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**CANADIAN**

# ELECTRICAL NEWS

**STEAM ENGINEERING JOURNAL**

OLD SERIES, VOL. XV.—No. 6.  
NEW SERIES, VOL. VII.—No. 4.

APRIL, 1897

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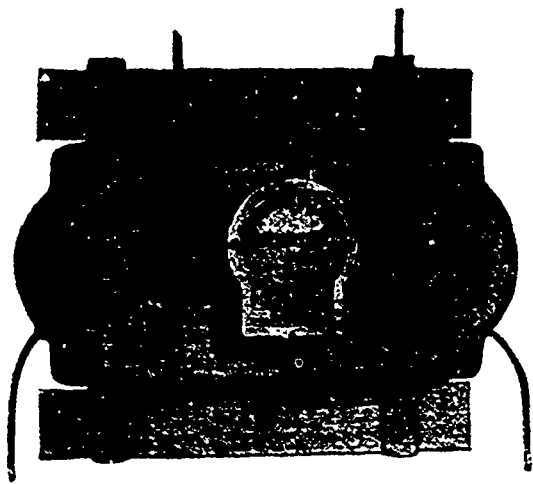
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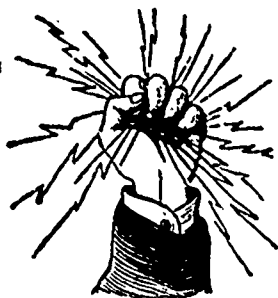
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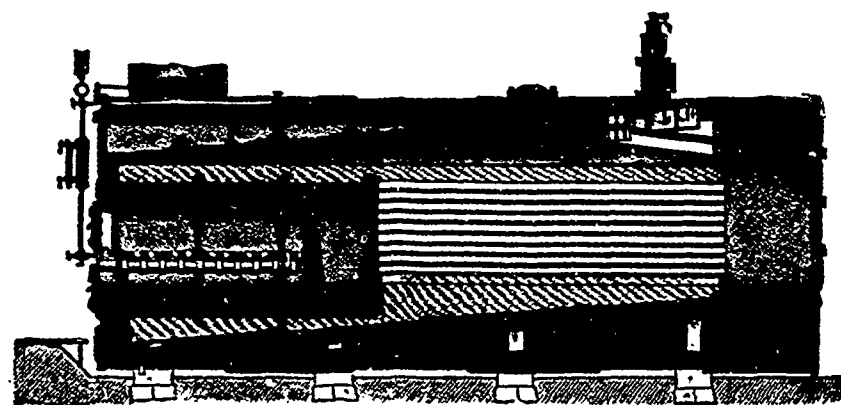
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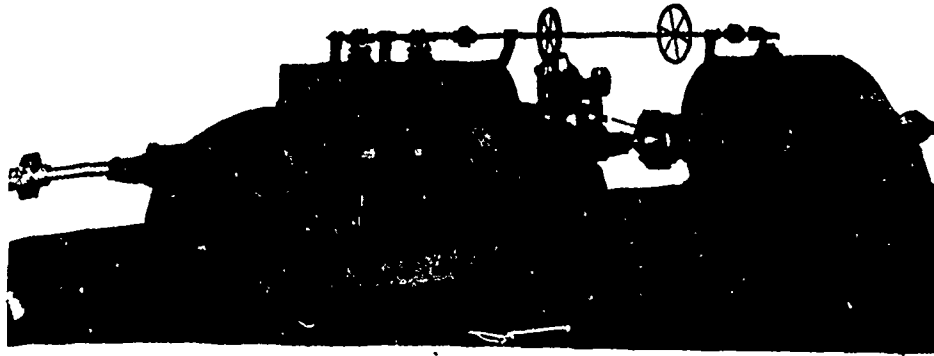


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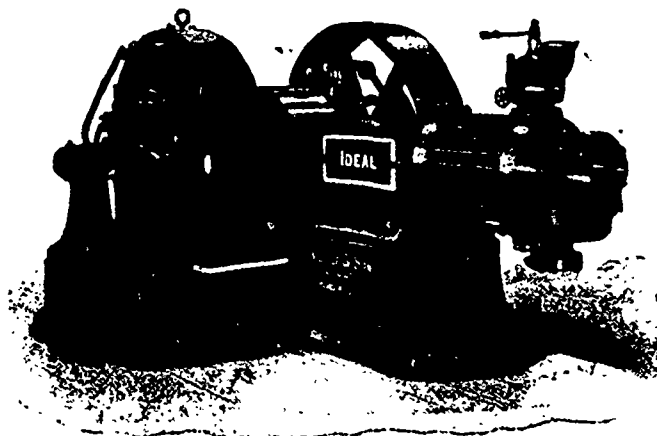
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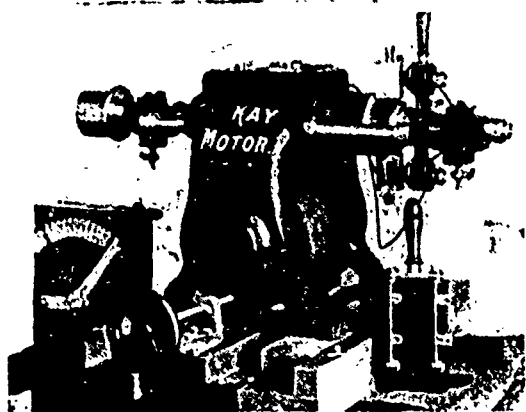
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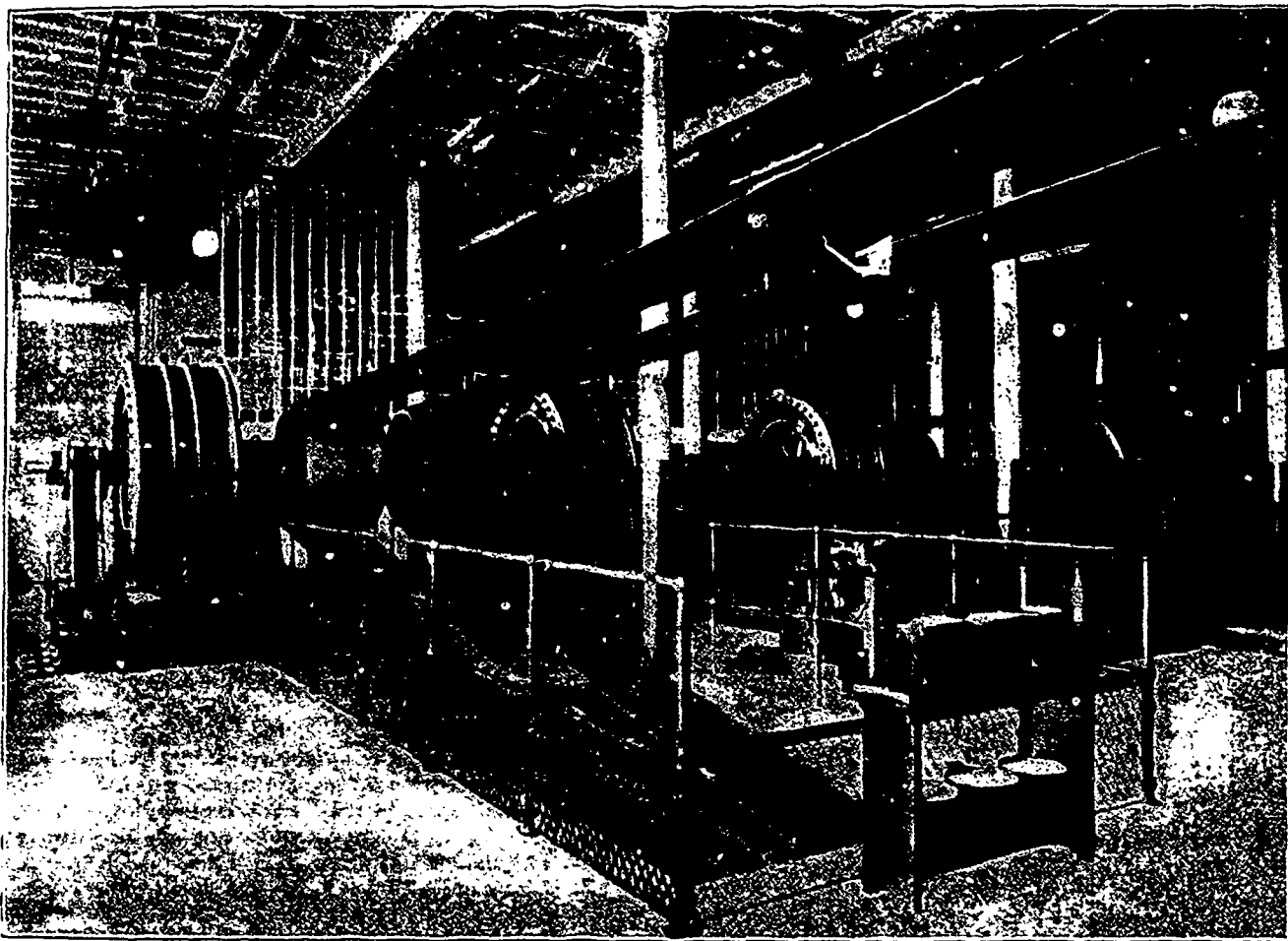
**RECONSTRUCTION OF THE ALTERNATING CURRENT SYSTEM OF THE ROYAL ELECTRIC COMPANY, MONTREAL, CANADA.**

By P. G. GOSSLER.

To meet the generally increasing demand for light and power supplied from central stations, it has, in many instances, been necessary to erect new generating stations, or to reconstruct the existing plant, discarding the old inefficient apparatus and substituting therefor equipment of modern design. In some of the larger

conditions. Besides, there is generally a multiplicity and variety of apparatus, the operation of which is accompanied with danger and unsatisfactory service.

The necessity of giving satisfactory and uniform service, of reducing the cost of operation, and of meeting the increasing demands for light and power being recognized, and the conditions being such as to permit of meeting these requirements, an investigation of the existing conditions generally results in the adopting of one of two plans: First, the building of a new generat-



S. K. C. GENERATORS, ROYAL ELECTRIC COMPANY'S ALTERNATING CURRENT LIGHTING STATION, MONTREAL.

cities this fact has apparently been appreciated for some time, as there have been erected stations which are magnificent examples of modern generating plants, operating with the highest economy obtainable at the present time and giving evidence in their design of the highest engineering skill.

Many generating stations at present supplying a large output have attained their growth gradually, having from time to time installed additional apparatus as it was required by an increasing business and extension of territory supplied. These stations are now confronted by figures and results showing their cost of operation per unit of output to be much more than it should be, or would if the same output was produced by more efficient apparatus operating under modern

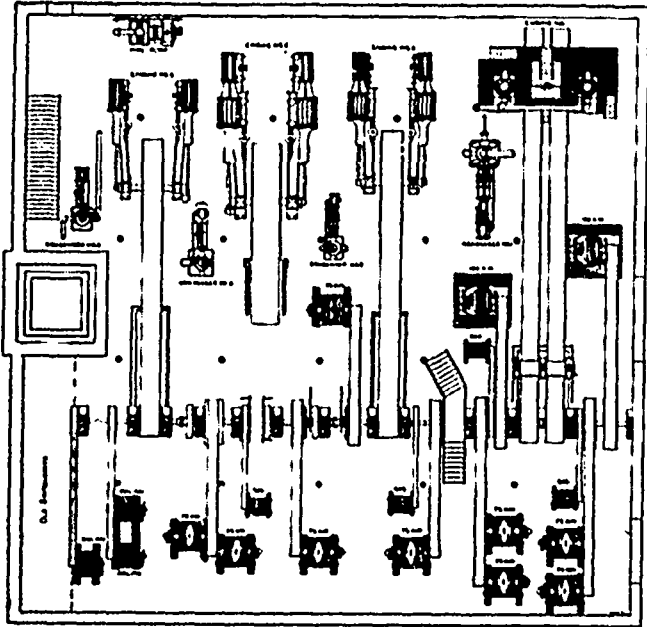
ing station and equipping it with modern apparatus, utilizing the old plant for continuing the service during the course of the construction of the new one, and possibly retaining it afterwards as spare capacity, or secondly, to reconstruct or re-equip the existing plant to conform to the aforementioned requirements.

The latter plan of reconstruction will, without doubt, be decided upon in the majority of cases, as the use of large units permits of the installation of sufficient capacity, in the same space occupied by the old apparatus, to meet future demands for a reasonable length of time.

There have been numerous descriptions published giving examples of plants erected to replace those found to be inefficient and giving unsatisfactory service. It is to be noted that, so far, these new plants, with but few

exceptions, are direct current stations serving light and power to congested districts and comparatively small areas. This account is of the reconstruction of an alternating current system supplying current to a large territory.

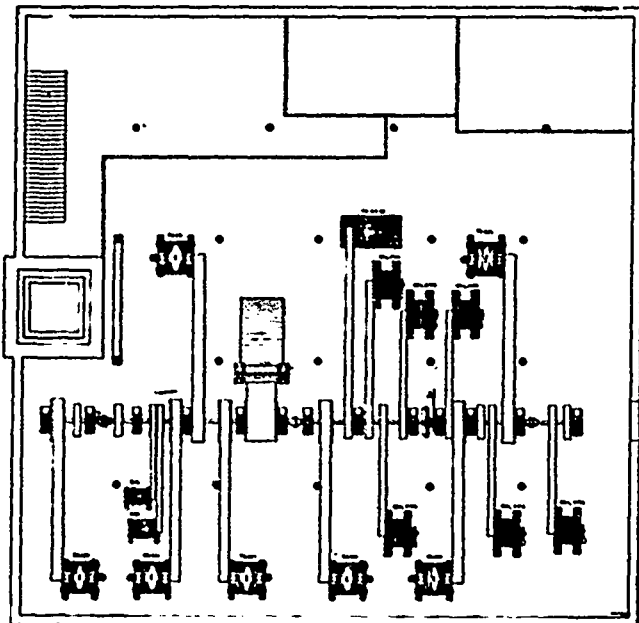
The history of the Royal Electric Company of Montreal, and the growth of its lighting and power plants



from a 12 light arc machine in 1884 to the present time of serving about 65,000 incandescent lamps, 1750 arc lamps and 750 h. p. in motors has been told in previous issues of electrical journals.

Early in 1896 the directors of the company, upon the recommendation of the general manager, Mr. W. H. Browne, authorized the entire reconstruction of its alternating current station and lines - this reconstruction to be carried out upon plans which should adapt the system to be served either with power from its existing steam plant or from the water power plant at Chambly, which is at present being rapidly developed.

The foresight shown in the recommendation and authorization of this wholesale reconstruction and re-equipment has been well established by results already



obtained. The economy of replacing inefficient apparatus by apparatus which is the production of the highest grade of engineering is, in this instance, no longer a possibility but an established fact.

One of the generating stations of the R. E. Co. is devoted exclusively to supplying direct current arc service.

The equipment of the second or Queen street station, for serving light from an alternating system, with a spare series arc capacity, prior to its reconstruction, consisted of 18 alternators, 6 exciters and 9 arc machines, with their numerous belts, pulleys and shafting, shown in diagrams 1 and 2, representing the apparatus on the ground and first flats. The D. C. power generators and engines are located in a separate building.

The upright engine, known as No. 1, shown next to Queen street in diagram 1, was connected by two 30" belts to a line shaft from which were operated four 75 k. w. and two 150 k. w. alternators and 2 exciters. Operated from the line shafting connected to No. 2 engine were three 75 k. w. alternators and an exciter.

