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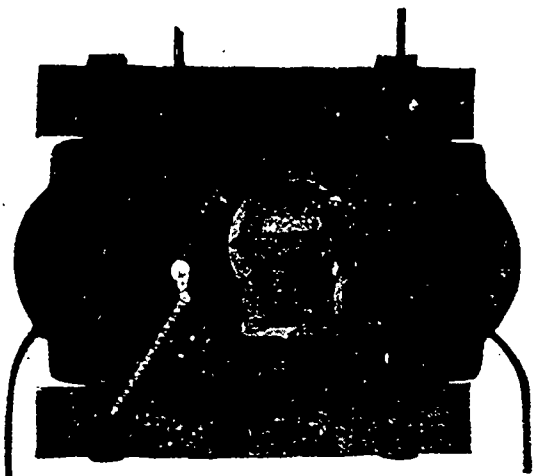
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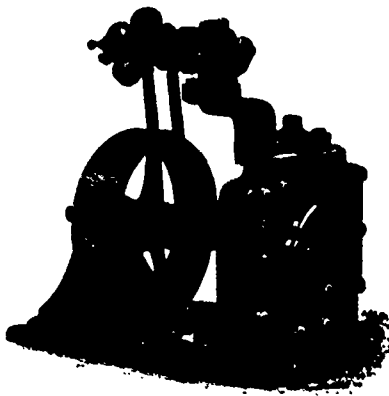
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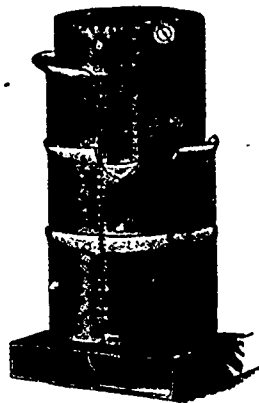
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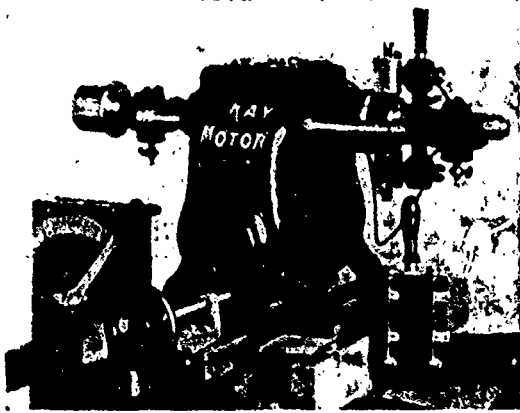
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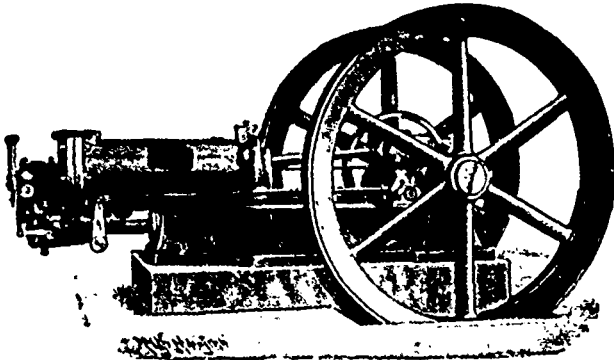
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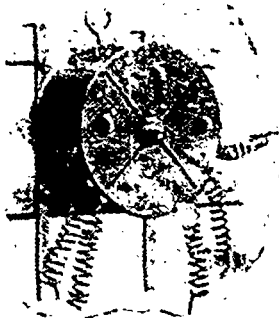
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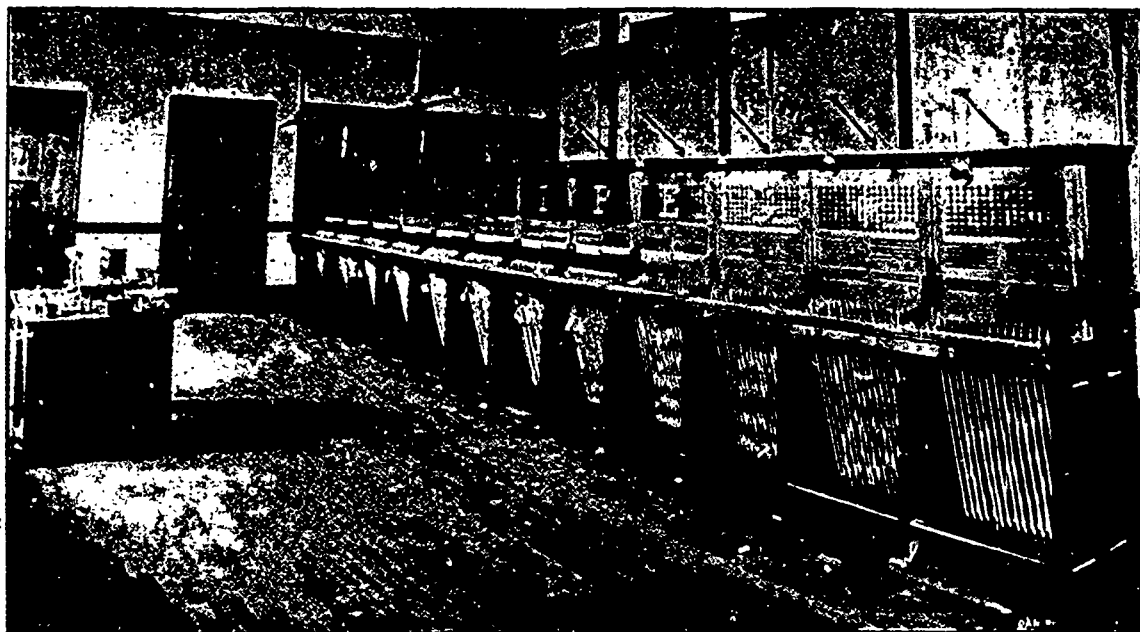
**NEW BELL TELEPHONE EXCHANGE AT WINNIPEG.**

THE Bell Telephone Company, of Canada, has recently completed a new exchange in the city of Winnipeg which is one of the most efficient in the country. The building is situated on Thistle street, near Main; constructed of white brick and faced with brown stone; it is two stories in height and is used exclusively by the telephone company.

In the basement are the distributing room, inspectors' and linemen's quarters and the heating apparatus. On

ard form in use in so many of the offices of the company. The switch has a capacity of twelve hundred lines. The present number connected up is about nine hundred. Each operator has charge of one hundred lines, which are brought through jacks to the annunciators in the usual way.

Some difficulty has, in the past, been experienced with boards, where it is necessary to transfer connections from one section to another, in having the line properly disconnected when the conversation was finished. A special feature has been introduced into



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the ground floor are the company's general offices, with the district superintendent's private office, the power room, and a room in which is installed the city fire alarm apparatus, which is operated by the telephone company. The upper storey is used for the operating room and the operators' retiring and lunch rooms.

All the wires enter the building under ground in paper insulated cables, and are carried through flexible rubber cable-heads direct to the distributing frame, which is of the most modern type, and equipped with the best lightning arresters and strong current protectors known. The wire used in the distributing frame is insulated with wool, a novel feature, designed to make the mass of wires as flame-proof as possible. From the distributing frame the lines are carried in small cables up to the switch-board.

The switch-board is of somewhat novel construction, being a decided improvement on the well-known stand-

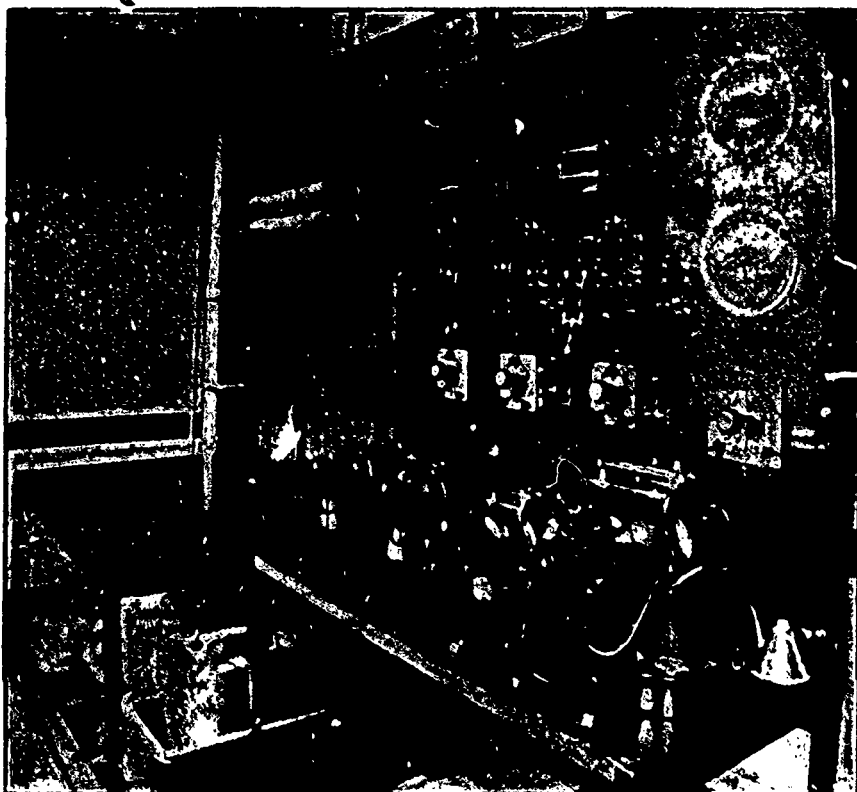
this board to obviate the trouble. One hundred and eighty transfer lines are multiplied through all the boards, fifteen being brought back and terminated at each section in cords and plugs. Let into the key-board, in front of each plug, is a miniature four-volt incandescent lamp, connected up in such a way as to glow when the transfer line plug is in a jack and the other end of the transfer line is open, thus furnishing a most accurate disconnect signal.

The operation of making a connection from one switch to another is as follows:—Suppose operator on section No. 2 receives a call from subscriber 234, for subscriber No. 781—the operator on No. 2 section depresses the order wire key connected to the operator's telephone on the 7th section and says "781." The operator on the 7th section sees at a glance what transfer lines she has idle at her section; picking up any one of these plugs she repeats back to No. 2 operator "781



on 6" (for example), at the same time inserting the 6th transfer line plug into line jack 781. The operator on No. 2 section now inserts the front cord of the pair with which she has answered subscriber No. 234 into the 6th transfer line jack of the 15 leading to the 7th section. On the termination of the conversation the subscriber rings off, throwing the ring-off drop connected with the pair of cords in use on section No. 2. The operator at the section comes in on the line after assuring herself that the conversation is finished, and withdraws the cords from the jacks. This causes the lamp in front of transfer plug No. 6 on the 7th section to glow, showing the operator at that section that the conversation is finished, whereupon she, in her turn, removes the plug from the jack and, on replacing it into its socket, the lamp goes out. These supervisory signals enable the operators to do very much more work than under the old system. All the details of the board—jacks, drops, keys, etc.—are of the very latest design and of the most substantial construction, and should ensure good service with a minimum amount of trouble.

The current for operating the switch-board and other



POWER ROOM, SHOWING MOTOR-GENERATORS, SWITCHES, STORAGE BATTERIES AND RESISTANCE LAMPS.

transmitters, supplying the four-volt lamps, operating the fire alarm, together with the alternating current required for signalling the subscribers, is furnished by the power plant on the first floor of the building. This consists of two motor-generators for charging storage batteries, and two motor-generators furnishing an alternating current for signalling the subscribers, four chloride cells furnishing current for the transmitters and lamps, and twenty-four small cells operating the fire alarm.

The power switch-board is of polished slate, on which are mounted all switches, lightning arresters, cut-outs, ammeters, etc., used in connection with the system.

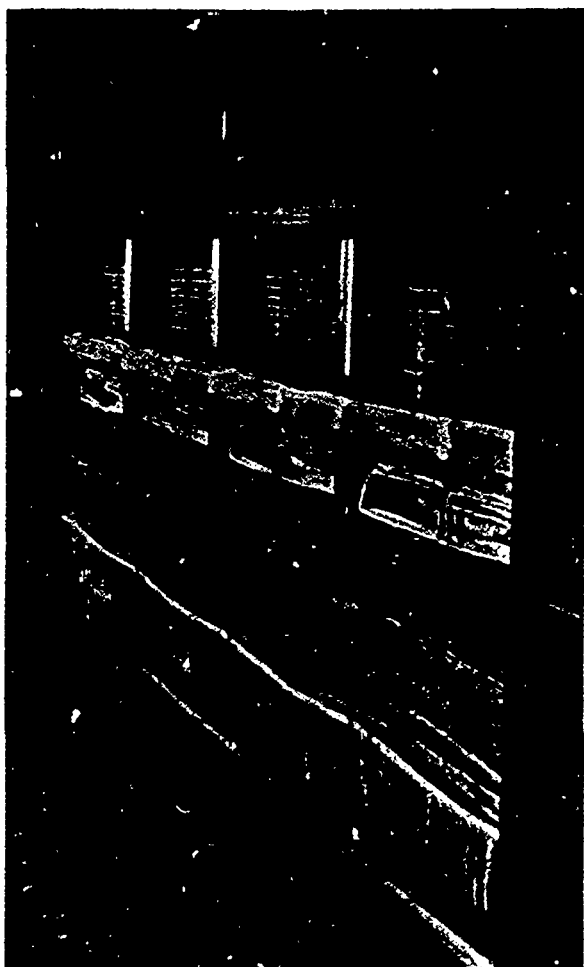
The lines were successfully transferred from the old to the new offices on the evening of the 25th October, 1896, the total time occupied in making the transfer of the lines being about two minutes.

The entire apparatus was manufactured for the Bell Telephone Company by the Northern Electric & Manufacturing Company, of 31 Aqueduct Street, Montreal.

Mr. F. G. Walsh, the district superintendent of the northwestern department of the Bell Telephone Co., has also the direct supervision of the Winnipeg office, with which he has been connected from the time of the first introduction of the telephone in the Northwest, and to his ability, energy and good judgment much of the company's success in this section must be ascribed.

The Winnipeg street railway system was recently tied up for several hours owing to a sudden thaw, followed by a blizzard. Manitoba is having an exceptional winter of sudden changes in temperature.

The new electric light plant at St. Mary's, Ont., was successfully started on the first of December. It is composed of twenty-eight 2,000 c. p. "Reliance" arc lamps, supplied with current from a Reliance dynamo, which is giving thorough satisfaction. It was installed by Mr. H. H. Ingram, of Seaforth, and is now in charge of Mr. Jos. H. Ward, electrician, late of Toronto, who is also installing a small incandescent plant to light Messrs. Weir & Weir's flax mills, which furnish the power for the arc plant.



REAR VIEW OF SECTION OF SWITCHBOARD, SHOWING METHOD OF WIRING.

### FIRST CANADIAN MOTOR CARRIAGE.

THE interest which has been taken of late in the horseless vehicle in many parts of the world received a local impetus by the appearance on the streets of Toronto last month of the first motor carriage yet constructed or to be seen in Canada. Appearing shortly after the test which took place in England, and which is said to have been a good demonstration of the utility of this class of carriage, there was much interest manifested in the success of the trial trip, which revealed no disappointment.

The carriage was constructed for Mr. Fred. B. Featherstonhaugh, patent solicitor, the electrical equipment being the design of Mr. W. J. Still, of 70 Yorkville ave., Toronto. The general design of the carriage is after the style of the London hansom cab, except that the driver occupies a seat inside, instead of being perched up at the back. It is hung on ball bearings and mounted on three wheels, with 2-inch Dunlop pneumatic tires. The two wheels at the back are 28 inches in diameter and the front wheel 20 inches. It is supplied with a top, and as an extra precaution against the weather a celluloid blind, perfectly transparent, may be used when required. The total weight of the carriage is approximately 750 pounds, of which 370 pounds is for the electrical equipment. It is estimated that it could be placed upon the market at a cost of about \$650, including electrical equipment, which would cost from \$200 to \$300.

The storage battery is placed directly under the seat, and contains 12 cells weighing  $23\frac{1}{4}$  lbs. each. They occupy a space about 16 x 24 inches and 14 inches deep, and are what is known as the lead-lead pasted type, being the invention of Mr. Still, for which patents have been applied. The electrical contents of the cells are  $4\frac{1}{4}$  h.p. hours, or, in other words, they will give one horse power for  $4\frac{1}{4}$  hours. The cost of re-charging is about twenty-five cents. Mr. Still claims that they are built particularly for high discharge rate work, and are fully one-half lighter than any storage battery yet placed upon the market. The controller has three positions, giving 6, 12 and 24 volts. It is an iron bar with a handle to the right of the seat, and is also used for steering. The device is very simple, and enables the driver to propel or reverse the carriage almost instantly. The motor, also the invention of Mr. Still, is four maximum h.p., and is supported on the back axle. It is geared 12 to 1 to the driving wheels, and hung on roller bearings. On the dash-board are two incandescent carriage lamps supplied by the battery.

