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# The Canadian Engineer

Vol. I.—No. 7.

TORONTO AND MONTREAL, NOVEMBER, 1893.

PRICE, 10 CENTS.  
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## The Canadian Engineer.

ISSUED MONTHLY

BY THE CANADIAN ENGINEER COMPANY

IN THE INTERESTS OF THE

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### OUR CIRCULATION.

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This is to certify that we have printed and mailed  
TWO THOUSAND copies of THE CANADIAN EN-  
GINEER for the month of September.

MONETARY TIMES PRINTING CO.  
OF CANADA (LIMITED).

Per A. W. LAW, Sec.-Treas.

Toronto, November 1, 1893.

### THE CIVIL ENGINEERS.

The action of the Canadian Society of Civil Engineers in appointing a committee to consider and report on the professional status, is well taken. The present age is one in which great demands are made on a man's intellectual resources; there is, perhaps, no calling in which this demand exists more extensively than in the profession of Civil Engineering. The prefix "civil" has a considerable amount of ambiguity attached to it, as it is becoming difficult to define the lines between mechanical, electrical, hydraulic, railway, sanitary, and other branches; it seems to us the best course would be to drop the term "civil," and employ the more comprehensive one of ENGINEERING, to designate the profession.

In every branch of the profession the highest qualifications of intellect are necessary to become a successful practitioner; the public has recognized this by making most liberal public and private grants of money for buildings and apparatus to further engineering education. The engineer is now received as a man of special technical training, whose opinion has to be sought before extensive outlays of capital are embarked in large enterprises; his standing is the guarantee of honesty of the estimates, and relying on this the capitalist lends himself to the project. All this bodes well for the present and also for the future of the profession, still it will be requisite for the profession to advance a step further. It requires to consolidate itself, and to obtain power for its members to practise throughout the whole

Dominion, through some stable and established medium which will give them a solid standing. Some coign of vantage is required from which a professional rank will be attained, making the title of engineer, with the special prefixes of railway, hydraulic, electric or sanitary, the guarantee of education and fitness. It will be well for the profession at the initial stage to consider this matter carefully, and to participate in this movement for improved recognition of the professional status; this can be readily accomplished, as the majority of the profession are already connected with the Canadian Society of Civil Engineers, and they should join heartily in forwarding that movement.

### THE SCHOOL OF MINES.

The School of Mines recently established at Kingston by the Ontario Government was formally opened on the 30th October. The whole staff has been appointed, and so far as the reputations of the gentlemen selected have preceded them, nothing is left to be desired. The majority of the men are, as is but right, Canadians, and we point with not a little pride to the fact that it was possible to make so many Canadian appointments, when we have been without means hitherto of special instruction in this particular department of science. We may expect the mining industries of the country to at once feel the invigorating influence of a school devoted wholly to the scientific study of metallurgy, assaying, and their kindred arts.

Those of us who are fond of the cry "economy," may criticise the establishment of the school at Kingston when it could have been maintained more cheaply in Toronto, in connection with the Provincial University and the School of Practical Science. To consider one item alone, why should the Ontario Government pay two professors of mineralogy and maintain lecture-ships and laboratories when the one already in Toronto could do the work?

But we must not complain, now that the development of the mineral wealth of the country is about to receive that encouragement which has been so long denied it.

The staff of the School of Mines is as follows:

Wm. L. Goodwin, B.Sc. (Lond.), D.Sc. (Edin.), F. R.S.C., Professor of Chemistry.

Wm. Nicol, M.A., Professor of Mineralogy, Metallurgy and Assaying.

Willet C. Miller, B.A., Lecturer on Geology and Petrography.

Wm. Hamilton Merritt, M.E., F.G.S., Lecturer on the Economic Geology of Ontario and the Discovery and Winning of Minerals.

R. Carr Harris, C.E., Professor of Engineering.

William Mason, Lecturer on Freehand, Mechanical and Office Drawing, Typography and Surveying.

T. L. Walker, M.A., and Dr. Isaac Wood, M.A., Laboratory Demonstrators.

WE trust our readers, when wishing to place orders for machinery or goods, will scan the advertising pages of THE CANADIAN ENGINEER, not forgetting, by the way, to mention the paper when writing. If any reader in search of machinery or goods should not find what he needs advertised in our pages, and will state his wants to the publishers, he will have our advice and assistance in procuring such, or rather in putting him in communication with the dealers or manufacturers.

MR. ALAN MACDOUGALL, of Toronto, read a paper on domestic sanitation at the first meeting of the Canadian Society of Civil Engineers, in which he recommended that all drains should be laid in rear of a building. This practice has been adopted in Britain for nearly half a century, and is advocated by Baldwin Latham and Sir Robert Rawlinson. During the discussion which followed, Mr. Fleming said that the question of filing drain plans was the first step towards sanitary reform, and the sanitary department should enforce it.

THE Russian Government is preparing for a large amount of work on the Trans-Siberian railway next year. It may be remembered that before starting this great enterprise Russia sent out several engineers to Canada to get points from the engineers of the Canadian Pacific Railway. They are now hard at work on this road, which will give Russia access to the Pacific Ocean as our own trans-continental has given to Canada but it will be 1904 before Russia will reach the ocean. The road is to be 4,700 miles long from Chelabinsk, and will cost \$200,000,000.

WE see from a circular issued by the Department of Trade and Commerce with reference to the British Merchandise Marks Act, that goods imported into or through Great Britain not properly marked are liable to confiscation. Now the courts hold that the use of abbreviations such as Ont. for Ontario, Can. for Canada, etc., in giving a firm name, are improper markings, so that goods described as manufactured by Brown, Green & Black, Toronto, Ont., would be liable to confiscation. A little care on the part of exporters will avoid a very unpleasant delay in the delivery of their goods.

"STAFF," which has drawn so much attention to itself owing to its large use in the construction of the World's Fair buildings, is composed of plaster of paris and New Zealand hemp. A thin coating of plaster is thrown over the face of a mould to give it a smooth surface. The mould is made of gelatine, for the sake of elasticity, if the staff is to be ornamented; if, on the other hand, it is to have a flat plain surface, the mould may merely be a wooden box. When the layer of plaster has dried, the fibre is beaten until it is in a feathery condition, dipped in liquid plaster and pressed into the mould. After the composition has had time to dry it will be found to be as hard as wood, and slabs of it can be nailed together like ordinary boards. So far as is at present known, "staff" is not affected by alternations in temperature or changes in the weather in any way.

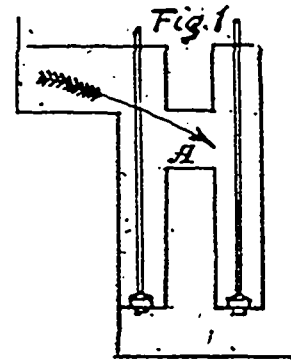
THE career of the Auer Light Company in Canada has certainly been an eventful one. Following not long after a rumpus among the local shareholders in Montreal, and the demand for refund of money paid in, came the charge of undervaluation of goods at the customs, and the consequent forcible displacement of the manager, A. O. Granger. Then came the suit of Mr. Granger for \$10,000 against H. J. Beli, his suc-

cessor, for alleged libel, and after this came a strike of the workmen who put up the lights. The Auer light, which hails from Germany, is certainly a remarkable invention, and the claim appears already to have been substantiated that it reduces the gas bill while greatly increasing the light, and that moreover the poisonous fumes of sulphur, which are such an injury to health in Montreal and other cities, are largely done away with. But how the company are now going to come out since the split with Mr. Granger is a question.

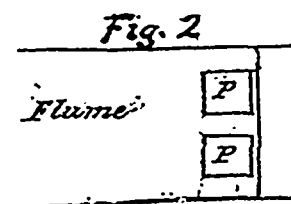
A RECENT number of the *Electrical World* had a cartoon suggesting an ocean telephone as a possibility of the near future, and picturing John Bull at one end of the line and Uncle Sam at the other. The suggestion was founded on the paper on the subject by Sylvanus P. Thompson, read before the Electrical Congress in Chicago. In concluding his paper Mr. Thompson said: "Ocean telephony is possible. The means for attaining it are within our grasp. Compensated cables of the new type are entirely practicable. It may be needful to begin with some shorter line than an Atlantic cable, in order to gain experience. But an Atlantic cable constructed on the new plan will not cost much more, when laid, than one of the old type; and whether or not it is successful in conveying telephonic speech it will certainly transmit telegraphic messages at a greatly accelerated speed of signaling. If one Atlantic cable can be constructed to do the work now requiring eight cables, that cable will be constructed. The advance will not be complete until telephonic speech is transmitted from shore to shore."

#### THAT PROBLEM.

In answer to Mr. Bell's inquiry in the last number of THE CANADIAN ENGINEER, I may submit the following explanation:



The water flowing in, as shown by the arrow in Fig. 1, when the second wheel is at rest, will continually displace, at the point A, a portion of the water filling the second penstock, thus causing a turmoil which must necessarily affect the flow of the water in the first penstock and reduce the mean velocity. The case is not the same with the second penstock when the first wheel is at rest, because, as may be seen by the arrow in Fig. 1, the flow of water is less distorted in entering the second penstock. When both wheels are in motion the same inconvenience will exist, but not to so great an extent.