No. 3 engine, located on the ground flat was belt driven by a 50" belt to a line shaft on the first flat, shown in diagram 2. To this line shafting were connected seven 75 k. w. alternators, two exciters, one 45 k. w., D. C. generator, five 40 light and one 35 light arc machines. These latter were used only as spare capacity for the series arc system located in the east end station, and the 45 k. w. generator as spare capacity for the D. C. power system. The total capacity of the machines connected to this line shafting was much more than the capacity of the engine, consequently only part of the machines connected to No. 3 line shafting could be fully loaded at any one time. With that part of the shafting thrown out of service by the clutch shown at "A"

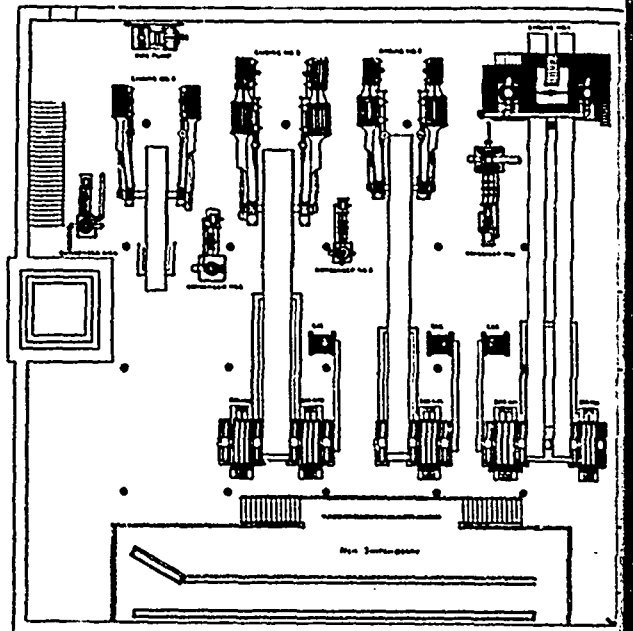


diagram 2, there yet remained connected to the shafting in service three 40 light arc machines, which had to be up to speed whether they were required or not. To No. 4 engine were connected by line shafting two 75 k. w. alternators and three 50 light arc machines.

It will be unnecessary to give in detail the heavy line shafting losses, the dangers and disadvantages of such an arrangement of machines as shown in diagrams 1 and 2, as they will be apparent at first sight.

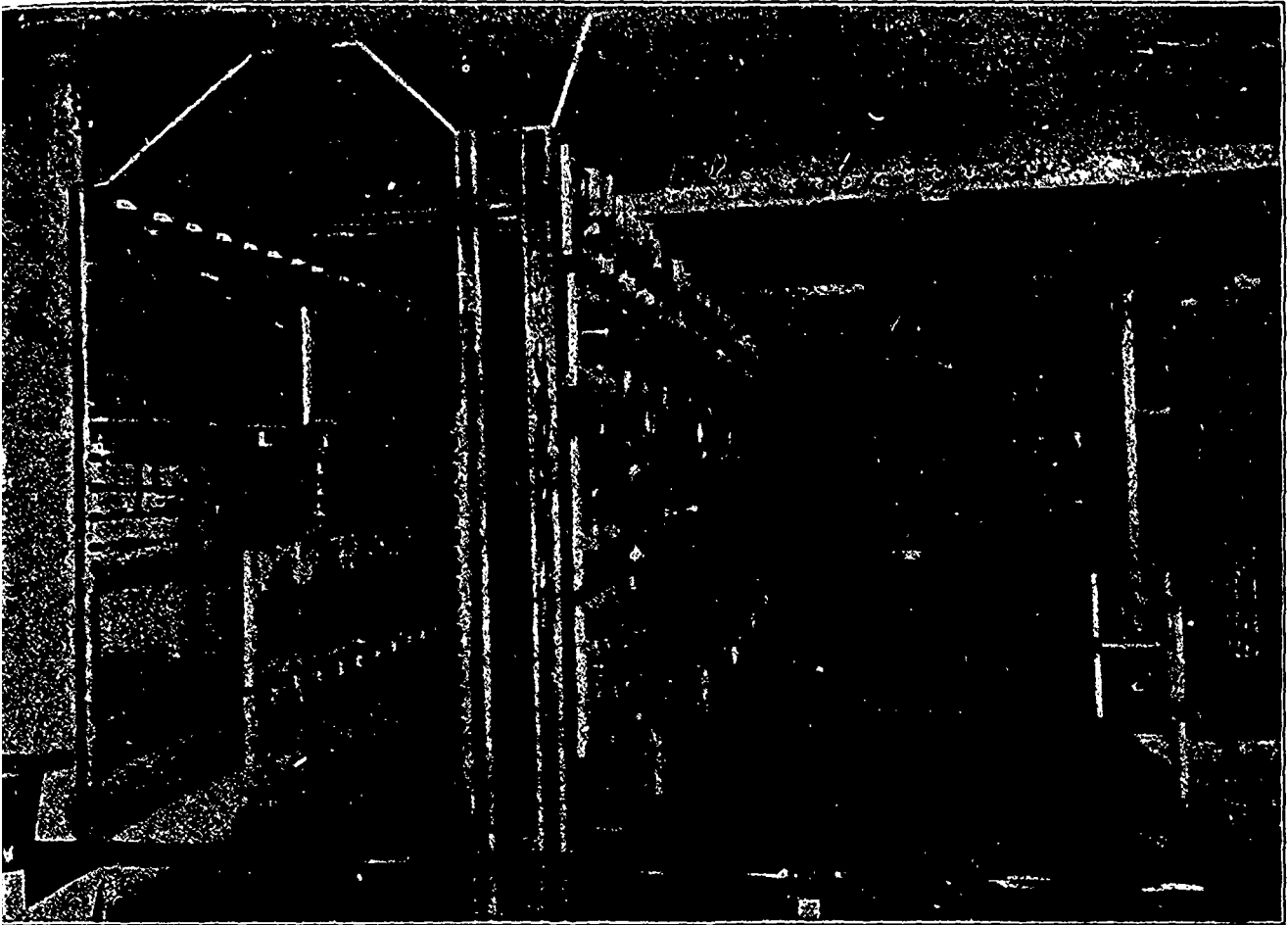
There was another danger which menaced the safety of the entire system - a wooden switchboard, the capacity and arrangement of which was entirely inadequate for the service required of it.

The alternators connected to the same engine were run in parallel, six operating in parallel from No. 1 engine, three from No. 2, seven from No. 3 and two from No. 4 engine. The ordinary advantages to be gained from operating in parallel were to a great extent offset by the fact of there being no clutches on individual machines. This also introduced irregularities and interruption to the service from armature burn-outs. In running so many comparatively small units in parallel it was difficult to overcome the "idle" currents in the alternators, and the numerous belts and pulleys required a nicety of adjustment which was hard to maintain after synchronism had once been established.

The foregoing statements setting forth past conditions have been made to illustrate the results of a gradual growth. It is needless to state that had the present demands for light and power been foreseen, and the efficient apparatus of to-day been available, the station equipment, in all probability, would have been far different from that which necessitated its entire reconstruction. The first step of this reconstruction was the rearrangement of the overhead lines. These had been divided into three routes, each taking approximately one third of the station output. The relative positions of the wires on the poles forming these routes were such as to cause serious fluctuations in the lights, due to mutual induction. This became so objectionable that it was necessary to operate all the circuits forming one pole line from one set of alternators running in parallel to get comparatively steady service. When the total load was too heavy to be run from one set of alternators, this condition of the pole lines neces-

represents the generating plant as it at present exists, occupying one instead of two flats—eighteen old generators being replaced by five 300 k. w. generators of the S. K. C. inductor type, the latter being belted directly to the engines. Also, in diagram 3 is shown the outline of the new switchboard, located overlooking the generator and engine room.

The five 300 k. w. S. K. C. 2 phase generators were built in the manufacturing department of the Royal Electric Company. To utilize the engines in their existing condition it was necessary to have the shafts of the two alternators for No. 1 engine rigidly connected, also the shafts of the alternators for No. 3 engine rigidly connected. The machines on No. 1 engine are run in parallel, also the two in No. 3 engine are run in parallel. This arrangement practically makes 600 k. w. units on both of these engines, at the same time having the many advantages of being able to subdivide these units and have four independent alternators.



MAIN DISTRIBUTING SWITCH-BOARD, ROYAL ELECTRIC COMPANY'S ALTERNATING CURRENT LIGHTING STATION, MONTREAL.

sitated the running of two or three engines underloaded, introducing a serious loss in coal consumption. The relative positions of the wires on the poles were changed to overcome this mutual induction and most satisfactory results were obtained, as after this change it was possible to operate any circuit from any engine without the slightest fluctuation resulting.

The transformer system was next rearranged, the old transformers being replaced by ones of close regulation and small core losses and secondary systems established wherever economical. The extent to which the latter was carried may be judged from the fact that 1161 old transformers were replaced by 628 "Stanley" transformers, with a consequent reduction in leakage load of 245 amperes, representing a tremendous saving in coal.

After getting the lines in shape attention was next directed to constructing a new switchboard and installing new alternators.

Diagrams 1 and 2 show the generating plant prior to its reconstruction, occupying two flats. Diagram 3

represents the generating plant as it at present exists, occupying one instead of two flats—eighteen old generators being replaced by five 300 k. w. generators of the S. K. C. inductor type, the latter being belted directly to the engines. Also, in diagram 3 is shown the outline of the new switchboard, located overlooking the generator and engine room.

Due to the crowded condition of the station prior to reconstruction, the installing of the new machines and construction of the new switchboard, at the same time maintaining continuous service, introduced many conditions and difficulties not encountered in the erection of a new station. All of the available space being occupied by old equipment it was not possible to first install new apparatus to replace that which was to be removed. It was therefore necessary before beginning the station reconstruction to await such time as the capacity of one of the engines could be dispensed with, with the least danger of running short of capacity in case of accident to one of the other engines.

To have at all times sufficient capacity to meet the requirements and at the same time to have spare capacity for emergencies was of course the difficult part of the reconstruction.

Work was commenced in the station by the removal of the old equipment connected to No. 2 engine and replacing it by one 300 k. w. S. K. C. generator. The apparatus connected to No. 3 engine was next replaced

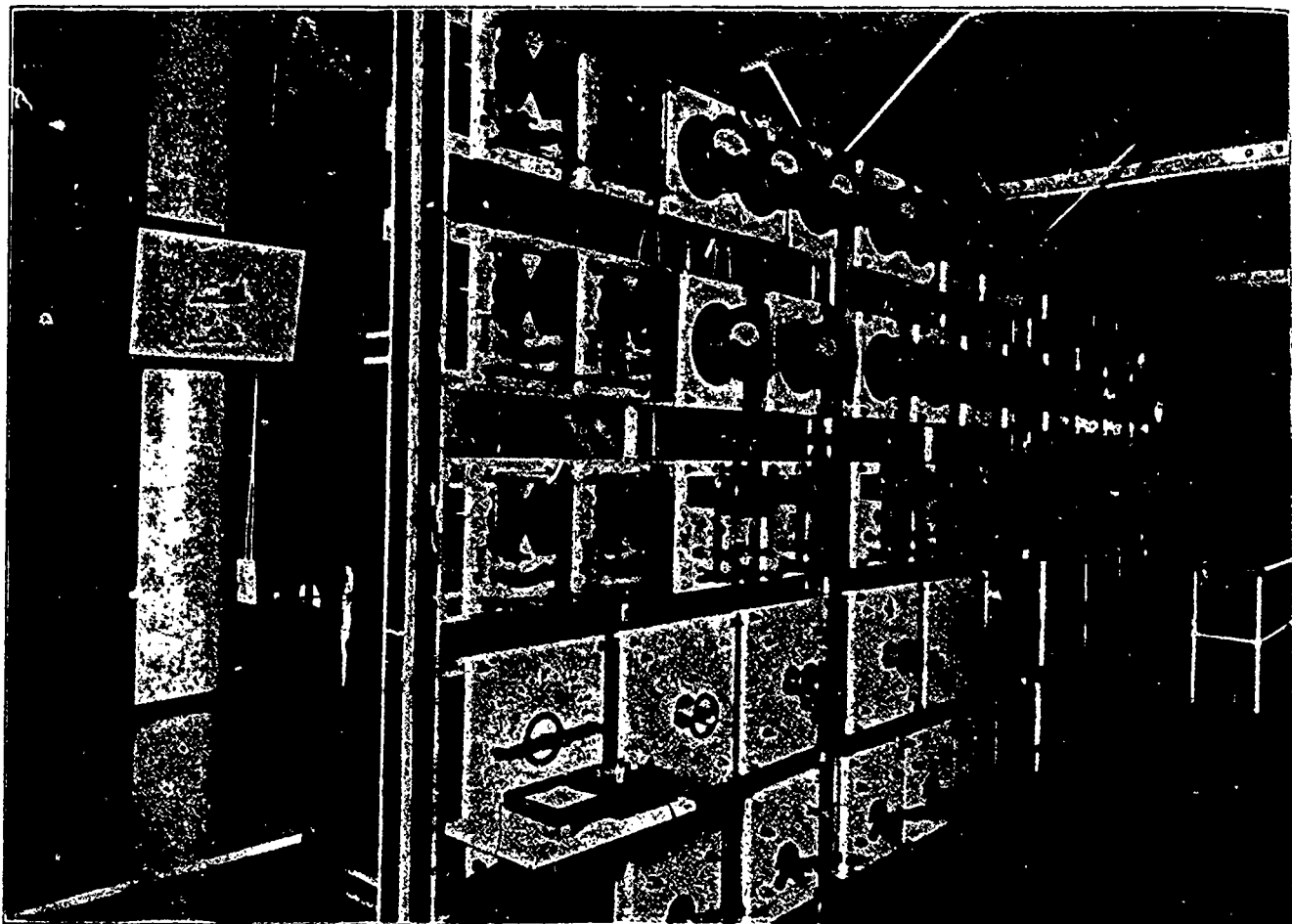


by two 300 k. w. S. K. C. generators. No. 4 engine was then reconnected to part of the line shafting on the upper flat which had previously been run by No. 3 engine. By this time the fall load was near at hand with the new machines yet to be installed on No. 1 engine. This was an unpleasant fact confronting us at this time, and it was a great temptation to allow the old equipment to remain on No. 1 engine until spring, but the saving sure to follow the installation of new generators on this engine made it advisable to complete the reconstruction. The load had increased to such an extent that it was not safe to be without at least, part of the capacity of No. 1 engine at all times. To provide for this there was installed, to be run temporarily from No. 1 engine, one 300 k. w. generator, and later, owing to a heavy increase in load, one 180 k. w. generator both belted directly to the engine and running with very short centres to allow of the new generators intended to be run regularly from this same engine be-

larly difficult operation with the service "dead", the transferring without any interruption to the service was a rather ticklish undertaking. It was made in the day time, within a period of ten hours, without any interruption to the service or inconvenience to the customers, in fact, they were not aware at any time of the changes taking place in the station.

Cut 2 represents the generator board and cut 3 represents the circuit board and the terminal board of the new switchboard. The board has been designed on the "universal combination" plan, by means of which there is a universal interchangeability of circuits, dynamo and exciter connections, enabling any circuit to be operated from any generator, and any generator to be excited from any exciter.