Mr. Still states that the carriage differs from any yet constructed, both in the class of cells, character of motor and controlling apparatus, and is built especially for town and city purposes. When the battery is fully charged it is estimated that it will be capable of propelling the carriage about 60 miles before requiring to be re-charged, making an average of 12 miles an hour for five hours. On a level road three-quarters of a horse power is required per hour for its operation, but on steep grades this, of course, would be greatly increased. The trial trips which have been made on the city streets have fully met the expectations of those interested, and prove that at least the construction of the machine is mechanically and scientifically correct.

Mr. Still, the inventor of the electrical apparatus, is an Englishman, who came to this country seven years ago. He was not originally connected with electrical

work, but was prompted, he says, to make experiments in that line through sheer necessity. He required a motor for a special purpose, but could not obtain one to meet the requirements, so set to work to study the science himself, with the result that he shortly afterwards designed a motor and secured a patent therefor. Subsequently he turned his attention to the storage battery, and after diligent research his efforts promise to be rewarded. It is his intention to form a syndicate to manufacture cells and motors for railway and locomotive work. One of the objections to storage batteries has been their great weight, but this Mr. Still claims to have overcome in the article which he will shortly place upon the market.

### QUESTIONS AND ANSWERS.

"R. M.," Milton, Ont., writes: How should I cut a coil out of an Edison exciter armature? Should I cut the two wires loose from the section and then close that section to the next one? What should I do with the wire that I cut loose? If the sections are near together can more than one be cut out?

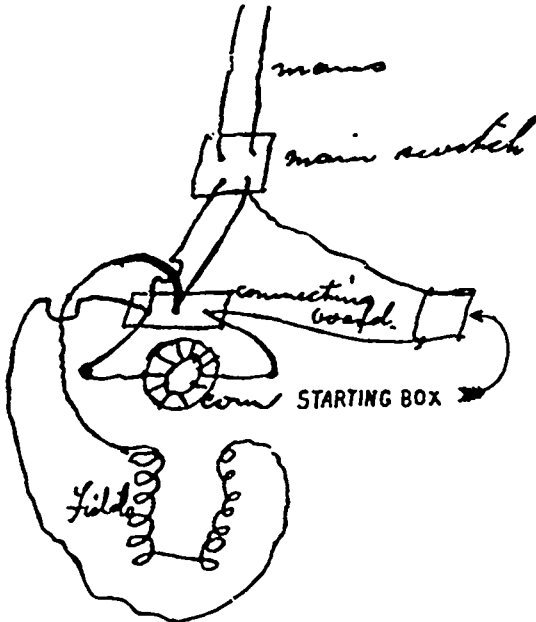
ANSWER. We should suggest that if you feel in the least doubtful about the results of cutting out the coil, you should send the armature to some repair shop where they do such things. You have the general idea all right. Don't do anything with the wires you cut loose, but take care they don't come together or touch anything else. If they touched together they would form a closed circuit of low resistance in which a large current would continually flow, and great heat would probably result. You can, of course, cut out as many sections as you like, but must remember that the armature will probably lose its electrical balance.

"U.M.A.X." writes: Would you kindly let me know in your NEWS for January what causes an electric light machine to go to sleep, and the best thing to do in such cases. I am told that one of the machines in the Ottawa power house went to sleep, and after three or four days started up again. And is it not right to have all wires free from touching trees or branches? I claim that all wires should be clear, as such contact would cause grounds on the lines.

ANSWER. The only thing that could cause a dynamo to "go to sleep" would be the complete demagnetization of the fields, and it is difficult to understand how this could occur in a place where the machines are run every night. It is more probable that a connection was loose somewhere, or a wire broken, so that the fields were not magnetized. It would be interesting to hear from Ottawa about this case. You are quite right in your claim that all wires should be clear of any chance of rubbing against branches, etc.; grounds are caused by this continual rubbing, which tends to scrape off the insulation, leaving the copper in actual contact with a body that is generally, at least, moist, and frequently quite wet, and therefore a good conductor. Besides which insulation is not much good anyway, and after a few months' exposure to the air will leak through.

"B. E.," Hawkesbury, Ont., writes: "As a subscriber to the ELECTRICAL NEWS, kindly assist me out of a difficulty. I am operating a 4 h. p. ball motor on a 110 volt straight current circuit, which formerly worked on a 4 ampere constant current circuit. If I am not mistaken the machine should require about 35 amperes at

110 volts, but I cannot get more than 25 amperes on the meter on the 25 K. W. Edison machine, from which it is driven. The winding is correct, having come from its maker. The connections are all correct, for it works well except as regards its power and speed. The distance from generator to motor is about 100 yards, and very little loss is shown on the volt meters. The data is No. 12 D. C. C. on armature (it being ring type), and No. 18 S. C. C. on field magnets. The field magnets show about the same strength of magnetism. The voltage test was taken while running. The mains from the generator are No. 8 B. & S. w. p. wire, and are sufficiently heavy for 35 amperes, the motors only requiring about 32 amperes at full load. The weight of field coils is 20 lbs. No. 18 B. & S. S. C. C. and armature 33 lbs. required No. 12 B. & S., D. C. C.; there were some five or seven pounds left over after winding the armature. I have enclosed a sketch of the connec-



tions. The speed of the machine is reduced to about one half when it is working.

ANSWER.—The wires leading from generator to motor are entirely too small. The safe carrying capacity independent of most advantageous size for No. 8 is only 25 amperes. The loss between generator and motor with 32 amperes at 100 yards with No. 8 B. & S. wire would be about 15 volts, or 14 per cent. There are other reasons, however, that might cause the trouble. The position of brushes may not be correct. The proportion of wire appears about right. It is difficult to diagnose a case unless we see the patient. I think, however, the whole trouble is that the line is too small.

#### PERSONAL.

Mr. George Campbell, manager of the Winnipeg Electric Railway, has severed his connection with the road, to engage in mining operations.

Mr. Maurice Quain, electrician, of Ottawa, Ont., left last month for Rossland, B. C., where he has secured a position with a large mining company. Before leaving Ottawa he was tendered a farewell supper.

Mr. Frank Green, electrician of the Hamilton, Grimsby and Beamsville railway, has resigned, and accepted a similar position with the Hamilton Radial Railway. It is expected that other changes will be made in the Hamilton, Grimsby and Beamsville railway at an early date.

Mr. R. G. Moles, proprietor of the electric light plant at Arnprior, Ont., declined to accept municipal honors at the late election, after serving for seven years as reeve and three years as mayor. During his regime the best interests of the town had been advanced, and his retirement was a source of regret to the citizens.

Readers of this journal will regret to learn of the serious illness of Mr. A. E. Edkins, inspector for the Boiler Inspection and Insurance Co., of Toronto, and Registrar of the Ontario Association of Stationary Engineers. An attack of inflammation of the lungs was followed by an abscess on the brain, which necessitated a surgical operation. For several days he was thought to be beyond medical skill, but as we go to press it is learned that he is somewhat better, and hopes are now held of his recovery. The *ELECTRICAL NEWS* joins with his many friends in hoping that he may speedily return to convalescence.

## CANADIAN ASSOCIATION OF STATIONARY ENGINEERS.

LONDON NO. 5.

THE above association is in a prosperous condition, and all the meetings are well attended. Two new members have recently been initiated, and the applications of four others are now awaiting to be passed upon. At the last meeting a debate took place on "Steam Engine Economy," which was ably discussed and illustrated. The Association has been presented with forty catalogues from manufacturers.

KINGSTON NO. 10.

At a meeting of Kingston No. 10 held on December 10th, papers were read by Messrs. R. Priestly and W. Woodrow relating to the horse power of steam engines and boilers. Mr. F. W. Simmons followed by an essay on the latest production of electricity directly from coal, illustrating the subject by experiments and the use of charts. Below will be found the calculations of Mr. Priestly, which we have simplified in some respects:

RULE: To find the horse power of a boiler always find the number of square inches and divide by 144, which gives the square feet of heating surface, and divide by fifteen square feet, which is an average allowance for one horse power of a boiler. Divide the horse power by 2 and you have the proper grate surface, and allow  $\frac{1}{2}$  square inch of safety valve to each square foot of grate surface generally. From  $\frac{1}{2}$  to  $\frac{3}{4}$  of a square foot grate surface is allowed to each horse power of a boiler. To find the horse power of a boiler, find the number of square feet of heating surface and divide by 15. Fifteen square feet of heating surface is the general allowance for a h. p. of a boiler.

EXAMPLE:

Let D = diameter.

T = tubes.

H = heads.

S = shell.

L = length.

Heating surface in S =  $\frac{2}{3}$  of total area of S,  
 $\therefore \frac{2}{3}$  (D of S  $\times$  3.1416  $\times$  L of S) =  $\frac{2}{3}$  (4'  $\times$  3.1416  $\times$  25') = 209.44 sq. ft.

Heating surface in H = area of H - area of ends of 2 T.

$2(D^2 \text{ of } H \times .7854) - 4(D^2 \text{ of } T \times .7854) =$

$2(4' \times 4' \times .7854) - 4 \frac{(16'' \times 16'' \times .7854)}{144} = 2.0944 \text{ sq. ft.}$

Heating surface of tubes =

$2(D \text{ of } T \times .7854 \times L \text{ of } T) - 2 \frac{(16'' \times 16'' \times .7854 \times 25 \times 12)}{144} = 209.44 \text{ sq. ft.}$

Total heating surface = 209.44 + 2.0944 + 209.44 = 420.9744 sq. ft.  
 15 sq. ft. per h.p.

$\therefore$  h.p. of boiler =  $\frac{420.9744}{15}$ , or about 28 h.p. Ans.

RULE: To find the horse power generated in any kind of a boiler when running, first, notice how long it will take to evaporate 1 inch of water in the glass gauge, divide this into 60, which gives number of inches evaporated in one hour; second, multiply the average diameter where evaporation took place by the length of the boiler in inches; this multiplied by the number of inches evaporated and the answer divided by .1728 gives the cubic feet of water evaporated in one hour.

There is no such thing as a horse power to a steam boiler—it is a measure applicable only to dynamic effect; but as boilers are necessary to drive steam engines the same measure applied to steam engines is now universally applied to the boiler. The standard as fixed is one cubic foot of water evaporated per hour from and at 212 degrees. For such horse power this at that time was the requirement of the best engine in use. At the Centennial Exposition in 1876, a board of engineers selected from all parts of the world adopted as a standard for tests of boilers 30 pounds of water evaporated per hour under a steam pressure of 70 pounds per square inch as representing one boiler horse power. The general rule in estimating horse power of boilers is based on its evaporating one cubic foot of water horse power per hour one foot, or 62  $\frac{1}{2}$  pounds, or 6  $\frac{23}{32}$  gallons of water evaporated per hour is equivalent to one horse power; that is, a boiler that will evaporate ten cubic feet of water, 625 pounds of water, or 62  $\frac{1}{2}$  gallons of water per hour is a boiler of 10 horse power.

## CHEMISTRY IN THE BOILER ROOM.

By WM. THOMPSON, Montreal West.

PERHAPS a more elaborate heading might have been chosen, but after careful consideration of the importance to be attached to the requirements of the engineering profession and the actual need of at least a rudimentary education in chemistry before an engineer can become acquainted with what is really taking place in the plant under his charge, I cannot think of a more suitable or appropriate title for the subject to be discussed.

All engineers, no matter how practical, require a theoretical education, and to this end associations have been established where engineers can meet together and discuss the various branches of their profession. Varying degrees of success have been attained, and in a large number of cases a new enthusiasm has been propagated and many engineers have been turned from mere "machines" to thoughtful, earnest men, anxious to know their business, and resulting in a new class of engineers having been formed who are well acquainted with the nature of the duties required of them, and giving to the steam-user a greater degree of confidence in the ability of his engineer; on the other hand giving to the engineer a degree of confidence in himself that was formerly an unknown quantity, and establishing the usefulness of the steam engine as a producer of power more fully and with more favor than heretofore.

The designer and builder of steam engines and boilers in Canada has, I think, kept pace with the demand upon his energy and resources, and he can to-day bravely and confidently face competition from whatsoever source, and prove that a steam plant is not the hungry article many people would have the consumer believe. The designer, however, to enjoy success, must of necessity have the co-operation and assistance of the operating engineer. A modern plant in the hands of an engineer who only knows enough to oil and "tinker" stands a mighty poor chance of proving an unqualified success. The importance of this has already been evidenced by the establishment by the engineers themselves, of the organizations already mentioned, and more particularly by the establishment in our leading universities of faculties to impart this important knowledge. A new era seems to be opening up in engineering circles, when ability will be more readily recognized and when an engineer will require another kind of ability than that necessary to do a certain amount of manual labor in a given time, or a certain amount of wire-pulling to secure a "job." Prominent evidence of this can be seen by the recent decision of the Toronto City Council to appoint the engineer to the new city hall by a competitive examination.

Public safety demands that every engineer should pass a qualifying examination before being allowed to take charge of a steam plant, although, unfortunately, we have no general law to this effect. Where these examinations are in effect, candidates are examined on what may be termed a graduated scale, and certificates granted accordingly. The examination comprises, as it very properly should, a close examination on the strength and management of boilers—such as the required thickness of plate, diameter and pressure being given; the safe working pressure, thickness of plate and diameter being given; the strain per sectional inch, thickness of plate, diameter and pressure being given; the required strength of furnaces and flues under varying conditions; strength of plate at joints as compared with solid plate; strength of all rivetted joints, etc. In other words, the examination proceeds under the well known theory that the weakest part of a boiler is its greatest safe working stress, and no engineer should under any circumstances be allowed to take responsible charge of any steam boiler until these questions are thoroughly understood, any more than a navvy out of a ditch should be called upon to prescribe for a case of smallpox or other disease.

If, then, public safety requires the engineer to have a certain theoretical as well as practical knowledge and experience, his employer will require a certain other knowledge, and his own pride and skill in his employment will demand that he acquire all the knowledge possible as to what takes place from the coal pile to the time he turns out his power as the finished article. Unfortunately this knowledge is not easily acquired even after years of experience, and when the engineer has mastered the operation of his engine, he stops there and looks no further.

Every engineer who is at all observant knows that combustion takes place under certain defined conditions, and that in many cases a sediment is formed in his boiler feed water that is a constant cause of anxiety to him and a menace to the life of his boiler, and that from some cause or other a certain deterioration gradually takes place in his boiler plates, stays and other acces-

sories; that different conditions exist under different circumstances, and to such an extent that it seems almost impossible to master the various difficulties.

A close student of chemistry will find that in nearly every case the cause of these varying conditions is the result of a certain *chemical reaction constantly taking place, and also that a knowledge of chemistry, enabling the operator to understand the reaction, will also enable him to neutralize the reaction to a greater or less degree.* Hence it becomes essential that an engineer, to thoroughly understand and comprehend what is constantly taking place from coal pile to finished power, requires a knowledge of chemistry, and the more complete our chemical knowledge, the better and more proficient engineers we shall certainly become.

It is not my intention to undertake at the present time to discuss all the chemical reactions that may usually be expected to take place, but in the present instance to discuss, and as plainly as possible, the chemical reaction constantly taking place during the combustion of fuel.

As every engineer knows, coal is a black, inert mass, obtainable in many grades and degrees of efficiency; that when supplied with draught and heat it burns up and disappears, giving off during this operation both heat and light, and that it is this peculiarity that makes it so valuable and generally used for the production of power. If our knowledge stops here we have really learnt nothing of any importance. Then, engineers, go still further, and note that during the process of "burning," as usually styled, certain gases are formed which have a given calorific value, and to save fuel we must take precaution to utilize these gases. We know as a matter of fact that these inflammable gases had no existence as such when coal was placed in the furnace, consequently they must have been formed after being placed within the furnace, and by some process not at once understood. We all know this to be an actual fact, then in the face of this, is it not reasonable for us to endeavor to learn first, what is the composition of coal that gives it this peculiarity of burning up and throwing out heat? We know that it does this, but "why?" Why will not clay, iron, stone, sand or any other mineral do the same work or behave in the same way under similar conditions? We know they will not, but when asked "why?" we have simply to say we do not know. Now, if coal has this peculiarity, and under certain conditions forms gases, there is certainly a reason for it, and fortunately for us the chemical art places all these things in simple array before us, so that they are easily understood and actually placed under our control. This very fact leads me to say that the more chemical knowledge we can obtain, the better engineers we shall become. No matter how clever you are you cannot intelligently operate an engine unless you understand it, and for the same reason you cannot intelligently produce power from coal unless the process of combustion is fully understood. We want to know what coal is, what are its component parts, what makes it burn, why gases are formed, what they are, how formed, how burned to give best results, and why, when coal burns, it gives off heat, and how much, and finally what becomes of it.

