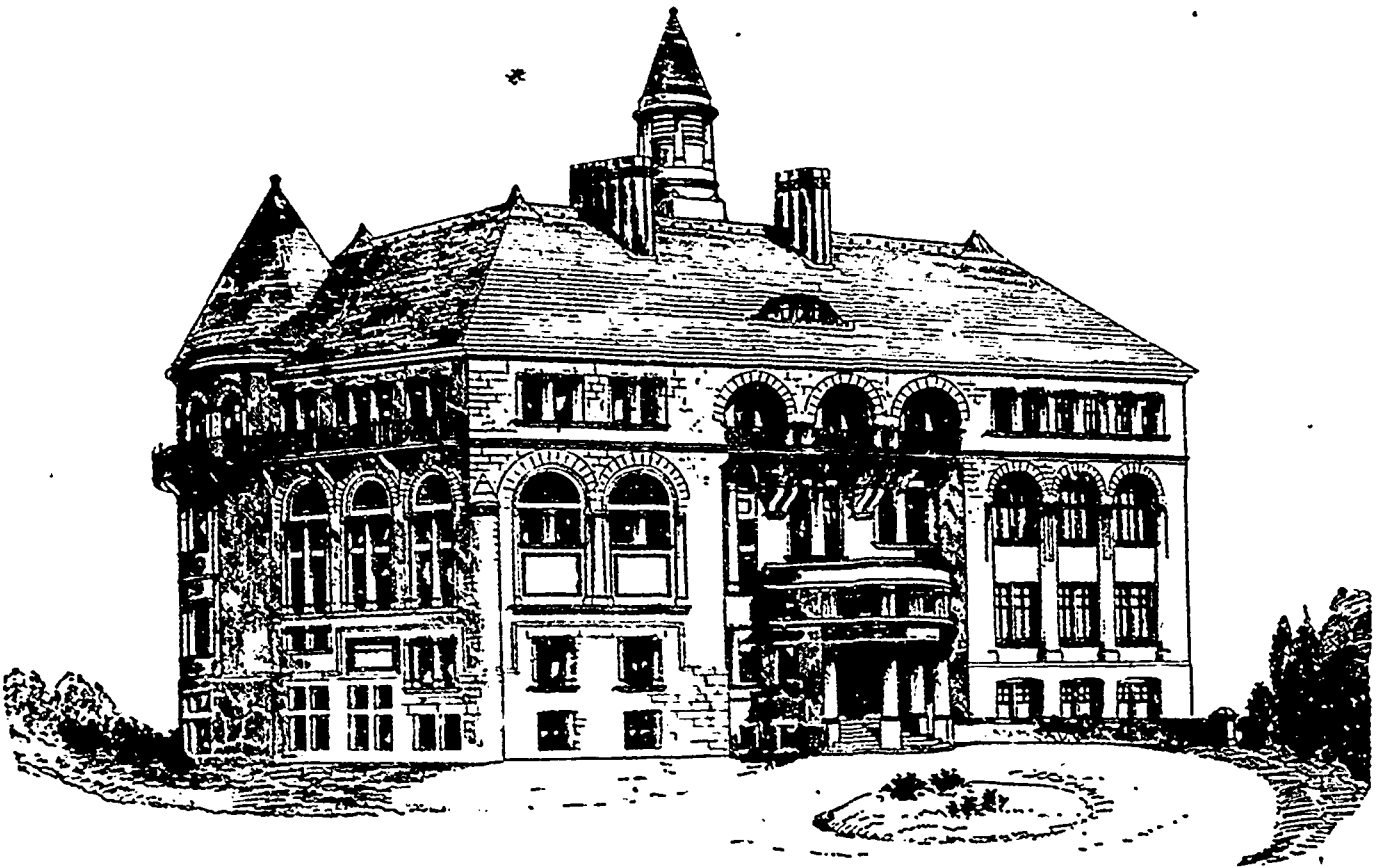
"ENGINEER."

BRANTFORD BRANCH NO. 4, C.A.S.E.

BRANTFORD, August 15th, 1890.

Editor ELECTRICAL NEWS.

DEAR SIR,—The following were recently elected officers for the ensuing year:—Bro. Thos. Pilgrim, President; Bro. C. A. Walker, Vice-President; Bro. Jos. Ogle, Recording-Secretary,



PHYSICAL BUILDING, MCGILL UNIVERSITY, MONTREAL.

measurements, such as instruments for determining coefficients of self and mutual induction, etc.

The Electrical Department, in which many of our readers will feel an especial interest, has been placed upon a sound basis by the generous endowment of Mr. W. C. McDonald.

In the early years of its history the usefulness of McGill University was largely curtailed by want of adequate means, but of late years, thanks to the beneficence of several of the leading citizens of Montreal, it is now in a position to do for the youth of this country what larger institutions of similar character have done and are doing for the young men of America.

#### FEED WATER HEATERS.

VICTORIA, B. C., August 3rd, 1891.

Editor ELECTRICAL NEWS.

DEAR SIR, In the July number of your valuable paper I see a feed water heater, with an article appertaining to the same, which sets forth its advantages, but I cannot see where they come in, as by introducing the feed water into the space, thereby converting that part of the boiler into a jet condenser and getting wet steam for the engine, is the very thing we try to avoid.

As to its being a scale forming preventive, I do not think it

Bro. L. A. Fordham, Treasurer; Bro. J. Nichols, Conductor; Bro. H. McKinnon, Door-Keeper.

Bro. Ames, past President, installed the officers, and afterwards made some very suitable remarks, urging the members to attend regularly, propound abundance of questions for discussion, and make good use of the blackboard.

Bro. Ames has filled the President's chair since the organization of No. 4, but has declined the offer of a further term in favor of Bro. Pilgrim. He is ever ready and always willing to work for the interests of the C.A.S.E.

Bros. Pilgrim and Walker expressed their appreciation of the honor and privilege of being placed in a position to work for the interests of the Association. Bro. Ogle having been in office since the inception of No. 4, was praying for a term's rest, but the members think they have the right man in the right place, and therefore have asked him to toil on a while longer. His books are always in good shape and ready for inspection.

Yours truly,

STEAM.

The John Doty Engine Co., of Toronto, have just opened a branch of their business at Vancouver, B. C., and have placed in charge of their western interests, Mr. O. P. St. John, late Government Steamboat Inspector at Toronto. The venture having been entrusted to such capable hands, should prove successful.

### OUR FIRST ELECTRIC RAILWAY.

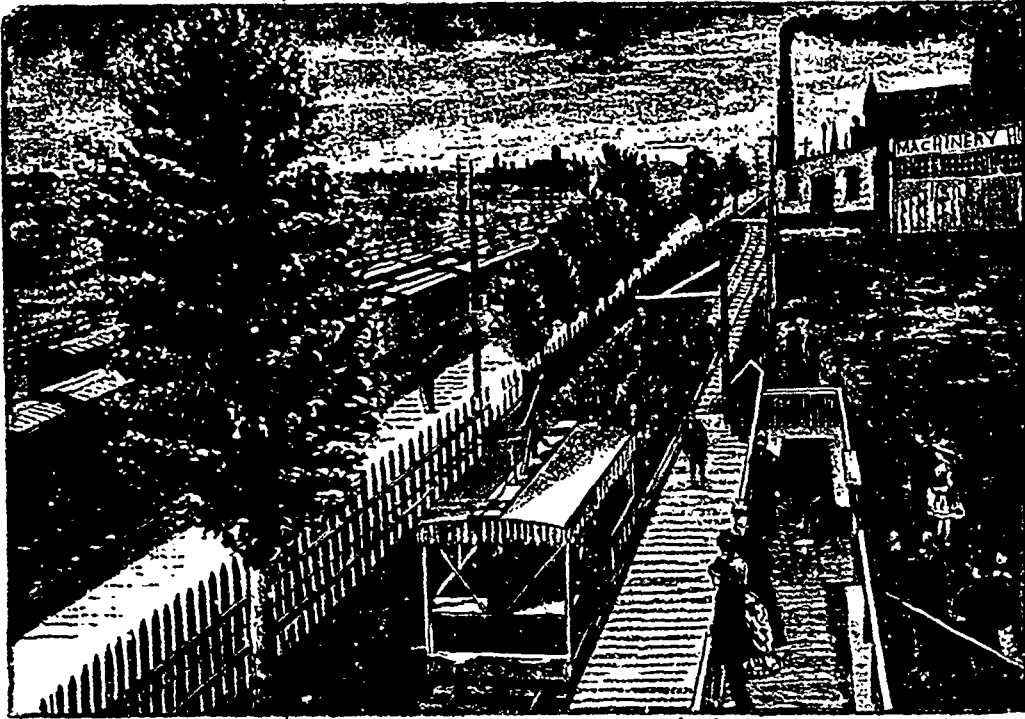
CONSIDERABLE interest has always centered on the electrical railway of the Toronto Industrial Exhibition. Not only was it the first electric railway operated in the Dominion of Canada, but it was among the first on the continent. It is also interesting from the fact that devices were first tried on it which have become necessary to the operation of electrical tramways the world over. The first year, 1883, in which the experiment was made, only a short piece of track was laid. The motor, an imitation outwardly of the experimental machine tried at Chicago the year before, did not "mote" to any great extent, owing to the dynamo used on the car being a double armature one with only one pole piece to each armature. The year following, 1884, produced the first practicable road. It was the work of Mr. C. J. Van Depoele, of Chicago, a genial gentleman and clever mechanic, who will be remembered by the pioneers of the electrical business in this province. It would be considered a crude affair as compared with the modern electric car, but it nevertheless "got there," though with the expenditure of a considerable amount of fuel and supplies. The current was taken from copper strips laid in a wooden box between the rails. This answered perfectly as long as the weather was fair and the box dry, but with the first shower of rain the trouble commenced. It was said to be as good as a play to see the astonished "Van" peering over the end of the car at the streak of blue fire a yard long that streamed out from it as it flew down the grade. But he was not beaten by any means. The next season he was to the front with the overhead wire, and the trolley arm, the original of those now used exclusively in railroad work.