Diagram 4 shows the arrangement of switches, rheostats and instruments on the generator board. The instruments on the top row, excepting the three mounted on single bases, are voltmeters, there being



GENERATOR SWITCH-BOARD, ROYAL ELECTRIC COMPANY'S ALTERNATING CURRENT LIGHTING STATION, MONTREAL.

ing placed in their proper positions, in line with the generators connected to No. 2 and No. 3 engines.

During the time of installing the new generators there was also being constructed the new switchboard. From the diagrams it will be seen that the location of the new board brought it directly over several of the old generators, and the close quarters in which the work was done in the station will be appreciated from the statement that the iron framework supporting the floor of the board cleared the eye bolts on top of these old machines, still operating, by only six inches.

The installation of the five 300 k. w. generators was completed by the middle of October just at the beginning of the heavy winter load, and the new 2 phase board was completed about the same time.

The transferring of the service from the old to the new switchboard transformed the entire alternating system from a single to a two-phase system. The operation of transferring the circuits from the old to the new board was, of course, made with all circuits alive, and while this transfer would not have been a particu-

one for each phase of each generator; the single instruments are ammeters in the exciter circuits. Below these are the generator ammeters and switches, there being one for each phase of each generator. The two lower rows show the rheostats and exciter switches.

The circuit board consists of two rows of 4-pole switches, two switches being required for each circuit. These switches are so connected that by a single throw of one switch a circuit can be connected to any generator. Above the rows of switches are mounted ammeters, one ammeter for each phase of each circuit, and above the ammeters are fuse blocks.

In the rear of the circuit board is the terminal board, on which are mounted a single row of 4-pole switches, one switch for each circuit, and an auxiliary set of buss bars, and below these a row of recording meters. By means of these auxiliary switches and buss bars any circuit panel or panels on the main circuit board can be cut "dead" and the circuit or circuits transferred to the terminal board. As the buss bars on the latter can be connected to any alternator, the terminal board dupli-

comes to a great extent the circuit board and generator board. During the day the entire output can be handled from the terminal board.

Diagram 5 gives a floor plan of the switchboard and detail of iron framework supporting the slate floor. The location of the switchboard, shown in diagram 3,

over this two layers of mica, the edges of this framework being protected for mechanical purposes with fibre angles. This character of framework for switchboards was first used in the construction of the switchboard of the United Electric Light and Power Company, New York City, and after that company had made extensive

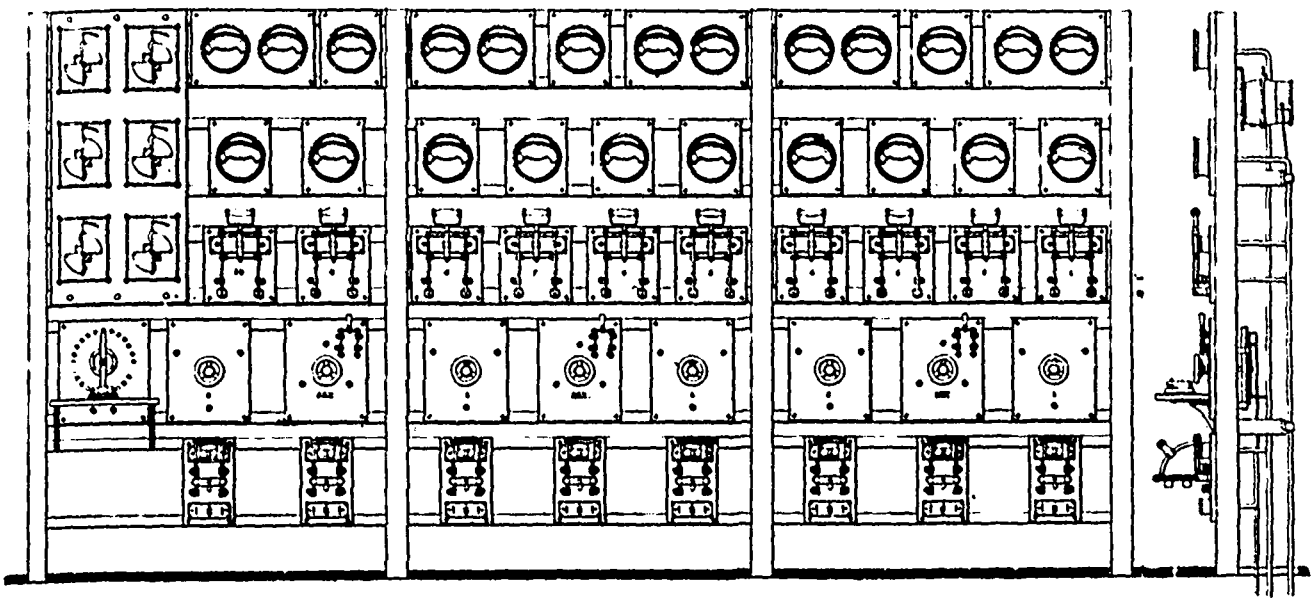


DIAGRAM NO. 4.

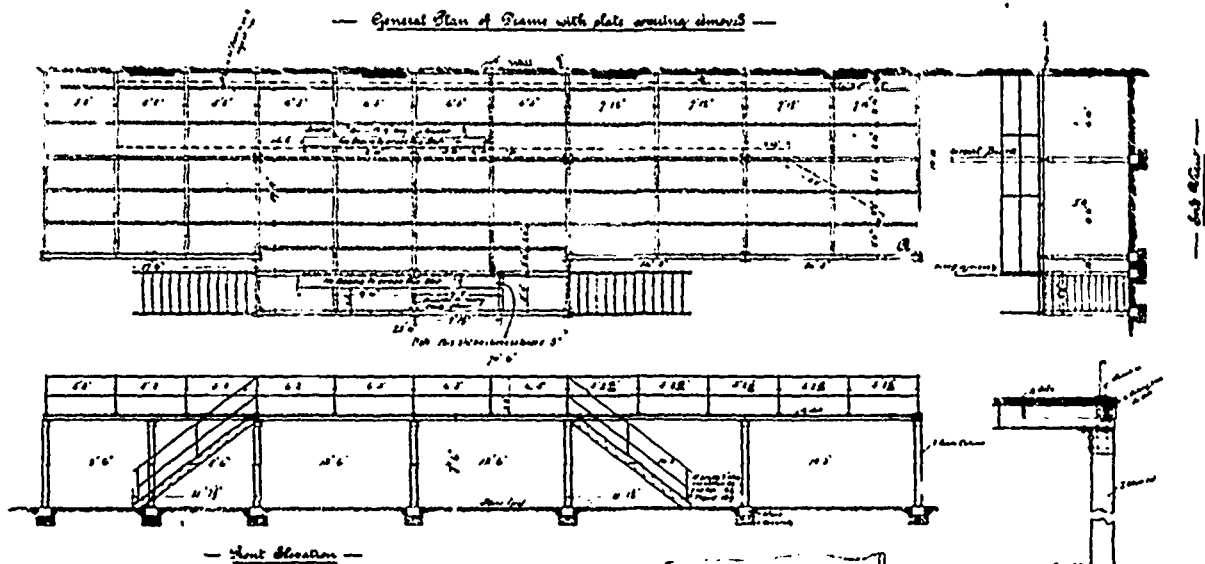


DIAGRAM NO. 5.

PLANS AND DIAGRAMS OF NEW SWITCHBOARD IN ROYAL ELECTRIC COMPANY'S ALTERNATING CURRENT LIGHTING STATION, MONTREAL.

directly in front of the driving belts of the engines, is of course not desirable, but it was the only available space. There have been erected heavy wrought iron bars immediately in front of the belts for protecting the board in the event of a driving belt breaking.

The framework of the switchboard consists of seasoned white oak, over which is a layer of asbestos, and

experiments with iron and frame switchboard construction. It is practically fireproof as well as being a good insulator, and from the severe tests during the past four years which it has withstood, there are reasons to believe that it is a very superior and satisfactory framework for switchboards.

The switches, fuse blocks, etc., are of the standard

S.K.C. type. They are independently mounted on the switchboard, which permits of great interchangeability of all parts of the board.

From the preceding account it will be noted that every part of the alternating system of the Royal Electric Company was rearranged and redesigned. The lines and circuits were rearranged to overcome objectionable inductive effects and to transform them from single to double phase circuits. 1,161 old transformers were replaced by 628 new transformers with a reduction in leakage load of 245 amperes. Eighteen old style single phase generators, with their revolving wire on the armatures, collector brushes and rings, their numerous belts, pulleys and line shaftings, were replaced by five S.K.C. generators of the inductor two phase type, the latter being belted directly to the engines. The old wooden single phase board was replaced by a new fire-proof two phase board designed to distribute current for light and power from the same circuit.

### QUESTIONS AND ANSWERS.

H. K., Walkerville, Ont., writes: "What kind of safety valve would you recommend for a stationary boiler—a lever valve or a spring or pop valve?"

ANSWER.—A lever valve is recommended for simplicity, and also for efficiency. It should be carefully set, and the weight absolutely fixed in position so it cannot move. The valve should also be operated now and again, both by raising steam to blowing point, and also by hand at lower pressures, in order to ensure its not sticking to the seat.

### POINTS ON SHAFTING.

THE author of a paper on "Shafting in Factories," presented before the American Society of Mechanical Engineers, summarizes his conclusions on the subject as follows:

It seems to the writer that in ordinary machinery es-



SPACE UNDERNEATH SWITCH-BOARD, SHOWING WIRES FROM GENERATORS, ROYAL ELECTRIC COMPANY'S ALTERNATING LIGHTING STATION, MONTREAL.

All of this reconstruction has been designed and carried out on plans which adapt the system to be served either from its existing steam plant or from the Chambly water power plant. Upon the delivery of power from Chambly, the five 300 k.w. generators recently installed will be used as synchronous motors, from which will be operated the D.C. arc machines.

The system affected by the above-described changes, operating for five months under the old conditions, from Oct. 1, '94, to March 1, '95, consumed 2,931 tons of coal more than was consumed in the five months from Oct. 1, '96, to March 1, '97, the number of incandescent lights being 10,200 more during the latter than during the former period.

### ALL RIGHT.

Mr. S. H. Reesor, proprietor of the St. Mary's Electric Light Co., writes: "Enclosed please find \$1.00, subscription to the ELECTRICAL NEWS. Your paper is all right."

tablishments an observance of the following rules might effect a saving that would be noticeable in the annual balance.

1. Use pulleys of large diameter on counters and narrow fast-running belts.
2. Use nothing but the best oil and plenty of it, catching all drip, and either purifying it or using it for some other purpose.
3. Have all the shafting and counters oiled regularly and do not depend too much on automatic oiling.
4. Inspect line shafts from time to time, and see that they are in line and can be turned easily.

Many line shaft boxes bind at the sides when screwed down, sometimes increasing the turning moment 100 per cent.

The town of Fort William, Ont., is obtaining estimates for an electric light plant.

The Bushnell Oil Company has purchased the Alpha Refining Works at Sarnia, Ont., and will reconstruct and modernize the plant.

## CANADIAN ELECTRICAL ASSOCIATION.

### SOME PARTICULARS OF THE APPROACHING ANNUAL CONVENTION.

SINCE the announcement in our last issue of the dates selected for the convention of the Canadian Electrical Association at Niagara Falls - viz., the 2nd, 3rd and 4th of June - very satisfactory progress has been made with the arrangements. A meeting of the Committee on Arrangements was held at Niagara on March 27th, at which there was a full attendance. A very satisfactory programme was drafted, and sub-committees appointed to perfect details and complete necessary arrangements.

Pending the completion of arrangements, it is not possible in this number to give the programme in detail. This much may be said, however, that satisfactory

interest and value in those which shall be presented. Several of the papers which have been arranged for and are in course of preparation are in hands which leave no room to doubt that this aim will be reached. The subjects of these papers have been chosen with a view to interest and instruct persons connected with every branch of electrical work. It should be borne in mind, however, that the most instructive part of the proceedings of a convention of this kind should be the discussions upon the papers. There was a marked improvement in this particular noticeable at the last convention, and it is greatly to be desired that members will go to the coming convention prepared to enter actively into the discussion of the points brought out by the authors of the various papers. A comparison of notes and experiences at gatherings of this sort is most helpful.



NIAGARA FALLS—SCENE OF THE CONVENTION OF THE CANADIAN ELECTRICAL ASSOCIATION ON JUNE 2, 3 AND 4, 1897.

terms have been made with the proprietors of the new Hotel Lafayette for the accommodation of members and friends of the Association while in attendance on the convention. This hotel has been recently erected, is most comfortably fitted up with all modern appointments, and is situated directly opposite the Suspension Bridge, presenting an excellent view of the great cataract.

The sessions of the convention will be held in the Assembly Hall of the Dufferin Cafe' in Queen Victoria Park, where the annual Association Banquet will also take place on the evening of the second day.

It is the purpose to compress the business of the convention into the first two days, leaving the third day entirely free for sight-seeing. With this object in view the number of papers will be somewhat reduced, and an effort made to secure the highest possible standard of

It is understood to be the intention to introduce a new feature at the coming convention, in the shape of a "Question Box." Members are invited to forward to the Secretary at any time prior to the date of the convention, but preferably as soon as possible, questions on any electrical subject on which they may desire information, and answers will, if possible, be given at the convention.

Mention is made elsewhere of matters which at present should have a vital interest for the owners of central stations, and upon which we hope to see action taken at this convention. The time has arrived when central station owners in Canada should get together and give united consideration to legislation and other matters affecting their interests. In the Canadian Electrical Association they have an organization able and willing to be of service in this direction. It only remains for

those who should be most interested to connect themselves with the organization, and strengthen its hands for this particular work.

So much for the practical business aspect of the convention. From the standpoint of interesting sight-seeing and pleasure, there is assurance that this convention will be a most attractive one. The natural beauties of Niagara—electric railways on either side of the Niagara gorge—one skirting the river bank, the other far down the side of the precipice near to the boiling current; the wonderful generating plant of the Cataract Construction Co.; the acetylene gas and electro-chemical works; the system in use for the transmission of power to Buffalo; the electric railway connecting the Falls with Buffalo—all these and more will be open for the inspection of the visitors—forming a combination of interesting sights such as cannot be witnessed elsewhere in the world.

A special committee has been appointed to provide for the annual banquet to members and invited guests on the evening of June 3rd, and it can confidently be promised that the affair will be thoroughly first-class and enjoyable. The catering will be in the hands of Mr. Barnett, proprietor of the Dufferin Cafe, and late of the House of Commons restaurant at Ottawa, of whose ability there can be no question.

Persons connected with the electrical interests who have not yet connected themselves with the Canadian Electrical Association should lose no time in doing so. There should be a large turn-out of such persons, as well as of present members, at Niagara on June 2nd, 3rd and 4th.

#### PERSONAL.

Mr. James Yuill, formerly city electrician of Winnipeg, died in that city last month. He was at one time a resident of Montreal.

Mr. J. W. Moyes, manager of the Metropolitan street railway, lately returned from the United States, where he arranged for the new rolling stock required by the company.

Mr. Thomas W. Lester, ex-president of the Hamilton, Grimsby and Beamsville Electric Railway, was recently married to Miss Emma Springer, daughter of the late Dr. Springer.

Mr. W. G. Blackgrove, who for many years had charge of the steam plant at the James Morrison Brass Co.'s works, has accepted a position as traveller for Wm. C. Wilson & Co., steamboat, railroad and mill supplies, Toronto.