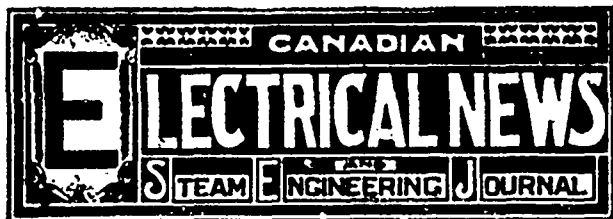
Coal burnt is not destroyed; it has simply changed from a black inanimate mass into some other substance or substances which we shall consider later on.

(To be Continued.)

### IMPORTANT PATENT DECISION.

By recent decision of the United States Circuit Court at Cincinnati, O., the Dodge and Phillon patent for separable wood pulleys, covering the compression fastening and interchangeable bushing system, is broadly sustained. Under the patent laws, the user, the seller and the manufacturer are all held to be infringers and liable as such to the owners of the patent. The Dodge Wood Split Pulley Company, of Toronto, is taking proceedings against infringers of their patent in Canada.

We have received from the publisher, Mr. Chas. A. Hewitt, 510 Royal Building, Chicago, a copy of a book entitled "The National Electrical Code, by Price & Richardson, electrical engineers. It is an analysis and explanation of the Underwriters' electrical code, and the common analogies and simple definitions used make it easily intelligible to non-experts. The authors have undertaken to explain the matter in ordinary language for the special benefit of insurance inspectors and electrical students, as well as central station men. In the appendix are found tables and curves for measuring wires, and the full text of the underwriters' code. Price \$2.00.



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#### EDITOR'S ANNOUNCEMENTS.

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

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

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KINGSTON BRANCH NO. 10.—Meets 1st and 3rd Thursday in each month in Fraser Hall, King street, at 8 p. m. President, F. Simmons; Vice-President, J. W. Tandy; Secretary, A. Macdonald.

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### ONTARIO ASSOCIATION OF STATIONARY ENGINEERS.

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Looking Backward  
and Forward.

In all business it is of importance to balance up at certain periods—to take stock of what is left in hand, to see

whether the business has improved or not since last stock-taking, and from the operations undertaken to derive some useful information which may increase the experience, or indicate in what particular direction the business will be capable of extension in the future. Engineering works are as easily reduced to book-keeping as any other business, and it will be of considerable value to every engineer—no matter whether he belong to the civil, mechanical, or electrical branch of the profession—to periodically edit, so to speak, the experience gained during the preceding year or so, with the view of enabling him either to avoid errors in the future or of strengthening his convictions along any particular line. In electricity such a review is likely to be of even greater value than in the other branches, for the science is now in the period of vigorous growth and extension, when almost every week adds something new to our knowledge, and experiences crowd in so thick and fast that we are sometimes almost bewildered with their number and variety. And yet it will never do to say "Enough," for a slight halt will mean falling far behind in the race of progress. This progress has become evident along very many lines, and has every prospect of being permanent. As the student becomes more and more interested in the countless problems presented to him, so does his desire for knowledge increase, so does his comprehension improve, and in like proportion do his results become more satisfactory. It is especially remarkable that for some time, the interest evinced by those responsible for the operation of electric lighting and power houses in Canada has stimulated a more thorough investigation into the economics of central station practice. These investigations have been fruit-

ful of results, leading in very many cases to a startling change in methods of operating, and in some few to scrapping or alteration of entire plants. It is observable that electric plants are being more and more recognized as capable of careful designing; that the opinion is growing and taking firm hold, that the various component machines and apparatus are all intended to work together as one coherent, harmonious whole, and that therefore the due and proper proportion of boilers, engines, generators, etc., to each other should be carefully calculated. This conviction has led to considerable attention being paid to the preliminary engineering, to which little or no importance used to be attached. Speaking generally, however, the past year has been memorable for the breaking away from old-time ideas and opinions, for the somewhat cautious acceptance of those principles of practical electricity which have been experimentally determined in Europe and the United States, and for the general awakening to the fact that electricity is a special science, to be studied as such. We are now shaking off the fetters placed on the industry by an extreme conservatism; we are climbing out of the ruts marked for us by manufacturing exigencies, and are learning more to think for ourselves. This is really the cause of the developments that have taken place along many lines, and is a favorable augury for the future. The lines of progress may be grouped into probably four, viz.: Improvements in Engineering Practice; Improvements in Manufacturing; Improvements in Operating Practice; Application of Electric Power in New Directions.

Taking these up serictim: It is quite remarkable how, in the last twelve months, the engineering of electrical enterprises has received great and increasing attention. The European practice of placing all engineering details from water power or steam plant, right up to the distribution system of a lighting, or the transmission system of a railway plant, in the hands of competent engineers in independent practice, is apparently becoming more favorably considered among us, with the most beneficial and evident results. By the adoption of such a course electrical enterprises have been more and more planned with reference to the engineering and commercial conditions of a particular case; have been designed as means to particular ends, and less and less as so many "ads" for a particular "system." In this we are adopting the course so strongly recommended by American electrical publications, as tending to better engineering, and therefore to greater pecuniary success.

In manufacturing also we have seen great improvements and extensions. At least two quite new manufacturing companies have entered the field, and purchasers have now a very much more extended market wherein to select what they consider most suitable for their wants. For lighting purposes we now are able to choose between generators representing three well known types—inductor, iron-clad and surface-wound armatures. Alternating arc lamps, and long burning arcs on constant potential circuits, are quite numerous, and giving good satisfaction, and what is of special importance to single phase central stations, a single phase alternating current motor is now obtainable, and giving good results, in sizes up to 10 h.p. and larger. Whereas a couple of years ago direct current generators and motors were sold only by about four companies, now

we find at least nine different makes, and all good. The consequent competition, while it has greatly reduced the cost of goods, has also happily necessitated great improvements in their quality and efficiency; competition has been along the lines of improvement as well as along that of price only. In lamps and transformers the same result is noticeable—competition has forced a much closer study of the principles of design and construction of all apparatus, with consequent benefit to the purchaser. In alternating current apparatus the market has been extended so as to include two new makes of generator, and at least one entirely novel form of watt-meter. Electric railway apparatus does not seem to have broken new ground yet, although in the near future we may reasonably expect great advances.

As power machinery, two and three-phase generators, with motors both induction and synchronous, represent quite the highest development of such apparatus, we would not be justified in expecting any marked improvements or modifications for some time yet. In this line probably the most interesting and important achievement is that by which we are enabled to transform a set of currents bearing one particular phase relation to another set bearing a quite different relation. That is to say, we can transform a two-phase to a three-phase, and vice versa; so that, for instance, current may be generated in two-phase by a suitable machine, and if desired it can be transmitted to any reasonable distance as a three-phase and then transformed back to a two-phase or used as a three-phase, as may be most convenient.

In steam engine circles we have had occasion to welcome the introduction of another first-class high-speed engine. In the matter of improvement in operating practice the industry has great cause to congratulate itself on the marked progress made, and more especially on the fact that it is a natural one, having been started spontaneously in operating circles, and not as a kind of unnatural growth. The continually increasing interest taken in electrical matters by the owners and operators of central stations, large and small, has led to a more careful investigation into results, which in turn has itself pointed out many possible economies. Younger men are more frequently found in the positions of electrician and engineer men whose ideas have not been formed in the very early days of electrical activity, and who therefore have had nothing to unlearn before acquiring the new notions. Study seems to be more general, and the conviction growing that in electricity the more one studies the more one finds to study. In steam practice particularly, it is very encouraging to find that properly qualified engineers, holding certificates from some recognized authority, are more generally sought for, and that the holder of a certificate takes a better position, and frequently can command higher pay, than one not so vouched for. This is entirely as it should be, and we should like to see the principle extended to the granting of certificates, after due examination by some competent authority, to electrical men. This infusion of younger blood has had very beneficial results in many cases, and it is not difficult to predicate that within the next few years we shall hear a different story from central station men who now write in the doleful plaint: "Electricity doesn't pay."

In the line of new enterprises we can chronicle some that place Canada at least in respectable competition

with other countries. When the Lachine Power Co. and the Chambly Power Co. have completed their constructions, Montreal will take a front place among cities as regards its power facilities; and there are other proposed power enterprises, such as that of the Keewatin Power Co., whose magnitude will be unrivalled. The advantages of electrical distribution of power through factories and cities have been more cordially acknowledged by the manufacturing interest, and we see with satisfaction that motors are used in cotton mills, paper mills, etc., displacing small, inefficient steam engines. Electricity is also forcing its way "electrolytically," as witness a western Ontario salt works using current for the electro-deposition of salt. It is to be regretted that storage batteries are not yet received among us, as aids in power houses. In the railway line there has not been a great deal to notice, but the very many enterprises in the promotion stage augur a wonderful activity in the near future. There has been for some time before the public a proposed long railway to connect points in eastern and western Ontario, utilizing several water powers along its route, and transmitting current therefrom over great distances, but it is well to be cautious in expressing any opinion as to such very extensive enterprises.

A forecast of probable electrical developments in the near future seems to indicate a great activity in all lines. Manufacturers will in all likelihood have their hands full of business, but competition—if the public cares to avail itself of the advantage—will keep prices down. Inductor type alternators, both single and polyphase, will probably grow in favor and in time displace the older types of armature. We hope to see the 220-volt lamp take a front place in new work. In railway work it seems probable that the alternating current will evolve up to the commercial point, and produce an induction motor suited for railway requirements. We also hope and believe that the improvement in operating practice will be even more satisfactory during the coming twelve months than in the past. We would suggest that the good resolutions for '97 should include the following: Careful reading and study; an examination into the economics of our power houses; an experimental study of our distribution systems, including transformers; a sharp look-out for any new methods or devices whereby we can increase our efficiency or decrease our expenses.

THE Montreal Street Railway Company Turkey and Pudding. are said to have distributed six tons of turkey and three tons of plum pudding among their employees at Christmas. We are not informed as to whether the company's system was in workable condition or not on the day following the festival, but presuming it to have been, it speaks wonders for the digestive powers of the staff.

Standard of Efficiency for Incandescent Lamps. A COMMITTEE recently appointed by the German Electrical Institute to investigate this subject, and draft a set of standard rules and regulations for the guidance of manufacturers and consumers, has concluded its labors. Among the recommendations is one to permit of a variation of 2 per cent. in the voltage marking of lamps ordered, the lamps to be tested by the marking. It is suggested that a variation of 6 per cent. in candle power or energy be permitted, but the lamps may be rejected

if it is found that upwards of 25 per cent. of the lamps tested exceed these limits. The standard of lamp life is to be the number of hours at which the lamp has lost 20 per cent. of its rated candle power when operating at normal voltage.

Prevention of Accidents from Electricity. A CARD containing warnings and suggestions designed to prevent injury to persons from contact with electric currents has been issued by the Manufacturers' Accident Association of France, to be posted in all factories where electric currents or electric apparatus are employed. It is prescribed that work, workmen, iron tools, or other objects not connected with the electrical machinery, should not be allowed to come in proximity thereto. It is recommended that rubber carpets or mats or board platforms supported on glass or brick should be placed on the floor about the machines for the attendants to walk upon while in the discharge of their duties. Attention is called to the fact that an imperceptible puncture will destroy the protective quality of a rubber glove, and for this reason persons handling wires should use one hand only and keep the other as far removed as possible from wire or metal of any kind. In case fire should appear around any wire, switchboard, or other electrical apparatus, it is absolutely forbidden to throw water or wet cloths on it, or to allow anything of the kind to come in contact with any wires or electrical apparatus whatever until the current has been shut off from the locality by cutting the wires or otherwise. High tension wires are not to be touched on any pretext, however thick the insulation; and no person is to be allowed to enter, without special authority, the place where transformers are installed, or to carry a light or smoke in a room containing accumulators. In regard to the latter it is explained that the action of accumulators is accompanied by the evolution of hydrogen gas, so that explosions may easily occur, unless the place is well ventilated and fire kept out of it.

The Future of the Horseless Vehicle.

ELSEWHERE in this number is printed particulars of a motor carriage which has been invented, manufactured and practically tested in Toronto. The vehicle is propelled by electricity generated by a storage battery. While it is gratifying to know that Canada is well to the front in this as in other lines of development, the question presents itself, what useful purpose is likely to be served by such a vehicle that is not now as well served by the horse, the electric car and the bicycle? In other words, can the need for motor vehicles be demonstrated in a way to lead to their introduction and use on a large scale? To us it does not seem probable that they could be made to displace the horse to any extent either outside or inside of cities. In the country the horse is employed for a variety of purposes in addition to traction. This, added to the fact that ordinary horseflesh is cheap and cheaply maintained for country purposes, seems practically to shut the door in this direction to the motor vehicle. On the contrary, in cities, transit requirements for freight and passengers appear to be cheaply and efficiently supplied by horses, electric cars and bicycles. Even now, as compared with a few years ago, horses have largely disappeared from our streets. Those that remain are chiefly employed for cartage purposes or for the pleasure of the wealthy. For neither of these purposes does the motor vehicle seem as well adapted

or likely to come into favor. It might be employed for the carrying of light parcels, but unless its estimated cost can be greatly reduced, it will prove too expensive for this purpose. If any of our readers can find a basis on which to form a more sanguine estimate of the outlook for the motor vehicle, we would be pleased to publish their views on the subject.

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**Acetylene Gas.** The revolution in lighting which was predicted from the discovery of acetylene gas has not assumed a material form, and, judging by the indications, never will. If the discovery had been as valuable as many persons supposed it to be, the time which has elapsed since it was publicly announced would have sufficed to give it a commercial standing. Instead of advancing it appears to be fast retrograding in public esteem, as it becomes better known. Its dangerous character can be judged by the restrictions with which the Chicago Board of Underwriters has surrounded its use. These restrictions are briefly as follows: "The apparatus for the generation or storage of the gas or of calcium carbide to be contained in a fireproof building detached from any insured building at least ten feet, and not elsewhere on the premises. 2. The valves or devices of whatever nature for controlling the pressure of the gas shall be located inside the fireproof building above described, and a cut-off provided between said building and the building insured. 3. The piping of the building insured shall be provided with a pipe outlet into the open air, controlled by a safety device so arranged as to let the gas escape outside the building insured whenever the pressure on the piping in the building exceeds four ounces to the square inch. This permit is granted in consideration of the agreement of the insured to comply with the above restrictions and conditions. The generation, storage or use of acetylene gas or of calcium carbide in violation of the restrictions and conditions named is hereby agreed and declared to be an increase of hazard that is not assumed under this policy, and in case of any such violation this policy shall thenceforth be null and void." It is a foregone conclusion that a method of lighting which is thus marked "dangerous," and which can only be used under special and inconvenient conditions such as those stipulated by the Underwriters' Association of Chicago, will never find its way into general use. The trend of events in relation to this discovery is also seen in the fact that shares of the Acetylene Company, of New York, after being quoted at \$400, are said to have been recently sold for 50 cents.

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### KEEP ON ADVERTISING.

No business man not yet dead in the shell but can see even in dull times an opportunity to let the world know that he is alive. In advertising one's business it is perhaps three times out of four a blind and fatal mistake to leave the public in the dark as to whether the factory is still running and the owner thereof alive or dead. No industry that is not overdone or wrongly located can be effectually downed by a spell of depression. Consumers do not quit the world as some gentlemen did in the days of Noah, and if unable to purchase what they need to-day, the same need speaks for itself tomorrow. When the wind is low, mend your sails, and the man who is prepared for the breeze is the man most benefitted by the same.—Power and Transmission.