The track was lengthened, and became in this year for the first time an electrical railroad proper, running for business purposes, and it was largely patronized by the public as the readiest means of reaching the Exhibition grounds. The following years 1886-7-8-9 the road was operated by Mr. J. J. Wright under the auspices of the Toronto Electric Light Company, who built new machinery and otherwise improved the road. The passengers carried frequently numbered as high as twelve to fifteen thousand per day, and it is a noteworthy fact that there never was an accident even of the slightest nature to any person. The nearest approach to anything of the kind was during the year of Van Depoele's conduit, when an inquisitive agriculturist put his hand through the slot in the top of the box to see where the power came from. He made the discovery at once and effectively, but beyond this sudden accession of knowledge he was not hurt. However, it was noticed that he kept considerable real estate between himself and the railroad for the balance of the day. There were during the later years, four cars, each capable of carrying 70 to 75 persons. As these had to be hustled up a grade of considerable extent at a speed of twenty miles an hour or so, and there was only one motor, it can easily be seen that it took a considerable streak of electricity to do the work, and many a tale could be told of the difficulties that had to be encountered, in all kinds of weather, to keep it within due bound, and hold down to its

work day in and out for sixteen hours at a stretch, and of the expedients resorted to at times to avoid an impending stoppage. But withal, the road was a great success, so much so, that Mr. Wright was made the recipient of a handsome testimonial from the Exhibition authorities in recognition of the fact. We refer to this subject as now, on account of the extension of the street railway to the gates of the park, this historic road has become a thing of the past. The spot where crowds of merry excursionists were wont to flit along the line is to be used as a siding to unload cattle upon. *Sic transit gloria mundi*, but all the same, when the city's tramways are "electricized" and the modern motors achieving their perfect work, there will be in this city those whose thoughts will revert in loving remembrance to the old exhibition road, and the scenes and incidents of its stirring existence. Its grievous sins of omission and of commission, as shown up in the brilliant light of to-day, will be heartily condoned, inasmuch as, with all its faults, it achieved for its sponsors both moral and financial success.

### SANDWICH, WINDSOR AND AMHERSTBURG ELECTRIC RAILWAY.

THE Sandwich, Windsor and Amherstburg Electric Railway, which went into operation a couple of weeks ago, is reported to



FIRST CANADIAN ELECTRIC RAILWAY.

be working most successfully. In fact, if we are to believe the statement of a local paper, the citizens are "tickled to death" over it. We do not understand this to mean that electrocution is getting in its work on them, but simply that they are greatly pleased with the new enterprise.

The people on the Canadian side of the river are

now taunting Detroiters with being behind the age, and are enquiring when it is their intention to make an effort to "keep up with the procession."

The motive power used is the Westinghouse overhead trolley system.

We are pleased to see that the cars on this line are lit by incandescent electric lamps, a new and very desirable feature of electric railway equipment.

### PUBLICATIONS.

The Fort Wayne Electric Co. have published a pamphlet entitled "Kind Words," which contains a large number of flattering testimonials to the excellence of the system of electric lighting of which the company are the promoters. We are indebted to Mr. W. J. Morrison, general agent for Canada, for a copy of the book.

The intellectual wealth of three continents is represented in the September *Arena*. The well-known English essayist, F. W. H. Meyer, of Cambridge, England, speaks for European thought in a careful paper on physical work. Kuma Oishi, M.A., of Tokio, Japan, represents Asia in a brilliant paper on the Extrinsic Significance of Constitutional Government in Japan; while such able thinkers as Rabbi Solomon Schindler, Rev. George C. Lorimer, Thomas B. Preston, Sylvester Baxter, and the editor represent America.

A quantity of electrical apparatus imported by the Calkin Electric Light Co., of St. John, N. B., was recently seized by the customs officers of that city on the ground of undervaluation.



BIRD'S EYE VIEW OF THE CITY OF MONTREAL.

**THE NATIONAL ELECTRIC LIGHT ASSOCIATION OF THE UNITED STATES.**

PROGRAMME OF THE MONTREAL MEETING, SEPTEMBER, 1891.

Session to open at 10 a.m., and adjourn at 2 p.m.

SEPTEMBER 7TH.—3 p.m.—Convention called to order; addresses of welcome and reception; response; address of president; report of secretary; report of treasurer; reading of communications received; adjournment to meet in evening at Exhibition Rink at 8 o'clock p.m. 8 p.m.—Formal opening of the exhibition.

SEPTEMBER 8TH.—Reports of Committees on Relations of Manufacturing and Central Station Companies, etc.; Reports of Committees on Data; Reports of Committees on World's Fair; Reports of Committees on Legislation; Reports of Committees on Underground; Reports of Committees on Safe Wiring.

SEPTEMBER 9TH.—Discussion of T. C. Smith's Paper; Paper W. C. Warner, "Various Forms of Carbon for Use in Arc Lamps"; Paper—Capt. Eugene Griffin, "Three Years Development of Electric Railways"; Paper—H. Ward Leonard, "A Central Station Combining the Advantages of both Continuous and Alternating Systems."

SEPTEMBER 10TH.—Paper—J. I. Ayer, "Some Details of the Care and Management of an Arc Lighting Station, as Practised in the Municipality of St. Louis"; Paper—C. J. Field; Paper—George A. Redman, "Central Station by Water Power"; Paper—J. J. Burleigh, "Uniformity of Method in Keeping Central Station Accounts."

Executive Session to follow immediately to elect members of Executive Committee, and to name place of next meeting.

Entertainments to be arranged for each day and announced by bulletin.

The following is the the programme arranged for the entertainment of the National Electric Light Association of the United States, by the Citizens' Executive Committee, Montreal:

MONDAY, SEPT. 7th.—Opening proceedings of the Convention in the Windsor Hotel, addresses of welcome by His Worship the Mayor, and other distinguished members of the Reception Committee. 3 p. m.—Formal opening of the Exhibition.

TUESDAY, SEPT. 8th.—2.30 p. m.—Fire Department Display on Champs de Mars. 4 to 7 p. m.—Garden Party. 8 to 11.30 p. m.—Conversazione at Redpath Museum, Molson Hall, McGill University.

WEDNESDAY, SEPT. 9th.—3 p. m.—Drive through the city and around the mountain. 4 to 7 p. m.—Garden Party.

THURSDAY, SEPT. 10th.—2.30 p. m.—Through the kindness of the Harbor Commissioners, trip by boat down the St. Lawrence and the Lachine Rapids, stopping on the way at Caughnawaga. 8 p. m.—Banquet at the Windsor Hotel.

FRIDAY, SEPT. 11th.—3 p. m.—Lacrosse match, Garden Party. In the evening Promenade Concert at Sohmer Park, through the courtesy of Messrs. Lavange and Lajole.

SATURDAY, SEPT. 12.—3 p. m.—Yachting excursions for ladies, on the St. Lawrence and Richelieu rivers. 7 p. m.—Excursion to Quebec at reduced rates.

It is expected that His Excellency the Governor-General will be present during the Convention.

**A REPLY TO "R."**

TORONTO, Aug. 17, 1891.

Editor ELECTRICAL NEWS.

DEAR SIR,—Allow me to say in answer to a letter signed "R" in last month's NEWS, that, judging him by his letter, he does indeed (as you say) show a little of that intolerance which he so unsparingly condemns in others.

As regards the explosion on Dufferin street, I can only say that if the particulars of the case were as "R" reports them, no blame could possibly be attached to the engineer in charge, and the letter which I wrote to your paper would in that case be doing him an injustice, and as I never (to my knowledge) saw the man in my life and have no idea who he is, I would be the last man to do him an injury intentionally.

On the other hand, the information I received on the subject and the source of same (in the absence of further proof of "R's" statement), I consider equally reliable. "R" should not talk of "venting spleen," &c., as it is very easy to see after reading his letter in the NEWS that he is venting his spleen against, and showing his hatred for, the C.A.S.E. I may say that I am a member of the Association, and am proud of it, too; for it has done me more good than any other organization I ever became a member of, and if "R" is an engineer (but I feel sure he isn't), I can assure him it will do him all the good imaginable to become a member of the "ring," as he calls it.

It would not be a hard matter to take the wind out of "R's" sails on one or two points in his letter, but I do not consider it is worth while, as it might only give him a chance to again open his tirade of jealousy and slander against an organization that is honestly striving to do a good work in raising by all

legitimate means the status of the stationary engineers of Canada, and which has up to the present time met with a fair measure of success in its undertaking.

We invite our employers, the steam users, to unite with us and even attend our meetings, feeling satisfied to leave the verdict in their hands as to whether or not the objects of the Association are such as should command the respect and esteem of our fellow citizens. We have no fear of the result.

The latter part of "R's" letter I will leave to the tender mercy of "S" (whoever he may be), although I see that "R" gives in his wisdom one writer the credit for both letters. In this guess he is far astray.

Apologizing for taking up so much of your space, and wishing the NEWS the success it so well deserves, I remain,

Yours, &c.,

SAFETY.

**SAFETY VALVES, THEIR HISTORY, ETC.**

611 & 612 Electrical Exchange.

NEW YORK, 12th August, 1891.

Editor ELECTRICAL NEWS.

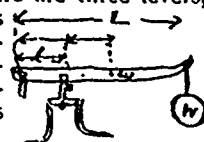
It is with some hesitation that criticism is offered upon Mr. Le Van's articles upon safety valves, begun in your paper vol. 1, No. 7, p. 88, issue of July, '91. The following points are noted that no beginner may be accidentally led astray:

Throughout the article appears the term "static momentums" where it is usual to use the term "static or statical moment," (see Weisbach "Theoretical Mechanics," p. 195)—the word momentums or quantity of motion belonging to that part of mechanics treated under the head of dynamics rather than under statics when the lever is rightly put.

Instead of saying: "The resistance at *f* is called the fulcrum," would it not be more accurate to say that the fulcrum is the point of application of a third force about which two other forces or sets of forces are being balanced, the axis or point about which rotation or equilibrium is established being defined as the fulcrum (Weisbach, p. 255, or D. K. Clark's "Manual of Rules, &c.," 5th edition, 1890, p. 296; "Kinematics and Dynamics"—J. G. Macgregor, 1887, p. 406, &c.

Going into it a bit deeper, the fulcrum is really the "permanent centre" of the lever, ("Mechanics of Machinery," A. B. W. Kennedy, 1886, p. 47.)