Mr. J. A. Rutherford, a native of Hamilton, Ont., and formerly with the Edison Co. in that city, after having been connected for a number of years with the Westinghouse Co. at Pittsburgh, has recently taken a position as salesman in the street railway department of the Johnston Company, at Johnstown, Pa.

Mr. D. C. Dewar, local manager of the Bell Telephone Company at Ottawa, has received promotion to the management of the Montreal office and is succeeded by Mr. J. E. Macpherson, who has been travelling auditor of the company for eastern Ontario and Quebec. Mr. Dewar is well qualified to fill the responsible position to which he has been appointed.

Mr. J. J. Franklin, of Toronto, has been appointed secretary of the Rossland Board of Trade, and will shortly leave for that city. Mr. Franklin was for ten years superintendent of the Toronto Street Railway, and during his management the road was converted into an electric system. After leaving Toronto he went to Paris, where he organized a tramway service for an English syndicate. Latterly his attention has been devoted to securing a franchise for the Chatham City and Suburban Electric Railway Company.

The Electric Power Company, of Fraserville, Que., proposes to extend its telephone lines as far as Quebec.

The City Council of Waterloo have reached an agreement with the Waterloo Electric Light Company for lighting the town by electricity.

## CANADIAN ASSOCIATION OF STATIONARY ENGINEERS.

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

#### MEETING TO DISCUSS LEGISLATION.

The stationary engineers have taken action in the direction of obtaining legislation from the Dominion government. On the 17th of March a committee of the Ontario Association conferred with a committee of Toronto No. 1, C. A. S. E., at Toronto, when it was resolved to ask for an inspection and license law. A sub-committee, consisting of Messrs. A. M. Wickens, of Toronto, A. E. Ames, of Brantford, and James Devlin, of Kingston, was appointed to proceed to Ottawa to explain the objects of the bill to Parliament, and to endeavor to secure its adoption. The draft bill to be presented will contain several important changes from that placed before the Ontario House recently. It is intended to exempt from the working of the law small steam plants, perhaps up to 15 h. p., to grant a permit to the older engineers to retain the positions held at the time the act becomes law, or to operate a similar plant, and to make such provision as will remove the opposition which has in the past been met with from saw mill owners, by allowing them a specified time in which to obtain the services of a licensed engineer. With these points overcome, it is hoped to obtain such a law as will elevate the standard of steam engineering and lessen the number of disastrous explosions which occur each year.

#### HAMILTON NO. 2.

An open meeting of the above association was held on the 19th of March. Mr. Ballard, Inspector of Public Schools, gave an interesting lecture on decimals and fractions. Mr. Edwards, architect, made a few remarks, and past-president W. G. Blackgrove, of the Executive Council, gave a short address. The certificates of membership were handed to the members by the president. Our annual dinner will take place on April 15th.

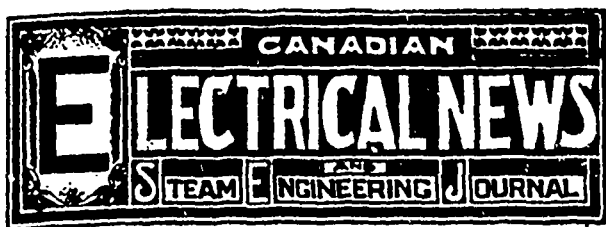
JOHN IRONSIDE, Rec.-Secretary.

#### LONDON NO. 5.

At the regular meeting of London No. 5, held on March 4th, a lively debate took place on "Strength of Steam Boilers," and some very interesting illustrations and calculations were made. The members were presented with certificates of membership.

An interesting feature of the meeting held on the 18th ultimo was a lecture by Mr. H. W. Page, of St. Mary's, on the regulator and the atmospheric governor. Mr. Page, who is a former Londoner, is the inventor of several engineering appliances, and his address was much appreciated. He congratulated the engineers upon the advancement made in late years in engineering science.

"Electric Transmission by Power," by Dr. Louis C. Bell, is a book containing upwards of 500 pages, with 230 illustrations. It describes in a very simple manner the fundamental facts concerning present practice in electrical power transmission, and shows by what processes the work is planned and carried out. The work is divided into thirteen chapters, in which is described and illustrated such apparatus as are typical of the methods used, rather than representative of any particular scheme of manufacture or fashion in design, making it especially valuable to students who desire to obtain knowledge regarding the principles of electrical construction. Price \$2.50. The W. J. Johnston Company, New York.



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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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**The Study of Electricity.**

It may serve a useful purpose to point out to intending students of electricity that a good knowledge of mathematics is a most essential requirement. The student who is not well grounded in mathematics would do well to properly equip himself in this direction before entering on an electrical course. Of the students who take this course in our scientific schools, at least thirty per cent. fail in their examinations through lack of the requisite knowledge of mathematics. It is safe to say that no young man who has not successfully mastered the mathematical problems presented to graduating students of the high schools can hope to succeed in an electrical course.

**Enforced Cleanliness in Cars.**

THE cars of the Toronto Railway Company have for some time past carried placards requesting passengers to refrain from spitting on the floors. No doubt the principal object of the company in seeking to put a stop to this practice was to remove a cause of offense to the sensibilities and injury to the clothing of well-mannered passengers. There is, however, a more important phase of the subject, viz., the danger to health from exhalation of consumptive germs. Realizing the necessity of protecting the public from this danger, the Board of Health of New York have placed placards in the street and elevated cars of that city forbidding spitting on the floor. The Board of Health of Los Angeles, California, two years ago passed an ordinance against expectorating on the streets and in public places, but it is said that the measure has not been enforced. The danger from contact with consumptives is illustrated by the fact that in Southern California, which has been the resort of large numbers of persons afflicted with this

disease, the native population has become seriously affected. It is to be hoped that our Canadian railway companies and boards of Health will give the attention to this matter which its importance requires.

#### Methods of Interior Distribution.

AN increasing number of large buildings are being equipped electrically, provision being made for the easy running of the distribution system by the installation of interior conduits during the progress of construction of the building. As a result several different forms of conduit are being placed on the market, presenting many different features. There is plain gas piping with rounded elbows, insulating piping, iron pipe with an insulating lining. But a great number of prominent electrical engineers have agreed that for all purposes the ordinary iron pipe is as good as can be used, the wire to be drawn into it being heavily insulated. It is interesting also to observe that alternating current wires are both drawn into the same tube, it having been found that the counter E.M.F. of induction (in the iron pipe) set up by using only one wire in the tube was very noticeable.

#### The Power of Electric Waves.

MR. W. H. Preece, chief of the electrical department of the British postal system, is said to have induced the British Government to undertake a test of the possibilities of a method of telegraphing without wires, invented by a young Italian named Guglielmo Marconi. By means of his apparatus, consisting of a transmitter and receiver, each about 15 in. x 10 in. x 8 in. in size, Marconi claims to have sent and received waves over or through a hill three-quarters of a mile in thickness, and over a distance of 100 yards through seven or eight thick walls of the general post office building in London. His belief is that by the method he is using electric waves can be transmitted through the air over a distance of at least 20 miles, and made to pass through all kinds of metals and solid substances. This discovery following close upon that of the Roentgen rays, opens to our view wondrous possibilities, and shows that in some respects electricity is indeed yet in its infancy.

#### Acetylene Gas.

NOTWITHSTANDING all unfavorable criticisms, which in great measure are founded on commercial rather than on scientific considerations, the manufacture of acetylene still continues, and it is only reasonable to admit that it has its field as an illuminant, and that in certain conditions it may compete favorably with electricity. At the same time it is doubtful whether, in the present state of its manufacture or use it can be said to be fully understood, its effects on the conduit for distributing it having yet to bear the test of time; and its physiological effects being rather startling in some cases. Professor Mosso, of Italy, has been recently conducting some researches into the action of the gas when leaking into the atmosphere, and found it strongly poisonous. Experimenting on animals dogs, cats, birds, etc. he found that a small quantity in the air or inoculated in the blood is followed by death, directly attributable to it; a mixture of 20 per cent. acetylene (which is, of course, larger than would ever probably be an actual case) in the air was followed by death in one hour. The effects of a small leak, while not probably

being necessarily fatal, might, at least, be the permanent injury of some of the respiratory organs.

#### Transformers.

THERE can be no question of greater importance to a central station than the class of transformers used and their distribution. Their selection on the basis of price only is a mistake that is of too frequent occurrence, and that results in loss direct and indirect. Their regulation is a matter that is of importance directly to the consumer, and indirectly to the central station, as anything unsatisfactory in the service naturally reacts at once on receipts. The magnetizing currents and core losses are felt directly by the coal pile, and in very appreciable amounts. A very prominently known transformer of 6,000 watt capacity, has a magnetizing current of .06 amp. on a 2,000 volt circuit; anyone can figure for himself what this means in point of coal consumption during a year, and multiplied by the number of transformers gives the total consumption owing solely to this cause. It is also easy to calculate how much more coal would be consumed by a transformer of same capacity having a magnetizing current of .1 amp. or .04 amp. greater than in the above case. A few such calculations will go very far towards proving in a plain arithmetical manner how very extravagant a cheap transformer can be, and per contra that a good one is worth money.

#### Municipal Lighting.

A BILL now before the Ontario Legislature gives municipalities of less than 5,000 inhabitants the power to issue 30 year debentures for the purchase of electric lighting apparatus. The bill received considerable opposition in committee on the ground that the life of an electric plant is at longest twenty years, and that the time at which the debentures should mature should correspond to that at which the investment representing the proceeds of such debentures would be wiped out. The advocates of the measure urged 30 years on the ground that this would correspond with the period allowed for water works debentures, and would enable small municipalities which could not afford to construct and operate water works alone, to reduce the operating cost by combining with the water works electric lighting. The mayors of several interested municipalities appeared before the committee to urge the passing of the measure. The owners and managers of electric lighting companies should be able to see in this legislation the trend of events, the manner in which their interests are likely to be affected, and the necessity for greater watchfulness and united effort in the direction of self protection. The Canadian Electrical Association has done, and is doing, what it can to guard the interests of the electrical companies against hostile legislation. If the electrical companies whose interests it is looking after will give the Association their united and hearty support, a great deal may be done to protect the investments of those engaged in the electrical business. One thing to our mind appears clear, viz., that legislation should at once be enacted compelling municipalities who may desire to do their own lighting to purchase by arbitration the plant of the existing private company. If this is not done, hundreds of thousands of dollars of private capital invested in electrical machinery will be wiped out of existence. An electric lighting company differs from other manufacturing companies in this, that it

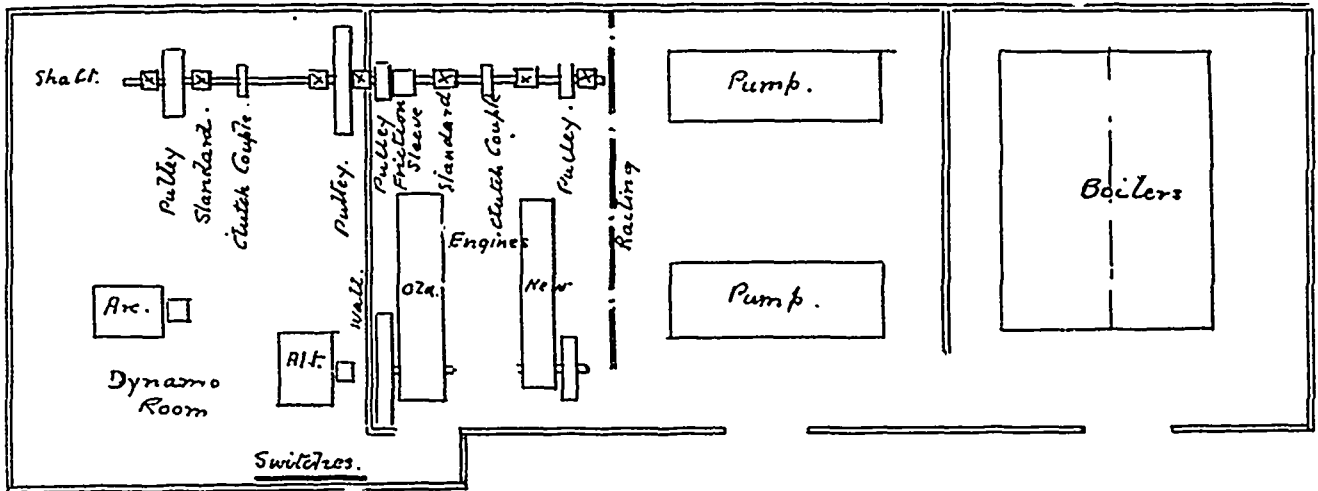
cannot easily change its location. Each town has its own lighting company, whose plant has been purchased with a view to the special requirements of a particular locality there would be difficulty in finding another opening were the company forced to change their location, and if an opening were found, much of the apparatus would become valueless, in as much as it could not be adapted to the new conditions, and a large amount of new material would have to be purchased. For this difficulty of making a change of location is due the fact that prices for electric lighting have been forced down far below a fair basis. The municipalities have known the disadvantage at which they held the companies, and have not been slow to take advantage of it. It is time, as already stated, that those who have invested their means in the electrical business should awake to united effort for their self protection.

**THE MUNICIPAL ELECTRIC LIGHTING PLANT AT GODERICH, ONT.**

(CONTINUED.)

NOTWITHSTANDING the many strong arguments urged by political economists against the morality and advisability of municipal control of electric lighting and waterworks services, the great public, who is the final court of appeal in such matters, has

for the purchase of the necessary machines. The corporation engaged the services of Mr. G. White-Fraser, consulting electrical engineer, Toronto, to take entire charge of the work, and all plans, specifications, etc., for steam and electrical apparatus were drawn by him, and the work done under his personal supervision. They took the very sensible view that if they engaged an engineer at all they had better take his advice and be guided by him in technical matters, and the result is that every day proves the wisdom of such a course. The waterworks building is on the lake side, the town itself being on the high level of the surrounding country about 250 to 300 feet above this, the power house about 3,000 feet from the Square, and the town spreading out half to three-quarters of a mile on every side. An engine of nominal 60 h.p. used to run the two arc machines, being belted to a light shafting placed on brackets near the ceiling of the pump room, which in its turn was belted to the arcs. It was decided to purchase a 30 ampere, 2,000 volt (nominal 1,000 light) alternator, and to replace the commercial arcs by incandescent; thus the steam power required must be enough to run the alternator and the 35-light 2,000 c.p. arc together. An offer was received from the engine builders to take out the old engine and to put back on the same foundation one new one powerful enough to do the combined service, but it was decided that to do so would result in great inefficiency in operating, as there would be times when the arcs were not in and when the alternator had only about a quarter load, and then the 150 h.p. engine would be running only 25 h.p., or 17% load. Therefore the old engine, which required only some slight repairs to put it in excellent condition, was speeded up to about 100 r.p.m., which brought up its capacity to about 85 h.p.