### BY THE WAY.

ONE of the most attractive window advertisements ever shown in Canada has been constructed by the aid of electricity, to draw public attention to the Massey-Harris Company's bicycle. The frame of a bicycle placed in the window of the company's show-room on Yonge street, Toronto, has been covered with small incandescent lights, which, when lighted, display the outline of the machine in a variety of beautiful colors. By the aid of a miniature electric motor the machine is shown in operation. Electricity played an important part in the window decorations of the great stores during the holiday season, and is continually coming more and more into evidence for decorative purposes at public and private assemblies.

x x x x

It may serve to illustrate the ability of the electric light to hold its own against any other form of illuminant, if I repeat a little story which a friend of mine related to me the other day. "I had occasion," said he, "to visit recently a little German village in Western Ontario, and was surprised to find the streets and business places lighted by incandescent lights. In the hotel where I put up there were twelve lights. Curious to know what profit was being made by the owner of the lighting plant, I enquired of the hotel man, how much his lights cost him. "Shust von cent each for efery nighd," was the reply. "Do you mean to tell me," said I, "that you pay only about 70 cents per week for 12 incandescent lights." "That's shust about id," said he, and added, "it ust to cost me 20 cents a nighd ven I burnd lamps." "Well," said I, "I guess the owner of the lighting plant doesn't make anything out of the business." "Doesn't he?" replied the hotel man, with a sarcastic smile, "he gets his mill lighted for nodtings!" It will doubtless be comforting to the hearts of owners of electric lighting plants to know that in one instance at least the modern illuminant has been able to distance all competitors, but municipal corporations and others will do well to beware of drawing from this incident the inference that there are heaps of money to be made in the electric lighting business.

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### APPARATUS FOR TESTING COAL.

AN apparatus by which an engineer may test or determine the quality and adaptation of the coal he receives is described in the Boston Journal of Commerce. The test is not intended to be an analysis, but principally to show the amount of fixed carbon in the coal and the percentage of ash. As each carload of coal is received, samples are taken from twenty or more parts of the car, thoroughly mixed and quartered, each quarter being also mixed and quartered until the sample is obtained; this sample is then carefully weighed, the volatile matter driven off, weighed again, and the carbon consumed and the ash weighed. This estimate is important in guarding against the use of coal having an undue percentage of ash. The various coals differ in percentage of ash which they contain, some Cumberland coals having from 12 to 14 per cent of ash, while a good New River will have as low as 3 or 4 per cent. Thus, though the coals may look alike to the average engineer, the heat value characterizing them is 10 per cent greater in one description than the other, and, ascertaining this, an important saving in the cost of fuel may result.



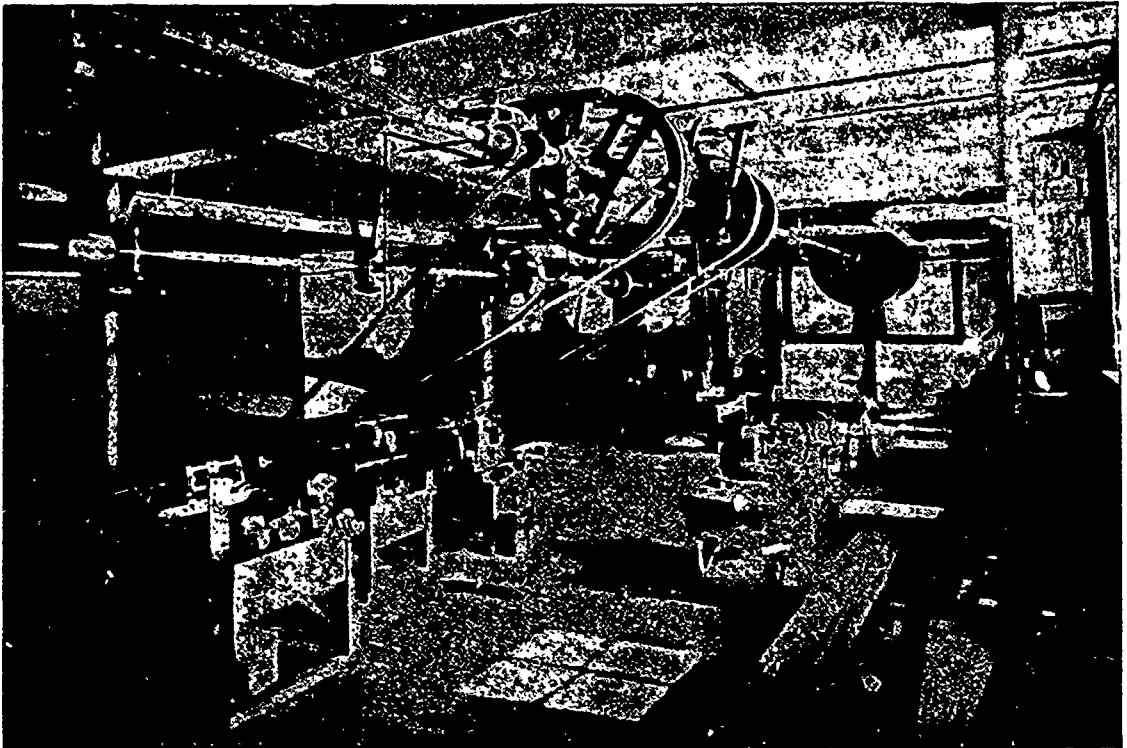
## TORONTO SCHOOL OF PRACTICAL SCIENCE.

THE necessity of providing facilities by which the young men of the country might obtain a thorough scientific training, to fit them for the positions which were afforded by the developments in the civil, mechanical and electrical engineering field, was first recognized by the Ontario Government in the year 1887, when an act was passed sanctioning the establishment of a School of Practical Science. Arrangements were made with the Council of University College by which the students of the School of Science were permitted to enjoy the advantage of the instruction given by the University professors in all the departments of science embraced by the work of the school, and when, in 1889, these departments were transferred to the University of Toronto, the Senate passed a statute affiliating the school with the University. In that year Professor Galbraith was appointed by the govern-

this journal are more particularly interested. The engineering laboratory occupies two floors, and has a total area of 10,000 square feet. It is divided into three departments—the department for testing materials of construction, the department for investigating the principles governing the application of power, subdivided into the steam laboratory, the hydraulic laboratory, and electrical laboratory, and the department for investigating problems connected with standards of length, time, astronomical observations, etc.

In the equipment for testing materials is included an Olson torsion engine for testing the strength and elasticity of shafting. This machine will twist shaft up to 16 feet in length and two inches in diameter. The equipment of the power department is as follows:

A Babcock & Wilcox 52 horse-power boiler; A Harrison-Wharton 12 horse-power boiler; a 50 horse-power Brown engine, constructed specially for experimental investigation. It is steam jacketed, and has



DYNAMO ROOM, SCHOOL OF PRACTICAL SCIENCE, TORONTO.

ment as principal of the school, and the management thereof was entrusted to a council of which he was chairman.

The regular departments of instruction are five in number, viz: Civil engineering (including sanitary engineering), mining engineering, mechanical and electrical engineering, architecture, analytical and applied chemistry.

The regular course in each department is of three years' duration, at the completion of which the diploma of the school is granted to the student. The equipment of the school has been proceeded with year by year, and is now almost complete. There are the chemical, blow pipe, and assaying, stamp mill, electrical, meteorological, hydraulic, steam engine, and the testing of materials laboratories, in all of which the appliances are of a standard in keeping with the requirements of a first-class school.

We give herewith illustrations and some particulars of the engineering equipment, in which the readers of

three alternative exhausts to the open air, to a jet condenser, and to a Wheeler surface condenser presented to the school by Mr. F. M. Wheeler of New York, the inventor. There are also a Blake circulating pump, a Knowles air pump and a Blake boiler feed pump (the latter being a gift from the manufacturers), and a machine for testing lubricating oils and measuring journal friction, built by Richie Bros., Philadelphia.

The hydraulic division is furnished with a three throw pump, having a capacity of 500,000 gallons per 24 hours. There are also large tanks furnished with orifices, and weirs, measuring tanks, etc. A three feet jet turbine, a nine inch McCormick and a six inch New American turbine, the latter the gift of William Kennedy & Sons, of Owen Sound, are also included, together with the usual measuring instruments, indicators, gauges, gauge testing apparatus, scales, brakes and dynamometers. The shafting is driven by a 7 horse-power Otto gas engine, a 20 K.W. Edison motor, and a Brown engine.

Coming to the electrical laboratory, the first section is the engineering division, in which a 20 K.W. motor furnishes the power to drive several continuous current dynamos of constant potential and current, as well as an alternator. There are two motors of 6 and 3 h.p., besides several smaller motors, one of which is for alternating current. Recently there have been added a polyphase motor, and a rotary converter. On the walls, besides rheostats, are four types of transformers and meters for continuous and alternating currents. Arc lamps of seven types are hung around the laboratory, and incandescent lamps which may be used for the purposes of a rheostat. There are also a battery of Roberts storage cells and several chloride accumulators. A new switchboard is being constructed under the personal supervision of Mr. Rosebrugh, which, in addition to affording facility for inter-connection, will also carry measuring instruments which may be readily introduced into any circuit. A Thomson balance,

The electrical apparatus in connection with the University of Toronto, to which students have access also, includes electronometers, galvanometers, resistance coils and bridges, testing keys, batteries, electrical machines (Holz and Carre), Ruhmkorff coils, Crookes' tubes, telephones, etc.

Electricity has also been used to facilitate the study of the science of architecture, a powerful electrical stereopticon being employed for the illustration of designs.

In the mining department a six K.W. constant potential motor, supplied by 110 volt incandescent circuit of the city, and made by the Canadian General Electric Co., at Peterboro', is used for driving the machines for making tests of ore, etc.

In addition to taking the course of instruction in the school and passing the requisite examinations a candidate for the diploma in mechanical and electrical engineering is required to present satisfactory evidence



GALVANOMETER LABORATORY, SCHOOL OF PRACTICAL SCIENCE, TORONTO.

multicellular electrostatic voltmeter, and high potential electrostatic voltmeter, a Siemens' electro-dynamometer, and standard Weston measuring instruments furnish the means either of accurate observation or for standardization of instruments for ordinary use. These are generally used in a separate room, to which connection is made. The second section of the electrical laboratory is a room 24 by 49 feet, in another part of the basement, from which iron has as far as possible been removed. Here ten masonry piers support galvanometers, an electrometer, and other mirror reflecting instruments, and testing work can be done free from disturbing influences. Fume cupboards and sinks have been provided for work with galvanic and storage cells; the room is also supplied with Wheatstone bridges, Kohirausch apparatus for electrolytes, standard divided microforad condenser, Clark cells and other apparatus. Wires leading from this room to the switchboard allow measurements to be made in connection with experiments in the other laboratory. Connections to the 110-volt circuit of the city are accessible in all the rooms.

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 connection with the school there is the Engineering Society, which is carried on by the students, with the approval and encouragement of the teachers.

The efforts of Prof. Galbraith, the Principal, to maintain the high standard of the school have met with much success, while the cost of its maintenance is said to be less than any similar institution. Mr. T. R. Rosebrugh, M.A., is lecturer in electrical engineering, assisted by Mr. A. E. Blackwood; Mr. J. A. Duff, B. A., is lecturer in applied mechanics, and Mr. W. Minty, B.A.Sc., in mechanical engineering.

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The ratepayers of Alexandria, Ont., are moving in the direction of securing an electric railway from the Canada Atlantic depot to Green Valley, a distance of 4½ miles.

### THE ROMANCE OF THE TELEGRAPH.

THE December number of the Methodist Magazine contains an article under the above title by Marion Norma Brock, in which the fact is related that in China, when the telegraph line was built at Foochow, the people broke it every night, believing it would cast an evil spell over the country. They considered even the shadow of a pole falling across a tomb as a desecration, and as the graves in China are often in the private gardens, it was difficult to secure "way leaves," for neither love nor money would induce the Chinaman to tolerate this sacrilege. The natives of Senegal have a superstitious dread of what they call the "white man's talking-jumbo," and both line and linesmen are left unmolested. In Coomassie, the natives left the white man's wire alone after they had constructed a thread line of their own and so satisfied their self-respect.

The writer of this article alludes to the vigorous

The bison, on the plains of the Great West, found the accommodating posts could be pleasantly used as currycombs. They were, however, not at all durable for this purpose, as the bison gave them vigorous usage. To protect the poles from such treatment, sharp iron spikes were driven into a large number of them. But this ingenious device did not work well, for the buffalos regarded the spikes as a great improvement to their currycombs, and chose the spiked poles every time in preference to the others.

### RESIGNATION OF MR. RUTHERFORD.

Mr. W. Rutherford, chief engineer of the Canadian General Electric Company, has resigned his position, to accept the management of the electric traction department, which is now being established by the well-known English engineering and contracting firm of Dick, Kerr & Company.

Mr. Rutherford's experience in mechanical and electrical engineering, gained first in Cardiff, Wales, then with the Thomson-Houston International Electric Company in South America and



EXPERIMENTAL ENGINE, SCHOOL OF PRACTICAL SCIENCE, TORONTO.

opposition to the land wires offered by the animal creation. We are told that in some parts of Norway, the lower part of the poles has to be protected in order to keep the bears from clawing them to pieces, under the supposition that the humming of the wires is the drone of insects within the posts. The large woodpecker of Norway and the green woodpecker of California, probably deceived in the same manner as the bears, bore myriads of holes in the posts. Our busy Canadian woodpecker appears to be more sagacious—at least his attacks on the telegraph pole have not been frequent enough to be anywhere recorded. In the tropics, the posts have been treated with creosote, where iron poles are not used, to prevent the destructive raids made by the white ants. Monkeys find the wires of the telegraph make delightful performing bars, and frequently use them in their gymnastic exercises, thus causing a serious leakage of the current. Mischief-loving elephants, in the glory of their strength, will occasionally perform the feat of levelling a dozen poles or more.

elsewhere, and finally since 1890 as chief engineer of the Toronto Construction and Electrical Supply Company and the Canadian General Electric Co., has been such as to render him eminently fitted for the important and responsible position which he is about to undertake. Practically the entire period of electric railway development in this country is covered by the five years which Mr. Rutherford has spent with the Canadian company, in his official connection with which he has had the supervision of the engineering features of the greater number of the important electric railway installations throughout the Dominion. The engineering firm of Dick, Kerr & Co. is one of the largest in Great Britain, their business as manufacturers of rails and general railway supplies being carried on in all parts of the world. In Canada they are principally known as selling agents for the Phoenix steel rails, used on the Toronto and Montreal railway systems. That they should have considered the present an opportune moment for entering the electric railway field may be taken as establishing the fact that the long deferred development of electric traction in Great Britain has commenced in earnest. The ELECTRICAL NEWS, while regretting Mr. Rutherford's departure from the ranks of Canadian electrical engineers, feels at the same time bound to congratulate him on the enlarged scope of his future work, and Messrs Dick, Kerr & Company on having secured the right man for the right place.

## CORRESPONDENCE

### AN ELECTRICAL LABORATORY.

MONTREAL, December 10th, 1896.

To the Editor of the CANADIAN ELECTRICAL NEWS.

SIR,—In reading over the CANADIAN ELECTRICAL NEWS for the month of December I noticed a paragraph headed "Electrical Progress."

Your suggestion that a central station laboratory under competent direction should be established, in which all sorts of tests could be made is a valuable one. Let me state, however, that in our electrical department of McGill University such a laboratory already exists, in which we have been carrying out practical tests on transformers, arc lamps, dynamos, etc., for manufacturing establishments. The laboratory is very fully and completely equipped for carrying on such tests, but, strange to say, the greater part of our work has come from the United States. We should, however, be very pleased to carry out similar work for Canadian firms.

Yours truly,

HENRY T. BOVEY.

### INFORMATION WANTED.

SCOTSTOWN, P. Q., Dec. 16th, 1896.

To the Editor of the CANADIAN ELECTRICAL NEWS.

SIR,—I wish to transmit about eight horse power a distance of about 1,500 feet from a water wheel, which I can do by using an electric motor, but that is expensive.

I have been thinking that I could connect an air compressor directly to the water wheel and carry the air in steam pipes to the place where the power is required, and use an ordinary steam engine. There is only one difficulty I see in the way, that is, to keep the engine from heating. Perhaps some of your readers have had experience with this kind of power, and can give me some light on the subject through the columns of THE NEWS.

Yours truly,

C. H. PARKER.

[It is perfectly feasible to transmit the power by means of a compressor and a steam engine as you propose. There is no difficulty about the heating. The cylinder of course would need oiling, but the principal difficulty that has been found has not been the heating but the cooling, as the air expands when released from the engine and usually produces frost. The method of transmission by compressed air has a good deal to be said in its favor, but in this individual case we are of the opinion that the cost of the apparatus, namely, the compressor and the engine, would be considerably more than the cost of the electric outfit.—ED. NEWS.]

### ONTARIO ASSOCIATION STATIONARY ENGINEERS.

TORONTO, Dec. 21, 1896.