It would have been better to place the two penstocks transversally to the flume, as at P.P. in Fig. 2, instead of placing them one ahead of the other, as in Mr. Bell's case.

J. A. GRENIER, C. E.

Montreal, 20th Oct., 1893.

*Editor CANADIAN ENGINEER:*

The last ENGINEER contains the problem of two turbine water wheels in line with and supplied by the one flume, the first wheel—or the one next the flume—yielding less power when the water is shut off from the second wheel than when both are taking their supply. The writer offers the following solution: When both wheels are taking water the head is drawn down in the penstocks, as shown in your diagram; the cross sectional area of the flume not being sufficient for the amount of water required by the two wheels, consequently the first wheel receives the benefit due the impact from the fall of the water from the level of the head in the flume to the level in the penstocks, and that not only from the water it is to use itself, but also from that to be used by the second wheel. The difference of the effect of the water on the two wheels being what would be due to an additional head equal to double the difference of height of the two levels over the head in the penstock. When the water is shut off from the second wheel, the area of the flume being then sufficient for the supply, the head does not lower, and the first wheel receives only the benefit due from the then existing head, which would be up to the level of water in the flume, or nearly so. If the flume would be deepened so as to supply a sufficient quantity of water to prevent the head drawing down when the two wheels were open, these irregularities would in all probability cease. The writer thinks that when the first wheel is shut off the second wheel will yield more power than it did before, for the reason that it will have a higher head of water over it.

R. S.

#### TECHNICAL EDUCATION FOR ENGINEERS.

BY CHAS. F. KINSEY.

The young engineering student soon finds out that theory which has been impressed on his mind at the School of Science, and practice, do not quite agree, but he need not be discouraged at that; his business is to keep theory in his mind and make practice come as near to it as possible. Up to the present time we have been unable to make the conditions in a working boiler room conform to all the rules laid down for us in theory, but that must not prevent an engineer from trying to get as near as possible to it. With diligence, about a year spent with the boilers makes him proficient in the art of firing them, drawing fires and cleaning, keeping up a steady pressure of steam, making joints and all the necessary little details which go towards making a successful fireman, and we all know a good fireman can be made a good engineer, but a poor one never. He is now introduced to the engines, and after a very few weeks he may be safely relied upon to start and stop them without damaging them. Then follows the use of the indicator. Of course, the young fireman has used the indicator at the School of Science, but now he uses it under working conditions, and the cards he takes off makes him feel disposed to despise theory or condemn the engineer; but here the engineer comes to his help and explains to him that up to the

present time we have not been able to make engines conform to all the rules laid down for us in theory, but he must still keep theory in mind and must try and make the engine work as near as possible to it. Then comes the calculating of the diagrams for horse power, water consumption, amount of steam used, condition of the engine and a host of other little things that only an indicator can expose, and here the education that our young man received in the beginning begins to shine. Having learnt mathematics, he can figure up areas of pistons, cubic contents of cylinders, mean effective pressures, speeds of pistons and revolutions, in half the time that we old heads with our laborious style of figuring can do. He has horse-powers and percentages of clearance for certain sized cylinders on the tip of his tongue; logarithms and constants have no more terrors for him than his dinner; he has initial pressures, cut offs, expansion curves, release, terminal pressures, back pressures and compression all off by heart; in fact, when it comes to figures he is master of the situation. After a couple of years spent in this manner, during which time he has learnt to set valves, repair cross-heads and crank pin brasses, and keep the engine in good working order, he may be trusted alone with them. He now tackles the dynamos, he is taught their principles, how they work, how to fix the brushes and set them, how to wire up for lamps and repair them, how to avoid short circuits and grounds, and the best means to get rid of them if they do appear in spite of all attention. After becoming thoroughly acquainted with the care of dynamos, electric lighting and wiring, a very short time suffices to enable him to understand and successfully operate electric motors. During his probation in the engine room he has acquired a knowledge of steam pumps, hydraulic and power elevators, and a smattering of mill-wrighting, steam-fitting and heating. Our young man who decided to become an engineer is now as efficient in his profession as the best man amongst us, and we now call him a first-class engineer. Engineers, he has now advanced as far as we have got. Both the young engineer and the old engineer are daily expecting greater changes to take place in the profession; we who are old cannot sustain the strain much longer, we must give way sooner or later, but the young man with his superior training is prepared to receive much more. What the future has in store for us, none can tell, but we can rest assured with the thought that if we train the young engineer thoroughly he will not disgrace our profession in years to come, but will be found fully capable of performing any task set before him as well as we have done during the last twenty years that have passed.

#### SUNDRY NOTES ON HEAT.

BY CHARLES HEAL, TORONTO.

The object of the study of steam, and its application, is to obtain the greatest possible amount of work with the least possible expenditure of fuel. In order to arrive at a correct understanding of the principles which underlie the economical production and use of steam, we must study among other subjects the nature and effects of heat. Here a difficulty meets us which we cannot altogether overcome; that difficulty is to define what heat really is; it is, however, so familiar to us in the effects it produces on our bodies, and on objects around us, that we need not be deterred in our inquiries from our inability to solve the question.

The chief physical source of the heat which we enjoy is the sun, which, although situated at such an immense distance from us, warms the earth with its rays—of this source nothing is known. In addition to this external heat we have an internal source, whose product is known as terrestrial heat; this heat is very great, and it is computed by scientists that at the depth of a few miles it is capable of melting the most refractory substances. Though we are mainly dependent upon these sources for maintaining our temperature, there are mechanical and chemical sources which are of great importance to us, the most important being chemical action. Nearly all chemical combinations are attended with the production of a greater or less degree of heat, and it is the chemical combination termed combustion which we, as engineers, are mostly interested in. I will not touch directly on the subject of combustion, as that will be dealt with in a separate paper.

The temperature of a body indicates how hot or how cold it is, and should be distinguished from the quantity of heat in that body. For example, if a cup of water be taken from a vessel, the temperature is the same, but the quantity of heat varies as the weight in each vessel, the temperature or intensity being measured by the thermometer, but the quantity of heat is the temperature multiplied by the weight in pounds. The specific heat of bodies varies considerably, water being the highest of any (except hydrogen), it being the standard and considered as 1, while that of iron for instance is  $.113 = \frac{1}{9}$  almost, so that the quantity of heat that would raise 1 lb. of iron through  $9^{\circ}$ , would only raise 1 lb. of water through  $1^{\circ}$ . These properties are taken advantage of by the engineer to ascertain approximately the temperature of bodies beyond the range of the ordinary thermometer, the uptake of a boiler for instance. Nearly all bodies expand by the action of heat, and the mechanic and engineer have ever to keep in view the fact, or disaster is the result, for instance, cracked boiler fronts and settings, broken steam pipes and leaky joints. At the same time this property is daily utilized in our workshops; cranks and pins are secured, locomotive tyres shrunk on, and many defects made good by the judicious application of heat. The transfer of heat from one body to another may take place in any of the following ways: Radiation, conduction or convection. Heat is given off from hot bodies in rays, which radiate in all directions in straight lines; this is the process of radiation. Conduction is the process by which heat passes from hotter to colder bodies: by contact the conducting power of bodies varies considerably. Iron and copper are good conductors, wood and some mineral substances are bad ones. The engineer uses good conductors to transfer the heat from the furnace to the water in the boiler, and the bad ones to prevent loss of heat by radiation from steam pipes, cylinders, etc. Convection or carried heat is that which is transmitted from one point to another by currents. The freer and more direct the currents the more readily is the heat transmitted. Steam boilers should be so constructed as to secure a free circulation of the water.

Before quantities of heat can be measured we must have a unit of heat, just as we require a unit of weight or length, as the pound or foot, and the unit of heat is the quantity required to raise 1 lb. of water through  $1^{\circ}$  F. But the all important point with the engineer is the conversion of heat into work. We

will, therefore, consider the relation between the two. By the term work is understood the overcoming of a resistance through space, and the amount of work done is measured by the resistance in pounds overcome, multiplied by the distance through which it is overcome in feet: thus, if 7 lbs. be lifted through 10 feet,  $7 \times 10 = 70$  F. lbs.

Thus it will be seen that work is not measured by the pound or foot, but by the product of the two, and the unit of work is the lifting of 1 lb. through a vertical height of 1 foot, and is termed the foot pound. It will also be noticed that the unit of work has no reference to the time taken, as the same amount of work is done whether it takes one second or one hour. The power of an agent is measured by the rate it can do work, and the unit of power adopted by engineers is the horse power, and is represented by the lifting of 33,000 lbs. 1 ft. high in one minute. In the case of pumping engines the work done is measured by the foot pound, and is termed "duty per lb. of coal."

We will now consider the effect of heat in producing a change of state in different bodies, as ice, water and steam. "The temperature of a body ceases to rise while it is melting." An illustration of this fact may be obtained in this way. Take equal weights of water at  $32^{\circ}$  and  $174^{\circ}$ , and mix. The temperature of the mixture will be the mean of the two,  $103^{\circ}$ ; now take equal weights of ice at  $32^{\circ}$  and water at  $174^{\circ}$  and mix as before; the temperature will only be  $30^{\circ}$  instead of  $103^{\circ}$ ; all the ice, however, will be melted; the  $142^{\circ}$  of heat has evidently been consumed in melting the ice and is now latent in the water. This heat would require to be given off again before the water could be transformed into ice, and were it not for this provision, as soon as any body of water had sunk to  $32^{\circ}$ , it would immediately become a mass of ice.