MUNICIPAL ELECTRIC LIGHTING PLANT AT GODERICH, ONT.

decided in its favor in several instances recently; and so far the results seem to have justified the decision. The town of Goderich in western Ontario is perhaps the most prominent example, for the reason that it possesses a population of nearly 5,000, is a county town, a railway terminus, and is growing rapidly in importance as a manufacturing center. Goderich was one of the earliest towns established by the Canada Company, and is most attractively laid out, the streets radiating from a central space, the center of which is occupied by the County Buildings, and being broad and level. A number of the old well-known Ontario families originated here, their residences being built solidly in the "Colonial" style, and standing in beautiful grounds laid out in parterres and orchards. The business part of the town is mostly around the central space or "Square," as also are the large hotels, the opera house, two banks, and various offices, lodge rooms, etc. There are numerous large and handsome churches; the Roman Catholic and English churches, both beautifully lighted, and others to follow. The private residences, as might be expected in a town of such importance, are of a most superior character, and as the corporation has exercised the most careful and minute supervision over every detail of installation, inspecting wiring work, equalizing pressures and watching the interests of its customers, the light is every day growing in popularity and the business greatly increasing. A waterworks system was put in some years ago, to which was shortly added a street and commercial arc system, the former of 2,000 and the latter of 1,200 candle power arcs. Within the last four years numerous applications were made to the Council for franchises for the incandescent lighting of the town, but it was eventually decided to take a vote on the subject, and the rate-payers in August last year authorized the expenditure of \$6,500

at quarter cut-off 80 lb. steam. A smaller engine of 35 rated h.p. at quarter cut-off 80 lb. was purchased and placed in the position indicated in the diagram, which had previously been occupied by the two arc machines. The foundations for the new engine and new shafting were excavated and built without interfering with the regular arc service, as the machines were lifted off the floor on beams, and so operated off the old shafting until the building extension and the new shafting had been completed, when they were moved out to allow of the new engine being placed. Ultimately, the whole arrangement was as shown in diagram, room being left for the addition of more steam and electric machinery when conditions required it. The shafting is of peculiar interest, as the arrangement of clutches permits the throwing in or out of either engine or dynamo, so that no more engine capacity is running at any time than the actual load requires. Finally, the two engines were so piped that they can either exhaust free or be run condensing with the pump's condenser. (Diagram 1.)

The entire wiring system has been so designed as to secure three very important advantages: Very low drop; perfect equality of pressure everywhere; and extreme simplicity. The total drop allowed between generator and lamps is less than 5%, a considerable proportion of this being on the feeders between generator and main distributing center on the Square. The primary system is two-wire, a single-phase alternator having been installed; while the entire secondary system is 3-wire with banked transformers, wires being interconnected at corners so as to form a network. An interesting feature is that the connections are made at the back of the houses on the Square, the poles being placed in back-yards, and the wires, etc., not disfiguring the street. The wiring system was designed with a view to the ulti-



mate requirements of the town, and not merely to meet the present demand; hence there is a unity and coherence of plan not possible where small additions are made from time to time without reference to the whole. It was thought a more economical and efficient arrangement to spend money in copper and so greatly reduce the drop, than to save a little in wire and spend more in coal; therefore both primaries and secondaries are large in proportion to the distance and amperage. A feature of special importance to a power plant where fuel is expensive is the house-wiring and kind of lamp used, and this was wisely paid special attention to. A separate specification was drawn up by the engineer covering all installation details, such as class of material, maximum allowable drop between lamps; make, wattage and voltage of lamps, etc.; and separate tenders were called for on these specifications, the successful tenderer having to place a 5% cheque as guarantee, and being required to furnish a wiring plan of each installation for the approval of the engineer before being allowed to proceed. The public was then notified through the papers that no installation that had not been passed by the engineer would be accepted, nor current turned on. The result was that irresponsible wiring contractors were excluded; that all houses were wired on a coherent plan, and everything under the eye of the engineer—carrying out his general designs, the public also being protected against incompetent wiremen.

Many radical departures from hitherto accepted practice were made in the purchase of entire plant. In the first place, separate specifications were drawn up for (a) steam engine and shafting completely installed as per plans; (b) generator and instruments completely installed ready for test; and (d) house-wiring of not less than 500 lights, including lamps, sockets, labor, material, etc., at so much per light. The engine was specified as a certain h.p. at a given steam and a given cut-off, and a maximum speed regulation was laid down; it was also a condition that a test would be made of a certain duration, during which cards would be taken to prove h.p., regulation and valve adjustments, etc. The generator specification was perhaps that one which differed most from accepted practice, in that, without mentioning lamp capacity, it specified a certain amperage, certain voltage, certain voltage increase for full load, certain maximum allowable temperature, increase, etc., and it was specified that the test should consist of a run of 12 consecutive hours, during eight of which the amperes and volts must be so much, and during the other four they must be so much more, and in excess of the lamp requirements. The transformers were also specified in watts (not lamp capacity), and data was called for as to voltage drop, magnetizing currents, full, half and quarter-load efficiencies.

A considerable number of tenders were received, and as the conditions were the same for all failure to meet guarantees entailing absolute rejection of plant and loss of deposit, etc.—it was felt that selection should be largely based on price. This was the principal basis of comparison, taking of course into careful consideration little differences of efficiencies, heating limits, etc., and assigning to them their money value. After reducing all to precisely the same basis of kilowattage, efficiency, heating, regulation, etc., taking also into account probable freedom from repairs, ease of effecting repairs, etc., the generator contract was awarded to the National Electric Co., of Eau-Claire, Wisconsin; the transformers to the Packard Electric Co., of St. Catharines; the wiring contract to the Rogers Electric Co., of London, and the engine and shafting to the Goldie & McCulloch Co., of Galt.

On October 21st and 22nd the entire plant was tested in accordance with the terms of the specifications. The engine was run for some time with and without load, and numerous cards taken; each friction or other clutch was examined and tested. As there were only some 200 lights wired up, not giving a full load for the machine, a water rheostat was constructed, and for 12 consecutive hours it was run on this load, temperature being previously taken. The test was conducted by Mr. Fraser, representatives of the National Electric Co. and of the Goldie & McCulloch Co. being present, and members of the waterworks and light committees. After shutting down, the temperature of armature, field coils and cores, commutator, etc., were taken, and the power dissipated through the water load checked against the temperature of feed water and the amount evaporated.

This is probably the first complete plant in Ontario that has been specified, purchased, installed and tested on the above system, and the results seem to justify it. The lights all over town are of equal brightness, drops being small and the transformer capacity greatly economized. Although the plant was started only in October, 1896, there are now 1,250 lamps wired

up, and orders coming in steadily. The rate schedule is of itself sufficiently interesting to mark out this plant as standing almost alone in cheapness. There are no meters as yet. The rates are as follows:—

For commercial lamps in stores	45 cents per month per lamp
For residences, up to 5 lamps	30 " " "
" " 6 and 7 lamps	29 " " "
" " 8 and 9 lamps	28 " " "
" " 10 and 11 lamps	27 " " "
" " 12, 13 and 14 lamps	26 " " "
" " 15 lamps	25 " " "

For over 15 lamps, 20 cents each, with a minimum of \$3.75 per month. Hotels—Bedrooms and dining room at residence rates; bar office, halls, etc., at commercial rates. Churches and halls—\$1.50 per lamp per year, with 10% discount for prompt payments. And these rates are expected to cover all expenses, including interest on debentures, sinking fund, depreciation, etc. The plant was installed during the mayoralty of Dr. Shannon, with Mr. P. Holt as chairman of the Waterworks and Light Committee, and Mr. W. H. Smith as engineer of the waterworks, who is responsible for operating and upkeep.

### SPARKS.

The corporation of Liverpool, Eng., has purchased the assets of the United Tramways & Omnibus Co.

The town council of Port Hope, Ont., have invited tenders for lighting the streets by gas or electric light.

The St. Catharines Electric Light Co. will increase their capacity by installing an additional water wheel.

Messrs. Cooke & Son, of St. Catharines, will at once install an incandescent plant, and water wheels with which to operate the same.

The village council of Weston have extended the date for the completion of the Toronto and Suburban Street railway until the 30th of June.

Mayor Marks, of Port Arthur, Ont., has been granted permission by the Ontario government to purchase an electric light plant for lighting the streets of the town.

The Fort Erie Electric Railway Company have asked for and obtained permission from the Ontario legislature to run from Fort Erie to Chippawa, and from Crystal Beach to Ridgeway, and to operate their cars on Sunday.

Mr. C. R. Hosmer, manager of the C. P. R. telegraph systems, expresses his belief that the Pacific cable enterprise will be brought to a successful issue, and that if the cable is not laid from Vancouver it will be laid from some other point.

The Toronto Electric Light Company are rapidly extending their incandescent lighting business—a large demand coming from the principal hotels. The company are said to be at present installing incandescent lamps for new customers at the rate of 300 lamps per week.

At the convention of the National Electric Light Association of the United States which is to meet at Niagara Falls, N. Y., on the 8th of June, Prof. Carus Wilson, of the Electrical Department of McGill University, Montreal, will present a paper on "The Induction Factor, a New Basis of Dynamo Calculation and Classification."

The application of Edward Jemson and others to the Ontario Legislature for the right to develop the water power of the Kakabeka Falls, with the object of supplying electric light and power to Fort William and Port Arthur, is meeting with opposition from a Philadelphia company owning property on the river immediately below the falls.

A proposition has been made to generate power required for lighting the new municipal buildings in Toronto at the waterworks pumping station. The architect advised that an electric plant be erected at the buildings, but it is claimed that by putting in a large dynamo and utilizing the boiler power at the pumping station, a large saving to the city in operating expenses would be effected.

The Hull, St. Louis Dam and Victoria Springs Railway Company are seeking a broad gauge charter from the Ontario government. The promoters are Ottawa capitalists, who propose constructing an electric railway around the city. The first section will be built from Cumming's Bridge to the Victoria Springs, a distance of six miles. Following this there will be a belt line around the city to St. Louis Dam and other suburbs. The capital stock of the company is placed at \$1,000,000. T. G. Brigham is acting solicitor.

## SPARKS.

The council of Richmond, Que., has asked tenders for electric street lighting.

The Roberval Electric Light Company has been organized at Roberval, Que.

The town of Huntsville, Ont., has taken over the electric light plant from W. S. Shaw.

The electric railway at Sherbrooke, Que., is expected to be in operation by August next.

The Ottawa Electric Railway Company intend erecting a pavilion at the west end park, to cost \$10,000.

The Windsor Electric Light and Power Company, of Windsor, N. S., will shortly erect a large brick chimney.

The Nova Scotia Telephone Company will replace the present line between Amherst and Truro with a metallic line.

The Royal Electric Co., of Montreal, have put a new switch-board in the electric light station at Sherbrooke, Que.

The Preston and Berlin Street Railway Company are asking for an extension of time for the commencement and completion of the road.

The electric light company at Barrie, Ont., have asked the town to purchase their plant at a valuation, or to give a ten years' franchise.

Mr. Ormond Higman, chief electrician of the Inland Revenue Department, Ottawa, recently gave an interesting exhibition of the Roentgen rays at Government House.

Edward Lachapelle has taken an action against the Ottawa Electric Co., claiming \$5,000 damages for injuries alleged to have been sustained by falling from an electric light pole.

Foss & Davis, proprietors of the Eastern Townships Electric and Machine Works, Sherbrooke, Que., have dissolved partnership. The business will be continued by Geo. F. Foss.

The Nanaimo-Alberni Railway Company, composed of Andrew Haslam, R. E. McKechnie, and others, of Nanaimo, propose to construct railways and operate telegraph and telephone lines.

W. H. Brandon and C. K. Hammond, of Brandon, B. C., and R. B. Kerr, of New Denver, are asking authority from the British Columbia government to supply electric light and power.

Recently some subscribers of the Bell Telephone Company at Brockville were connected with the Queen's Theatre, Montreal, and were treated to the performance over the long-distance wire.

The Cataract Power Company, of Hamilton, have surveyors at work taking levels in the vicinity of DeCew Falls, and it is stated that the work of developing the power will be commenced shortly.

The directors of the Hamilton, Grimsby and Beamsville Railway contemplate erecting new stations at Grimsby Park and Beamsville, and will purchase a large new car specially adapted for the summer traffic.

A comparative statement of the Montreal Street Railway earnings for the first five months of the fiscal year has been issued. The total earnings for February were \$8,995.68, an increase of \$2,557.39 over February, 1896.

The town council of Portage la Prairie, Man., lately engaged Mr. J. F. Fanning, of Minneapolis, to report on a slough flooding and water power project. The total cost of the work is placed at \$100,000, including \$15,000 for a power house.

A threatened strike of the employees of the Birmingham, Eng., street railway is reported. This road was recently secured by a syndicate of Canadians, at the head of which is Mr. William McKenzie, of the Toronto Railway Company.

The Toronto Street Railway Company has submitted to the City Engineer its annual statement of rolling stock, etc. There are 211 motors, 180 large trailers, 42 small trailers, 9 sweepers, 12 snow plows, and 40 busses in the car equipment.

The Revelstoke Waterworks, Electric Light and Power Company, of Revelstoke, B. C., is seeking incorporation, to develop light and power. The applicants are John Abraham, Thomas Downs, Wm. M. Brown and Mr. Cowan; capital \$50,000.

The Quebec Electric Railway Company have purchased the rights and privileges of the St. John Street Railway Company and will assume charge on the 1st of May. The company has awarded the contract for trolley cross-arms to J. H. Gignac, for the sum of \$3,500.

Andrew Holland, Thomas Askwith, J. A. Trudeau, and others, of Ottawa, are seeking incorporation as the Dominion Electric

Heating and Supply Company, with a capital stock of \$100,000. The objects are to manufacture electric heaters and other electrical appliances.

Letters of incorporation have been granted to W. Sutton, W. P. Sutton, G. Philip, W. K. Anderson and F. B. Denton, of Toronto, as the William Sutton Compound Company of Toronto, with a capital stock of \$10,000, the object being to manufacture general engineers' supplies.

The Halifax Electric Tramway Company have acquired the entire street railway and electric lighting business of the city of Halifax, N. S. A modern power house has been erected, and the result of the first six months' operation shows gross earnings of \$87,882.25. The assets of the company are valued at \$1,360,000.

The first meeting of the shareholders of the Hamilton, Chedoke and Ancaster Electric Railway was held March 15th. A resolution was passed to obtain the necessary powers from the legislature to extend the road to Brantford and to increase the capital stock. The cost of the extension, it was calculated, would be about \$200,000.

Mr. B. S. Jenkins, superintendent of Canadian Pacific Telegraph, with headquarters at Winnipeg, states that important improvements are contemplated during the coming summer. New wires will be strung from Winnipeg eastward to Fort William; from Winnipeg westward on the main line, and south-west on the Pembina branch.

Incorporation has been granted to the Mineral and Timber Electric Railway Company, to construct an electric railway from Sudbury to Chelmsford, Nipissing, a distance of 20 miles, the work to be commenced within one year and completed within three. Among the promoters are Thos. M. Kirkwood and Killain McKinnon, of Sudbury.

Under the provisions of the General Electric Railway Act of 1895, the running of street cars on Sunday is prohibited, but the courts have held that companies incorporated before that time do not come under the provisions of the Act. The South Essex Electric Railway Company, which proposes to construct an electric railway from Windsor to Sandwich, thence to Amherstburg, Kingsville and Leamington, therefore requested permission from the Ontario government to operate their system on Sunday. The application was, however, refused by the Railway Committee.

The city of Chatham, Ont., is said to have reached an agreement with Mr. L. E. Myers, of Chicago, representing a syndicate of capitalists, for the construction of the Chatham City and Suburban Electric Railway. Mr. Myers agrees to construct a line of railway beginning at Third and King streets, and traversing King, William and Queen streets, to the city limits, thence to Cedar Springs and the lakes, also to install an electric light plant for furnishing electric light for public and private purposes. The lights are to be in operation by 1st September next, and the railway by first January, 1898.