To the Editor of the CANADIAN ELECTRICAL NEWS

DEAR SIR,—Since the first of November thirty-seven engineers have been examined by the O. A. S. E. Examining Board, and thirty were successful and received certificates.

The city council have lately passed a resolution providing that every engineer in the city's employ must hold at least a third class O. A. S. E. certificate, and

the Hamilton School Board have passed a similar resolution in regard to the caretakers of all their public schools. The city council of St. Thomas is at the time of writing considering the advisability of passing a by-law to provide that all men in charge of steam boilers in that city be required to hold certificates of competence.

During the past two months several manufacturing concerns have required engineers and have refused to entertain the application of any engineer who did not hold a stationary engineer's certificate. This is quite natural as things are, for the only proof the steam user can get, that an engineer has a knowledge of his work, is the fact that he has passed a practical examination and has a certificate of qualification. Of course, the fact that a man holds a certificate does not prove that he will not be careless, lazy or indifferent to his employer's interest, but it is proof that he has a knowledge of his duties as an engineer, and that he has (up to the time of examination) been steady and sober.

It is the intention of the C. A. S. E. and the O. A. S. E. combined to again introduce a measure before the coming parliament to provide for the qualification of all engineers in charge of stationary steam boilers and engines.

Any engineer desiring information regarding examinations under the present act will receive a copy of same and by-laws on receipt of a post card asking for same and giving name and address.

Yours truly,

ALBERT E. EDKINS, Registrar.

Office, 88 Caroline St., Toronto.

### THE YOUNG MAN'S CHANCES IN THE ELECTRICAL FIELD.

THE following opinion by Mr. Chas. B. Hunt, Manager of the London Electric Co., was received too late to be incorporated in the symposium on the above subject published in THE ELECTRICAL NEWS for December:

"In reply to your enquiry I beg to say that I believe the opportunities for young men who graduate as electrical engineers are many, and will increase yearly as the different branches become more perfected, particularly in connection with all central stations, street railroads and other electrical establishments.

"As you are aware, a great deal of the electric current losses are caused by a want of knowledge of the proper construction of the lines, and distribution of same.

"Unless the manager, superintendent or foreman of companies are competent, and know the carrying capacity of wires at all distances, the resistance of the different kinds of metal used, the interior construction of every part of the generating machinery, including boilers, engines, dynamos, also transformers and meters, it is impossible for a company to know why they are not making money, or to locate the trouble.

"I therefore, believe that in a few years all important positions in connection with electric lighting stations, electric street railroads and electric manufacturing establishments will be filled by graduates from our different electrical colleges, and as fast as vacancies occur in the older stations, young graduates will be taken in to fill same. But like any other profession, they must not expect to receive large salaries until they "ve proved themselves capable and worthy of them."

## SPARKS.

The 15 year old son of Wm. Cruse was killed in Kingston by an electric car.

Geo. Alexander has been granted a franchise for electric lighting at Kaslo, B. C.

The Hull Electric Co. will place an additional dynamo at the power house, Deschenes Mills.

Parrsboro, N. S., will probably be lighted by electricity. The question of purchasing a plant is now under consideration by the town.

It is said that Greenwood, Ont., will shortly be lighted by electricity. It is intended to utilize the water power in the neighborhood.

The annual meeting of the shareholders of the Toronto Street Railway Company will be held in Toronto on the 20th of this month.

The West Kootenay Power and Light Company and the Kootenay Power and Light Company, of Kootenay, B. C., are seeking incorporation.

Messrs. Plewes & Spence, of Creemore, Ont., have secured the contract of lighting the streets of Colborne, and will put in an electric light plant.

A new 7,000 light dynamo has recently been placed in No. 5 power house of the Ottawa Electric Co. This dynamo replaces eight 750-light machines.

An action was brought by Mr. Easton to recover \$60,000 damages from the Brantford Street Railway Company for injuries received in an accident, by which he has become paralyzed. A verdict for \$12,000 has been given.

A company in which Mayor Elliott, of Brantford, is interested, propose building an electric railway from Brantford to Ayr, via Paris, and another from Brantford to Port Dover. The city of Brantford will be asked to grant a bonus.

It is reported that on condition that the Dominion Government will assist, the Grand Trunk Railway Co. have offered to convert the Victoria Bridge at Montreal into a double-track structure, with an additional track for a trolley service.

The whole of the lines of the Consolidated Railway & Light Company, of Vancouver, B. C., were offered for sale by auction by Mr. W. H. Hooper by order of the Yorkshire Guarantee & Securities Company, trustees for the bondholders, but no offers were received.

The Hull Electric Co. are busy building their double track between Aylmer and Hull. When the road is reballasted in the spring and the double track finished into Aylmer, Mr. Spencer asserts that the run will be made in fifteen minutes or at a rate of about forty miles an hour.

James Best has begun an action against the Hamilton Street Railway Company for damages for being put off a street car after having dropped a punched 5 cent piece in the fare box. The conductor, he alleges, refused to allow him to ride to his destination unless he paid the second time therefor, the coin with a hole in it not being acceptable.

The Superintendent of the Government Telegraphic Service is engaged in preparing for the extension of telegraph lines from Esquimaux Point, Que., the present easterly terminus of the line on the north shore of the gulf, to Belle Isle. In the course of the next year it is expected to add about 80 miles of line, which will carry the wires as far as Natishquan, 666 miles below Quebec.

The city council of Halifax are not satisfied with the service supplied by the street railway company, and resolutions have been adopted authorizing that legal proceedings be taken if in thirty days the company do not furnish the council with time table and scale of fees and system of transfers. The city engineer has also been instructed to report on the cost of an electric light plant to be controlled by the city.

A charter has been granted to the British Columbia Tunneling and Development Company, Limited, of Rossland. The purpose of the company is to construct a tunnel through Red mountain, and to construct double tracks on which it is proposed to operate electric cars to convey ore from the different mines. The projectors of the undertaking are J. F. McLaughlin, W. A. Campbell, and John J. Moynahan, and Col. Frank Moberley is preparing estimates of the work.

The new combined passenger, baggage and mail car now being constructed for the Ottawa Electric Railway will shortly be completed. It will be a fine piece of workmanship. The interior will

be finished in polished oak and beautifully carved and the windows in the passenger portion will be of plate glass. The length of the car will be 28 feet. The compartment for passengers will be at one end, the baggage room in the centre, and the mail matter room at the other end.

It is reported that a company has been organized in Philadelphia to promote a system of gold mining without removing the ore from the earth. The scheme is to sink shafts a few inches apart and pump into them a suitable dissolvent. A strong electric current is then to be passed through the soil between the shafts. The action of the electric current is claimed to be that it will carry with it the dissolved gold from one shaft to the other and deposit it there on any metallic circuit in the same manner as electro-plating.

The Toronto Radial Railway Company is seeking incorporation from the Ontario Legislature to acquire the franchise and property of the Toronto Belt Line Railway Company, or any other company operating or having the right to operate an electric or other railway in the city of Toronto, or within fifty miles thereof. The company propose to convert into an electric road the steam railway which was constructed around Toronto some years ago by the Grand Trunk Railway. Messrs. Mercer, Bradford & Titus are acting as solicitors.

Mr. James Hill, of Cleveland, Ohio, has just completed the construction of a chimney for the St. John (N. B.) Electric Railway Company, which is the third largest in Canada. The chimney is 177 feet in height from the ground and goes beneath the ground 32 feet, where it rests on a solid rock foundation. It contains, approximately 400,000 brick. The foundation is 18 feet square, and this exterior size is preserved to a height of 40 feet above the ground. From that point up it is rounded and below the top it narrows to 10 feet 6 inches, swelling out to 12 feet nine inches at the top.

The transmission of electric current from Newcastle to Sacramento, Cal., has been successfully performed. The distance is thirty miles. Three high potential wires carry the current from the power house to the station, which is furnished with two motors and two arc light dynamos, which run 120 arc lights. It has also eight step-down transformers to reduce the voltage, and the switchboard is furnished with several of the latest improvements. A current of 15,000 volts was turned on at Newcastle to test the line, and it was found to be in perfect order when reaching Sacramento.

There is an engine built 150 years ago, which is said to be still in use in a coal mine in England, doing duty five hours a day. It pumps water from a shaft 750 feet deep. The engine is considered to be the oldest steam user in the world, being built by a blacksmith named Newcomen. The engine works at a pressure of two and a half pounds to the square inch, giving a little over fifty horse power. Its weight is about 600 pounds. The cylinder is five and a half feet in diameter with a six foot stroke. The walking beam is of oak. The father and grandfather of the present engineer preceded him at the post of operating the Adam of all steam engines, so that three generations have had the honor of operating the ancient piece of machinery.

The waterworks and electric light systems of the corporation of Sudbury were successfully started a few days ago. They are operating from their alternating current two-phase dynamo, furnished by the Royal Electric Co. of Montreal, over 1000 16 c. p. incandescent lamps, 16 street arc lamps of the Helios type of 2000 c. p. each, and a number of small motors driving printing presses, meat choppers, etc. The power house, in which are erected the pumps as well as the electric light and steam power, is a solid brick structure 2½ stories high in the main part, with a boiler room extension, solid stone basement, cement and hardwood floors, and situated close to the lake on property bought for the purpose. The plant consists of two boilers of 60 h. p. each, made by Jenckes, of Sherbrooke, two Northey duplex pumps with a capacity of 30,000 gallons per hour, one 125 h. p. Wheelock automatic engine with condenser, one 75 k. w. "S.K.C." generator, with station apparatus complete. The water is forced by the pumps into a steel tank built on a steel tower, which holds 70,000 gallons. The elevation of the tower gives 82 lbs. pressure at the hydrants, which is ample to put a fire stream over the highest building in the town. The city fathers and the people in general are highly pleased with the entire plant and much credit is due to the engineers, Messrs. J. R. Gordon, C. E., and L. Y. Rorke, D. L. S., for the first-class manner in which this second and new plant was installed.

MOONLIGHT SCHEDULE FOR JANUARY.

Day of Month.	Light.		Extinguish.		No. of Hours.
	H.M.	H.M.	H.M.	H.M.	
1.....	P.M. 5.15	A. M. 6.25			13.10
2.....	" 5.15	" 6.25			13.10
3.....	" 5.15	" 6.25			13.10
4.....	" 5.30	" 6.25			12.55
5.....	" 6.00	" 6.25			12.25
6.....	" 6.50	" 6.25			11.35
7.....	" 8.00	" 6.25			10.25
8.....	" 9.10	" 6.25			9.15
9.....	" 10.30	" 6.20			7.50
10.....	" 11.30	" 6.20			6.50
11.....	" .....	.....	.....	.....	.....
12.....	A.M. 12.30	" 6.20			5.50
13.....	" 1.40	" 6.20			4.40
14.....	" 3.00	" 6.20			3.20
15.....	" 4.00	" 6.20			2.20
16.....	No light.	No light.			.....
17.....	No light.	No light.			.....
18.....	No light.	No light.			.....
19.....	No light.	No light.			.....
20.....	P. M. 5.30	P. M. 8.30			3.00
21.....	" 5.30	" 9.40			4.10
22.....	" 5.30	" 9.40			4.10
23.....	" 5.30	" 11.00			5.30
24.....	" 5.30	" 12.00			6.30
25.....	" 5.30	A. M. 1.30			8.00
26.....	" 5.35	" 3.00			9.25
27.....	" 5.35	" 4.10			10.35
28.....	" 5.35	" 5.30			11.55
29.....	" 5.35	" 6.10			12.35
30.....	" 5.35	" 6.10			12.35
31.....	" 5.35	" 6.10			12.35
Total,					227.55

TRADE NOTES.

It is said to be the intention of the Canadian Pacific Ry. Co. to substitute mica and wool for the wooden covering which has hitherto been used on their locomotive boilers.

Beginning with the new year the name of the well-known manufacturers of leather belting, Messrs. Robin, Sadler & Haworth, was changed to "Sadler & Haworth." With this change the business will be conducted exactly as before.

Mr. R. E. T. Pringle, Montreal, agent for the Packard Electric Co., Ltd., of St. Catharines, Ont., has recently opened a large store at No. 216 St. James St., Montreal. Mr. Pringle's largely increased business has necessitated this, and he is fortunate in having one of the best located electrical stores in Montreal.

The Royal Electric Co. are installing an electric lighting plant for Wm. Irving, of Sundridge. They are furnishing one of their latest type two-phase "S.K.C." 25 k. w. dynamos. Contracts have already been secured for about 200 lights, and also for one motor to run off the same two-phase alternating circuit.

The Consolidated Milling Co., of Peterboro, are having their large mills lighted by electricity. The Royal Electric Co. is furnishing the dynamo and material, and Mr. J. H. Greer, of Peterboro, is installing the plant. The Consolidated Milling Co. expect to run about 24 hours per day, from which it would appear that they have plenty of business in view.

We are advised that as the result of their rapidly increasing business the Packard Electric Co., of St. Catharines, will shortly be compelled to double the capacity of their plant for the manufacture of lamps and transformers. They report having brought their transformers up to the highest stage of efficiency, and that they are finding excellent sale for their Schieffer watt meters.

The Dodge Wood Split Pulley Company, of 74 York street, Toronto, are now offering for immediate delivery high grade turned and polished steel shafting in any diameter and in any length up to 24 feet each; new designs in either compression, grim-death or flange couplings; hangers of all kinds, any drop, of latest style, adjustable in all directions, with either plain bearings or the Dodge Company's new patent capillary self-oiling bearings. This is positively claimed to be the most up-to-date line of power transmission appliances on the market, and manufacturers and others using shafting, hangers, pulleys, clutches, etc., will do well to get the company's prices when in want.

The Brantford Electric & Operating Co. have purchased from the Royal Electric Co., of Montreal, and now have in operation in their station, a 150 k. w. "S.K.C." two-phase alternating current dynamo. This company had a number of serious misfortunes with its lighting apparatus, and desired a new machine delivered there quickly. The order was given to the Royal Electric Co., of Montreal, on December 5th at 5 p.m., and on Friday, December 11th, the dynamo was furnishing light to the city of Brantford. It was ready for operation in a little more than five days after the order was given. It was set up in running order in the factory of the Royal Electric Co., in Montreal, had to be dismantled and boxed, shipped to Brantford and there unboxed and put together again, set on foundations and connected to the old systems. The time of transit was from 6 p.m. Monday, until 12 noon, Thursday. The balance of the time was consumed in dismantling and boxing

at Montreal and unboxing and setting up in Brantford. It is the intention of the Brantford Electric & Operating Co. in future to furnish power from the two-phase system. In this they are following the lead of a number of the best companies in Canada. This "S.K.C." dynamo was purchased under the new management of the Brantford Electric & Operating Co., and shows unmistakably that they are prepared to remain in the front rank of the electrical business.

SPARKS.

An addition is being built to the works of the Montmorency Electric Co., Montmorency Falls, Que.

The employees of the Ottawa Electric Light Co. lately presented Mr. W. G. Bradley, superintendent of construction of arc lights, with a beautiful gold locket.

The Thompson Electric Co., formerly of Waterford, Ont., will remove to Hamilton, where they have secured the large Wanzer premises and will continue the manufacture of dynamos, arc lamps, and other electrical apparatus.

The city council of Chatham, Ont., are wrestling with the question of street-lighting, and a by-law will probably be submitted to provide the sum of \$15,000 to purchase an electric light plant. The cost under the present arrangement is \$65.80 per lamp of 2,000 c. p.

The Kingston, Portsmouth and Cataraqui Street Railway Company have assumed control of the plant of the Kingston Light, Heat and Power Company, the lease being extended over five years. The last mentioned company controlled the gas and electric light plants.

The bold enterprise shown by Canadians fairly takes a New York contemporary's breath away. The Electrical Review expresses its astonishment thus: "The Keewatin Power Company is making contracts to supply electric power in Winnipeg, Manitoba, transmitted a distance of 130 miles. Whew!"

Mr. F. W. Simmons, electrician for the Kingston Light, Heat and Power Company, has invented an operative arc lamp intended chiefly for use in theatres. It can be used either on an alternating or continuous current from 800 to 3,000 candle power, focussing electric rays from a four foot radius to eighty foot area.

Two tenders were received by the Toronto City Council for a telephone franchise. Mr. Geo. Musson, on behalf of the Automatic Telephone Co., offered to supply office telephones at \$36 per annum, and houses at \$20, and to pay a percentage to the city of 6 per cent. on gross earnings. The offer of Mr. James Curry, acting for the Wilhelm telephone system of Buffalo, was for a ten-year renewable term, and the price \$32.50 for offices and \$18.50 for residences. No action by the council has yet been taken.