On p. 106 it is correctly stated that "there are three levers," but it is incorrect to say that the weights act only at two different points. The general equation (1)  $W.L + w.x = A.p.l$  is incomplete. The "moments" (not momentums) of the form forces involved are as follows: The weight of  $v + 3 = 2$



Forces.		Their Lever Arms.	Their Moments.
A.p.		l	A.p. l
W		L	W.L
w		x	w.x
Z		l	Z.l

making the general equation:—

$$Apl = W L + w x + z l$$

The weight of the valve and stem act with the arm *l*, not with the arm *x*, and ∴ it is incorrect to add the weights *v*, *s* and *w*, and take their sum as a force acting with the arm *w*. This mistake may be due to an article in *Power-Steam*, vol. X, No. 5, p. 6, May, 1890, where the error likewise occurs.

Yours truly,

J. STANFORD BROWN,

Consulting Engineer.

The famous Crocker-Wheeler Perfected electric motors are having an immense sale. The Crocker-Wheeler Electric Motor Company, N.Y., U. S.A., sole manufacturers, find it impossible to keep up with the demand, though they have recently enlarged their shops and otherwise increased their manufacturing facilities. These motors are made without regard to cost of material or labor, and are so designed that they do the regular rated work at a much slower speed than has been possible before. They are said to be acknowledged by leading electrical engineers, dealers and manufacturers to be the most perfect, efficient, best proportioned, most reliable, and best looking motors made.

Visitors to the convention who may be passing through Toronto should, if possible, stop off long enough to take a look at the city and visit the electric lighting station on the water front. The works of the Toronto Electric Light Company are always open to the public and they will be especially so to the members of the convention. This station occupies a somewhat unique position inasmuch as all their plant is manufactured on the premises. They have a well-equipped machine shop, including winders and braiders for covering all the wire used for line work and dynamos. There is no secretiveness about the policy of the management, and many devices originating here have been adopted by other electric light companies throughout the country, notably an automatic cut-out for use on lamp poles to prevent open circuits through breaking of leading wires. They are nothing if not original, and visitors could no doubt be able to pick up pointers that might be of great use to them in the business. There are lightning arresters on each line which are contained in a separate building, so avoiding any chance of fire in the main building through an accidental short circuit in the arrester; and they have a very complete apparatus in connection with the fire alarm service of the city, enabling their patrolman with horse and wagon to start out within ten seconds of the striking of the alarm in case his services should be needed to look after the safety of any of the lines. We are assured that visitors to the works of the company will be made most welcome.

## JNO. C. FERGUSON.

By "PROCTOR."

THE announcement in the evening papers of Thursday, Aug. 20th, that J. C. Ferguson, Chief Engineer of the Toronto waterworks was dead, came to his large circle of mechanical friends with all the soreness of a personal bereavement.

It was known to some of them that he had been unwell—to a few that he was very ill—but to the great majority who had heard nothing of his indisposition (and who knew of his anxiety to have everything right, and his close attention to his duties, and were therefore not surprised at not seeing him on the streets occasionally), it was quite an unexpected paragraph.

I have known him both as a mechanic, a student, and a Christian gentleman for upwards of twelve years past, and I deem it due to your readers—and especially the younger men with aspirations that I should give a few "points" out of his life history.

I write under my old *nom de plume* because it brings back to me pleasant memories of the times when he used to criticize my "Proctor's Points," and take great delight in pleasantly disputing my theories.

To mechanics who were not personally acquainted with him, it was a matter of some surprise that he came out at "the head" in the crucial examination through which the applicants for the position of waterworks engineer had to pass in 1887, but to some of us who knew him as a careful, critical student in mechanical matters, as an engineer who accepted no theory or method unless it would bear the fullest investigation, who knew that, in his own way, his head was well stored and skilful with facts, figures and formulas, as his hands were expert in fitting, it was no surprise that he demonstrated his ability to fill the position.

His close attention to the duties and obligations of the engineership, his almost morbidly conscientious anxiety, lest by any slip on his part there should be a failure in the city's water supply, and the watchful care required both day and night, were just a little too great a burden for him. This burden was added to when, lacking the assistance of his assistant, Mr. Kilby—who is now soon to follow him—some stupid bungling fellows drove a spike through the intake pipe at the island, and let a flood of sand into it that day after day was slowly but surely grinding the cylinders and pistons of his pumps, so that they at last were not capable of doing much more than half duty.

Just at this time, too, with all this burden and anxiety upon him, some "Daniel come to judgment," seeking for a kind of fish-wife notoriety by fault finding, in the press and at the council board, said a number of things that seemed to reflect on his department, every word of which, though entirely undeserved, hurt him like the sting of a Russian knout, and he simply broke down under the combined pressure.

It was hoped that a few months rest might restore him to usual vigor, but he came home two months ago after a two months absence only to find himself unable to give any further attention to his duties, and went to his quiet home to die, as he had lived, a true man.

I remember the first time I saw him. In the winter of '78, I think, passing through one of our city machine shops in a leisurely way, looking at the men at work, I noticed a tall, well-built, athletic workman, chipping on a machine casting. The man himself attracted me first—he was working as if he meant to get his job done on time. But the swing of that hammer! I never saw but one other man who could swing a chipping hammer with John Ferguson. On the occasion referred to I remarked to the owner of the shop that he had one first-class hand upstairs. "Oh, yes," said he, "but I pay him good wages." "How much?" "\$3.50 per day; but," he added, "he's worth it." Ordinary vise hands were worth \$1.75 to \$2.00 a day.

In those days he engineered on a lake steamer in the summer and wrought as a journeyman machinist in the winter. Every spare moment was spent in study. Lane after lane was taken up and gone into as thoroughly as if it were an absolute necessity that he should master both elementary principles and mechanical construct on hydraulics, steam engineering, bridge work, machine building, marine work, etc., etc.

It became fully known, early in the "eighties," that anything he did was done well, and he always had a choice of situations. The only reason why he did not attain to special prominence was simply the lack of any important mechanical enterprises in Canada. His remodelling of the large pumping plant, and the complete efficiency obtained, justified the confidence of his friends in his mechanical ability.

He was always gentle, quiet and reserved in his intercourse with others, and whether as journeyman or master mechanic, kind, considerate and helpful to all around him. In his personal and private life he was ever—since I have known him—a consistent, earnest Christian. Reticent almost to a fault sometimes, it is yet true that he spoke very freely to those who came in heart-touch with him, of religious matters. No man could buy or sell him. He lived above the petty ambition of private gain out of public

relationships. I well remember the indignant scorn which flashed in his face as he told me of some fellow who—not knowing him—offered to pay him a commission on all the goods he sold to the city, if he would recommend the goods. I interrupted him in his narration by interjecting the question:—"What did you tell him, John?" "Tell him," said he, straightening up, "I fired him out of the office!"

Just passing out of his manhood's prime, sooner than some of us, he has entered that other and higher realm where force hath origin, where system and order have their source, where law is eternal, and life and being but the pulsing of the Infinite.

Not the *dying* but the *living* with its trusting,—

With its motives, broad and ample, and its purpose strong and deep—  
Measures up the worth of being. All adjusting  
Is with One who knows the balance and doth righteous record keep.

Every beating brain and throbbing heart are factors  
In the mystic revelations of the hidden and unknown,  
And each toiling hand is helper. But the "Actors"—  
Never thinking, loving, doing—live for self and earthalone.

They who *knock* at Wisdom's portals, in rogation,  
Have the promise, she will "open" and reveal her golden prime,  
And, no doubt, it will, to crown each aspiration,  
Take Eternity to answer all the questionings of Time.

Every action with a motive hath its promise  
Of eternal bane or blessing as its ultimate reward,  
Let us (fearing, lest our good be taken from us)  
See that every thought and purpose clearly glorifies the Lord.

To God's Acre, where nor fear nor care molesteth,  
We resign the pulseless mortal, of life's sentient forces shorn.  
He was true and so we leave him where he resteth,  
Whence the Christ—"The Truth"—will call him on the Resurrection Morn.

## THE C. A. S. E.

TORONTO, Aug. 10, 1891

Editor ELECTRICAL NEWS.

SIR,—When looking over the correspondence in the last issue of the NEWS, I noticed in a letter signed "R" a question is put to me as President of the C.A.S.E., as to whether any engineer was ever refused admission to the Association for lack of the necessary qualifications, or, as "R" puts it, because he did not know enough.

In answer, allow me to inform "R" that several engineers have been refused admission for lack of the necessary qualifications as engineers, therefore he is not stating facts when he asserts that all who have applied have been admitted. I would also remind "R" that the Association is no exclusive ring. Any engineer who is sober, steady and of good moral character, and who can satisfy the examining committee that he has the practical experience which the by-laws provide for, can become a member; and after going this far, if he regularly attends the

meetings and has any ambition at all, he will certainly find that he has considerably improved himself as an engineer, and will ultimately find himself in a better position. There are many engineers in the city of Toronto to-day who from personal experience can bear me out in the above statement. The writer himself speaks from experience on this point.

The chief object of the Association is to unite engineers in a body for mutual improvement and instruction, and to help each other along in our journey through life. We know there are many engineers who have not as yet identified themselves with the Association, and who would, both as engineers and citizens, be a credit to any organization. For these gentlemen we have nothing but the best feeling, and extend to them at all times a cordial invitation to "come with us."

I think it most unfair for "R" or any other person to use such language as he employs towards a body of men who, to say the least, are his equals both as men and citizens, just because one of their number, according to his idea, rushes into print with something which the facts of the case do not warrant.

I presume every institution for a good cause has had and always will have some enemies; therefore we should not expect to be an exception to the rule, but the C.A.S.E. has come to stay, and will get there, too, as long as its motto is "Excelsior."

I remain, yours &amp;c.,

ALBERT E. EDKINS,  
President No. 1, C.A.S.E.