A telephone cable has been laid across the inlet between Moodyville and Vancouver by the New Westminster and Burrard Inlet Telephone Company, under the supervision of Mr. H. W. Kent. The cable crosses the inlet from Hastings to a point directly opposite, and is about a mile in length. For the purpose a scow was fitted up with a reel for paying out the cable. By an ingenious arrangement attached to the cable reel it was possible to communicate by telephone from the cable scow to the shore while the cable was being laid, and thus a thorough test was made of the cable. The time occupied in laying the cable was less than three-quarters of an hour.

The city engineer of Toronto was instructed to report on the merits of the Wilhelm and Strowger automatic telephones, offers having been received to install these systems in Toronto. In this connection he visited several cities in the United States. The Strowger, he says, is a good deal of a novelty, and he watched its operation at Albion, a town where some sixty-four telephones are in use. It is, he says, excellent for a small number of subscribers, but he is not prepared to say whether it would serve the needs of a great city with some 5,000 to 6,000 telephones. There is no operator for the Strowger, but a key-board, with the numbers one to nine and an indicator. To get 234, or any similar combination of numbers, one must set the indicator opposite these numbers. Critics of the system state that it would take some 60,000,000 connecting wires to give a circuit of as many telephones as Toronto would require, and this, it was asserted, would be vastly more costly than operators.

**A SHIFTED ECCENTRIC.**

By CAPT. JAMES WRIGHT, Montreal.

SOME time ago an automatic engine in this city that had formerly worked to the satisfaction of all concerned, began to fail, and got worse and worse. The owner rented power to six tenants, each one taking his quota from the main shaft, and the pulleys for the purpose required were sized to agree with an engine speed of 75 revolutions per minute.

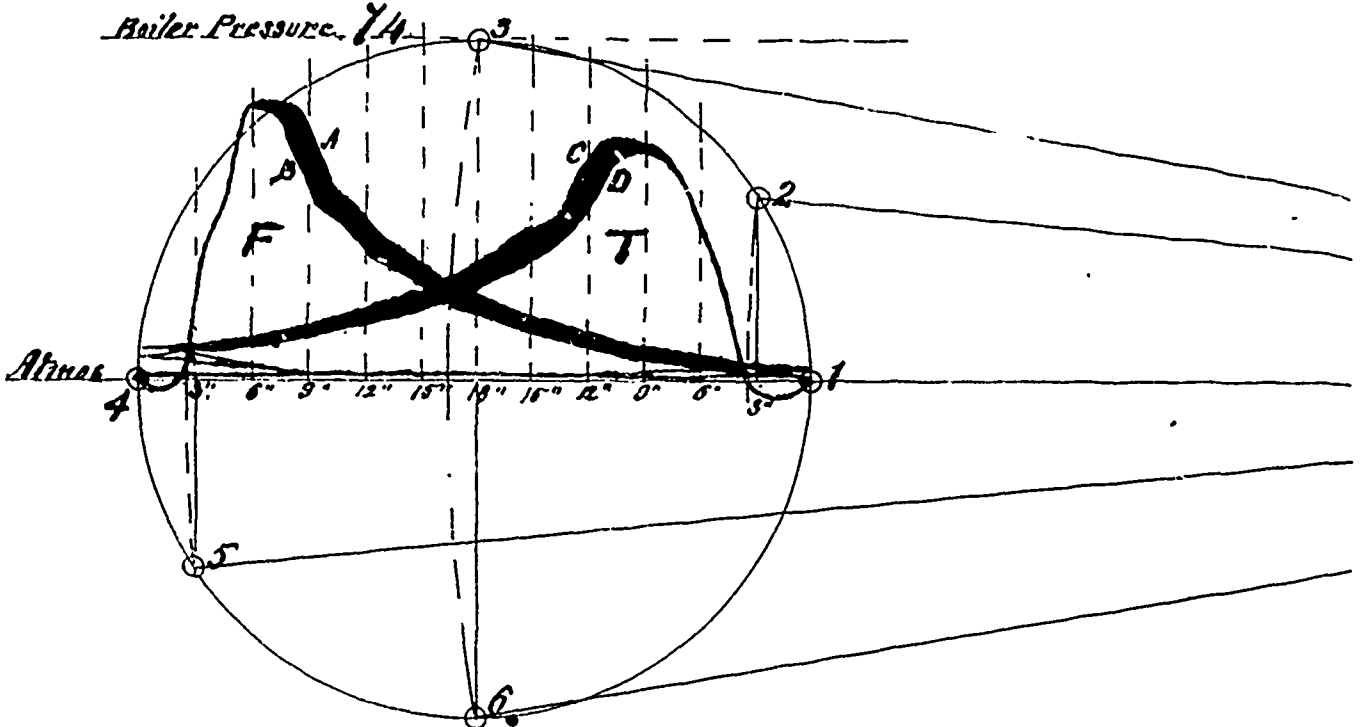
It had got so that the engine could not keep up speed if more

shading. This space in the originals was covered with expansion curves impossible to separate.

The characteristics of a good diagram from an automatic engine are:

- 1st. That the admission line from the beginning of the stroke to cut-off should closely approach the boiler pressure.
- 2nd. That cut-off should be as sudden as possible.
- 3rd. That at any point in the expansion curve the same weight of steam is practically accounted for.

**FIG. 1. First Diagram - 9+30 A.M. Jan. 3<sup>rd</sup> 1896. Scale 40**



than half the work was put on. For a couple of days complaints from the tenants were in order. The owner was willing to do anything required. A man from a shop tinkered the governor; another recommended reboring of the cylinders; an "expert" looked wise and gave a heap of good advice. After all, no improvement had been effected, and tenants said it was going from bad to worse. Some acquaintance of the owner suggested that the indicator should be used. When this had been decided the cylinder was piped in such a manner that indicators at each end of the cylinder could be simultaneously operated. When only one indicator is used on an engine that is subject to great and sudden changes in load, the obtained data may, in many respects, be misleading.

Fig. 1 was the first diagram taken. A glance proves that the eccentric has slipped backward on the shaft.

In taking the accompanying diagrams a patent reducer simultaneously operated the paper barrels of both indicators. It follows, that if the length of the diagrams is divided into any number of equal parts by ordinates or lines drawn perpendicular to the atmospheric line, each division accurately represents, on the reduced scale of the diagram, a uniform amount of travel of the piston while a stroke was being made; and also the effective pressure of the steam on the piston during each division can be read with the scale of the spring in use.

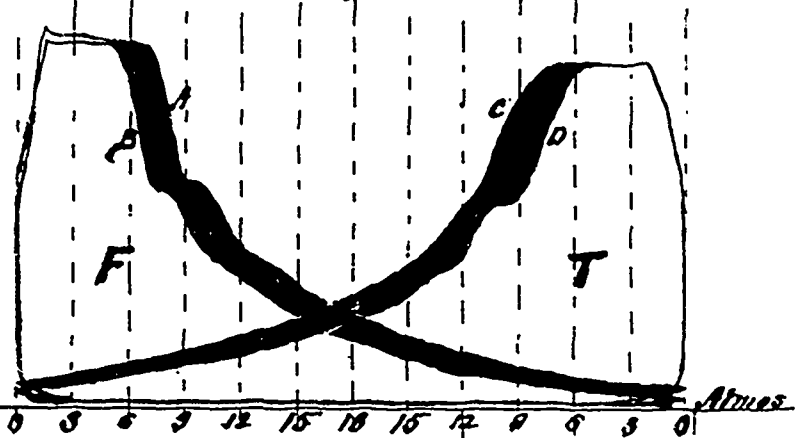
In practice it is convenient to make the number of divisions a multiple of the inches in the stroke—that is a number which divides it without a remainder. In this case there are twelve divisions, and each one equals three inches of the stroke. In all of the figures F is the stroke from the crank and T towards.

In Figs. 1, 2 and 3 the pencil was kept on the paper during 50 revolutions. The variations in work done are shown in dark

4th. Sufficient exhaust lead to permit the cylinder to discharge its contents before, or immediately after the beginning of the return stroke, and followed with a back pressure not exceeding one or two pounds.

5th. Compression or cushioning; this is a debated quantity, but in any case should, at least, be sufficient to prove that the exhaust port had been closed previous to the end of the stroke.

**Eccentric moved ahead, 9+53 A.M. Scale 40. FIG. 2.**



In diagram T on Fig. 1 the steam stroke begins at the right hand end of the atmospheric line. I read on the diagram that during the first 3½ inches of the stroke the pressure was below the atmospheric. From this point it slowly rises up to 34 pounds at the sixth inch, 51 pounds at the ninth, and 52 pounds at the tenth inch of the stroke, which is the highest attained, and is 22 pounds below the boiler pressure. Complete cut-off takes place at the twelfth inch, when expansion sets in and is continued to the end of the stroke with the exhaust port still closed. At the ninth inch of the return or exhaust stroke the back pressure settles down to 1½ pounds. This is carried to the end of the stroke, where there is

no appearance of cushioning. In this manner the other diagrams can be read. The mean indicated work of both strokes is 37 h.p.

Both of these diagrams show that the steam port was slightly open at the fourth inch of the stroke. The engine was stopped and moved into this position. A convenient point of greatest travel in the valve gear was selected, and its distance from a suitable stationary point was accurately measured. The engine was then moved back to the dead centre, or the beginning of the stroke, and the eccentric was turned ahead on the shaft until the valve gear was brought into the same position that it formerly occupied, at the fourth inch of the stroke. The engine was started. Tenants were asked to put on work as they pleased, and the diagrams on Fig. 2 were taken. Here the admission pressure is close to the boiler pressure, and the terminal pressure is about the same as on Fig. 1. Although the work is now 60 h.p., or 23 h. p. greater than in Fig. 1 (the engineer will perceive that the weight of steam accounted for by the indicator is practically the same in both), still the opening of the steam port is slightly late; so is the opening and closing of the exhaust port.

The engine was stopped again, and the eccentric was moved ahead 3/16ths of an inch on the shaft. The tenants were asked to put on all the work they could, and crowd it. The diagrams on Fig. 3 were then taken. During this time the engine worked at an average of 84 h. p. The action of the valve gear is now good, except that steam is carried farther on one stroke than on the other. This was a simple matter to correct, and without stopping the engine. A few minutes before 12 M., and with a falling pressure of steam in the boiler, Fig. 4, a single revolution diagram was taken. This was considered final.

It will be observed in Fig. 3 that in the diagram lettered E E, tripping did not take place. The result is surprising. Compared with the diagram lettered C, which has the greatest charge of steam, the engine could take and trip, the diagram E E accounts for the consumption of 82% more steam and only 18% more work.

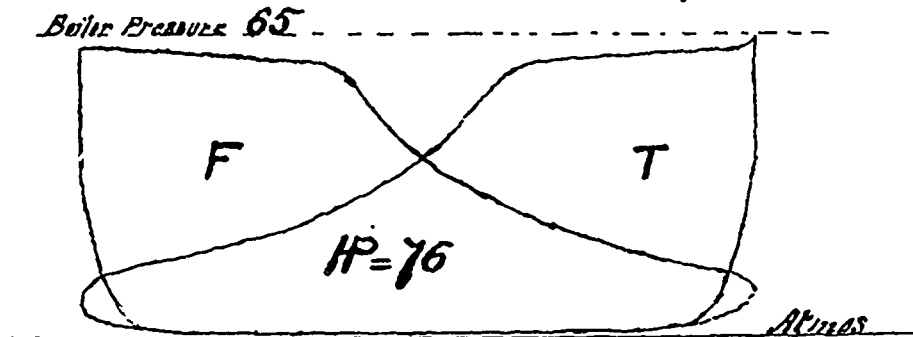
The circle and lines on Fig. 1 in conjunction with the stroke scale, is a simple method of representing on a diagram or a sheet of paper, the relative position of a crank pin and piston at any point of the stroke.

THE STEAM ENGINE INDICATOR.\*

By JOHN McEWEN.

The steam engine indicator is an instrument for drawing a diagram, on paper, which will accurately represent the various

FIG. 4. Tripping Rods adjusted — 11+50 A.M. July 3<sup>rd</sup> 1896. Scale 40.



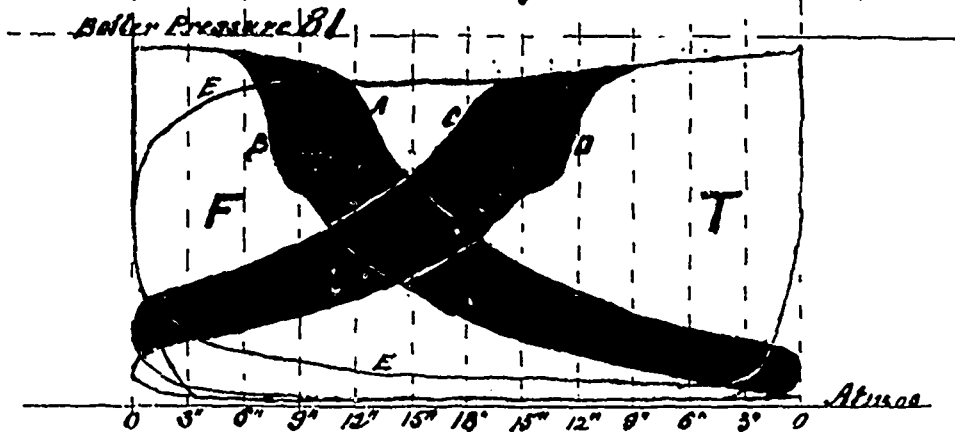
changes of pressure on the piston of the steam engine during both the forward and return stroke. The indicator was invented by James Watt and was extensively used by him in perfecting his engines. It was a somewhat crude affair as compared with the instruments of the present day, being in design very much like a walking beam engine, the cylinder and piston being at one end of the walking beam and the pencil, with paper drum, at the other.

Of the earlier forms of the indicator it may simply be said that they were unfit for use on an engine running at any but the slowest speeds; even then, owing to their many imperfections,

their indications were often misleading, and of little use beyond showing the points in the stroke at which the valves opened and closed—a service of great value, but affording only a small part of the information to be gained from a really good instrument.

The Richards Indicator contained many improvements on the instruments previously used. It was well adapted to engines running at the speeds commonly employed at that time; it was invented and was for years the standard indicator in both Europe and America. The weights of the many parts of this instrument are, however, so great that their inertia and momentum seriously affect the accuracy of the diagrams, and render it unfit for use under the conditions of high pressure and high speeds met with in ordinary practice at the present time.

FIG. 3. — 10+22 A.M. July 3<sup>rd</sup> 1896. Scale 40.



Some of the leading items of information to be obtained by the use of the indicator are: The arrangement of the valves for admission, cut-off, release, and compression of steam; the adequacy of the ports and passages for admission and exhaust, and when applied to the steam chest, the adequacy of the steam pipes; the suitability of the valve motion in point of rapidity at the right time; the quantity of power developed in the cylinder, and the quantity lost in various ways, by wire drawing, by back pressure, by premature release, by maladjustment of valves, leakage, etc. It is useful to designers of steam engines in showing the distribution of horizontal pressure at the crank pin through the momentum and inertia of the reciprocating parts, and the rotative effects around the path of the crank. Taken in combination with measurements of feed water, and the condensation and measurement of the exhaust steam with the amount of fuel used, the indicator furnishes many other items of information relative to the economical generation and use of steam.

The degree of excellence to which steam engines of the present time have attained is due more to the use of the indicator than to any other one thing, as a careful study of the indicator diagrams, taken under different conditions of load, pressure, etc., is the only means of becoming familiar with the action of steam in an engine, and of gaining a definite knowledge of the various changes of pressure that take place in the cylinder.