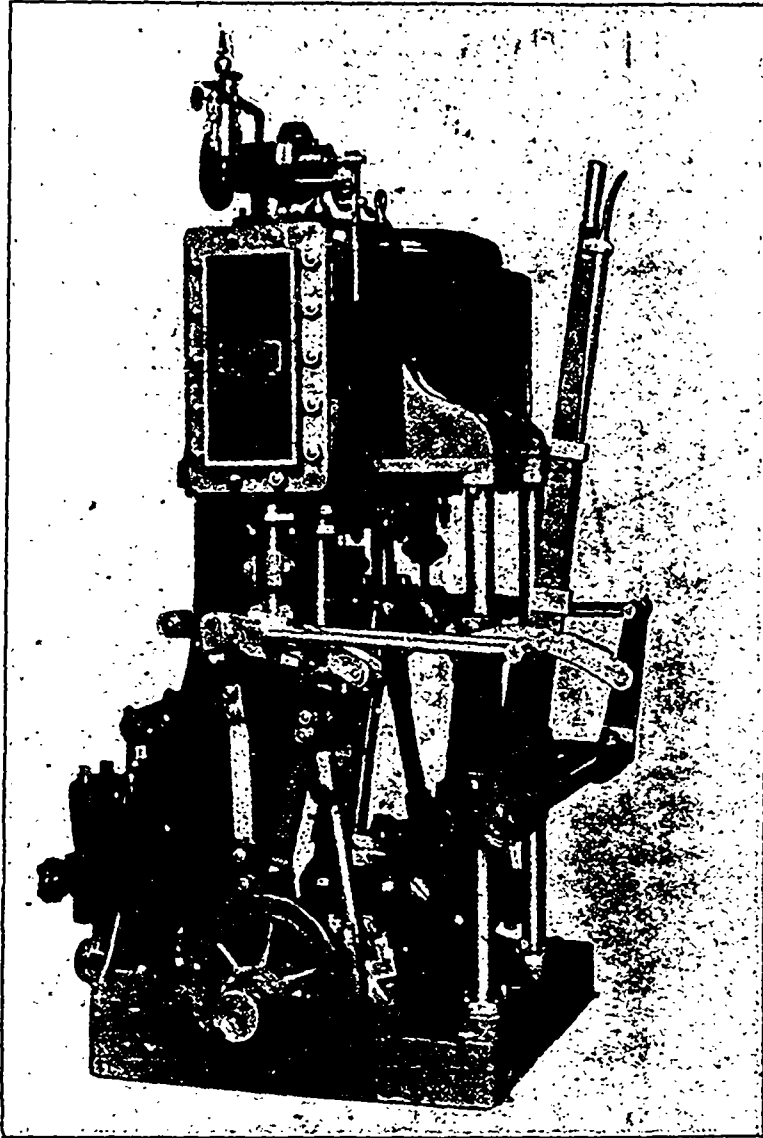
A simple experiment, which may be easily tried, will enable any one to determine exactly the quantity of heat which becomes latent when ice is converted into water or water into steam.

Procure a uniform source of heat and place a lb. of water over it to ascertain the exact amount its temperature rises in a given time. Assume it rises 10 degrees in one minute. Now remove and place 1 lb. of ice at a temperature below  $32^{\circ}$ ; the temperature will rise to  $32^{\circ}$  and remain at that point until all the ice is melted, which will be in about 14 minutes. Now in this time the amount of heat would have raised 1 lb. of water  $10^{\circ} \times 14$  minutes =  $140^{\circ}$ ; but the water is only  $32^{\circ}$ , then this  $140^{\circ}$  of heat has been rendered latent. Continue the heat and in 18 minutes it will have attained the boiling point,  $10 \times 18 + 32 = 212^{\circ}$ . Still continue the heat, and in 95 minutes or about  $5\frac{1}{2}$  times as long as it took to raise it from  $32^{\circ}$  to  $212^{\circ}$ , it will have all boiled away, and yet the temperature of the steam has at no time exceeded  $212^{\circ}$ . All this heat, nearly  $1000^{\circ}$ , has been rendered latent. It is this large amount of latent heat in steam that renders it so useful as a heating agent, and were it not for this property the moment water attained the boiling point would be one of extreme danger, as it would be immediately converted into steam with an explosive force akin to gunpowder.

A new process has been invented for obtaining aluminum from the oxide. The process includes chemical combinations hitherto supposed to be impossible. It is claimed that the metal produced by this process is cheaper than any other.

## MARINE ENGINES AND PROPELLERS.

Among the exhibits of Canadian machinery at the World's Fair, the marine engines and mining machinery shown by the F. G. Beckett Engine Co., of Hamilton, attracted much attention and were highly spoken of by visitors. This well-known firm (formerly the Killey-Beckett Engine Co.) make a specialty of marine engines and propellers, and have recently brought out some new ideas which are worth more than a passing notice. The illustration here shown is a photo-engraving of a fine type of marine engine recently supplied to one of the new British Columbia sealers. This is a "fore and aft" compound condensing engine designed for a



boat of about 120 feet length and develops 80 to 100 h.p. The vessel in which the engine is placed has a novelty in the shape of a feathering propeller or propeller with an adjustable pitch. It is made of bronze metal with two blades, connected by levers and rod to the shaft inside, the levers being there connected by a screw, the turning of which will set the blades to any pitch desired. The main object of having this adjustable pitch is that the vessel, which is rigged for both sail and steam, may run under canvas without any impediment in the shape of a dragging screw. When it is desired to run the vessel under sail only, the propeller, which has only two blades, can be placed with blades in a vertical position, so that to all appearance they form simply an extension of the stern-post and thus oppose no resistance to the water. To give all the

power needed the blades are made wider than in the case of three-blade propellers, and they can be made of either bronze or steel. The trials of this boat show that both engines and propeller are a pronounced success. The style of screw could be very well applied to our lake yachts. The owner of a yacht so built need never trouble himself about being becalmed.

The machinists of Hamilton organized a branch of the International Association of Machinists at a meeting held under the presidency of H. E. Easton, on Nov. 4th. This is the 418th lodge of the order, and the 18th in Canada.

The committee of engineering societies of the Columbian Exhibition have sent us their thanks for copies of THE CANADIAN ENGINEER furnished during the World's Fair, and in their letter they remark that "such literature has very greatly helped them in their investigations and made their headquarters a pleasant place of resort."

On Thursday afternoon, Nov. 2nd, a very interesting test was made in the testing laboratory of McGill University by Prof. Bovey and some of the fourth year students, of a specimen of British Columbia spruce. The specimen was a large beam 25 ft. 5 in. long, 8½ in. wide, and 17½ in. deep, and was taken from a tree felled in the Skeena River district, B.C., 600 or 700 miles north of Victoria, some time about the end of December, 1892. The beam was shipped from there by Messrs. Claxton, who furnished it to the University, and arrived in Montreal in August, 1893. It was now subjected to a transverse test in the Wicksted machine on supports 24 ft. apart on centres, the centre load being applied by increments of 500 lbs., and the deflection noted for each increase. The beam failed under a maximum load of 38,250 lbs., and not, as is usual, by the rupture of the fibres on the tension side, but by the crippling of the side in compression. The skin stress developed was 2750 unusually high, being a little over 6,000 lbs. per square inch, while the coefficient of elasticity was 1,670,000. The strength of the British Columbia spruce is, therefore, double that of ordinary spruce or pine. Among those who witnessed the test were T. C. Keefer, C.E.; P. C. Peterson, Chief Engineer of the C.P.R.; John Kennedy, Montreal Harbor Engineer; T. J. Claxton, F. J. Claxton, — Trevillick, Senator MacInnes, a representative of THE CANADIAN ENGINEER, and several young engineers from the city. The engineers and professors were struck with the remarkable strength and toughness shown by this sample of British Columbia wood.

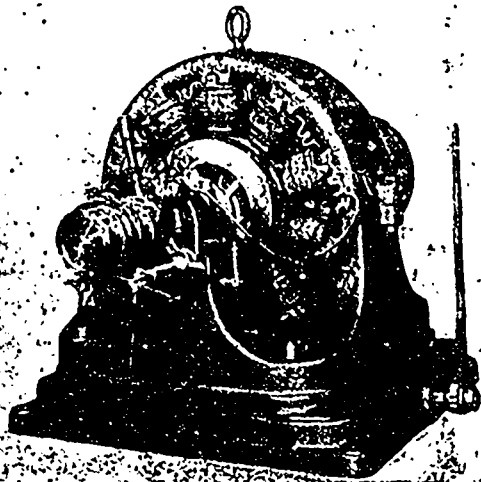
A LIGHTNING flash light of 4,000,000 candle power casting a beam visible 63 miles in clear and 21 miles in thick weather, is being placed in the new lighthouse, Penmarca Point, Brittany. Next to the great search light at the World's Fair, this is the strongest light in existence.