22 Agnes St.

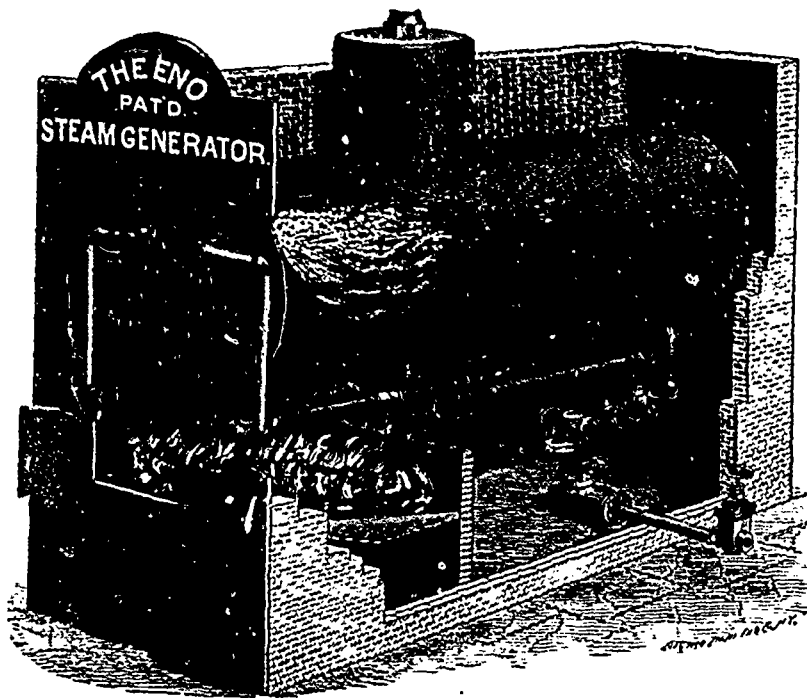


THE LATE JOHN C. FERGUSON.

**THE ENO STEAM GENERATOR.**

The accompanying cuts represent one of the most important and economic steam appliances of the present day, and one that every manufacturer and steam user must ultimately adopt if he would hold the field against his competitors in first cost of production.

This invention accomplishes for steam users all that has been vainly sought in the past, and secures at small additional cost the following demonstrated advantages, viz.: A very rapid and economical generator of steam, a large increase in the quantity of the steam produced; a rapid,



positive and continuous circulation of the water in the boiler and generator, preventing foaming and priming; the separation and removal of sedimentary matter; the increased durability and safety of the boiler; a large reduction in the quantity of fuel required, a saving of from 15 to 30 per cent. in the cost of coal consumed or steam produced is guaranteed by the company.

This apparatus is simple, strong, durable and easily applied to any boiler, being connected therewith by one pipe only at the rear and two at the front, and does not require removal of masonry, and can be applied in from 15 to 30 hours. It is perfectly automatic in its operation, and requires no attention. It has no valves to get out of order, and no coils or return pipes to clog and obstruct the circulation, but both the water and steam always flow in a direct continuous and constant current.

The accompanying cuts show the generator underneath the boiler and its connection therewith.

The generator proper consists of a series of pipe flues, numbering from 2 or more, according to size of boiler, or results required. Each flue is composed of an inner and outer tube, thus containing a water space between them that is always charged with the water of the boiler. These flues commence at the front of the bridge wall, and extend rearwards therefrom (as per cuts), thereby offering no obstruction to the direct action of the fire on the crown plate or other parts of the boiler. It will readily be seen that the apparatus gives the boiler a large additional fire surface (120 square feet, or more, according to size of boiler or result required), with only a very small additional amount of water. It keeps constantly in the fire a sheet of water over 6 feet square and only  $\frac{1}{4}$  of an inch thick, with both sides exposed to the fire, thereby converting the water into steam with marvelous rapidity, as well as causing an immense circulation.

The flames and heated gases, when leaving the fire box, pass through the inner tubes and also surround and envelop the outer ones, thereby converting the contained water into steam with the utmost rapidity, and least expenditure of heat.

The water through the pipe in the rear of the boiler flows in a steady current, into and through the tubes, re-entering the boiler as water and steam, through the two pipes at the front, maintaining thereby a continuous circulation of the water through both boiler and generator, largely preventing the formation of scale, and wonderfully increasing the efficiency as well as the durability of the boiler.

As a large quantity of the steam is formed in the flues of the generator instead of in the bottom of the boiler, it does not have to ascend through the water after its formation, but passes onward through the tubes in the fire chamber, where its heat is still further increased, thereby producing a pure, dry steam, instead of the saturated compound obtained from boilers by the ordinary process.

The rapid and continuous circulation of the water and steam, and the removal of the sedimentary matter therefrom, can at any time be witnessed at their factory, where they have a boiler with the top cut out and a generator attached, with glass connections, plainly showing the agitation and circulation of the water within the boiler and generator, also the separation of the sediment therefrom. The circulation and commotion of the water in the boiler is thereby revealed to the eye and is much greater than that portrayed in the cut.

The application of this generator to boilers in daily use has demonstrated that its employment will save from 20 to 30 per cent. of the fuel, or with the use of the same quantity of fuel will increase the amount of steam produced from 30 to 40 per cent. while the time heretofore required to raise the steam to its full pressure is thereby reduced one-half to two-thirds.

They court the most rigid examination of the generator and of all the claims made in its behalf, and are prepared to furnish abundant proof of every statement put forth, to the satisfaction of any candid investigator.

Patents for this invention have been secured in Canada, the United States and all principal foreign countries

**WHAT THE PEOPLE SAY:**

They more than fulfilled all your claims for them. We were able to do with two boilers the same work that required three previous to attachment. They also clean the boilers of scale and dirt.

**GEO. YORKE,**

Engineer for Ontario Government, Osgoode Hall, Toronto.

It has given perfect satisfaction, saving 1 to 2 per cent in coal bill, giving at same time an increased steam capacity sufficient to heat a building 27 x 90 feet, five stories.

**THE CROMPTON CORSET CO.,** Toronto

We have a second boiler nearly built in and want to put on another of your Generators. How soon can you have one ready to put on? We would like it this week if possible and same as one already on. Let us hear from you by wire upon receipt of this.

**THE R. FORBES WOOLEN CO.,** Hespeler, Ont.

Enclosed we beg to hand you bank draft for Generator attached May 15th. The Eddy Co. express themselves highly satisfied with them, and will require more of them soon.

**MCKINLEY & NORTHWOOD,**  
For the E. B. Eddy Mfg. Co., Hull, P. Q.

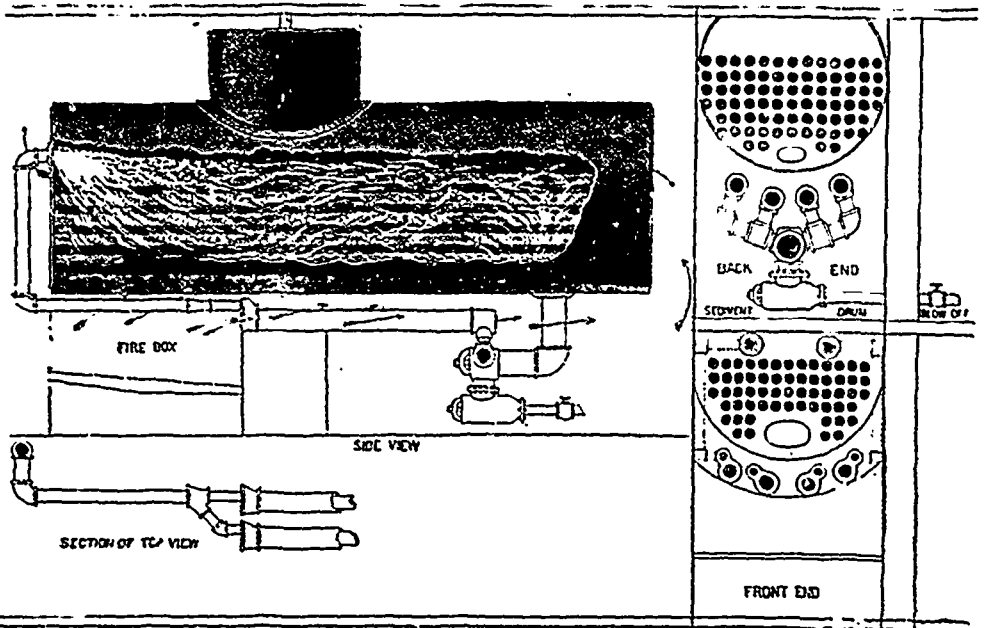
Your Generator when tested six months ago was saving between 20 and 25%. It is saving more now, having removed old scale from boiler.

**R. WHITELAW,** Engine and Boiler Mfr., Woodstock, Ont.

Please ship and attach to our boiler No 3, another of your Steam Generators. Price terms and conditions same as former contract.

**FERGUSON & PATTINSON,** Woolen Mfrs., Preston, Ont.

We now take pleasure in enclosing our cheque in payment of two Steam Generators



now on our boilers. We are now ready to have the third Steam Generator put on our other boiler. Please let us know when you can make the attachment.

**THE WATERLOO (ONT.) WOOLEN MFG. CO**

We were short of steam, but now we have plenty. At the same time we are burning over 500 lbs. of coal per day less than previously. It is keeping the boilers clean, old scale being removed by the rapid circulation, and the labor in firing greatly reduced.

**LANGLEY & BURKE,** Trustees Burke Estate, Toronto.

In addition to the many Generators already in use, contracts are now in course of completion for The Dominion Cotton Mills Co., Montreal; The Ontario Cotton Co., Hamilton; The E. & C. Gurney Co., Toronto; The Carling Brewing & Malting Co., London; The Toronto Board of Trade; The E. B. Eddy Mfg. Co., Hull, Quebec, Laval University Quebec, P.Q. and others.

For free illustrated book, estimates, and full particulars, address The Eno Steam Generator Co., (Ltd.), 7 Richmond Street West, Toronto, Ont.



MY DEARIE O!

(Written on Boston & Maine Railway, April, 1889.)

My Love, 'tis joy for me to know—
While sunlight streams so cheere, O—
That every happy mile I go
Is so much towards my dearie, O.
And though the fields of Maine are bare,
And vernal breezes 'eerie, O,—
In "Baldwin's bowers" "The Elms" are fair,
And 'neath them is my Dearie, O.
I've been a roamer many a day
In lands where all were strangers, O;
I've been exposed in many a way
To countless ills and dangers, O;
I've made new friends and bow'd farewell
Till all my soul is weary, O.
Now, every ringing engine bell
Sings :—" Going home to Dearie, O."
I've found some hearts that beat with mine
In love's divinest measure, O;
I've seen some eyes—confiding—shine
With trust I long shall treasure, O,—
But not an eye could beam so bright—
Or win a flame so cheerie, O.
As her's (whose glance is beauty's light)—
I joy to call "My Dearie, O."
I've seen Acadia's rugged hills,—
Breathed Bay of Fundy's breezes, O,
Praised Kennebec's rippling rills,
Where Hampton's hillside pleases, O;
But fair Ontario suits me best,—
Nor why, need no one query O,—
In her "Queen City of the West"
"The Elms" protect My Dearie, O.