The Hanover Electric Light and Power Co. have a neat electric plant at Hanover, Ont. The power used is supplied through an 81 h.p. "Kennedy" and a 71 h.p. "Barber" water wheel, developing from 275 to 300 h.p. In the power house are a 25 arc light machine, and a 1,500 incandescent light machine furnished by the Canadian General Electric Co. Besides Hanover, the villages of Carlsruhe and Neustadt are lighted from the plant, while requests for light have been made from other municipalities. Mr. Wm. Knechtel has charge of the power house, and Messrs. D. and Joshua Knechtel comprise the company.

The first case of alleged fraud with electric light meters was brought to the attention of Mr. Johnson, the Divisional Inspector of Electric Light, while in town yesterday. The meter in question had been so tampered with that it did not register, and hence the light was used without the amount of electricity consumed being recorded, and therefore with no means of ascertaining the amount that should be paid. The penalty for an offence of this kind is a fine from \$50 to \$100. Mr. Johnson has the facts before him and will decide as to what is the best course of action to pursue in the matter.—Peterborough Review.

At the annual meeting of the Montreal Park and Island Railway Company, held last month, a satisfactory report was presented, dealing with the last year's operations, and referring in hopeful terms to the work contemplated for 1897. The new board of directors was also elected as follows: Hon. J. R. Thibeau, Hon. Louis Beaubien, Mr. D. Morrice, Mr. H. Holt, Hon. Alfred A. Thibeau, Mr. W. Strachan and Mr. W. J. Morrice. At the first meeting of the newly-elected directors Mr. Herbert Holt was unanimously elected president; Hon. J. R. Thibeau, vice-president; Mr. Wm. Strachan, treasurer, and Mr. H. J. Holgate, secretary and manager. The company's new extension to Cartierville, three and a half miles distant from St. Laurent, and six and a half miles from the Cote St. Luc road, has been completed. Several new cars have been received from the manufacturers, the Rathbun Company, of Deseronto.

It is reported that the promoters of a large gold mine in Australia have placed an order with a California firm for a large auto-motor car for conveying supplies to the mine, located about 400 miles distant. The car will be equipped with a motor of seventy-five horse power, and will be driven by petroleum. It will be run over one of the worst stretches of desert in the world, where it is impossible to obtain either food for men or water for the automobile "beast of burden." The consequence of this is that the steam used for propulsion will have to be condensed and used over and over again. To meet this difficulty it has been arranged to place 1,000 feet of piping as a roof over the car. The piping will act as a condenser, the steam having ample time to cool in passing through its long length. The estimated speed at which the car will be run is between four and eight miles an hour, and its carrying capacity is fifteen tons.

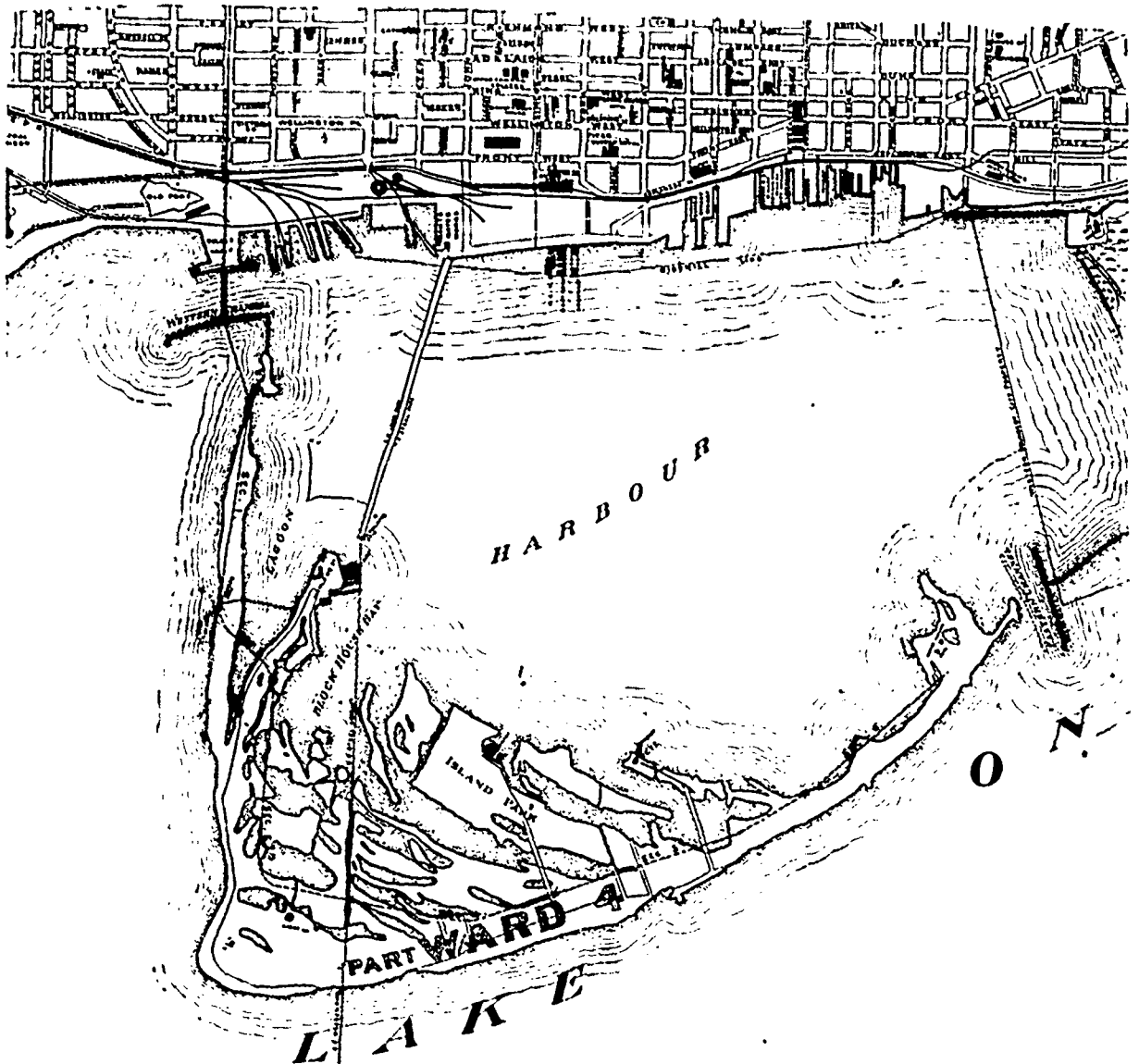
## ELECTRIC RAILWAY DEPARTMENT.

### PROPOSED ISLAND STREET CAR SYSTEM.

THE Toronto Street Railway Company have made a proposition to the City Council of Toronto to extend the street railway system to the island by means of a bridge extending across the bay. With a view to obtaining the estimated cost of the undertaking a report was prepared by the City Engineer, who also furnished the accompanying map showing the proposed route. Commencing at the corner of King and Bathurst streets, railway tracks would be constructed down Bathurst

concrete foundations, at \$59,374; No. 3, including the construction of an avenue 80 feet wide and two 12 foot plank sidewalks on each side of roadway, also a double line of street railway tracks in the centre, rails laid on concrete, is given as \$187,131. The total cost of the work under the three estimates would be \$144,987, \$164,094 and \$191,851. Should the extension be carried out, the road would no doubt be largely patronized during the summer season.

A scheme is on foot to amalgamate all the electric railways in and around Hamilton, in which case the Hamilton and Dundas



street to the Queen's wharf. This would entail the erection of a new bridge crossing the present railway tracks south of Front street. The line would continue down the roadway to the western channel, over which it is proposed to construct a swing bridge. The cost of the work thus far, including the bridges, is given as \$104,720. The swing bridge would cost \$61,000 and the bridge over the railway tracks \$20,000. Southerly from the Queen's wharf the proposed line will run along the sand bar, crossing the lagoon into what was formerly known as Heber's lot, then south in rear of cottages, crossing the waterworks cut north of the light house, thence easterly to Ward's island. Three estimates have been prepared of the cost of the island portion of the scheme. No. 1, for a 22 foot embankment for railway tracks, exclusive of concrete foundations under rails, places the cost at \$40,267; No. 2, including

Railway will be converted into an electric road and extended to Galt. Mr. B. B. Osler is said to be at the head of the movement.

A neat little calendar has been received, with the compliments of the Eugene F. Philips Electrical Works, Montreal.

At the annual meeting of the Hamilton Street Railway Company Mr. William Gibson, M.P., was elected president, Mr. B. E. Charlton having retired. In addition to the president, the directors are: Messrs. B. E. Charlton, Edward Martin, Q. C., Isaiah Beer, W. J. Harris, F. W. Fearman and John A. Bruce.

Mr. W. Y. Soper, of the Ottawa Electric Railway Company, introduced an attractive novelty in that city on Christmas eve. Santa Claus appeared on top of an electric car driving a reindeer and distributed gifts to the boys and girls on the street. The car, decorated in Christmas fashion, was filled with fruit and candy.

The earnings of the Toronto Street Railway during the year 1896 were \$986,501.37. The following is a statement of earnings by months: January, \$74,266.50; February, \$74,155.76; March, \$74,409.63; May, \$83,004.13; June, \$85,175.13; July, \$87,761.37; August, \$86,103.92; September, \$106,529.57; October, \$78,343.49; November, \$76,145.73; December, \$84,310.38.

### HURON AND ONTARIO ELECTRIC RAILWAY.

It is probable that the year 1897 will witness the construction of the longest electric railway in Canada, if not in America, namely, the Huron and Ontario Electric Railway. About a year ago a number of persons in Western Ontario were granted incorporation by the Dominion government as the Huron and Ontario Railway Company, the objects being to construct a railway from Port Perry westerly to Lake Huron, thereby intersecting several existing railways. The capital stock was placed at \$2,000,000, and to assist in construction the company were given power to issue bonds to the extent of \$10,000 per mile of railway, and \$6,000 additional for each mile double-tracked.

The first regular meeting of the directors was held in Toronto in May last, at which Mr. M. McNamara, of Walkerton, was elected president, H. J. Rolston, of Shelburne, vice-president, A. McK. Cameron, of Meaford, secretary, and J. M. Roberts, of Dungannon, treasurer. The second meeting was held a month later. The route of the proposed road was considered, and it was stated that negotiations had been entered into with Messrs. Miller Bros., of New York, to undertake the construction of the road. At a meeting in July, Mr. A. Brunel, C. E., was instructed to prepare a profile of the proposed route, together with a statement of the available water power and probable cost. The report was presented on August 27th, according to which the road will be 285 miles in length. The accompanying map will show the proposed route. The report divides the road into seven sections, as follows:

Port Perry to Beeton.—This line is 52 miles in length, and passes through several towns and villages. There are a number of culverts along the route, as well as several bridges, but none of them are very large. On this division there is no water power of any importance, and steam power will probably be used for the eastern portion of it.

Beeton to Flesherton.—The length of this section is 64 miles, but the road is somewhat level all the way and no engineering difficulties are likely to be encountered. The line crosses the Grand Trunk Railway three times. The first water power available is situated at Thompsonville, seven miles north of Beeton, which, with improvements, would give from 300 to 400 horse power. The dam, building and flume is estimated to cost \$8,000. At Eugenia the Beaver river has a descent of 64 feet in a distance of 2,000 feet, where there are at present four good water powers. About 1,000 horse power could be developed, while the falls below would provide a corresponding amount. Below the falls the river drops 220 feet, which would furnish a large amount of power. The basement of the Wilson factory could be converted into a power house at a small expense. In addition to the cost of the electric plant, the cost of the work is given as \$6,500.

Flesherton to Walkerton.—The distance between these two points is 37 miles. The bridging is heavy on this section, there being several large bridges over the Saugeen river. There is a water power on the Saugeen river, two miles west of Durham, which would supply 500 horse power at a cost of \$7,000.

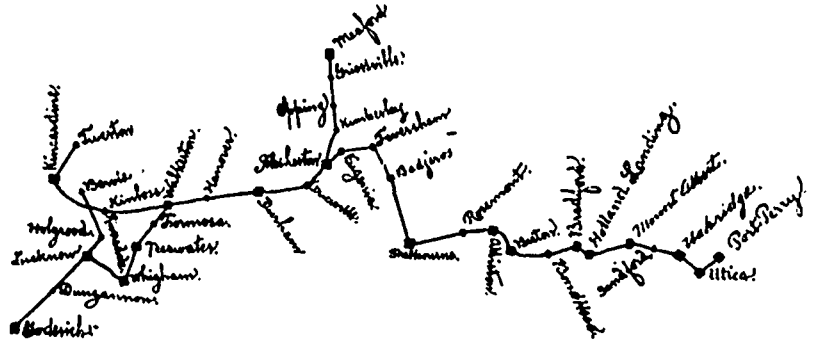
Walkerton to Tiverton, via Kincardine.—This section is 37 miles in length, and will require the construction of a number of small bridges and culverts. The grading would not exceed the maximum of ten per cent. at any point. There are a large number of bridges, including one of 100 feet span. No report is furnished by the engineer on the water power in this district.

Walkerton to Goderich.—Between these two points the road would be 55 miles in length. From Formosa to Teeswater there would be three 60-foot and two 15-foot bridges, besides other culverts. The Grand Trunk, Canadian Pacific, and W. G. & B. division of the G. T. R. are crossed at various points. The Maitland river will be crossed by a large bridge of three spans of

145 feet each. About 200 horse power may be obtained about a half mile west of Dungannon, and on the Maitland river near Goderich there is a good site for power, capable of developing 800 horse power. The cost for dam and buildings would be from \$12,000 to \$15,000.

Bervie to Lucknow.—The shortest section is between these two points, the distance being 15 miles. It is proposed to connect the line to Kincardine at a point near Bervie with the Goderich line at Lucknow, by way of Ripley and Holyrood.

The rolling stock required for each division will be two motor cars and four trailers for passengers, mail and express, and one heavy freight motor, which would



PROPOSED ROUTE OF THE HURON AND ONTARIO RAILWAY.

give for the six divisions 12 motor cars, 24 trailers and 6 freight motors for the whole line.

The company have for some time been negotiating with Messrs. Miller Bros., of New York, to arrange for carrying out the undertaking, and it is said that an agreement has been reached with Mr. Moore, a wealthy contractor of that city, to undertake the work of construction, which they hope to have completed by the 1st of January, 1898. The total estimated cost is between four and five million dollars, and the contracts for electrical equipment, etc., will likely be awarded in the spring.

### TORONTO STREET RAILWAY ASSESSMENT CASE.

THE decision in the appeal case of the Toronto Street Railway Company vs. the City of Toronto was given late in November last, and reverses the decision of the Court of Appeal confirming the assessment of \$537,137 upon the rails, poles and wires of the company. According to the decision, these are declared non-assessable. Below will be found the full text of the decision of the three judges, Messrs. J. Darnell, J. McGibbon and J. McDougall:

McGIBBON, J.:—This is an appeal from the decision of the Court of Revision for the municipality of the city of Toronto to three judges under the provisions of the Consolidated Assessment Act of 1892 and amending Act, in respect of the Appellant's property, consisting of rails, poles and wires.

The Company contend that they were improperly assessed for \$537,137 in respect of the said property. The assessment of the Appellants for 1897 is \$563,403, and it is conceded that part of that sum, namely, \$537,137, was for rails, poles and wires of the said company. The assessment was confirmed by the Court of Revision. The question submitted for our consideration is, are these rails, poles and wires ratable property within the meaning of the Consolidated Assessment Act of 1892?

The Appellants contend that it was either personal property and exempt from taxation under section 34, sub-section 2, of the Consolidated Assessment Act—or if not personal property, was not land, real property or real estate, taxable as such within the meaning of that Act, being merely rails laid in and forming part of the streets and highways, and wires affixed to the said poles, and therefore exempt under section 7, sub-section 6, of the said act.

The classes of property mentioned in the said act, liable to assessment, are: first, land, real property and real estate, and second, personal property and personal estate.

After careful consideration of the law of assessment, I have come to the conclusion that the expressions land, real property and real estate, are synonymous terms, and that the only classes of property liable to assessment are lands and personal property, and the personal property of a railway company is exempt under section 34, ss. 2, of the said Assessment Act. The only remaining question to be considered is, "Are these rails, poles and wires land, real property or real estate, and liable to assessment as buildings erected to the buildings on the land assessed or the machinery affixed?"

It cannot be contended that either the rails, poles or wires are real estate, but only become so when they become affixed to the land and form a part thereof, and would be saleable under a tax deed for arrears of taxes.