EXPERIMENTS are being made with a light brick for ceilings, etc., where crushing strength is not so much an object. Ordinary clay and sand, and about forty per cent. of fine sawdust, are mixed and moulded under heavy pressure. The sawdust disappears in burning.

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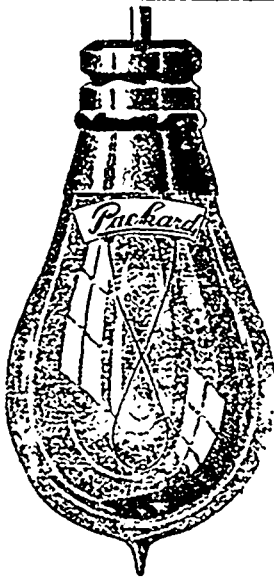
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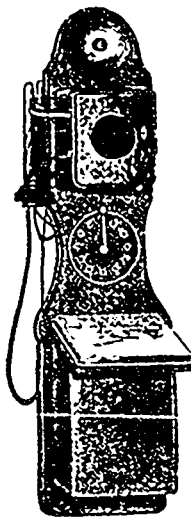


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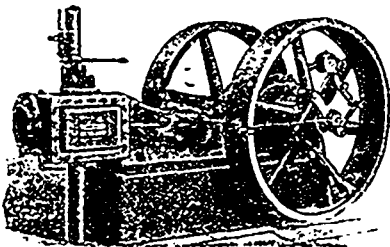
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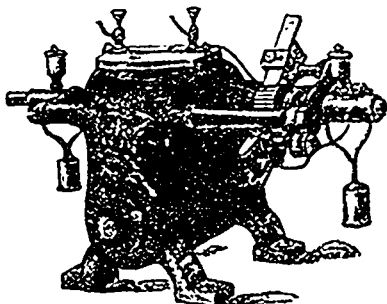
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# Electrical Department.

## ELECTRICITY FROM THE WIND.

Our readers will remember a paragraph in the last two numbers referring to an experiment at Dixville, Que., in deriving electric light from a wind wheel. A representative of THE CANADIAN ENGINEER has since had the pleasure of visiting the only electric light plant in Canada deriving its motive power from the wind. In this little village Eugene Baldwin, an amateur electrician, has put about twenty 15 candle-power incandescent lamps into his residence at Dixville, Que., which he is going to light with storage batteries, manufactured by himself, and so arranged and connected with a dynamo and wind wheel that the whole arrangement will work almost automatically.

At a short distance from his dwelling he has erected a tower fifty-eight feet high. Upon this tower is a sixteen-foot galvanized steel wind wheel which is connected by a vertical shaft to the machinery below. In the base of the tower there is a room fourteen feet square in which are the dynamo, regulators, automatic switches and other accessories. The dynamo was also built by Mr. Baldwin and is a one-thousand Watt machine, with certain improvements which make it more suitable for its special work.

Connected with the counter shaft is a regulator which keeps the electric potential at a uniform voltage. There is, in addition to this, an electro-magnetic switch that opens and closes the circuit of the charging current whenever the potential of the dynamo, in stopping, falls below the voltage of the accumulators, or rises above it in starting.

The wind wheel gives more power in an ordinary wind than is required to run the dynamo (for it will run in a very light breeze), and stores more energy than the lamps require, therefore Mr. Baldwin contemplates putting into his house one of the electric cooking stoves now being exhibited at the World's Fair.

The storage batteries referred to are designed to lay up a supply of electricity sufficient to light the lamps for three or four evenings, in case of a lack of wind for motive power.

The projector and proprietor of this new enterprise is quite a young man, and for his opportunities has acquired a practical and very remarkable interest in electricity, and this chiefly through reading and digesting the articles in the technical papers and whatever books he has been able to procure on the subject.

Readers of THE CANADIAN ENGINEER will no doubt hear more from Mr. Baldwin.

## ELECTRICAL TOOLS FOR USE IN CONFINED SPACES.

Speaking of the recent accident on the steamer "Umbria" when her propeller shaft broke, and the tremendous efforts which had to be put forth by the engineers to repair the damages, an English journal concludes that the Atlantic liners are not well enough equipped with appliances for grappling with such contingencies, and predicts that the use of electrical tools in such confined spaces must soon become general. A well equipped engineer's shop cannot be carried on ship-board, and in addition, ordinary machine tools can-

not be readily moved about and are impossible of application in confined spaces. Since all large ships are now supplied with electric light plant, it would seem to be a simple matter to carry the current to any part of the ship, no matter how remote or cramped it might be, and there use it for actuating tools by means of motors. For instance a portable electric drill could have been readily used for boring the holes in the shaft of the "Umbria," and the task accomplished in one-fifth of the time and with very little exertion on the part of the engineers. Such a drill can be used in confined spaces, where there is scarcely room for a man to stand in. Many of these appliances of modern power and dimensions are in use in engineers' shops, and they prove an immense saving. Instead of bringing a boiler, cylinder shaft or any other heavy piece of machinery to a fixed machine, portable drills are carried to the spot of application, and no other connection but a pair of wires is necessary to convey the motive power from the generator to the motor. These machines are efficient and inexpensive, and they ought to form a part of every steamer's tool stores. Numerous mechanical operations are continually being performed on the steamships, which involve the most laborious hand labor, and which can be done in far less time and at a nominal cost, besides with much greater effectiveness, through the medium of electricity.

## THE EDUCATION OF THE ELECTRICAL ENGINEER.

A PAPER READ BEFORE THE CANADIAN ELECTRICAL ASSOCIATION BY E. B. MERRILL.

Though the subject of the education of the electrical engineer has received considerable attention from electrical societies, and in the electrical press of other countries, it has not so far been discussed in our own society; so that in view of its importance to the rising profession it may not be fruitless, of good results to those of us interested in the education either of ourselves or others, if we spend a short time in considering it here.

Like everything else electrical, the scope and methods of electrical education are continually changing, and on the whole in the direction of improvement. In no profession are the instructors so closely connected with the practice, and to this vital contact they owe a great deal of their strength. This helps to keep them abreast of all advancements and greatly increases their value to the student engineer.

In the widest sense of our subject we should have to do with more than a college education. That is only one phase of it. It neither begins nor ends here. There must be a preparation, and afterwards there must be a continuous advance if one is to retain or better his position. We must not get the idea that a graduate is an electrical engineer, though he may have earned the distinction of such a degree. He is in reality merely in a position to make a start, but if he has faithfully cleared up the work behind him, he is able to make a good start and a rapid advancement. A college training is necessarily one-sided and needs the addition of practical experience to complete it.

However, let us limit ourselves to the consideration of the college education. And first, is it necessary? and if so, what should be its aims and in consequence its important features? Is a college education or an equivalent an essential part of the equipment of the electrical engineer?—we say an equivalent, for it is quite possible, though generally attended with great difficulty, for a man to follow out a course for himself by making use of spare minutes and taking advantage of every opportunity. But the instances of those that have accomplished this satisfactorily are not many.

A few years ago the answer to this question would perhaps generally have been different from what it must be to-day. We have little hesitation now in answering it in the affirmative. An adequate training in mathematics and electrical and mechanical principles must be had, however it is obtained. The college course itself is not all important, but it offers great advantages. Besides the guidance and help of the instructors, the fact of the time being carefully mapped out for employment, and the familiarity gained with the use of apparatus and machinery not often accessible elsewhere, the student has also the assistance derived from association with others and the encouragement of emulation between those working along the same lines; factors whose importance is not often overestimated. It is true that a good man, by himself, may do more than a poor man at college; but the same man will do much better with the assistance to be derived at college. A college training will not always make a good man out of a poor one, but it will make a better man out of a good one.

Of course we cannot overlook the many examples of men who have done well, and some who have met with great success, who have never entered college or taken up advanced mathematical and scientific work; but if you were to question these, you would find that most of them regret that they did not see the value of such an education sooner, or that they have not had the opportunity or time to avail themselves of it. It is a sufficient indication of its value to glance over the foremost names in the electrical field and to note the proportion of them that have received this training. That it is being appreciated is shown in the demand of the large companies for graduates of engineering schools, some admitting none but such men to the special student courses established by these works for the purpose of training men to look after the installation and running of the machinery they manufacture.

There are still some, however, who advocate the merits of the machine shop, the repair shop, the dynamo and motor room, field and armature construction and winding, the test room, etc., as an ample schooling, but the weight of opinion is now that the electrical engineer needs something more. A man who is trained only in this way, and has not obtained a pretty good working acquaintance with the elementary laws of electricity and magnetism, is liable to make ridiculous if not serious mistakes, which the man properly grounded in these principles could not possibly fall into. As a case in point, it came within our notice not so long since, where three men trained in this way agreed that a certain connection of the shunt fields of an Edison dynamo was wrong, and had it changed because they had not seen it made in that way before, and although it was pointed out to them that the current had to circulate in exactly the same direction in the coils as it did with the connections with which they were satisfied.

And what are the essential elements of this college education? This brings us to another important question. It is that of—*specialist or generalist?* or, to what extent should one specialize?