LLEWELLYN A. MORRISON.

We asked Mr. Morrison for an electrical contribution. He sent us the above with the remark that light and power were electrical productions sometimes, and it was easily discernible that this was a light contribution, but he doesn't think that many of the electricians can measure the "voltage."—ED.]

TRADE NOTES.

We would call the attention of the delegates to the Electrical Convention, to the Balmoral Hotel. The accommodations are first-class, location central, and under its present management it is enjoying a reputation that is second to none in Canada, and the rates are reasonable.

Messrs. Chas. A. Schieren & Co., New York, U.S.A., find the demand for their patent perforated electric leather belting increasing right along. For use on dynamos and other swift running machinery it is claimed to be unequalled. One of these belts is illustrated in our advertising columns in this issue.

Electricians visiting Montreal will find central and in every way desirable quarters at the Turkish Bath Hotel on St. Monique Street, not far from the Windsor. This large hotel is a high class temperance house, with the conveniences and comforts of all first-class hotels, while the charges are moderate. F. E. McKyes, manager, is always glad to answer inquiries.

If you want a satisfactory insulated wire or cable, either for aerial, underground or submarine use, get the Okonite, manufactured by the International Okonite Company, (Ltd.), New York and London. These goods are known all over the world for their many superior qualities and have received the endorsement of the most prominent electrical experts and electricians.

A most important factor in the operation of every central station successfully, is a good boiler feed pump. The "Davidson," manufactured by M. T. Davidson, Brooklyn, N.Y., U.S.A., is claimed to be the simplest, most durable and efficient pump made. It is certainly very popular with the electrical fraternity, and a large number of them are in use throughout the States for central station work.

The attention of our readers is directed to the advertisement of Mr. John Starr, of Halifax, Nova Scotia, appearing for the first time in this number of the ELECTRICAL NEWS. Mr. Starr is the general Canadian agent for the sale of the Lahmeyer incandescent light dynamo for municipal, factory and residence lighting. Mr. Starr has received strong testimonials regarding the efficiency and economy of these dynamos from the judges of the American Institute Fair, Messrs. Henderson & Potts, of Halifax, the superintendent of the Halifax Protestant Industrial School, and others.

One of the busiest electrical manufacturing establishments in the city of Newark, N.J., U.S.A., is that of the Weston Electrical Instrument Co., manufacturers of the Weston direct-reading voltmeters and ammeters for direct current circuits. All persons engaged in the electrical business and others having occasion to make accurate electrical measurements should investigate the merits of these instruments. Neither trouble nor expense has been spared to make them perfect in every detail. They have been adopted as standard instruments by nearly every company engaged in the manufacture and sale of electrical machinery.

It is rapidly becoming the custom for firms in the United States, who use the industrial press extensively, to pass their favors through special agents about the same as they do their insurance. Many large and influential firms in the electrical line thus enjoy the experience and privileges of the Manufacturers' Advertising Bureau and Press Agency, conducted by Benj. R. Western, 112 Liberty street, New York, U.S.A., and find their work not only well and conscientiously done, but secure many advantages that no single concern could hope to obtain of itself. We take pleasure in recommending Mr. Western to the consideration of our friends.

Messrs. A. Holden & Co., of Montreal, are the sole agents in the Canadian provinces for the Goubert "Water-Tube" feed water heater, claimed by the Goubert Manufacturing Company, New York, U.S., sole manufacturers, to be the only heater in the market meeting the requirements of high pressure, free exhaust, high efficiency and great durability under all conditions. It is extremely popular with steam users in the States, and we notice is attracting considerable attention from Canadian manufacturers and others who wish to produce steam economically. Messrs. A. Holden & Co. will gladly give our readers full information regarding the merits of this heater upon application.

The following is a list of plants sold by the Edison Company since June 15th :—Merriekville Ont., Electric Lt. Co., capacity 420 16 c.p. lamps; C. Saurman, Paris, Ont., 150 16 c.p.; Palmer & Paul, Carberry, Man., 270 16 c.p.; Belding, Paul & Co., Montreal, 900 16 c.p.; A. W. Parker & Son, Lindsay, Ont., 420 16 c.p.; Gananoque Electric Lt. Co., 720 incandescent; Temple Electric Co., Montreal (increase), 1080 16 c.p.; Steamer North

King, Kingston, Ont., 110 16 c.p.; Gazette Print Co., Montreal (increase), 1080 16 c.p.; B. R. Mowbray & Son, Gravenhurst, 30 16 c.p.; S. T. Willett, Chambly, Que., 560 16 c.p.; Nicholls Chemical Co., Capleton, Que., 210 16 c.p.; Edison Electrical L. & P. Co., Sydney, C. B., 720 16 c.p.; James Coristine, Montreal (increase), 90 16 c.p.; Heath, Tait & Turnbull, Huntville, Ont., 30 16 c.p.; R. Forbes & Co., Hespeler, 420 16 c.p.; Ioba Campbell, St. Thomas, 35 16 c.p.; N. D. McDonald, Winnipeg, 3/4 h.p. motor; Dominion Express Co., Montreal, 2 1/2 h.p.; Dominion Bank 16 motor, 1 3/4 h.p. and 1 1/2 h.p.; Temple Electric Co., Montreal, 2 10-h.p.; McGill University, Montreal, 2 3/4 h.p. and 1 10-h.p.; James Coristine & Co., Montreal, 1 10-h.p. and 1 6-h.p.; Davidson, McFarlane & Co., Montreal, 1 6-h.p.; Singer Mfg. Co., Montreal, 1 1/2 h.p.; Walkerville Malleable Iron Co., 150 16 c.p. and 6 arc lamps; Montreal Elevated Ry. Co., an electric railway 5 miles in length with 100 h.p. generators and 6 cars fully equipped; Metropolitan Street Ry., 1 electric car fully equipped. Besides the above the Toronto Incandescent Company have put in a large number of Edison motors and additional apparatus.

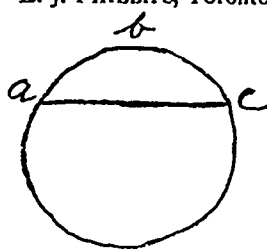
EXHIBITORS AT THE MONTREAL CONVENTION.

Up to the time of going to press the list of firms who will exhibit at the approaching Montreal Convention, was as follows:

- Eureka Tempered Copper Co., North East, Pa.
Chas. A. Schieren & Co., 43 Ferry St., New York.
New York Insulated Wire Co., 649 Broadway, do
Standard Underground Cable Co., 18 Times Bldg., do
W. J. Johnson Co., Ltd., 167 Times Bldg. do
Standard Electrical Time Co., New Haven, Conn.
Standard Paint Co., 3 Liberty St., New York.
Fort Wayne Electric Co., Fort Wayne, Ind.
Electrical Engineering & Supply Co., Syracuse, N. Y.
Eugene Phillips Electrical Works, Ltd., Montreal, Can.
Felton & Guilleaume, c/o Middleton & Meredith, Montreal, Can.
International Okonite Co., 13 Park Row, New York.
Weston Electrical Instrument Co., Newark, N. J.
The John Pratt Co., Hartford, Conn.
The Ball Electric Light Co., Ltd., Toronto.
Electrical Engineer, 150 Broadway, New York.
Interior Conduit & Insurance Co., 42 Broad St., New York.
R. Mitchell & Co., Montreal.
Thomson-Houston International Electric Co., Boston, Mass.
Toronto Construction & Electrical Supply Co., Toronto.
H. Ward Leonard & Co., 42 Broad St., New York.
Dominion Wire Manufacturing Co., Montreal.
T. W. Ness, Montreal.
Edison General Electric Co., 77 Bay St., Toronto.
Norwich Insulator Wire Co., 58 Cedar St., New York.
Excelsior Electric Co., Boston.
Canadian Electrical Construction & Supply Co., Montreal.
Russell Electric Co., Boston.
Electric Power, 150 Liberty St., New York.
McGill University, Montreal.
Hart & Hegeler Mfg. Co., 190 Pearl St., Hartford, C.
M. E. Dansereau, 32 St. James St., Montreal.
The Connecticut Motor Co., Plattsville, Conn.
John Fitzgerald, Montreal.
The E. S. Greeley Co., 5 & 7 Dey St., New York.
The Jewell Belting Co., Hartford, Conn.
The La Boilleaux Electric Motor Fan Co., Cincinnati.
Delaware Hard Fibre Co., Wilmington, Del.
Phenix Glass Co., 729 Broadway, New York.
Germania Electric Co., Boston, Mass.
Electric Review, New York.

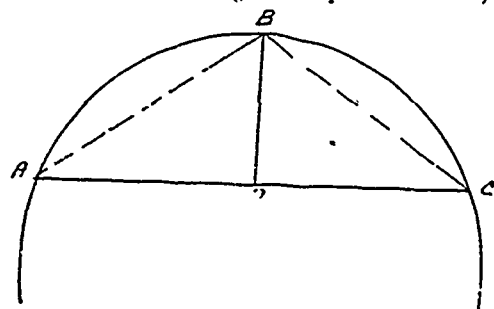
QUESTIONS AND ANSWERS.

E. J. PHILLIPS, Toronto, asks: How can I find the area of the part of head of a boiler that has to be stayed? Or the area of a part of a circle (such as a, b, c)?



ANS.—To calculate exactly the area of the segment of the circle a, b, c, is rather difficult for ordinary every day work. Tables are published in some mathematical works giving the area of segments of all sizes up to half circle, assuming the diameter of circle to be

1". For the purpose of determining the size of boiler stays, however, it will be found sufficiently accurate to measure the length of the line A C along the top row of tubes, and the



height D B. Multiply these together and divide by 2, and the result is the area of the triangle A B C. As the tubes and the shell take a share of the strain upon the boiler head, the area of the triangle is a fair amount to reckon as having to be supported by the stays.