In the case of Toronto Street Railway Company v. Fleming, 37 U. C. R. 116, Patterson, J. A., page 127, says, "the property of these defendants is only land as being part of the public street." The streets



remain "public streets" if the soil of the streets is exempt; I find nothing in the Act to say that that portion of it is not exempt which is occupied by the Plaintiff's railway while still remaining a part of the public road.

In my opinion the rails, poles and wires are not buildings erected upon or affixed to the land of the company, or machinery or other things affixed to any building erected on the said land under sub-section 9, section 2, of the said Act. The rails are laid on and fastened to the superstructure which is attached to the road or street, and are in no way attached to the land, real property or real estate of the company; so likewise are the poles and wires.

If the rails, poles and wires are attached to any land, they are attached to the roadway or street and form part of the same, and therefore exempt under section 7, sub-section 6, of the Consolidated Assessment Act.

It is contended by the Respondents that the Appellants are occupants of the street, and their property, therefore, liable to taxation. I do not think the Appellants have such an occupancy independently from the Respondents as to say that the Respondents have parted with their official occupancy and given it to the Appellants, and that the Appellants are liable to be taxed for the said streets under the said sub-section 2 of section 7 of the Assessment Act. The Respondents do not part with the occupancy of the streets, but retain possession of the same, merely granting to the Appellants certain rights and privileges, and the Appellants cannot be considered the occupants under section 2 of section 7, and liable to assessment. The streets remain the property of the Crown under the jurisdiction of the municipality, and they are exempt from taxation, as also are the rails, poles and wires of the Appellants when affixed to the said streets; ss. 1 of section 7 of the Assessment Act.

I do not think the decisions in the English rating cases are applicable to the present case. The difference in principle is shown in the judgment of Burton and Patterson, J. J. A., and in the case of the Toronto Street Railway Company v Fleming, 37 U. C. R. 116. I do not consider the assessment law has been materially changed since the decision in the Fleming case so as to affect this case. The sections are now, with the exception of a few trifling verbal changes, the same as they were when the Fleming case was decided. I cannot distinguish this case from the Fleming case, in which it was held that the railway company was not assessable for these portions of the streets occupied by them for the purpose of their railway, as being land within the meaning of the Assessment Act of 1869. This case is distinguished from the Consumers' Gas Co. v. Toronto in that the pipes and mains of the gas company were laid in the city streets and attached to the plant and buildings of the company, whereas, in the case under consideration, the rails, poles and wires are in no way connected with the power house, plant or building of the Appellants' company.

I hold this case to be covered by the decision in the Fleming case, and would therefore allow the appeal with costs.

I am well satisfied to arrive at this conclusion because the city and the company entered into their agreement, 55 Vic., Chap. 99, on the faith of the law settled by the Court of Error and Appeal in the Fleming case, and it would be, in my opinion, inequitable for the city by an assessment of the railway in the streets of the city, to increase the liability of the Railway Company under the agreement.

DARTNELL, J. - The matters in question before us are of the highest interest and importance to the parties concerned, and require the most careful consideration. There are no contested facts in dispute, no evidence having been offered, and such facts as are necessary for consideration are fully set out in the arguments of counsel for each side, and the documents, papers and authorities submitted to us.

What we have to consider is whether, under all the circumstances submitted to us, is the Toronto Street Railway Co., for the remaining 25 years of this franchise, liable to taxation in respect of their rails, poles and wires erected and being upon the city of Toronto. It is conceded that for the first time since the agreement between the city and the company entered into some five years ago, and which has received legislative sanction, the city has undertaken to assess the company for the property now in question, and which has heretofore escaped taxation. It is also considered that such a taxation for such 25 years will amount to a sum aggregating in the whole to about \$200,000.

The city, apparently acting on the assumption or belief that the case in the Court of Appeal of the city of Toronto and the Consumers' Gas Co. has practically modified, distinguished or overruled the case of Fleming vs. Toronto Street Railway, conceived that the latter case was no longer binding upon them, and undertook for the first time to impose a rate upon the property of the company, now the subject of appeal.

These two judgments leave the state of the law in a somewhat unsatisfactory condition, arising from the fact that the judgments of the members of the Courts are not unanimous, and those judges who have arrived at conclusions which unitedly are the framework of the decision of the Court, have reached such conclusions by devious ways.

Since the case of Fleming vs. Toronto Street Railway has been decided, the verbiage of the Assessment Act has been altered, and, in that respect, the authority of that case as applied to the question before us is somewhat weakened. But for this, I should be inclined to hold that we were concluded by that case, and should without question allow the company's appeal.

I humbly conceive that there is a marked difference between the position of the gas company and the railway company. The former company is essentially a commercial corporation having an article of commerce to dispose of, which has been ranked in our courts as a mineral, which can only be distributed to the company's customers through pipes connected with their main works and the storage reservoirs containing the commodity they sell. The general public have no interest in the works at all analogous to the use of the public highway and can at will put an end to the contracts made with their customers, subject, of course, to the ordinary rules governing all contracts. The railway company, on the other hand, offer to the city an improved and convenient method of utilizing the highways of the corporation, and undertake to do for the city what the city itself has power to do without their intervention. The city has surrendered to them certain portions of the surface of the city highways, for the greater ease of the propulsion of their vehicles, giving them the legal right of way over other vehicles,

and the right of exacting toll from the passengers using such vehicles, and exacting as the price of such concessions a mileage rental or assessment and a percentage of the gross profits of the company. They are common carriers, and are bound to receive all passengers presenting themselves for carriage and to keep in constant good condition their whole system. They also perform other services for the city, such as street watering and the conveyance and dumping of city garbage and refuse. In these respects the positions of the gas company and the railway company are essentially different. I am clearly of opinion that the relationship between the city and the company is not that of landlord and tenant. It is rather that of licensor and licensee. In fact the agreement between the parties ratified by legislation explicitly treats and styles them as "vendors" and "purchasers." No weight whatever can be given to this argument.

Neither do I think that this railway can be treated as a railway company in the sense that the C. P. R. or the G. T. R., or any railway incorporated under Dominion or Provincial authority can be classed as such, and entitled to exemption from taxation in respect of their rails as part of their superstructure. They have never taken that position until now.

I have carefully considered the discussion, arguments and judgment in the case before the Privy Council of the Queen vs. the Toronto Street Railway. I do not consider that the effect of that judgment is to declare that the latter is a "railway" in the sense that a Dominion or Provincial railway is a railway. It simply decides that certain rails imported for use and to be laid on the company's "railway track" and being over a certain weight, were exempt from customs duty.

I have had the advantage of the perusal of my brother McDougall's able and exhaustive judgment. He has so fully gone into the historical part of the subject, and so fully collected and set forth all the authorities bearing upon the matter, that it would be superfluous on my part to endeavor to supplement his remarks, even if I were able to do so. I may be permitted to remark that the English authorities, however instructive and illustrative, are not altogether binding upon us, inasmuch as the method of rating in England for the purposes of taxation is essentially different from our own. There the question before the courts is "Is this a bona fide occupancy?" and the occupant is rated. In Ontario the property is rated and is primarily liable. The question of ownership is entirely subsidiary.

I agree with my brother McDougall that the poles and wires of the company are governed by the ratio decidendi in the gas companies' cases as being the vehicle by which the generating power is conveyed from the power house. I think that they are so intimately connected with the source of motor power as to become as much realty as say a shaft drawn by a central machine, or a cable laid along or under the public streets. I think the rails, if utilized for conveying the current to the motors, or after the expenditure of its force on the motors, returning it to the power house, in other words, completing the circuit, would be assessable, but if such circuit could be completed without the aid of the rails that then the rails would not be assessable, because they would form part of the highway constructed and used for the purpose of more effectually and rapidly furnishing the paramount object highways are established and maintained for, namely, rapid, convenient and efficient transit and traffic.

To illustrate my view as to the non assessability of the company's rails, I would suppose the not unlikely case of the city, instead of constructing, maintaining and keeping in repair the public streets of the city, had, under contract with some construction company possessing the right to use some new or advantageous form or method of street paving, employed them for a consideration to do this work at an annual rate for a term of years; would it be just, equitable or fair for them to seek to diminish the price they have engaged to pay by an assessment upon the value of the material used in the construction of the pavement? I submit that the difference between that case and the use of the rails of this company for the greater ease of traction is only one of degree.

The judgment of the Court of Appeal in the gas case, in which the gas mains and pipes were held assessable, proceeds largely upon the assumption that those mains and pipes are, as Mr. Justice Rose expressed it (23 A. R. at page 556) "liable to taxation as part of the property of the company, increasing the value of the building and plant." It could not well be held otherwise, for the special case submitted to the court expressly states that these mains and pipes "were attached to buildings and plant of the company." Unless the use of these rails for this company for the purpose of transmitting the motor power can be said to attach them to the plant and buildings of the company to my mind they are entirely detached, and are personable property and are non-assessable. It is not essential that this company should use this current in this particular way as a motive power. They could use it in another way by erecting a return wire, discarding the current by means of the rails, or they could establish storage batteries or motors driven by compressed air, or by other means which the advance of science is so constantly suggesting.

I have perused the report of the New Brunswick case cited to us and am not convinced that it is an authority binding upon us. I have considered the effect and the meaning of the references to "tax" in the agreement of the contracting parties. To my mind it does not refer to more than such taxes as were no doubt imposable upon such property of the company as is not placed upon the streets of the city, the use of which was the franchise which was the subject matter dealt with. The company would require other property, such as their power house. They would have to erect or rent office buildings, waiting rooms, car stables, etc., and might require space, buildings and machinery for the construction of cars, etc. The reference to these transactions was wisely inserted in the document for the purpose of avoiding any difficulty which might arise as to the disposition of these taxes between the public and the separate schools.

This brings me to the consideration of the concluding argument advanced by the company against the imposition upon them of these taxes, viz. That to do so is to import into the agreement between contracting parties a new and onerous condition or stipulation which was never in the contemplation of the parties to the contract at the time of its execution, which it would be inequitable to enforce, and which cannot be evolved from the four corners of the document as it stands.

Corporate bodies are bound by the same rule of law and conduct as individuals. Their component parts are variable, but the corporation continues to exist as a whole. The city may change its policy or reserve its former action, but it must always be held to its contracts and agreements entered into previous to such change or reversal. The agreement between these two contracting corporations was the outcome of a contest between men of keen business and legal acumen, and after the fullest and most prolonged discussion the result was embodied in the pages of this document. These parties had before them the judgment of the highest courts of the province declaring that this very property of this very railway is not liable to taxation. Because, since that decision, a change has been made in the verbiage of the Assessment Act, and the authority of such decision by a subsequent judgment is supposed to be weakened or impugned; because "Another king has arisen which knew not Joseph," is that a reason why the parties should either be relieved from an obligation or have another onerous one imposed upon them? I humbly conceive not. If the legislature to-morrow passed a law declaring that the rails, poles and wires of all street railways are liable to taxation, I do not see how the position of this company would be affected, unless it was declared that such legislation should be expost facto. This might be confiscation, but it would have to be obeyed. I think this corporation is endeavoring to filch with one hand what they have given with the other.

I have considered the point whether this tribunal has any power or authority to determine more than the question whether this particular kind of property or any part of it is liable to taxation or not. In my opinion, to do so would be "Academic" only and would not be a binding value, or such a determination or finding that the contestants are entitled to. This court is one of review upon the proceedings upon a body of men composed in all urban and rural municipalities except the city of Toronto of all, or the greater part of, the members of a corporation, one of the litigants. It is meant to be a check upon their proceedings and is given power to redress a wrong when a wrong has been done. If this corporation, after granting an exemption from taxes, had undertaken to assess and levy taxes, contrary to such an agreement, the Courts would quickly interfere and restrain them. I think this Court would have equal authority.

With great diffidence I venture to place on record my opinion that (save in so far as my judgment agrees with that of my brother McDougall) the judgment of the Court of Revision should be reversed with appropriate costs to be paid out of the fund paid into the City Treasurer to cover the costs of appeal.

McDOUGALL, J.:—The first question I propose to consider is as to whether street railways come within the purview of sec. 29 of the Assessment Act; because if they do so the superstructure is not assessable, under several decisions in our own courts. *G. W. R. vs. Rome* 15, U. C. 168; *Landon vs. G. W. R.*, 17 U. C. 269, approved in *Central Vermont Railway vs. St. Johns*, 14 Supreme Court 284. It is well to note that in the case of the *Toronto Street Railway Co. v. Fleming*, 35 U. C. 264, and appeal 37 U. C. 116, no question was discussed as to the right of the plaintiffs to escape taxation on the ground that the superstructure of their road was exempt. *Richards C. J.*, and *Wilson J.* placed the liability on the company because they occupied with their tracks the soil on the highway, and that that occupation and user, though not exclusive, was an interest in lands. The thing (track) they had fixed to the land became land, and (like gas mains laid beneath the surface), was liable to taxation. It was argued that the case of the *Toronto Railway v. the Queen*, decided recently by the Privy Council, determines the status of a street railway, and makes it a railway within the meaning of the Custom's Act, and in consequence, for the purposes of the Assessment Act, it must be viewed as a railway as much as the Grand Trunk or Canadian Pacific. I do not so read the decision. *Toronto Railway v. the Queen* simply decides that when steel rails above a certain weight, and to be used in railway tracks, are exempt from duty, the general expression "railway tracks" is sufficiently broad to include the track of a street railway which uses such rails in the construction of their roadway, and in this manner provide a permanent way for their cars. *Lord Hobhouse*, in delivering the judgment of the Court, says: "The appellants then are the owners of what the Legislature of their own Province calls a single or double track street railway, and the time which they work is called a railway track. These expressions are not conclusive as to the meaning of the term as used by the Dominion Legislature in the Act under discussion, but they show that the term is known to the Canadian draughtsmen of statutes in Canada, and is there applied to such a line as that of the appellants. It seems to their Lordships to be good evidence as to the meaning in the mouth of a Canadian Legislature, and to afford prima facie ground for holding that railway track includes the line of street railway." Again he says: "It may be in other Acts and for other purposes there are substantial distinctions between railways or railway tracks and tramways, but for this purpose and in this Act and its three predecessors (Customs Acts) there is not traceable any idea of making such a distinction, but rather the idea of putting all kinds of railways on the same footing." Now, when we trace up the history of sec. 29 of the Assessment Act of 1893, we find a section substantially the same introduced on the first time by 16 Vic. cap. 32, sec. 21 (1851-3) requiring railway companies to transmit to the clerk of the municipality the statement therein provided. This section is preserved with very slight verbal alterations in all the subsequent Assessment Acts down to 1893. It could not be said that this section was intended to include street railways at the time of its introduction, for none, so far as I know, were then in existence, at least in Canada. They are a more modern creation. The railway companies intended to be covered by sec. 29 of the Assessment Act are in my opinion only those companies which are subject to the provisions of the Ontario and Dominion Railway Acts. The other companies are known as street railways, and were always incorporated by special Acts of Parliament. They may since 1893 be formed under the provisions of the Street Railway Act R. S. O. 171. It is quite true that the expression "railway track" is in some sense a generic term; but, as I have said before, an examination into the origin of sec. 29 in my opinion clearly shows that it was never intended to apply to or to include a street railway. The fact that this contention, though raised in the summary appeal, is not mentioned in the judgments in appeal in the *Toronto Street Railway v. Fleming*—the only case where the taxable status of a street railway company has been enquired into prior to the present appeal—in some degree strengthens the opinion above expressed. If I am right in this conclusion, then such decisions as *Great Western Railway Co. v. Rome* do not apply to street railways.