Is the electrical engineer to be a mechanical engineer as well? Some have answered "yes," and others more recently have said "no," with considerable emphasis. Sir William Thomson, now Lord Kelvin, gave as his opinion that the electrical engineer should be nine-tenths mechanical and one-tenth electrical; some of the best educationists across the line would now reverse these figures. Perhaps both are extremes; at least, they appear to be so for the requirements of the average electrical engineer of the present and for some time to come. Conditions have somewhat changed since Sir Wm. Thomson gave this advice, although there are still some engineers not even one-tenth electrical. A more even division would, however, better meet the present requirements.

The man who is working along advanced lines has need for economy. The electrical field is now so wide and extending so rapidly that many may well occupy all their time on special work. Such men are able to do with only a slight acquaintance with mechanical engineering. However, the general electrical engineer is not a specialist. As the general practitioner in medicine, he must cover a wider field. In installing plants for lighting, power supply, etc., he has to do with steam engines and boilers, and all their accessories, with shafting and bearings, belting and gearing, fly wheels, driving pulleys, etc., with water turbines and their control, with the fitting and running of construction and repair shops, etc., etc. He should, therefore, be familiar with at least the mechanical principles of the construction and running of ordinary machinery, the running conditions of the steam engine and the utilization of water power. It is not necessary that he should be a practical machinist. Most engineering colleges, therefore, either combine the two courses, or else require the electrical student to cover a good deal of the work in mechanical principles. A large part, such as the mathematics and mechanics, is necessarily the same in both.

In the planning of a college course, one of the first difficulties met with is in deciding the relative importance, with regard to the time-table, of the theoretical and practical work, and this is what different colleges disagree upon most, some devoting considerable time to foundry work and pattern making, forging, machine shop work, such as vise work, turning, etc.; while others restrict the practical work to draughting, electrical testing, etc., engine and boiler testing, dynamos and motor testing, etc., which involve the application of the more difficult principles and assist to illustrate and impress them. We think it a safe rule to follow in college to sacrifice practical work to theoretical when the former involves chiefly those operations which one can pick up readily in practice, or the mere acquiring of skill in a mechanical operation. In engineering, and especially in electrical engineering, the mathematical and scientific training necessary is becoming wider and wider. Once an engineer has started out in practice he has little time and usually less inclination to go back and work up mathematics. If he has not had a good mathematical training, he finds himself unable to read and keep abreast of the greater part of the electrical literature in the periodicals. He is not *up to date* in electrical matters, probably becomes disgusted with advanced electrical work, and the plums of the profes-

sion, the introduction of new applications, the perfecting of methods, designing and inventing, he resigns to others. With the man, however, who has devoted three or four years to a careful study of mathematics and the direct and related principles underlying the science of electricity, it is different, for though he may still have some difficulty in following electrical advancement, he is not wholly at sea. It is best, therefore, that the college student should pay special attention to those parts of his work that are usually classed under the head of theory. It is true that he may not do as well at first when he starts out in his profession as the graduate of a school where more attention is given to the practical side, but he will more than make it up in the long run. It is a case of slow, but sure.

Another objection to the class of practical work before mentioned—foundry, machine shop work, etc., is that, in college, it is usually under too artificial conditions, and is therefore not of as much value to the engineer as if he had obtained the experience in actual machine shops, etc., under normal conditions, and especially is this true in questions of the commercial value of the work done. Moreover, students may obtain this practical experience, or a large part of it, before graduating, for in most colleges there is a long summer vacation; in our own in this city they have five months, and the students are especially advised to and most of them do, obtain employment in various works, mechanical and electrical, and so supplement their course in a valuable way. An electrical student should, if possible, obtain his experience in an electrical machine shop for construction or repairs—the more general the work the better—and in this way he will be obtaining mechanical and electrical practice at the same time.

We have not the time now to go with more detail into the work of the college, or consider what subjects should or should not be included in the course and how they should be dealt with. The importance of the laboratory as an educational aid is generally recognized; a good library is also a great help, and in our day of such rapid advancement the electrical journal is indispensable; but a wide-awake staff and students that *mean business* are the chief factors in the success of any college.

#### SOME OF THE CAUSES OF INTERRUPTION TO TELEGRAPH CIRCUITS.

A PAPER READ BEFORE THE CANADIAN ELECTRICAL ASSOCIATION, BY F. C. ROBERTSON.

A telegraph system, with its lines stretching over country in different directions, connecting cities, towns and villages, is to some extent at the mercy of the elements, with its batteries, instruments and wires, it is constantly subject to disturbance from various causes. The substance of this paper is a brief description of some of the common forms of interruption (usually called "troubles") which are experienced on telegraph circuits.

The troubles usually met with in the operation of telegraph circuits are of three kinds, and are known as "the break" (or open), "the ground," and "the cross." The circuit is said to be "open" when its continuity is broken and the current prevented from circulating, "grounded" when there is an abnormal electrical connection between the ground and the earth, and "crossed" when the line is in connection with another line upon which there is a current of electricity.

A circuit may be opened in various ways, for instance, by the breaking of the line, breaking of the magnet wire of a relay outside of bobbin, a loose connection at a binding post, displacement of plugs in switchboard, or by a key being accidentally left open. A break in the line wire generally occurs during very cold weather when the wire is contracted by the low temperature, causing a greater strain in it, and is often found at a point where the wire had been kinked, or at a joint which in making had been twisted so tightly as to cause the wire to be partially severed. Breaks are frequently caused by a tree falling on the line, which usually takes place during a violent wind storm, although sometimes through carelessness of woodmen in felling trees. Sleet storms are very destructive to the lines, owing to the excessive weight due to the ice adhering to the wires, which frequently causes them to break, or the alignment to become distorted. Poles carrying a large number of wires have frequently been known to break down under the extraordinary weight due to ice on the wires. Sleet storms general over a large area of country, of such severity as to damage lines, are fortunately of rare occurrence. The circuit is sometimes found to be open in an office, and might be traced to a broken connecting wire, broken relay wire, loose binding screw, but more frequently to a broken key, or a plug out of position in the switchboard. The circuit is sometimes found to be open in the battery, due to a jar breaking and allowing its solution to escape, a zinc falling from its hanger to the bottom of the jar, or the wire connected to the copper element becoming detached. There is a kind of trouble which takes the form of an extraordinary and variable resistance in circuit, which is sometimes met with on old lines, the source of which usually is a rusted joint, or a joint on a portion of the line in which there is no tensile strain. During dry weather these joints cause the resistance of the wire to be much increased, but during a rain the joints become wet, improving their conductivity.

Grounds on the wires are of more frequent occurrence than breaks or crosses. All ground faults contain more or less resistance; when the resistance of a fault is very small, the connection of the line with the earth caused thereby is comparatively perfect, practically dividing the line at that point into two circuits and preventing the current from the battery at either end of the line from passing further than the fault, but when the fault contains considerable resistance the connection with the earth caused thereby is not sufficient to prevent a portion of the current from either battery from passing the point of fault, the working margin of current being that which finds its way past the point of fault. The circuit in such case is not totally interrupted and signals may be exchanged between terminal offices on the circuit by properly adjusting the receiving instruments. Such a fault is called a "partial ground," or more commonly termed an "escape."

Although "single" (or simplex) circuits may be worked fairly well with a considerable and varying escape on the line (as the adjustment of receiving instruments can quickly be changed by the operator to correspond with the variations of the current), quadruplex circuits cannot be worked successfully under the same conditions, the varying escape causes the balance of the instruments to become disturbed, producing a mutilation of the signals on the receiving instruments.

A large percentage of the number of grounds which occur are found either on the lines in the towns through which they pass, or in the offices, only a small proportion being found on the lines in the country. The wire coming in contact with a foreign wire, such as a telephone, call bell, or guy wire, is a very frequent source of the trouble, though the circuit is very often grounded at the switchboard during a thunderstorm by lightning fusing the metal at the air gap of the lightning arrester in passing over to ground. Partial grounds, or escapes, are often due to the wire touching the branches of trees, and are more susceptible during wet than dry weather, the effect of the moisture being to magnify the escape. Highway lines are more subject to escapes of this kind than lines located on the right of way of a railroad, owing to the numerous shade trees which they encounter and the difficulty experienced in keeping them trimmed to clear the wires; owners of the trees as a rule object to any extensive cutting of limbs which would tend to disfigure the appearance of the trees, consequently to maintain a clearance the branches have to be frequently pruned. If this operation were neglected for a long time the effect would be manifested by the insulation of the line deteriorating. In cases where trimming cannot be done, in order to clear the line it becomes necessary either to replace the poles by higher ones, so that the wires will pass above the tops of the trees, or to divert the line by setting the poles out.

Crosses are not of such frequent occurrence as grounds, and in many cases occur through some material defect in the condition of the lines. Wires become crossed usually during the prevalence of a wind storm, which causes them to sway; at long stretches, especially where the wires happen to be slack, they more easily cross. Frequently crosses occur in consequence of a pin or tie wire breaking at an angle in the line, an insulator working loose and raising, or a pin being pulled out of cross-arm at a depression, allowing the wire to depart from its parallel position relative to the other wires. Crosses caused by a piece of small wire or other metallic object being thrown amongst the wires often occur, and on account of its obscurity the cross is with difficulty found by the lineman. I know of several instances where wires were found to be purposely connected with a piece of fine wire (evidently by persons bent on mischief), in such a manner that the fine wire could not be seen from the ground. Eventually in each case a galvanometer test was made and the cross approximately located; the lineman sent out to the supposed locality of the trouble was obliged to climb a number of poles before finding it.