**THE SMALLEST STEAM ENGINE.**

THROUGH the kindness of the inventor, Mr. Thos. Ticknor, of Parkhill, Ont., we are enabled to present to our readers an illustration, reproduced from a photograph, of the smallest steam engine in existence. Mr. Ticknor has succeeded after years of labor in completing this marvel of mechanical ingenuity. The "Little Jumbo," as this miniature contrivance is designated, is a perfect model of a steam engine, complete in every detail, and works with the accuracy and ease of a Corliss, and performs in miniature the same work as the most massive engine ever constructed. Its dimensions are as follows: Diameter of cylinder,  $\frac{1}{8}$  of 1-16th of an inch; stroke, 1-32 of an inch; weight,  $\frac{1}{2}$  of



THE "LITTLE JUMBO" ENGINE.

a grain; bore of cylinder, .3125 of square inch; revolution, .1760 per minute; horse power, .12490 part of a horse power.

It is so small that it can easily be covered with the case of a 22 calibre cartridge, being two-thirds smaller than the famous Waterbury engine that attracted so much attention at the Centennial.

**IMPORTANT NOTICE.**

A meeting to informally consider the advisability of organizing a Canadian Electrical Association, will be held on Thursday, the 17th Sept., inst., at the hour of 2.30 o'clock p.m., in the offices of the Industrial Exhibition Association, Exhibition Grounds, Toronto. A cordial invitation is given to persons in any way interested in the electrical industry in Canada, to be present.

**GARLOCK'S ELASTIC RING PACKING.**

This packing, illustrated by the accompanying engravings, was patented and first manufactured by Orrin J. Garlock, at Palmyra, N. Y., about six years ago. The main offices and factories in connection with its manufacture are located at Palmyra, N. Y.; Rome, Ga.; and Hamilton, Ont. The Canadian factory was started about three years ago.

From very small beginnings the manufacture of this article



SPIRAL.



SECTIONAL RING.



ELASTIC RING.

has grown to such an extent that upwards of 200 employees are now at work in the various establishments. The material is said to be in use in 28,000 engine rooms in the United States and 2,000 in Canada.

It is made in rings a perfect fit to the rod and box. The sectional ring packing is especially adapted to rods out of line, cut rods, flat bottom stuffing boxes and places that are very difficult to keep tight. The Garlock Packing Co., of Hamilton, who are the Canadian manufacturers, state that they are almost daily in receipt of letters from consumers highly recommending the packing.

**PERSONAL.**

Mr. J. H. Northey, of the firm of Northey & Co., steam pump manufacturers, Toronto, is at present in Europe looking after the interests of one of the firm's recent inventions.

Manager J. J. Wright, of the Toronto Electric Light Co., is the owner of a handsome yacht, and has lately returned from a two weeks' cruise on the lakes. Mr. Wright's enthusiastic interest in electric development is almost equalled by his longing to live the life of a jolly tar aboard the steam yacht in question.

We little thought as we presented the readers of the News a few weeks ago with a portrait and brief outline of the career of Mr. James E. Baird, President of the Canadian Association of Marine Engineers, that we should soon be called upon to chronicle his death, but such is now our painful duty. Mr. Baird passed away on August 13th at his home in Toronto, after a few days illness. The news of the sad event was received with the deepest regret by the circle of his acquaintances, and particularly by the members of the Marine Association, of which he was the chief executive officer. The members of the Canadian Association of Stationary Engineers joined with their brethren of the Marine Association in attending the funeral and in presenting beautiful floral tokens of loving remembrance to one who in life commanded their highest respect and esteem.

**ROBIN & SADLER**  
*Leather Belting*  
 SPECIALTIES  
 DYNAMO BELTS  
 WATERPROOF BELTING  
 MONTREAL TORONTO  
 2512 & 2520 NOTRE DAME ST. 129 BAY ST.

**SPARKS.**

We understand that Messrs. Cone & Knight have commenced the manufacture of a new style dynamo at Fergus, Ont.

The electric light man has struck the town of Fleshertown, Ont., and as a result of his persuasive eloquence, a local paper states that the place will probably "emerge from its darkness in the near future."

The Canadian correspondent of the *Electrical World*, apparently from a desire to be thought enterprising, has in some of his recent communications made serious mis-statements regarding the business affairs of some of the Toronto electrical companies. These statements have naturally enough called forth indignant protests from the parties affected by them. Correspondents should not allow their zeal to lead them into presenting to the world statements which are contrary to the facts, and which are perhaps calculated to work injury to the parties whose names are connected with them.

St. John is now probably one of the most brilliantly lighted cities in the Dominion (owing in a large measure to the interest created in electrical work by the electrical exhibition recently held in that city), there being five of the finest central stations of electric light companies in the city, running the Edison, Thomson-Houston, Fort Wayne and Brush electric light systems. The competition between these companies brings the "light" within the reach of the citizens generally, and very many of the property holders have therefore indulged very lavishly in electric light. In addition to this the Corporation of the city is now running electric lights of their own in the north end, Brush plant, and Messrs. D. W. Clark & Son are running the Brush system at the west end, and the New Brunswick Electric Light Co. (Fort Wayne system) have completed their arrangements for lighting the east end, and are giving splendid satisfaction.

# Electric Light Supplies

**Covered Wire, Insulators, Cleats,**

**Soldering Salts, Tape, Cut-outs,  
Switches, Sockets and Shades.**

**Alternating and Direct Current Dynamos,**

**Converters and Meters.**

**Repairs prompt and reasonable.**

## TORONTO ELECTRICAL WORKS

35 Adelaide Street West, TORONTO.



**Brough**

B. & O. MAKE A SPECIALTY OF FINE CATALOGUE PRINTING

**& Caswell**

14, 16, 18 BAY ST.

TORONTO

**Printers**

.. SEND FOR PRICES AND SAMPLES ..

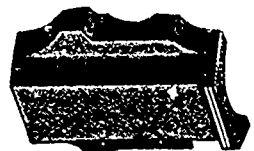
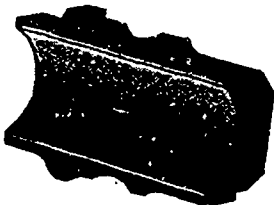
# EUREKA TEMPERED COPPER CO.

**NORTH EAST, PA.**

ONLY MANUFACTURERS OF

**Eureka Tempered Copper**

## JOURNAL BEARINGS

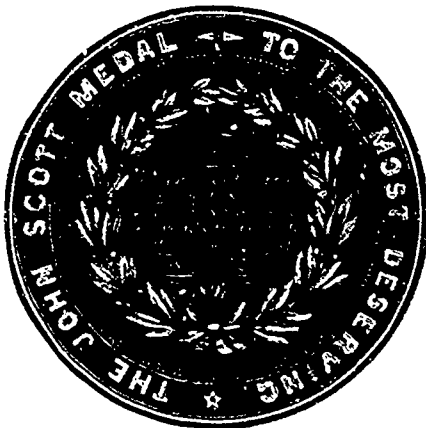


FOR USE IN

- COMMUTATOR SEGMENTS,
- COMMUTATOR BRUSHES,
- ARMATURE BEARINGS,
- GEAR PINIONS,
- TROLLEY WHEELS,
- STREET CAR BEARINGS,
- TROLLEY WIRE,
- ELECTRIC WIRE,
- ENGINE BOXES, FRICTION CLUTCHES,
- STEAM PUMPS AND VALVES, &c., &c.

Warranted to outwear any Brass, Bronze, or Anti-Friction Metal in the market, with

**LESS OIL AND LESS LOSS OF POWER.**



In a test of Eureka Tempered Copper at the University of Pennsylvania in Philadelphia, its strength was shown to be:

Tensile strength per square inch.....	41,230 lbs.
Breaking strength per square inch.....	41,130 lbs.
Total elongation.....	17 per cent.
Strength in compression .....	189,000 lbs.

The Committee on Science and Arts of the Franklin Institute, after subjecting the metal to the severest tests, reported as follows:

"We are of the opinion that the Eureka Tempered Copper Co. has made a decided step in advance in the preparation of copper for many uses, and we recommend the award to Almer Thomas and Luzerne Merket, of the John Scott Legacy Medal and Premium."

For copies of testimonials and all information, address the sole manufacturers,

## EUREKA TEMPERED COPPER CO.

Western Sales Office:

American Ry. Equipment Co., CHICAGO, ILL.

Eastern Sales Office:

35 BROADWAY, NEW YORK.

**H. WARD LEONARD & CO.**

Mr. H. WARD LEONARD, the general manager of the light and power department and also of the intelligence department of the Edison General Electric Company, resigned upon August 2 in order to start an independent electrical machine business under the above title. The new concern will be an incorporated company under the laws of the State of New Jersey. Mr. Leonard will take with him several well tried assistants who have been associated with him in the past, some of them as far back as 1885. Among those who will thus be connected with the company are Mr. A. St. C. Vance, Mr. E. H. Harrison, Mr. C. H. Bloomer and Mr. August Manning.

The company will operate specially in a field which is full of promise for the future, and is at present inadequately occupied, namely, the transmission of power by electricity, and the application of electric motors to the operation of special machinery, such as is not at present operated by electric motors, or whose operation is subject to improvement by careful attention to the requirements of the case.

Mr. Leonard's experience since 1883, when he became a member of Mr. Edison's first electrical engineering staff, has brought him into contact with every branch of electric light and power work. He has held positions from the lowest to the highest in the exploiting parts of the business, as well as in the constructing and in the operating of every kind of electric light and power plants, and it is not therefore altogether surprising that he should feel willing to resign his office with the Edison Company to take up a line of work which promises so well for one having such an exceptional experience as he has been fortunate enough to have.

H. Ward Leonard & Co. will have one important feature of their business which will be entirely unique, namely, an Electrical Intelligence Department. To any isolated plant the company offers at a very moderate subscription price (\$25 a year) the privilege of corresponding upon any electrical subject of practical interest, and thus an isolated plant will be able to secure expert information as to its own plant and the best methods of operating it, and about any new electrical apparatus, or methods and the principles underlying various devices, and the prices thereof. For central station companies, whose queries would go further into steam engineering and methods of distribution and also would cover business questions as to relations with consumers, systems of accounts, etc., the annual subscription charge for this electrical intelligence will be \$50.