An indicator diagram is the result of two movements, viz: a horizontal movement of the paper—and consequently represents by its length the stroke of the engine on a reduced scale—and by its height at any point, the pressure on the piston at a corresponding point on the stroke.

The steam engine indicator has become an appendage to the steam engine that has been entirely too little understood by the majority of men who follow the profession of steam engineering. Indeed it is not many years since the use of the indicator was considered to belong to a special profession or class of persons, styling themselves "experts," many of whom were not only entirely devoid of any cultivation with reference to the application of the indicator, but were decidedly deficient in their actual knowledge of steam, while some others were well qualified to give honest judgments as to what they found, what they saw, and to indicate, correct, adjust and advise without any sort of reference to their pocket interests. Many of these so-called

\* Paper read before Kingston Association, No. 10, C.A.S.E.

"experts" persuaded themselves that the working engineer was only a man to shove coal, or put on grease, oil or slush, as the case might be, and that the "expert" should be called in whenever anything existed that was not up to the mark. But the time for setting the valves of an engine by the eye, or by scratches, or centre punch marks, has, in the opinion of intelligent and competent engineers, passed away, and the engineer of the future will probably be a man who will be capable of a careful manipulation of the indicators, and of producing the highest economic results from following the lines drawn therefrom, without regard to the whims of builder, owner or others, being himself qualified to read the lines, and make them by the proper manipulation of the instrument.

#### WHEN AND HOW TO ATTACH THE INDICATOR.

There is always a clearance in every engine. This is the space between the piston at the extreme end of the stroke and the cylinder covers. There is quite a difference in the amount of clearance allowed by builders, but now all first-class builders have reduced the space to a minimum—as little as 5 to 8%—as this space has to be filled with steam twice during each stroke in a fast-running engine, it soon foats up to quite a sum of money in fuel; in fact, I know of one engine, the cylinders of which were 24" diam. and intended for 24" stroke, but it was found that the cranks, if they were 11" would not clear in the foundation plate, so they were made 10¾", making the stroke 21½"; the pistons and covers were left as originally intended. As a consequence the owners became bankrupt. The vessel was sold to another company, who put in new boilers, ran her on a good paying route for a few years, then had the good fortune to convert the engines into a compound, when the fuel was reduced from 110 tons per week to 49 tons; of course the compound got the credit.

But this is a digression. The proper place to put the connections for indicator is in the clearance space, so that the pistons will not at any time even partially cover the hole. If there is not ¼" clearance the hole should be drilled towards the cover and a groove cut in the cover to suit. To indicate an engine properly, so as to be able to give a correct report, it is necessary to know what is the total amount of clearance, including the ports. As this space has to be filled with a volume of steam twice during every revolution, if clearance is too great there will be great difference in the reading of the diagram. After the diagram has been traced by the instrument, it is necessary, when trying to get at the economic result, to erect the volume of clearance on the card. Some engines will take a beautiful card, but when the volume of clearance is added it looks very different. This often occurs in the marine walking beam engines with the Stevens cut-off.

In putting on the indicators it is best to have two instruments—one at each end of the cylinder—and have them both taken at once. The usual connections of a side pipe with a T or three-way valve in the middle, and taking both ends on the same card, may do very well for a short-stroke, slow-moving engine, but under any other conditions may be the source of error to a large extent, so it is much better practice to take the diagrams as already mentioned with two indicators simultaneously.

The next thing is a good reducing motion; one of the best is the Brumbo pulley; another good device is the Pantograph, which, if properly made and used, is scientifically correct. With the Brumbo pulley the line may be used at an angle, but with all other devices the line must run at true right angles. These conditions being complied with, you may put on your indicator and connect the cord so that the drum of the instrument works in the centre of motion; then warm up the indicators by turning on the steam, and after the water is all blown out, press the pencil lightly to the card, taking care to let the pencil go but once around the figure, then turn off steam and press the pencil again to the card and mark the atmospheric line, and your diagram is complete as far as the indicator can make it. The knowledge of the operator has now to be brought into use.

The British Columbia Light and Power Company has been organized and seeks authority from the provincial government to supply electric light and power to the towns of Trail and Rossland. Among the promoters are Messrs. W. S. Norman, of Rossland, and Wm. Archer, of New York. The syndicate have already spent \$100,000 in putting in turbine wheels, flumes, etc., in connection with placer mining on the Pend Oreille river, near Waneta, B. C., and have 3,000 horse power at their command. They wish to increase their capital to \$1,000,000, and to transmit 1,500 horse power over a distance of 17 miles to Rossland and Trail.

#### TRADE NOTES.

The contract for additional motors for the St. John Railway Company has been placed with Ahearn & Soper, of Ottawa. The equipments will be of the Westinghouse 12-A type.

The Packard Electric Co., Ltd., of St. Catharines, Ont., have notified their customers that their factory will be closed down during the first two weeks of April on account of unwatering of the Welland canal.

Pulp mills in New York, Massachusetts, Maine and New Hampshire are receiving large quantities of their raw material from Canada in the form of spruce logs. The middlemen who buy the wood from Canadian farmers and lumbermen and deliver them to the pulp mills on the other side of the line make a handsome profit. What is the matter with Canadians working their own pulp wood in their own country? The Robb Engineering Company, of Amherst, N. S., are now making a full line of pulp machinery.

The Northey Manufacturing Co., Toronto, the well known makers of steam pumps, have in course of construction a new building, to be used as a foundry. It is the intention of the company to in future make their own castings, and for this purpose the new building is being equipped with the latest type of cupola, tramways and cranes for the easy handling of iron and heavy castings, etc. A Robb-Armstrong engine has been purchased for the special purpose of operating the fans, which will supply the air blast to the cupola. The company have also about completed patterns for a 10 h. p. oil engine, and it is their intention to manufacture these engines in all required sizes.

A correspondent writes from Toronto Junction to the Toronto World as follows: The Dodge Pulley Company's works at Toronto Junction are running fifteen hours per day, with a full complement of men. The company tell us that never in the history of their eleven years' business in the Dominion have they been so crowded with work. The manufacture of their celebrated wood split pulley is constantly increasing. Recent large shipments have been made to Madras, India, and to agencies in Central America. While the order alone for over 1000 pulleys is at present being prepared for shipment for the English market. In addition to the manufacture of wood split pulleys, the Dodge Company are also general machinists and millwrights, and have now in work complete power transmission plants for several electric stations, including shafting, floor stands, friction clutch pulleys, bearings, heavy iron centre driving pulleys, etc. The Dodge Company are also doing a lot of special work for some of our largest mining plants. In the company's machine shop at present are sixteen friction clutches in work for contracts on hand.

It is stated that Mr. H. J. Beemer, who was instrumental in securing a charter for the Quebec electric street railway, will construct an electric railway between St. Joseph de Levis and Chaudiere, Que.

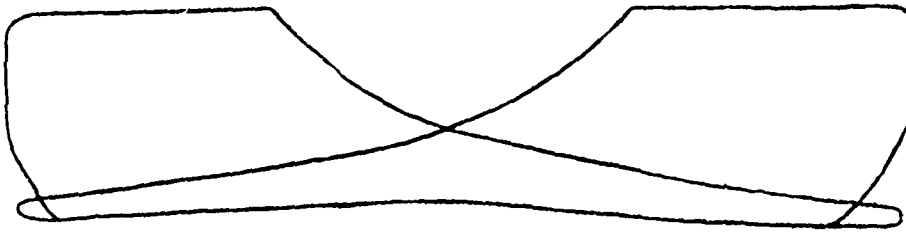
A bitter legal suit is likely to be the result of the competition for lighting patronage between the Ottawa Electric Co. and the Hull Electric Co. The Hull Electric Company has served the Ottawa Electric Company with notice of a claim for twenty thousand dollars damages for infringement upon the territory and rights of the Hull company in the city of Hull. In default of payment an action will be entered in the Superior court to recover the amount. The Hull Electric Co. claim that, according to a special act of the Quebec legislature, the exclusive privilege for supplying light for a period of 35 years from May, 1894, was granted to Mr. Viau. The Ottawa company, in addition to the payment of \$20,000, are requested to remove their poles, electric apparatus and appliances from the streets.

Representatives of the Canadian General Electric Company, Toronto and Peterboro, appeared before the Tariff Commissioners at Ottawa last month. They pointed out that they paid higher duties on their imported raw material, which constituted 75 per cent. of the finished machine, than the duty which is charged upon their finished article when imported, and consequently they had no protection. If there was a reduction of duty on the imported article, they desired a corresponding reduction on their raw material. The chief articles imported were steel castings, copper, charcoal, sheet iron, fine linen, certain varnishes, press board, parchment papers, silver tubing special tinned steel wire, German silver wire, music wire, all of which were not made in Canada.

**PUMPING ENGINE TESTS AT PETROLEA, ONT.**

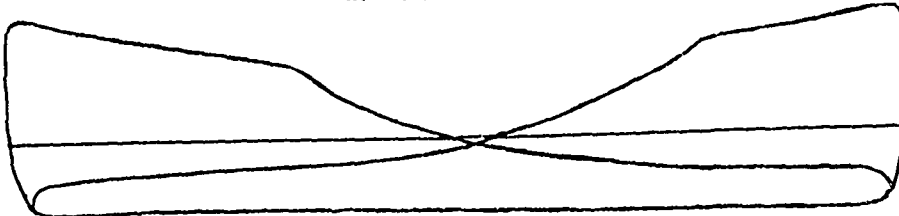
In connection with the new waterworks system recently constructed for the town of Petrolea, Ont., under the direction of Mr. Willis Chipman, C. E., of Toronto, there have been installed two pumping engines—one a high duty—the other a medium duty

CARDS FROM HIGH PRESSURE CYLINDER OF HIGH DUTY ENGINE.  
Scale 1/80.



Diameter of Cylinder, 13 inches. Stroke, 32 inches. Piston Rod, 2 3/4 inches. Pressure by Steam Gauge or Boiler, 125 lbs. Vacuum by Gauge, 25.3. Revolutions, 50 per minute. M. E. P., 51.5. I. H. P., 59.4.

LOW PRESSURE CARD.



Cards from Low Pressure Cylinder.

Cylinder, 26 inches by 32 inches. Piston Rod 2.5. Boiler Pressure, 124 lbs. Vacuum, 25 inches. Revolutions, 50 per minute. M. E. P., 14.2. I. H. P., 60.59. Temperature of Feed, 115. Scale of Card 1/32. Receiver Pressure, 32 lbs.

duplex. The contract for these engines was given to the Hughes Steam Pump Company, of Cleveland, who sub-let to the London (Ont.) Machine and Tool Works a contract for the construction of the high duty engine, in order that the whole contract might be completed within the specified time. The general specifications for these engines were drawn by Mr. Chipman, and gave the size of cylinders, plungers, valves and connecting pipes, and the general arrangement of the plant. Each engine was to have a capacity of 1,000,000 imperial gallons in 24 hours, against a head of 485 feet, and the specifications were so drawn that for each million ft. lbs. that the duty fell short of 100,000,000, the sum of one hundred dollars was to be deducted from the contract price. The duty was to be calculated from the amount of coal used, no deduction being made for ashes, and from feed water at 180°.

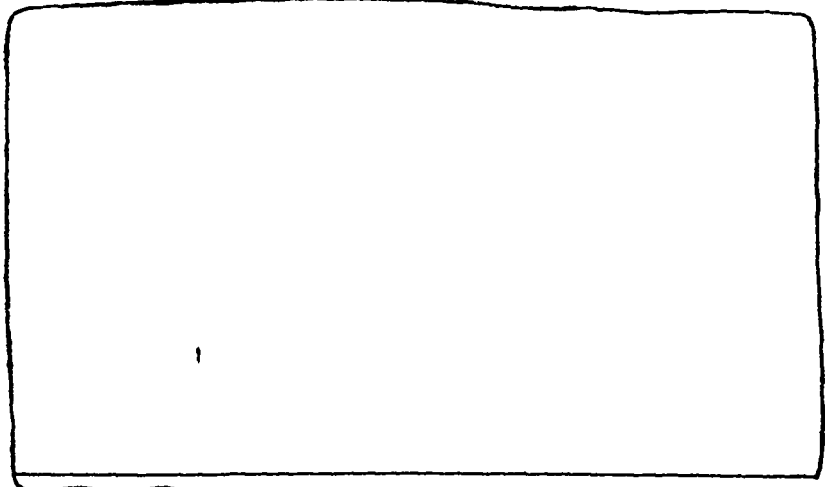
A ten hours test of the high duty engine was made on the 4th and 5th of February by Messrs. Willis Chipman, C. E., and J. H. Killey, of Hamilton, on behalf of the municipality and the manufacturers respectively.

There was considerable difference of opinion on the part of Mr. Chipman and Mr. Killey as to the result, the former placing the duty obtained at 95,000,000, and the latter at 103,798,200. It was agreed therefore, that a second test should be made, which was conducted by Mr. Chipman alone, in the presence of Mr. Yates, of the London Machine and Tool Works and Mr. Hughes,

of the Cleveland Company. The test, as in the former instance, occupied ten hours. The engine was run at 52 1/4 rev. per m.; water pressure, 200 lbs. to the sq. in.; steam pressure, 125 lbs. to the sq. inch; intermediate cylinders, 16 lbs. to sq. in.; vacuum 24; vertical distance from gauges to water in well, 14 feet; feed water used, 360 cubic feet at 110°; coal consumed, 2430 lbs.; ashes, 120 lbs.; temperature flue gases, 220°. As mentioned above the duty was calculated from the amount of coal used, with no deduction for ashes, and from feed water at 180°. The result was a duty of 98,500,000. This duty is stated by the gentlemen who conducted these tests to be considerably higher than that shown by any other pumping engines of similar size in Canada, and the engine and pumps are said to have worked well under nearly double the head of water of any waterworks engine in the Dominion, while the boilers are said to have steamed freely without forcing. The boilers are of the horizontal tubular type, set in brick work, externally fired. The gases of combustion pass under the shells and

return through the tubes and through two up-takes through a horizontal pipe flue to the brick chimney outside of the building. The accompanying indicator cards, taken at the first test, show how perfect was the

CARD FROM PUMP CYLINDERS.



Diameter of Pump Plungers, 6 1/2. Stroke, 32 inches. Piston Rod, 2 inches. Revolutions, 50 per minute. Lift by Suction, 12 feet. Indicator connected with pump band by a short 1/2 inch pipe having an angle; full way valve as well as indicator was wide open on test. Scale of card, 1/80. Area of Plunger, with one half the rod off, 31.61. The total lift not shown on steam gauge, including friction of suction pipe, pump, and valves, 20.5 feet.

action of the engine. The guaranteed capacity of the duplex engine was 50,000,000, and the result of the test gave a duty of 53,000,000.

Mr. Ross has introduced a bill in the Ontario legislature providing that a high school board may, by resolution, establish a technical school, and any high school already established may be changed into a technical school.

## ELECTRIC RAILWAY DEPARTMENT.

### DECISION RELATING TO SUNDAY CARS.

IN the Court of Appeal at Toronto judgment was recently given in the case of the Attorney-General of Ontario vs. Hamilton Street Railway Company, dismissing the plaintiff's appeal against the decision of Judge Rose declaring the street railway company within its rights in running street cars on Sunday. The text of the judgment delivered by Chief Justice Burton is as follows:

This is an appeal from a judgment of Mr. Justice Rose holding that the defendant company, which own and operate a street railway in the city of Hamilton, do not come within the meaning of the words, "or other persons whatsoever," as found in the first section of what is generally known as the Lord's Day Act, originally passed in 1845, and entitled "An act to prevent the profanation of the Lord's day, commonly called Sunday," and now to be found in the revised statutes, cap. 202.