When the nature of an interruption is such that the trouble does not remain on the wire constantly, but comes in and disappears again at intervals, it is called a "swing," and when the intervals are long and the length of time the trouble remains is short, the interruption, though of not so much consequence as regards impeding the working of the line, is more difficult and slow to locate than if the interruption were constant.

When two or more wires are crossed, one of them can be cleared by opening the others at stations on each side of the cross. In case a through and a way wire are crossed, it is customary to clear the through wire by opening the way wire at the stations between which the cross occurs in such a manner that said stations may have communication on the way with

their respective terminals and intermediate offices. Such an arrangement is accomplished in the following manner: Suppose two wires, number 1 and 2, running west from terminal station A to terminal station D, are crossed between way stations B and C, of which B is east and C west of the cross. It is required to clear No. 2 (the through wire) and ground No. 1 (the way wire), so that B can work with A and C with D respectively. B opens the west end of No. 1 wire at the switchboard and grounds the east end with instrument in circuit east of the ground, C opens the east end of No. 1 at his switchboard and grounds the west end with instruments in circuit west of the ground, thus that part of No. 1 between stations B and C will be "dead," causing no interference with the working of No. 2. At the same time the circuit in the portions of No. 1 between A and B and between C and D, will be closed by means of the ground connections.

Lightning coursing the wires during a thunderstorm has a strong tendency to do damage to the instruments, and were it not for the presence of that valuable arrangement called the "lightning arrester" (which forms an adjunct to modern cut-outs and switchboards) many relays would be burned out. Before the lightning arrester was invented the custom was to cut out the instruments during a thunder storm, but now it is considered quite safe to leave the instruments cut in, regardless of the storm, where the switch-board is provided with this protection, and it rarely happens that a relay is found to be damaged by lightning. The tendency of lightning to do damage is not confined to the instruments alone, poles on the line in the country being shattered and cross-arms splintered. In this connection it may be apropos to remark that the custom of modern line builders to provide the poles at intervals along the line with ground wires may be regarded as commendable; the arrangement appears to give good results in the capacity of lightning-rod protection to the poles.

Office main wires, especially if insulated with paraffined cotton covering, where allowed to rest in contact with a gas pipe or grounded object, are liable to become grounded by lightning penetrating the insulation and carbonizing it in its path, producing a conducting medium and creating a permanent connection between the main wire and grounded object.

During the brilliant display of luminous streamers exhibited in the heavens occasionally, and known as the Aurora Borealis, the telegraph circuits throughout the continent are more or less affected by earth currents, which become so severe at times as to entirely interrupt communication. These earth currents constantly vary both in intensity and polarity, making it impossible to keep the instruments adjusted on circuits having an earth return. It may be of interest to mention that some tests were made by Mr. William Finn, of the Western Union Telegraph Company, on a No. 6 gauge iron wire 213 miles long, extending from New York to Boston, during the magnetic storm of July 16th, 1892, which showed that the abnormal current in the wire reached the strength of 133 milliamperes, and the maximum difference of potential of the earth at New York and Boston was 492 volts—such a high voltage had not been observed during any previous storm. A wire can be worked during a magnetic storm by disconnecting the ground at each end and substituting a wire return instead, thus forming a metallic circuit. I beg here to state that a quadruplex circuit

arranged with a metallic return was successfully worked by the Canadian Pacific Telegraph Company between Toronto and Montreal during the magnetic storm of last year.

The foregoing mentions only a small portion of the troubles to which telegraph circuits are subject; to enumerate all would occupy much space and time.

In conclusion I beg to mention a few conditions which, when complied with, have a tendency to prevent trouble to a great extent. The line should be constructed in a substantial manner, only first-class material being used. Poles should be sufficiently stout in proportion to their height, set well in the ground, placed close enough together to render the spans not too long, so as to well support the wires and to prevent them from crossing. At corners the stretchers should be much shorter, the poles well braced or guyed, double cross-armed and straight grained pins used. The wires should be stretched tight and the joints soldered. At crossings of other lines it is best to go above them, but if this cannot be conveniently done, the wires in passing underneath should have a good clearance and be protected by guard wires to prevent other wires from falling on them. At a low point in the line where there is an upward strain the pins should be nailed in, and loops or hooks secured to cross arm over each wire so as to catch it in case it should raise through an insulator coming off the pin or a tie-wire breaking.

All limbs of trees liable to come in contact with the wires should be removed. Special attention should be given to the wires in cities and towns to guard against crosses with electric light or railway circuits. Office cut-outs and switch-boards should be provided with lightning arresters, and the wires where they enter terminal offices be supplied with automatic line-openers to act in case a cross with an electric or trolley wire occurs. For inside wiring it is preferable to use water-proof insulated wire, but if paraffined cotton covered wire be used, it should not be laid in grooved boards, but secured by cleats and placed where it will be free from moisture, and where the insulated covering cannot become abraded. The batteries should be placed in a dry place easy of access for frequent examination. Binding screws should be examined occasionally to see that they do not work loose. A vigilant and industrious lineman will prevent the occurrence of much trouble by frequent and careful examination of the lines in his charge, making repairs promptly when required and keeping the lines generally in such shape that the apparent liability of their becoming interrupted is reduced to the minimum.

JUDGING by the remarks of some of the speakers at the electrical convention in Toronto, there appears to be quite a misapprehension about the position of the engineering department of McGill University, Montreal. There was an impression that McGill provided a mere workshop course, but the fact is that though the workshop at McGill is very complete, it is provided to enable students to attain enough mechanical skill to apply themselves to the higher branches of engineering skill, in which the remarkably complete listing machines came into play. Regarding this listing outfit of McGill it may not be out of place to say that the best engineering authorities who have visited the new engineering hall of McGill say it is not only unsurpassed in America, but is unequalled by any institution in the world.

ALTHOUGH we may never know what electricity really is any more than we now know what is life or the force of gravity, might we not, at the present Electrical Congress, plant a milestone in the progress of science by stating what we, at the present time, think it is, says the *Electrical World*. While no decree of these savants could compel an acceptance of their conclusions in regard to a subject of which the wisest will confess himself ignorant, still a formulation of the ideas now held by the advanced thinkers on the subject would go far toward lifting us to a new plane whence advancement might be easier. If, in addition to promulgating an opinion that most nearly coincides with the ideas of the majority, the reasons for upholding that opinion and rejecting others were to be given, we think a distinct advance would have been made, and that it would throw some light upon the question as to where we stand to-day. It would give, at least, a datum point from which to work, and this really is the foundation of all science.

## Electric Glashes.

COLLINGWOOD, Ont., wants an electric street railway.

PEMBROKE, Ont., now has an all-night electric light service.

THE beet-sugar refinery at Berthier, Que., is now lit by electricity.

THE street railway track is being extended on St. Denis street, Montreal.

THE Carleton Place, Ont., Electric Light Co. has put in a new engine of 100 h.p.

THE Bell Telephone Co. are putting up another line between Stanstead and Coaticook.

BRACEBRIDGE, Ont., will spend \$25,000 putting in waterworks and an electric light plant.

THE *Guelph Herald* of the 20th Oct. was the first paper in that city the product of electricity.

THE Bell telephone is being extended from Dothwell to Mosside and Aberfeldy.—*St. Thomas Journal*.

A GERMAN has taken out a patent for a process for producing varnish from linseed by means of an electric current.

THE Smith's Falls Electric Light and Power Co. have developed satisfactorily the water power at Sly's Rapids.

THE mileage charge fixed for the H., G. & B. electric railway has been fixed at \$300, to come into operation ten years from now.

THE cars for the London West electric street railway have been delivered. The village council celebrated the opening of the line.

THE pulp mills at Milton and New Germany, N.S., are to be lit by electricity. F. Hutchinson, of Liverpool, N.S., has the contract.

WATERLOO, Que., will be lighted by electricity. W. H. Frost has contracted to supply 40 lights of 32 c. p. each, at a cost of \$400 per year.

PLANS are being prepared for the new power house for the electric street railway, in connection with the Winnipeg Gas and Electric Light Co.

CONROY'S mills, says the *Ottawa Journal*, will be supplied with a system of electric cars for the lumber yards, replacing the horse trucks now in use.

THE Hochelaga Cotton Mfg. Co. and the Dominion Blanket Co. have equipped their mills with electric light, the former with 160 and the latter a 400 light plant.

A PUBLIC meeting will be held at Buckingham, Que., on the 15th inst., to discuss the adoption of electric light and other improvements to the amount of \$25,000.

THE officers elected for the Montreal Park and Island Electric Railroad Company are as follows: President, Louis Beaubien; superintendent, J. R. Thibeau; treasurer, R. L. Gault, and secretary, M. Perrault.

THE Waterloo (Que.) Chair Factory is putting in electric light. J. CAMPBELL, of Kingston has placed a system of electric heating in his house.

LETHBRIDGE, Alberta, has been supplied with a 500-light electric light plant.

MEMBERS of some of the churches of Hamilton are petitioning for Sunday cars.

THE Government are asked to provide electric light plant for the Kingston dry dock.

WORK on the new electric railway from Toronto to Richmond Hill is going on rapidly.