This scheme strikes us as an excellent one, and we have no doubt that any plant will get several times the value of the subscription price by placing before this company the matters upon which it desires information, data and statistics. As Mr. Leonard created and developed the Intelligence Department of the Edison General Electric Company, he has had the broadest possible experience in this line, since information of every character issued to those in the Edison Company has been issued by the Intelligence Department of that company. In case the expert judgment of the company be desired as to the comparative merit of various competing apparatus or methods, such expert judgment will be given by special arrangement, although the company prefers to merely supply full information under the subscription arrangement and allows the purchaser to form his own conclusions.

H. Ward Leonard & Co. will do no manufacturing, and will do no supply business, neither will they under any circumstances act as the selling agents of any concern, directly or indirectly. They will, however, act for the purchaser, either as consulting engineers, supervising engineers, inspectors or purchasing agents. When acting this way they will make the following charges, based upon the contract price:

For making preliminary plans, designs, distributions and estimates, 1 per cent.; making final plans and specifications, 1 per cent.; drawing and executing contract on the behalf of the purchaser, 1 per cent.; supervising an installation made by another contractor, 3 per cent.; inspecting and reporting on the work of another contractor, 1 per cent.; acting on the behalf of the purchaser in making the settlement with another contractor, 1 per cent.; acting as the agent of the purchaser, from the beginning to the final settlement of a contract, including the making of estimate plan, termination, specification, contract, supervising the installation, final inspection and report, and final settlement, 5 per cent.

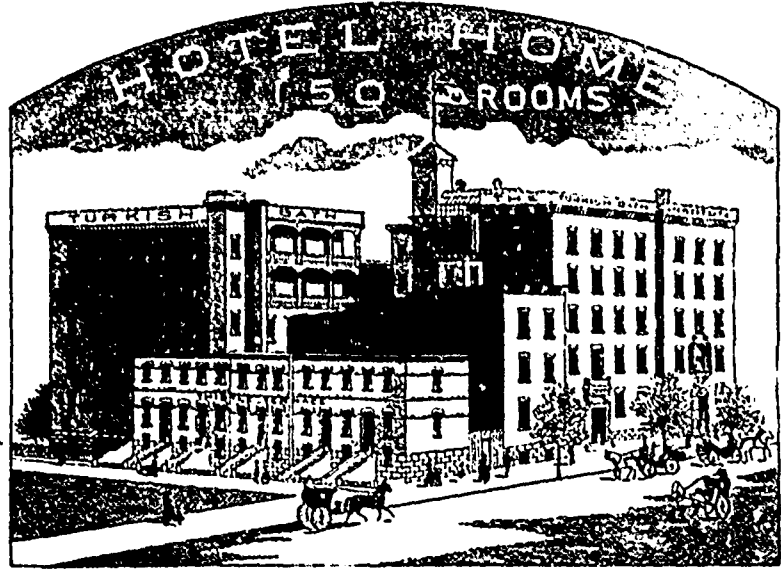
It will be seen from the complete schedule, given above that the purchaser will be able to obtain the services of this company for any portion of the work, and under terms which are so reasonable that there can be no question in the minds of those familiar with the subject that any purchaser contemplating the installation of an electric plant would not only save a great deal of his own time and be spared a great deal of annoyance, but would actually effect a very material saving in retaining the services of a concern such as this to represent the interest of the purchaser.

The various fan companies will also, no doubt, welcome the advent in the electrical field of an electrical engineering concern of this order, whose experience and ability is undoubted, and who are free from prejudice and have no affiliations of any kind with any of the various electrical concerns. Any parent electrical company can confidently refer a prospective purchaser to such a concern as this, with confidence that any opinions given by it to the purchaser will be based on the honest judgment of a firm thoroughly competent to judge any practical electrical question.

H. Ward Leonard & Co. will make a specialty of the transmission of power and the application of electric motors to such uses as necessitate the application of a wide experience in both mechanical and electrical engineering. Such applications of electric motors as met with in elevators, pumps, hoists, mine tramways, printing presses, etc., are those which this company feels itself especially qualified to undertake under guarantee of perfectly satisfactory results.

A by-law has been carried authorizing the expenditure of \$75,000 upon the construction of an electric railway from Port Arthur to the boundary of Fort William.

The Street Railway Committee of the Toronto Junction council has recommended the acceptance of the offer of the city and suburban electric street railway, and to grant the company the right of way and franchise over the streets of the town.



**ARE YOU COMING TO MONTREAL?**

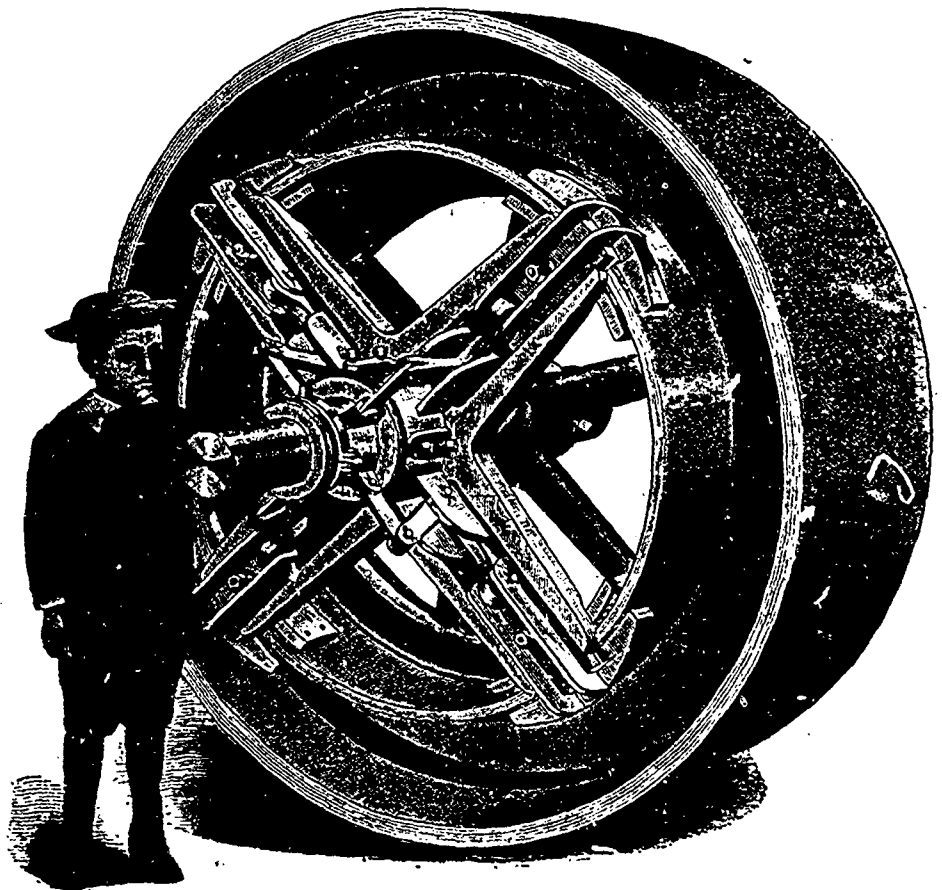
IF SO, PUT UP AT THE

**TURKISH BATH HOTEL**

On St. Monique Street, near the Windsor. 150 rooms. Quiet, comfort, luxury. No intoxicants. Terms moderate. All forms of water baths free to guests. Patronized by professional men, temperance men and the best class of travellers.

F. E. McKAYS, - Manager.

**Hill Patent Friction Pulleys**



**AND CUT OFF COUPLINGS**

For Electric Light Stations and all purposes where intermittent power is required.

**MILLER BROS. & TOMS,**

(Successors to Miller Bros. & Mitchell)

Toronto Office: 74 York Street.

MONTREAL, QUE.

ESTABLISHED 1869.

## SPARKS.

The Montreal town clocks are regulated by electricity.

Gen. C. H. Barney, of New York, has been appointed general manager of the Montreal Electrical Exhibition, and is now in Montreal getting matters in shape.

The Bell Telephone Co. will place instruments at different parts of the exhibition hall for the accommodation of those who attend the Montreal convention. The Edison company has offered to light free of charge the tent which is to be placed on McGill University grounds for the Montreal conversazione. A number of long distance telephones will also be in operation between the Montreal electrical exhibition and some of the principal American cities.

We hope the American delegates to the Electrical Convention will receive such hospitable treatment at the hands of the citizens of Montreal, and find so much to interest and please them in the scenery of Quebec, that they will resolve to convene in Canada again at some future time. In the event of such a resolution being reached, may we not hope that Toronto, which has earned the name of the "Convention City," will be selected as the scene of the gathering.

Mr. Henry E. Haferkorn, Milwaukee, Wis., is the publisher of a "Handy List of Books on Mines and Mining," which should serve the purpose of a useful catalogue to persons interested in mining matters.

## ROGERS' DYNAMO OIL

Guaranteed Superior Quality  
and Economical.

**SAMUEL ROGERS & CO.,**  
30 FRONT ST. EAST. TORONTO  
MANUFACTURERS OF  
Finest Engine, Cylinder and other Oils

## STEAM USERS

Desiring the services of **COMPETENT ENGINEERS** of any class, can obtain sober, intelligent and reliable men, by applying to

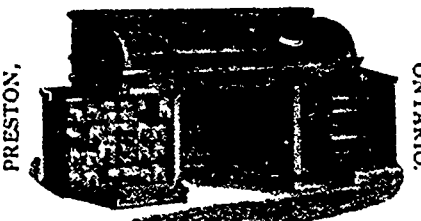
**CANADIAN ASSOCIATION  
STATIONARY ENGINEERS.**

A. E. EDKINS, President, care T. Eaton & Co., Toronto.

JAS. ROBERTSON, Secretary Montreal Branch, 1420 Mignonne Street, Montreal.

**NEW & 2ND HAND  
ILLUSTRATED MACHINERY  
CATALOGUE H.W. PETRIE  
FREE TORONTO, CANADA**

The Canadian Office & School Furniture Co.



PRESTON,

ONTARIO.

## F. E. Dixon &amp; Co.

MANUFACTURERS OF

## LEATHER BELTING

70 KING STREET EAST, TORONTO.

HEADQUARTERS FOR

## ELECTRIC LIGHT AND DYNAMO BELTING.

We have the following Leather Belts in use in the works of the Toronto Electric Light Co. :-

- One 36 inch belt 98 feet long.
- One 36 inch belt 100 feet long.
- One 36 inch belt 123 feet long.
- One 38 inch belt 100 feet long.
- One 24 inch belt 100 feet long.