Unfortunately the decisions in England under the statute of 29, Charles the Second, for a similar purpose, afford us but little assistance in the construction of our own statute. Had the language of our statute followed precisely sec. 5 of the statute of Charles, this question would have been free from doubt, and the decision in Sandiman vs. Breach decided in England in 1827, and the reasoning of that judgment, which is in conformity with a long course of decisions, would show that the maxim of ejusdem generis would clearly apply.

Our legislature did not, however, adopt that section, but after adding "merchant" to the enumerated persons who are forbidden to do or exercise any worldly labor, business or work of their respective ordinary callings upon the Lord's day, makes this exception, (conveying travellers or Her Majesty's mail by land or water, selling drugs and medicines, and such other works of necessity only excepted.)

Now this exception was clearly unnecessary as regards the persons specifically enumerated. No one would expect the carrying of travellers or conveying Her Majesty's mail to fall within the ordinary work or calling of a merchant, tradesman, artificer, mechanic, workman or laborer, and counsel for the appellant therefore contended that a wider construction should be given to the words "other persons whatsoever" than they should receive if they were found in connection with the specific persons named without other qualifications. There is much force in the contention, and I was at first inclined to think that in order to make the whole section consistent and intelligible the words should receive a wider construction and apply to all persons, including corporations, having an ordinary calling. I am satisfied, however, upon further consideration, that we cannot concur in such a conclusion without in effect overruling a line of decisions which have prevailed in the courts for over a century.

It must be borne in mind that the legislature must be presumed to have been aware of this line of decisions when they passed the 5th Vict., and if they then intended to embrace every description of persons and every species of business, in the ordinary calling of such persons, it would not have been necessary still to retain the specific enumeration of several classes of persons exercising particular descriptions of labor or business similar to those enumerated in the statute of Charles. It would have been sufficient to say in general terms that no person whatsoever should do any work or business in his ordinary calling on the Lord's day. But this is made more clear when we find that the legislature did decide to add to the enumerated classes merchants. Here again the object could have been attained by striking out the enumerated classes and extending the section to all persons, but when we find them adding "merchant" by that description to the other enumerated classes, followed by the words in question, it leads, I think, to the irresistible conclusion that a merchant would not be included in the words "or any other persons whatsoever," but that those words must, according to the general rule, that preceding particular words, control subsequent general words, be construed to mean persons ejusdem generis with those already mentioned, all of whom exercised an ordinary calling, and that if a carrier, and perhaps a fortiori a corporation, carrying on a business of a carrier of passengers, were intended to be included in the prohibition, they would have been specially mentioned in the same way as a merchant has been mentioned.

It is not within our province to determine the wisdom or expediency of the law, and although it may in the opinion of many persons be considered desirable that other secular concerns besides those expressly mentioned in the statute should be comprehended in it, we must be careful not to extend the words of the statute beyond their natural import; to do so would be to legislate and not to interpret the law as we find it.

It may be that the legislature may consider it desirable that all persons doing an ordinary calling shall not do any labor, business or work at that ordinary calling on Sunday; if so, it is easy for them so to declare. But this a penal enactment, and any infraction of it subjects the party infringing it to a penalty. We ought not therefore to hold any party within the first section unless it is clear to our minds beyond any reasonable doubt that he is intended to be included. But the Act contains internal evidence that was not intended to include corporations, for in the 14th section, dealing with penalties, it is provided that the party offending may, by default of payment of the fine imposed, be

committed to the common jail for any term not exceeding three months, and the form of conviction in the schedule to the Act is to the same effect.

I think it impossible therefore to hold that the learned judge was wrong when he held that the defendants were not within the words "other persons whatsoever."

This renders it unnecessary to decide the meaning of the word "travellers," as found in this Act. I think it worse than useless to refer to the interpretation of the word as found in the decisions in England under the Ale House Acts. Those acts were passed "alio intente," and can afford us no assistance in arriving at the meaning to be attributed to the word under our statute.

I think finding the word in connection with the carrying the royal mail and described as inter alia, a work of necessity, there ought to be no difficulty in ascertaining what was intended. I agree with so much of the judgment pronounced so many years ago by Sir John Robinson, delivering the decision of the Court of Queen's Bench, as defines the work travellers as used in the Act, and I think it sound law to-day as it was then.

Opinions may differ as to these statutes, some being of opinion that the statute of Charles is wholly unsuited to the present age, whilst others are of opinion that our act is "a useful and salutary enactment." But we cannot overlook the fact that in the time of Charles travelling upon Sunday was illegal, so that there could be no recovery from any injury sustained in the course of the journey. And although our act is not so stringent in its provisions, still its promoters had in view the prevention of what they deemed as profanation of the Lord's day, and excepted only such conveying of travellers as came within the meaning of a work of necessity.

How any one could hold that excursionists either to the Island or anywhere else came within the definition of "travellers" within the meaning of the framers of our own act (to use the very expressive but not perhaps very judicial language of Lord Bramwell) "beats me."

It was said in the case in which that was so held that Regina vs. Tinning was decided before the subsequent cases which are referred to in that judgment.

The application of cases decided under the English Ale House Acts to an act of this nature is most misleading, but none of them in the slightest degree conflict with the judgment of Sir John Robinson in Regina vs. Tinning, and obviously have no bearing in construing the exception of what is regarded as a work of necessity in the present Act, passed for the purpose of preventing what in the opinion of its framers was regarded as a desecration of the Sabbath. I am of opinion, therefore, that the appeal should be dismissed and the judgment below approved.

The court was unanimous.

Mr. Justice Osler concurred in the judgment of the Acting Chief Justice, but said that he did not desire to give any opinion as to the meaning of the words "conveying travellers." Mr. Justice MacLennan also concurred, but based his judgment entirely upon the ground that the Lord's Day Act was not intended to include and could not be made applicable to any corporation.

### SPARKS.

A company will, it is said, undertake the construction of an electric railway between St. Johns, Longueuil and St. Lambert, Que.

The Hamilton Radial Railway Company propose to extend its Beach line to the easterly limits of Burlington, and establish there a park and pleasure grounds.

The Hamilton, Chedoke and Ancaster Electric Railway Company will shortly let the contract for the construction of their road from the corner of Herkimer and Hess streets to Chedoke.

The Kingston Street Railway Co. will make several improvements to their line, including its extension to the depot. New motors will be secured for the cars running to Portsmouth, to provide a faster service.

The Railway Committee of the Ontario legislature have passed the bill to incorporate the Ingersoll Radial Railway Company, which proposes to construct electric roads to St. Marys, Tilsonburg, Brownsville, etc.

The Railway Committee of the Ontario parliament have passed the act incorporating the Lanark County Electric Railway Company, to construct a railway from Perth to Lanark, with branches. The promoters are: Alex. H. Edwards, Carleton Place; John B. Riley, Plattsburg, N. Y.; Thomas Henry, Montreal; James Fowler, Arnprior; George A. Fowler and J. A. Houston, Ottawa.

McKain vs. Ottawa Electric Railway Co. is a suit brought by the former, a property owner on Cedar street, claiming that as the result of the change in the grade of the street made by the Ottawa Electric Company, his property has been depreciated in value to the extent of \$1,500. The company claim, on the other hand, that any damage sustained in that way is counterbalanced by the proximity of a line of street railway, and also, having authority from the corporation of Hintonburgh to use the street, they were not directly responsible. A decision has not yet been given.

**THE METROPOLITAN STREET RAILWAY COMPANY.**

At the present session of the Ontario legislature the Metropolitan Street Railway Company sought several amendments to its charter. Permission was asked to extend its line to Lake Simcoe; to acquire the assets and franchise of the Toronto Suburban Street Railway Company; to operate its cars over the tracks of the Toronto Railway Company to the Union Station, and to supply electric power in Toronto and elsewhere. In the Railway Committee of the House the application to extend the road to Lake Simcoe and to purchase the Toronto Suburban Street Railway Company's franchise was granted. The scheme is to run a line parallel to the present road, touching Lake Simcoe at Jackson's Point, and passing through Weston, Woodbridge, Kleinburg and Schomberg, to Alliston and other points. Permission was refused to use the tracks of the Toronto Railway Company for conveying passengers to the Union Station, and the clause asking authority to distribute light and power was opposed on behalf of the Toronto Electric Light Company. It was conceded by the Metropolitan Company that the right to sell light and power in Toronto would not be asked, and in return the privileges for the counties of York and Simcoe were granted.

**MOONLIGHT SCHEDULE FOR MARCH.**

Day of Month.	Light.		Extinguish.		No. of Hours.
	H.M.	H.M.	H.M.	H.M.	
1.....	P. M. 6.50		A. M. 5.30		10.40
2.....	" 6.50		" 5.00		10.10
3.....	" 7.10		" 4.50		9.40
4.....	" 8.00		" 4.50		8.50
5.....	" 9.00		" 4.50		7.50
6.....	" 10.10		" 4.50		6.40
7.....	" 11.20		" 4.50		5.30
8.....	.....		" 4.50		4.40
9.....	A.M. 12.10		.....		.....
10.....	" 12.50		A. M. 4.40		3.50
11.....	" 1.20		" 4.40		3.20
12.....	" 1.50		" 4.40		2.50
13.....	" 2.20		" 4.40		2.20
14.....	No light.		No light.		.....
15.....	No light.		No light.		.....
16.....	No light.		No light.		.....
17.....	No light.		No light.		.....
18.....	P. M. 7.10		P. M. 9.40		2.30
19.....	" 7.10		" 10.40		3.30
20.....	" 7.10		" 12.00		4.50
21.....	" 7.10		" 1.00		5.50
22.....	" 7.10		" 1.40		6.30
23.....	" 7.10		" 2.10		7.00
24.....	" 7.10		" 2.40		7.30
25.....	" 7.10		" 3.10		8.00
26.....	" 7.20		" 3.30		8.10
27.....	" 7.20		" 3.50		8.30
28.....	" 7.20		" 4.10		8.50
29.....	" 7.20		" 4.10		8.50
30.....	" 7.20		" 4.10		8.50
31.....	.....		.....		.....
Total,					165.10

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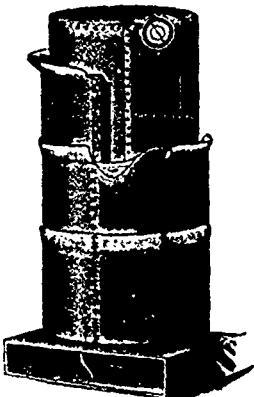
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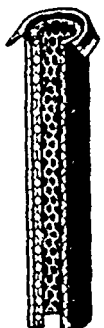
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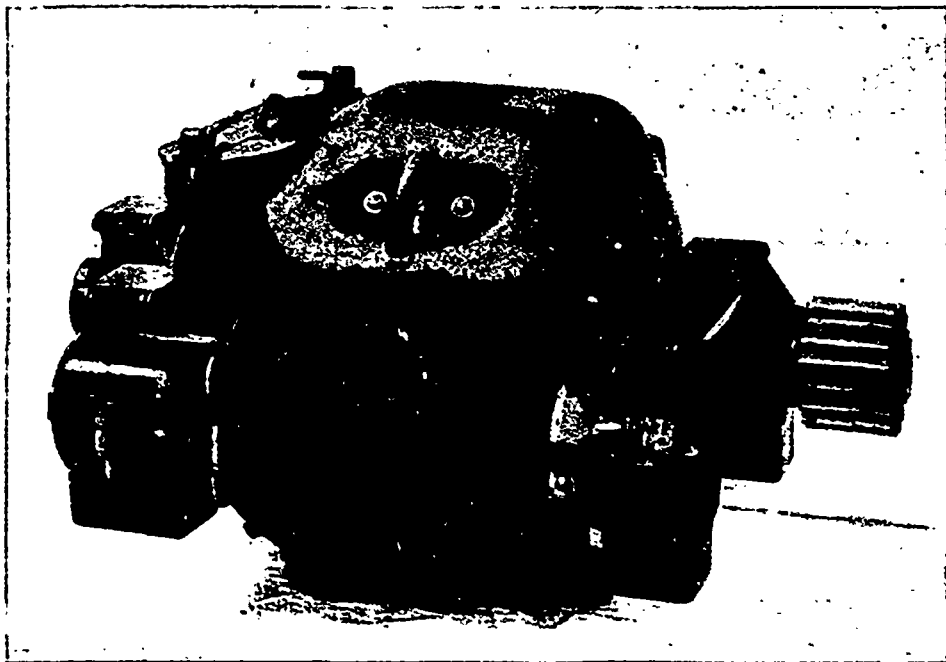
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Sherbrooke, Que., Feb 9<sup>th</sup> 1897  
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Gentlemen

We have tried the 180 K.W. Generator, with what we consider a good fair load. or perhaps a little more than fair, we had 50 Amps on one side for Sherbrooke. and 30 Amps on the other side for Lemmerville. We had the voltage 10 volts higher on the Lemmerville line. I must say it does more and better than I could imagine. The bearings of the machine were as cool this morning as when we had run one hour, and the lights did not seem to vary in the slightest, you see we had every confidence in your work and machine, and put the extremes on, you should have seen how pleased the men were when they saw how steady the voltage kept on the two different lines, when we get the new exciter on. it will be better I thank you Mr. Brown for coming for coming out. and giving us so much good advice. which will be carried out.

Yours respectfully

A. Sangster  
Supt

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A Volt was going along the wire one day,  
And met a little Ohm,  
"You will meet with more resistance, sir,  
You had better stay at home."

But the Volt went on with lightning speed,  
Not showing any feat,  
Until it overtook upon the wire  
A lively, hot Ampere.

"There's going to be some trouble, sir,  
A ground is on the line.  
And circuit-breakers are ahead,  
You had better drop behind."

A flash of fire flew from the Volt,  
That made the air look blue;  
This made the ampere hotter still,  
As through the wire it flew.

It jumped across a little gap,  
And to the pole on top,  
Then to the earth it glided down;  
But there it did not stop.

Back to the power-house it went,  
This alternating scamp,  
And gave the switch-board man a shock  
That made his muscles cramp.

The brushes snapped and flashed and cracked,  
The Ampere meter cursed,  
The rheostat began to smoke,  
The pilot lamp then burst.

The penstock inlet gate was closed,  
And all the turbines stopped.  
The dynamos then ceased to turn,  
The circuit switches dropped.

The ground was taken from the line,  
The "juice" turned on the bars,  
The rampant Volt that caused the hitch,  
Once more is running cars.

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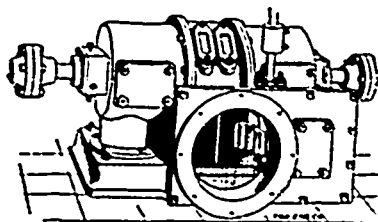


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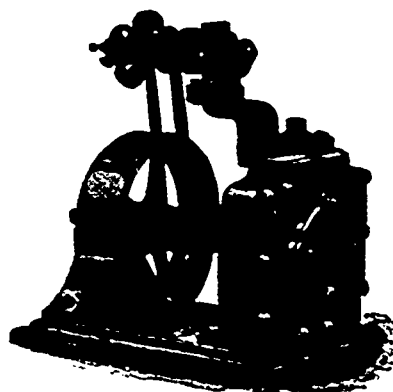
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