THE new electric light plant at New Westminster, B.C., is now in good working order.

A LAUNDRY at Lauter, Germany, has been equipped with electrically heated flat-irons.

A PRIVATE company is being formed at New Denver, B.C., to erect a telephone line to that place.

IT has been decided to exempt the Truro, N.S., Electric Street Railway Co. from taxation for a term of ten years.

THERE is talk of running an electric railway between the C. & E. railway station at Edmonton and the town.

ONE of the competing electric light companies at Smith's Falls, Ont., is advertising 30 lights for \$35 per year.

THE capital of the Citizens' Light and Power Company of Montreal is being increased from \$100,000 to \$200,000.

EDISON has been experimenting on an electrical iron ore concentrator which is expected to greatly cheapen the cost of pig-iron.

THE Hamilton Times says that a water service on James st. was recently found to have been completely eaten out by electrolysis.

THE Nova Scotia Power Co. have applied for permission to erect poles and string wire for operating an electric street railway in St. John, N.B.

THE Moncton, N.B., Telephone Co. are constructing a long-distance telephone to connect Fredericton, St. John and Halifax with intervening points.

THE Bell Telephone Company have purchased the line put up last year by French Bros. at Bishop's Crossing, Que., and are repairing and extending it.

THE Selkirk electric street railway is negotiating with the Winnipeg electric street railway for the early completion of the line between Selkirk and Winnipeg.

A. J. CORRIVEAU has obtained right of way for the Park and Island Railway Co., Montreal, on the St. Laurent public roads. This means an uninterrupted route to Sault au Recollet.

THE New Westminster Telephone Co. have purchased the Westminster and Ladner's telegraph line, and will use it in connection with their telephone business.

THE Richmond (Que.) County Electric Company offer to light the town for a sum of \$11,000 cash for ninety-nine years, giving as security a first mortgage on their property and plant.

WORK has begun upon the Toronto and Richmond Hill electric railway. The route of the new line will be along Davenport road and Spadina road, then to Forest Hill and Bedford Park.

NEW WESTMINSTER and Vancouver Tramway Co. also have provided their power house with a complete system of fire protection, which was strongly endorsed by the fire underwriters at a recent inspection.

THE Insane Asylum buildings at Mimico are to be fitted up with electric light. Bennet & Wright, engineers and contractors, Toronto, have the contract, and the motors used will be the Eddy, or which this firm are sole agents in Canada.

THOS FORRESTER, 118 St. James St., Montreal, informs us that the following Electric Light Companies are using his New Special Alloy Wire Gauge Dynamo Brush - Temple Electric Co., Montreal; St. Jean Baptiste Electric Co., Montreal; Standard Electric Co., Ottawa, and the Kay Electric Co., Hamilton.

THE new Montreal Board of Trade building has hitherto been supplied with electric light from the Royal Electric Co. but the committee have decided to put in their own lighting plant. One engine is already installed and two others are being put in. These engines, which are built by the Robb-Armstrong Co., of Truro, N.S., are 160 horse power in all, and will have a capacity for running about 1,200 incandescent lights, of which 900 are now in use. The work is being done under the direction of John J. York, the superintendent.

KAMLOOPS has deferred its electric street lighting owing to lack of funds.

THE Great Northern Railway is about to run a telegraph line from Vancouver to Liverpool.

THE Edmonton Electric Light Co. are going to replace their dynamo with a new and larger one, with a capacity of 2,000 lamps.

THE Galt & Preston Street Railway Co. will adopt the electric system, and at the same time have as an adjunct a steam motor for use in winter.

THE following have been appointed officers of the St. Johns (Que.) Electric Light Co.: President, J. B. Tresidder, vice-president, H. St. Mars.

THE Kay Electric Works, of Hamilton, are putting in an electric elevator at Hoodless' furniture factory in that city, and a 50-light electric plant in Lawrie's pork factory.

FREDERICTON, N.B., city council has accepted the Fredericton Electric Light Company's tender to light the city. The contract is for ten years, for fifty 1200 candle power arc lights, at \$2,750 per year.

THE amalgamated Vancouver Electric Railway and Light and the Westminster & Vancouver Tramway Companies, under the name of the Vancouver & Westminster Electric Tramway and Light Company, are applying for incorporation, with a capital of \$2,500,000.

THE Royal Electric Company of Montreal have broken ground for a new boiler house and engine room. The boiler house is 96 ft. square, and the engine room 58 x 96 ft. The new buildings, which are situate in the rear of the power house, will be finished early in the spring.

MONTREAL street railway cars are likely soon to be supplied with a new electric brake, the invention of Mr. Bremner, the company's electrical engineer. Power to operate this brake is generated by the motion of the wheels, and it is said that the faster the car is going the sooner it can be stopped.

IN the case of Rev. Mr. Botterill, who was run over and killed by an electric car, in Montreal, on the 26th Oct., the coroner's jury condemned the company for exceeding the speed allowed by law, for not providing cars with proper fenders, and for not paying their men adequately for their work.

THE fire which started in the Sussex street bridge, Ottawa, recently is ascribed to a leak in the gas-pipe caused by an electric current from trolley lines. The point where the iron gas-pipe melted is within three inches of an iron girder, which rests on non-conductors, and is charged from an improperly grounded rail.

THE trustees of the bondholders of the St. John City, N.B., Electric Street Railway Co. have applied for the appointment of a receiver. This is owing to a difficulty in transferring the bonds to the electric company which has been formed to consolidate the railway company with two other electric companies.

C. W. HENDERSON, manufacturer and dealer in electrical supplies, 44 Bleury street, Montreal, reports business very active. Since Mr. Henderson started three or four years ago on a very small scale, he has made rapid progress and now has a fine establishment well stocked with electrical goods of every description.

RECENTLY an electric light dynamo was put in the Grand Central Hotel to light that building, James Robertson's and other buildings at St. John, N.B. As the permission of city council to erect poles and string wires had not been obtained, the city engineer has ordered them to be pulled down unless it can be obtained at once.

THE Consolidated Electric Company, St. John, N.B., have just had constructed a geared duplex pump, to be used with a condenser by means of which the exhaust steam from the engines will be condensed and used again. The pump weighs six tons and furnishes a flow of 1,500 gallons of water per minute. It is connected with the harbor by means of a large copper pipe with a strainer at its end. Through this the water is lifted by the pump and forced through a pipe to the condenser. It is operated by a 30-horse power dynamo.

THE partnership hitherto carried on by John M. Harrison and H. A. Seyler, as the Montreal Electrical Supply Co., has been dissolved, and a new partnership formed consisting of the gentlemen named and John Dunlop Caldwell. Mr. Caldwell was for some time connected with an electrical firm in the old country, and brings with him valuable experience acquired. The new firm now being composed altogether of practical men, will now have increased facilities for coping with any orders given them, and they are prepared to start in the manufacture of some electrical specialties.



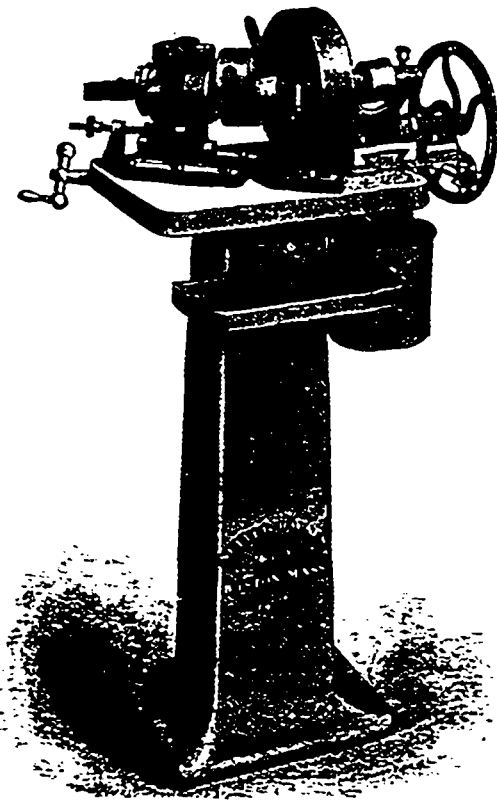
THE Westinghouse Company have the contract for the Niagara Falls electric power transmission plant. The system adopted involves the use of a two-phase current with a frequency of twenty-five periods per second, generated at a voltage of ten thousand, and the use of transformers for long-distance transmission at higher tension.

A SAD occurrence took place one day last month, when the Rev Edmund Botterell, of Montreal, was knocked down and instantly killed by an electric car on St. Catherine street. The deceased gentleman was nearly 82 years of age, and was somewhat deaf, and this, no doubt, was the cause of the terrible accident.

THOMAS FORRESTER, 118 St. James St., Montreal, has been appointed agent in Canada for the North British Wire Manf'g Co., of Glasgow, manufacturers of a well known make of dynamo brushes in general use in the Old Country, and which have given every satisfaction as far as they have been introduced in Canada. Mr. Forrester will give particulars of these brushes to all operators of electric light plants who are interested. Some strong points are claimed for this style of brush.