And over 1500 feet of 8 inch belting.

All of the above belts are **DOUBLE THICKNESS**. The 38 inch belt is the largest belt ever made in this Province.

We are prepared to furnish belts of any size, two or three ply, up to 48 inches wide. Every belt fully guaranteed.

SEND FOR DISCOUNTS.

Dixon's Belting Hand-Book mailed free on application.

# HOTEL BALMORAL

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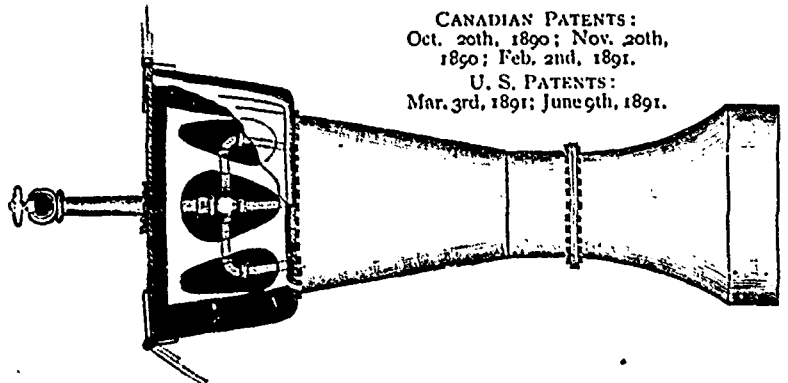
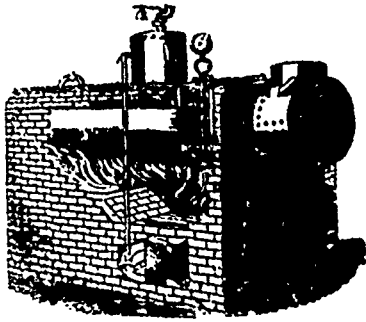
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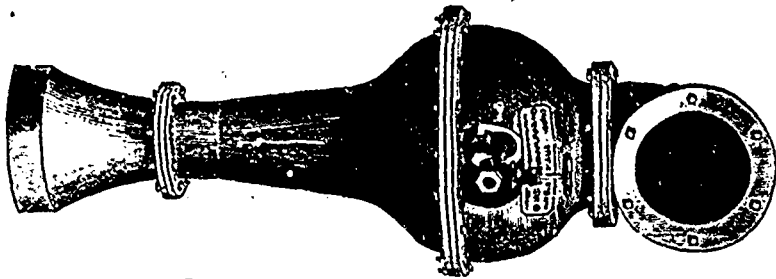
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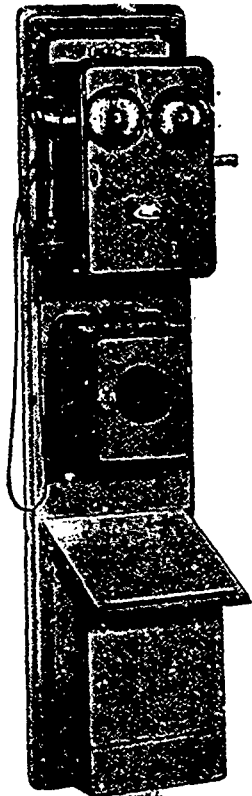
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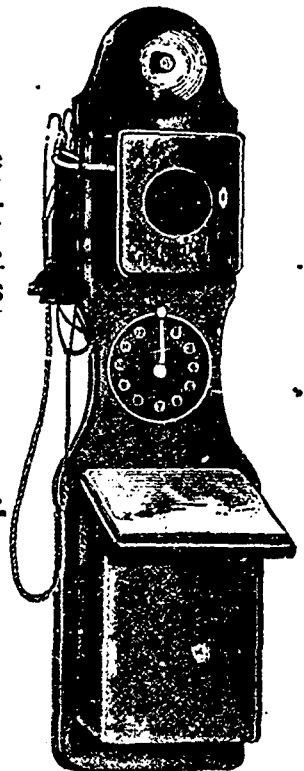
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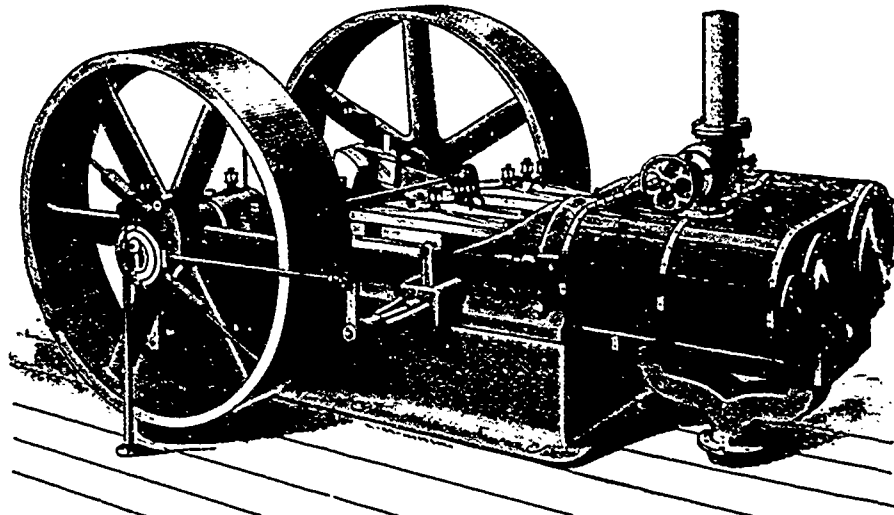
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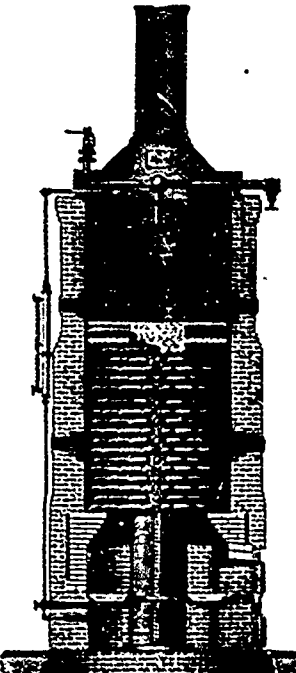
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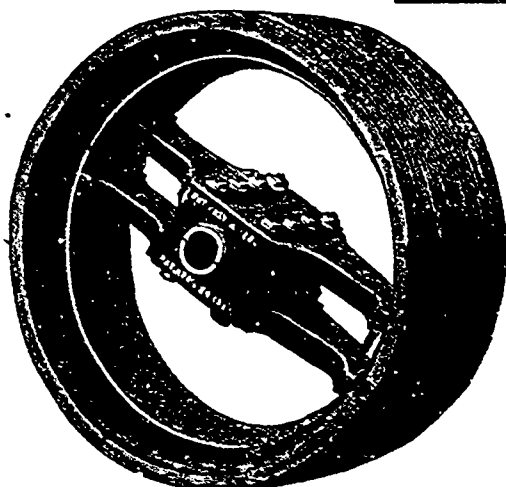
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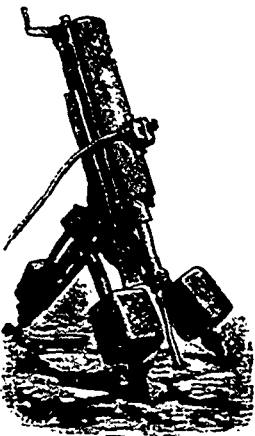
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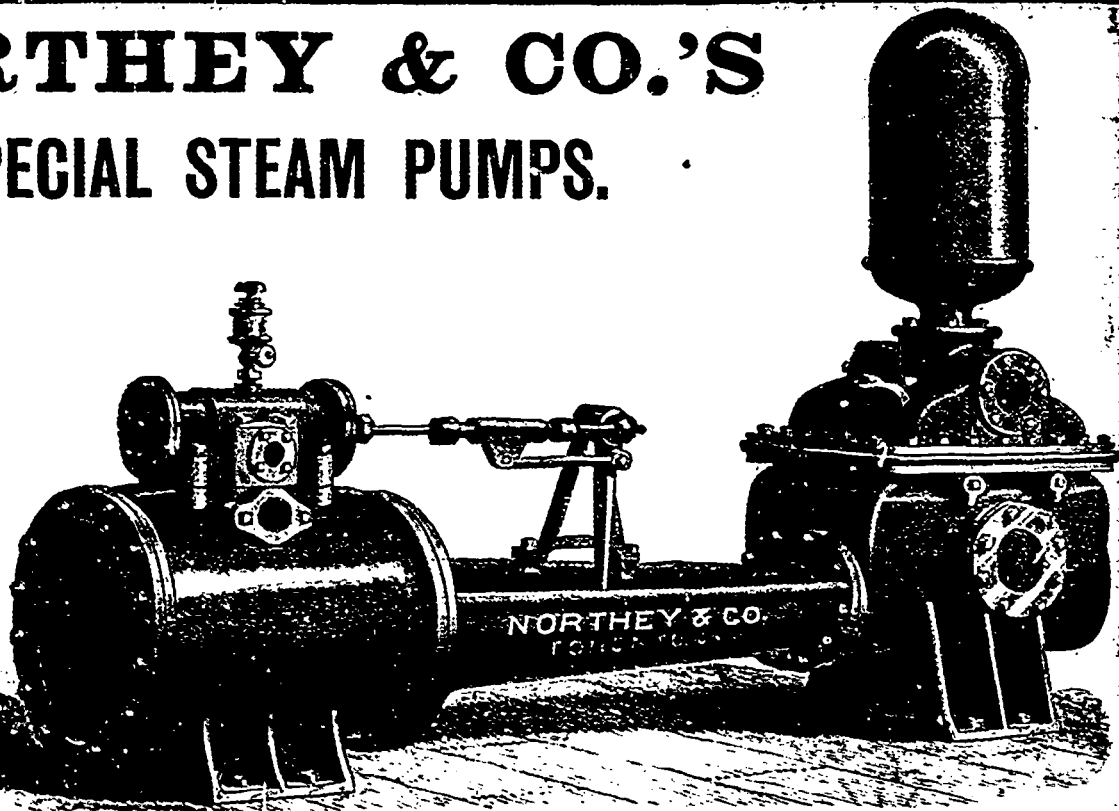
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