The next important matter to be considered is the effect of the decision in the Court of Appeal of the *Toronto Street Railway v. Fleming*, 37 U. C. 116. A judgment in that case was pronounced in 1873 upon the clause of the Assessment Act as they stand at that date. Sec. 3 of 32 Vic. cap. (36 Ontario, 1868) re 4:—"(3) The terms land, real property and real estate respectively include all buildings or other things erected upon or affixed to the land, and all machinery or other things so affixed to any building as to form in law part of the realty, and all trees or underwood growing upon the land, and all mines, minerals, quarries and fossils in and under the same, except mine belonging to Her Majesty." Sec. (4) "The terms personal estate and personal property include all goods, chattels, shares, incorporated companies, interest in mortgages, dividends from bank stock, in any, notes, accounts and debts at their actual value, income and all other property except land and real estate and real property as above defined and except property heron expressly exempted." Sec. (5) "The term property includes both real and personal property as above defined." Sec. (6) "All land and personal property in the province of Ontario shall be liable to taxation, subject to the following exemptions, that is to say—" Now, in the Act of 1893 the 9th section of the Act of 1873 is transferred, and becomes sub-sec. 8 of sec. 2 with a slight change of wording. It now reads: Sec. 2 sub-sec. 8 "Property shall include both real and personal property as hereinafter defined." Sub-sec. 9 takes the place of sec. 2 and reads: "Land, real property and real estate shall include," etc.—following the exact words of the old section, with the addition of the words "and land covered by water." Sub-sec. 10 takes the place of sec. 4, with some additions and modifications of the importance of this appeal. Sec. 9 of the Act of 1893 has an important change

made in it, and becomes sec. (7) in the Act of 1893, and reads now as follows: (7) "All property in this province shall be liable to taxation subject to the following exemptions, that is to say: The first point to be noticed is the passage in the judgment of *Patterson, J.*, in the Court of Appeal in *Toronto Street Railway v. Fleming*, at page 126. He says: "If there was a general law that all property should be assessable for municipal purposes, I should have no hesitation in deciding that this was assessable property. The question, however, is: Is it assessable as land?" Mr. *Patterson* then proceeds to argue that as, in the exemption clauses, sub-sec. 6 exempts every public road and way, or public square, and as it is sought to assess the company in respect of the portions of the streets used for the purposes of the railway, and it is only land that can be assessed, they are not liable, because all the land in the public roads is exempt. Upon reference back to the case stated in *Toronto Street Railway v. Fleming*, reported in 35 U. C. 264, it will be seen what was the subject of the controversy there and the assessment or alleged claim for taxable liability which was under consideration, in order to contrast it with the subject-matter of this appeal.

Paragraph 2 of the stated case shows this put clearly, and reads as follows: "The assessment for the said taxes in regard to which the said distress was made by the defendant was made by the city of Toronto in respect of the portions of Queen street, Yonge street and King street used by plaintiffs for the purposes of their said railway under the provisions of the Act, statutes and by-law hereinafter referred to." The present appeal is against the assessment of the company under the head of lands, buildings and improvements, and in the column headed "Value of Buildings and Improvements" the disputed assessment appears as follows:—

VALUE OF BUILDINGS AND IMPROVEMENTS.

{ \$ 4,000  
{ \$537,137—rails, wires and poles used by the company in connection with the said lands for the purpose of operating its railway in and upon the lands of the company or the streets of the city.

What this appears to mean I take it, is: rails, wires and poles used by the company, placed on the lands of the company or on the streets of the city, which said rails, wires and poles so placed as aforesaid are used by the company in operating their railway. Now, it has recently been held by the Court of Appeal in the *Gas Consumers' case v. Toronto* that the gas mains laid in the public streets beneath the surface are assessable, notwithstanding the existence of sub-sec. 6 of the exemptions section. The Chancellor, in his judgment in the same case, 26 Ont., page 772, says (at page 799): "To let graph companies the same rules apply where the wires are carried above or underneath the soil of the highway." In the *Electric Telegraph Co. v. Overseers of Salford*, 11 Exchequer, 181, the Court gave effect to the legal definition of land as including not only the face of the earth, but everything on it or over it; and that definition is not ruled out by our Assessment Act, which says "land" shall include such and such meanings—not that all others legally possessed by the word shall be excluded. In *Pimlico Tramway Co. v. Greenwich*, L. R. 9, Q. B. p. 9, the company was held to be rateable as occupants of the highway by reasons of the tracks being laid thereon, because it was held that although they had not the exclusive use of the surface of the track, that being in the exclusive occupation of any portion of the soil, as they were in laying their tracks in the same, they were liable.

*Lord Blackburn*, at page 14 says: "There is a considerable resemblance between the iron tram rail or artificial tramway here and the pipe which is laid down, though there is this difference, undoubtedly, that the pipe (I do not know that it would be necessary if it should be so) is generally buried in the soil some way below the actual pavement or macadamised road which forms the thing actually supporting the carriages passing along; but I do not think that makes any difference."

*Lush, J.*, said: "I am of the same opinion. The Act of Parliament enables the proprietors of a tramway to appropriate to their own purpose a given portion of the public road for the purpose of laying down the tram rails which are requisite for the conveyance of their carriages along the line of road. The tram rails occupy a portion of the soil. They are exclusively used by the tram rail company for the purposes of the tramway, and that, I think, makes them occupiers of that portion of the soil. I do not think they are the less occupiers because the public as well have the right of way over the surface of their iron road; and the road, as a tramroad, is in their exclusive use, and used for their exclusive benefit."

*Quinn, J.*, said he was unable to distinguish the case from the cases which had been decided on the occupation of land by water companies and gas companies. At page 16 he says: "It appears to me that no difference can be pointed out between this tramway and those gas and water mains, except that the gas and water mains are deeper in the soil than this iron tramway." Again he says: "I am unable to distinguish the iron tramway from the gas and water pipe. Both physically occupy the soil. One is somewhat deeper than the other, the tram rail having the upper surface level with the road, but they both occupy the soil of the road physically, and in exactly the same manner. I do not see either in sec. 37 or sec. 62 any provision which in any way interferes with that principle. They only preserve the right of the public to go over the surface as before, but in no way is it stated that these tramways so made, and the hauls of timber upon which they are laid, were part of the road in the sense of being the property of the public authorities. They remained the private property of the tramway company, and they by means of the iron rails and the hauls of timber are occupying the soil of the road in the same manner exactly as the gas pipes and water pipes; and the latter being rateable, I think the former are also rateable."

I have quoted at some length from this instructive judgment because I think its language is singularly apposite to the questions in issue in this appeal. The position of the tracks, etc., of the railway company buried in the soil, I cannot differentiate from that position of gas mains buried under the soil. The street railway has exclusive use of their rails and of the soil occupied by their rails and ties for the purpose of their business. It is true that the public can drive over and along these tracks. By their agreement with the city they are compelled to have them flush with the pavement to enable vehicles to do so; and they are consequently let into the soil except the mere surface of the rail. If gas mains are assessable, I am firmly of the opinion that these rails and ties are, with so much of the soil as is used therewith, rateable of the company, and in this respect assessable. As to this underground soil surrounding and between their ties and rails, they are owners and occupiers within the meaning of the Assessment law of Ontario. This conclusion is supported by the last cited English case of *Pimlico v. Greenwich*, and by the *Consumers' Gas Company v. Toronto*, 26 Ont. 772, and by the judgment of the Court of Appeal in the same case. Whatever doubt may have been felt as to the meaning of the word "land" as used in sec. 9 in the Assessment Act of 1893 is now, to my mind, dispelled by the change to the word "property" in sec. 7 of the Assessment Act of 1893.

As to the rights of the public, they are subordinate to the rights of the company, who have the right of way in preference to the public; the public must give way to them, to their cars, and they have in that way a prior and exclusive right to the possession and use of their tracks and rails. *Helwell Union v. Helwell Drainage Co.*, appeal cases 1895, page 117. In this last case—the case on *Pimlico v. Greenwich* is approved. The wires and poles in use by the *Toronto Street Railway Co.*, to my mind, are also undoubtedly assessable on the principle defined by the case of the *Gas Consumers v. Toronto*, as being in precisely the same position as the gas mains, save that they are in the air over the highway instead of being buried in the soil, and the wires, posts and cross wires form one general fixture connected with and forming an indissoluble connection with the power house of the company. Through them the electric current is carried along the whole system of the street railway to move their cars. Like the gas mains, they, thus united with the machinery in the power house, form one fixture with it, and it is one indivisible plant. They have the exclusive use of these poles and wires, beyond all doubt, and the public—whatever their rights may be on the surface of the street—have no joint or even subordinate rights in these poles or wires overhead. I refer to *Lancashire Telephone Co. v. Manchester*, 13 Q. B. D. 700 and 14 Q. B. D. 267 in appeal; *The Electric Telegraph Co. v. Salford*, 11 Exchequer 181; and the case of the *Consumers' Gas Co. v. Toronto*, 26 Ont. 772 and in appeal.

*Mr. Oiler*, with reference to the nature of the title of the *Street Railway Co.* in the streets and in their tracks, contended that they only had a tenant's interest in them; that they had what practically amounted to a lease; and as lessor their interest was a chattel interest only. On reference to the conveyance by the city to the company of the street railway franchise acquired by the city from the old *Toronto Street Railway Company*, we find in clause this recital:—And whereas the said corporation resolved to sell to said railway all the property acquired by the city from the *Toronto Street Railway Co.* and also to dispose of the right to operate surface railways in the city of Toronto as hereinafter mentioned, etc., etc. (6) And whereas the corporation advertised for tenders for the purchase of the said railway property and privilege, and the purchasers (*Kelly, McKimie and Everett*) tendered therefor, and their tender was duly accepted. Then in the 10th clause it is recited that in consideration of \$275,000 paid by the purchasers to the corporation they (the corporation) do sell, grant and assign to the purchasers, their heirs, executors, administrators and assigns, all the said railway and property acquired from the *Toronto Street Railway Company*. Clause 11, for the same consideration as mentioned in clause 10, goes on to grant to the purchasers, their heirs, executors, etc., etc., for twenty years with the right to renew for ten years, the exclusive right for the said periods to operate

surface railways in the city of Toronto. Now, two things are dealt with: The property, tracks, equipment, stock, plant and real estate acquired by the city from the old Toronto Street Railway Co. This was sold absolutely to the new company. Next, the franchise to operate, for a limited time, surface railways, is conferred. The property, or the portion thereof here sought to be taxed, was sold outright; but the franchise or privilege to operate a surface road was conferred for a term only. What is sought to be reached by the present assessment, to be taxed, is the property, not the franchise. That there was a sale is made more manifest by turning to sec. 4 of the Act of Incorporation of the Toronto Railway Company, sub-sec. 2 and 3, where it is declared that if the city did not renew the franchise at the end of thirty years, and desired to take over the property, they are to pay the company therefor at a valuation to be determined by arbitration; and it is expressly declared that they are not to pay for the franchise.

Mr. Osler also urged that as the title of the highways upon which these rails are laid was vested in the Crown or in the municipality under section 325 and 327 of the Municipal Act, no portion of the soil is therefore taxable lands so vested being exempt. Sub-sec. 2 of sec. 7 of the Assessment Act reads: "All property vested in or held by Her Majesty, etc., is exempt"; but sub-sec. 2 of the same section declares: "When any property mentioned in the preceding clause is occupied by any person otherwise than in an official capacity, the occupant shall be assessed in respect thereof, but the property itself shall not be liable." Similarly, municipal property by sub-sec. 7 is declared to be exempt whether occupied for municipal purposes or unoccupied, "but not when occupied by any person as tenant or lessee, or otherwise than as a servant or officer of the corporation for the purposes thereof." The land is liable to be assessed, and the occupant made liable for the taxes.

In this view of these provisions, and of the conditions of purchase by the Toronto Railway Company, they cannot be deemed to be tenants of the city, but are owners of the tracks and plants, and are occupants of the streets, whether said streets are vested in the Crown or in the municipality; and as such occupants, they are liable to taxation, though the land itself, and as such occupied, is not liable for the payment of said taxes. The fact that under sub-sec. 2 of sec. 7 exemption clause, a special liability is created against an occupant of Crown or municipal lands to pay taxes in respect of such lands and of such occupation, develops a taxable responsibility almost identical with that existing in England, and hence decisions in the English courts upon this point are germane and cogent in determining questions arising in reference to this class of ratepayers.

I have already pointed out that so far as my opinion is concerned, I am unable to

distinguish any difference in liability between the owners of street car tracks buried in the soil twelve or eighteen inches, and the owners of gas mains buried four or five feet beneath the surface in the same street. The Court of Appeal for this province, by its latest decision upon the same sections of the Assessment Act, as now amended, has held that gas mains are assessable. In the present case I think I am justified in following the principle of the latest decision upon these troublesome sections of the Assessment Act. I feel less hesitation in doing this as the case of the Consumers' Gas Co. v. Toronto is now pending before the Supreme Court; and we are given to understand by counsel at the argument of this case that any judgment pronounced by this court would in all probability be taken for review to the same court of last resort. I hope this will be done, and the many conflicting opinions expressed by our ablest and most distinguished judges be finally reviewed by the highest court of the Dominion, and these vexed questions authoritatively disposed of.

I have only had the opportunity of seeing the judgments of my learned brothers a few minutes before coming into court. I cannot adopt the reasoning of my learned brother Dartnell that the corporation of the city of Toronto are not justified in making the assessment complained of in this appeal because such taxation adds a term or burden to the agreement entered into in 1851 between the city and the Toronto Street Railway Co. The agreement itself does not purport to deal with the matter of taxation. The question of liability to tax on of any species of property must depend upon the Statutes in force from time to time in that behalf. If the property in question in this appeal is assessable under the Assessment Act, no bargain or agreement, express or implied, made between the city of Toronto and the Street Railway Co. to exempt it from taxation, can have any effect unless sanctioned by the Legislature. No such sanction is claimed or shown, I venture to think, that the sole duty of this Court is to interpret the meaning of the taxing clauses of the Assessment Act, and to determine if the property assumed in this case is taxable property under the terms of section 7 of the Assessment Act, qualified by the exemption clauses of the same section. I can find no authority in the Assessment Act to enable us to administer so-called equity, and to declare that although we may be of opinion that the property here sought to be taxed is legally liable, yet that it is unjust or inequitable to affirm such assessment because at some antecedent period when one or even both of the parties to a bargain or agreement incorrectly concluded that the class of property now sought to be assessed was not under the existing law liable to assessment and taxation.

The appeal was allowed with costs, McDougall, J., dissenting.

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A new Leonard-Ball engine, of 200 horse power, has been added to the Berlin Electric Light Co.'s plant.

Mr. Stanley Douglass is putting in an electric light plant at Stanley, N. B., to light the village and business places.

The Robb Engineering Co. have erected two tandem compound electric light engines for H. Walker & Sons, Walkerville, Ont.

The property owners of Southampton, Ont., will vote on a by-law to raise \$11,000 for the purchase of an electric light plant.

The construction of the Perth and Lanark Railway will shortly be commenced. Mr. Fowler, of Arnprior, is one of the promoters.

The Toronto Street Railway gross earnings for November were \$74,617, as against \$77,602 for the same month last year, showing an actual decrease of \$3,365.

The electric light company at St. John, N. B., have added two large generators to their plant, supplied by the Edison Electric Illuminating Co., of Patterson, N. J.

Another suit has been entered on account of the Point Ellice bridge disaster at Victoria, B. C. The city has issued a writ against the Victoria Electric Railway and Light Company, the

Consolidated Railway Company and N. Farrell, claiming \$25,000 damages for the collapse of the structure.

Mr. P. N. Smith, late manager of the Consolidated Railroad and Light Company, of Vancouver, B. C., is said to have been arrested for misappropriating funds of the company.

J. F. McLaughlin, late of Toronto, has bought the charter of the Spokane & Columbia Telephone Company. He intends to put in a system at Rossland first, then to extend to Trail and from there to Spokane via Northport.

A special general meeting of the shareholders of the Metropolitan Street Railway Company is announced to take place in Toronto on the 7th of January to consider the question of increasing the capital stock to \$500,000.

The State Department at Washington has received a description of a farm in Mecklesburg where electricity has been made to take the place of laborers in great part. A turbine drives a dynamo which lights the barns, yards and dwellings, and furnishes a current of low tension to work pumps, run a straw-cutter, lathe, grindstone, large handsaw and threshing machine. One machinist attends to the entire plant, which is said to have reduced the expenses of the farm in considerable degree.

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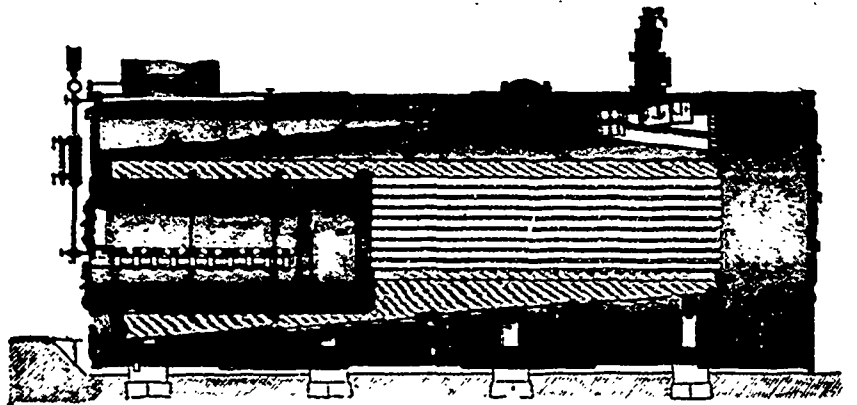
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