#### IMPROVED TWIST-DRILL GRINDER.

The engraving shown herewith illustrates a machine for sharpening twist or fluted drills, of any size from  $\frac{3}{8}$  to  $1\frac{1}{2}$  inclusive. It is simple and easy to adjust, and after a little practice can be quickly operated. The grinding wheel is 7 inches in diameter, and has a reciprocating movement of  $\frac{3}{4}$  of an inch, which gives a uniform wear to the wheel. It is run in a close case and supplied with water from a pump which works automatically. The frame on which the wheel is mounted has a swivel motion by which almost any desired angle can be obtained.



The makers of this machine, Robt. Gardner & Son, Montreal, claim that they do not depend on the chuck to hold the drill central, as the drill is supported at or near the point by a side guide-rest while being ground, which insures its being ground true and central from the outside. The drill being placed in the chuck and set to a gauge so as to bring the cutting-lips in a proper position with the eccentric, it is fastened to the chuck-jaws, and the chuck and eccentric sleeve are locked together; they are then rotated bodily on the guide-rest by a gear and worm worked by hand, and as the drill rises and falls on the rest, at the same time it receives a motion which gives a proper clearance to the back of the drill. As soon as the lip operated on is properly ground, the gauge on the screw should be set and the drill drawn from the wheel, the chuck sleeve and eccentric should be unlocked and the chuck turned half around by means of an index. This movement brings the other lip of the drill in position to be ground. The wheel should run 2,700 revolutions per minute.

#### CANADIAN ASSOCIATION OF STATIONARY ENGINEERS.

A NEW BRANCH FORMED AT KINGSTON.

On Tuesday evening, October 24th, at 7:30 p.m., a branch of the Canadian Association of Stationary Engineers was organized in the city of Kingston. There has been, for a year previous, a small association of engineers in Kingston, but it had no connection with the Canadian Association of Stationary Engineers. On Monday, October 23rd, a notice was put in the Kingston daily papers, inviting all engineers who were desirous of forming a branch of the Canadian Association of Stationary Engineers to attend a meeting in Engineers' Hall, over No. 1 Fire Department, at 7:30 p.m. At this meeting thirty engineers of Kingston put in an appearance.

After the meeting had been called to order by the secretary, Bro. James Devlin, chief engineer at the Penitentiary, was requested to take the chair. President Devlin then called on Bro. A. E. Edkins, Provincial Deputy, to address the meeting. In the course of his remarks, Bro. Edkins outlined the general work which the association was doing among the stationary engineers of Canada. He maintained that the object of the Association was not only to help its members and make them better both as men and engineers, but it was the desire of the members also to give the steam users who employed them the best possible results in the generation and utilization of steam in everyday work. With this end in view, it was decided when the Canadian Association of Stationary Engineers was first organized that it should be an educational affair entirely, and the results of the meetings, discussions and work generally of the different associations have proved beyond a doubt that such was the only proper course to pursue. Bro. Edkins advised his hearers (in the event of an association being organized) to pay strict attention to educating and helping each other over and above anything else, as it was impossible to overestimate the good effects which must actually follow from a body of men in any trade or profession meeting together and discussing subjects relating to that business to which they had devoted their services for a livelihood. In the case of engineers especially, it must certainly increase a man's self-respect to a large degree, if he has a thorough knowledge of steam engines and boilers, etc. and the general laws and theories laid down for the proper handling of the same. There was no better way for engineers to obtain knowledge of that kind than for them to meet together often and discuss matters relating to their calling. Bro. Edkins then gave them a general outline of the manner in which other associations of Stationary Engineers were conducted, and answered quite a number of questions relating to the association, and concluded by thanking the engineers present for the kind manner in which they had received him, and he assured them that he regretted very much that, owing to the lack of time, he was unable to have had other members of the Executive Council with him from Montreal.

It was then decided to dissolve the Kingston Association of Engineers, and form a branch of the Canadian Association of Stationary Engineers, and apply for a charter at once. All engineers who were desirous of becoming members of the new association were requested to sign their names and pay the fee. Twenty-five complied with the request.

Election of officers was then proceeded with, resulting as follows:

President—James Devlin, Chief Engineer Kingston Penitentiary.

Vice-President—H. Youlden, Chief Fire Department.

Secretary—A. Strong, Chief Engineer Dominion Cotton Mills Company.

Treasurer—H. Hoppins.

Conductor—J. Loughrane.

Doorkeeper—J. Gascoigne.

The officers were then initiated and installed by Bro. Edkins, and the members were then introduced and initiated. The President, Bro. J. Devlin, then declared a recess of 15 minutes in order that the members might get better acquainted. On the meeting being called to order again, it was resolved that a hearty vote of thanks be tendered to Prov. Dep. Bro. Edkins for the kind interest he had taken in the organization of the Kingston Association. Bro. Edkins replied, thanking them for their kindness, and assuring them that he would be glad at any time to be in a position to help along so worthy an organization. A vote of thanks was also tendered to Bro. H. Gilmour for his excellent services as secretary of the late Kingston Association, of which he was a devoted member. Bro. H. Gilmour replied in his usual happy manner.

President J. Devlin then addressed the members, asking them



to give him their best support in making No. 10 an association of which the Canadian Association of Stationary Engineers might be proud. It was decided that the nights of meeting be on the 2nd and 4th Tuesday of each month, in Engineers' Hall, over No. 1 Fire Station

Any members of the Canadian Association of Stationary Engineers are cordially invited, when in Kingston, to call on Bro. R. King, chief engineer Heat, Light and Power Co., or Anthony Strong, chief engineer Dominion Cotton Mills Co., or any other members of the Association. If they want to see President Devlin they must "do time in the Kingston Penitentiary."

The Canadian Association of Stationary Engineers, Toronto No. 1, held their regular meeting on Oct. 13. President Phillips in the chair. Most of the ordinary business was laid over till the next meeting night, with the exception of correspondence and the appointing of a committee to arrange for the annual supper to be held on the eve of Thanksgiving Day. The event of the evening was the reading of a paper by Chas. Heal of the high level pumping station entitled "Sundry Notes on Heat." After the reading of the paper, which will be found elsewhere, a most animated discussion took place on it, in which Bros. Wickens, Heal, Edkins, Phillips, Mooring, Fowler and others exchanged their ideas on heat. Bro. Wickens promised a paper for the first meeting in November, which will be an open meeting.

It is expected that by the end of this month a new branch of the Canadian Association of Stationary Engineers will be formed in Sherbrooke, and one is contemplated by the engineers in Three Rivers.

The meetings of Montreal No. 1 have been well attended during the last month, a great many questions having been presented and worked off on the blackboard. Two members have been initiated and applications received for two more. The progress of the association since going into the new hall has been something remarkable. The furniture purchased last spring at a cost of \$200 is almost paid for, and that has been done without touching the funds in the bank. The souvenir committee have about closed up and will make their final report next meeting, which will show a clear profit of \$300, after paying all expenses, convention included. The compliments showered on the souvenir committee by the members and others since the result was made known have been many. At the last meeting Exec. Pres. Hunt, who had just returned from the World's Fair, gave the members a very pleasant and instructive description of all he saw, and at the close was tendered a hearty vote of thanks.

#### JOHN J. YORK.

John J. York, the executive secretary to the Canadian Association of Stationary Engineers for the current year, was born in 1861 at L'Acadie, a village about thirty miles south of Montreal. At the age of 13 he was apprenticed to Prowse Bros., steam and hot water fitters, etc., Montreal. With that firm he advanced rapidly, and at the age of 19 was given the charge of some large contracts which he successfully carried through. After being for a short time with John Date and other firms, he secured a position in the machine shop of the St. Lawrence Sugar Refining Co., where, after some four years, he undertook the charge of the entire plant, under the chief engineer. He remained with this company until last year, when, his health becoming indifferent, he decided to leave, though his salary had, not long before, been substantially raised without solicitation on his part. His departure was a matter of regret to all, and the employees under him showed their appreciation of him by the presentation of a fine illuminated address, which occupies a prominent place in his home to this day. He then accepted a position with Garth & Co., founders and heating contractors, as outside foreman, and in this capacity he took charge of the sanitary and heating work in the new Board of Trade building. Upon the completion of the preliminary work connected with this, he was appointed superintendent of the same, a position he holds at the present time. Mr. York is not only a practical engineer and mechanic, but is an electrician also, and he has more than once re-wound arc and incandescent light machines himself. He holds a first-class license from the city. From the time he joined the Montreal No. 1 Branch of the Association of Stationary Engineers, he has always been an active member of that body, and was offered the post of president six months after his initiation, he however refusing. He is now secretary and is a member of all the committees on the list. A portrait of Mr. York, taken by R. Summerhayes, of Montreal, appeared in our September issue.

#### PAST-PRESIDENT EDKINS.

Albert E. Edkins, who has just completed his term of office as president of the Association for which he has done so much—the Canadian Association of Stationary Engineers—was born near Stratford on Avon, Warwickshire, England. He was educated at the Abbey Grammar School, Alcester, and having exhibited early in life a great love for machinery, was apprenticed in the shops of T. R. Part & Co., Wigan. After a time he had a longing for "pastures new," and decided to come to Canada. This he did in 1880. He soon found employment with Messrs. Heintzman & Co., of Toronto, at which city he has made his home. Leaving this firm, he engaged with Messrs. A. F. Manning & Co. as engineer in charge of pumping machines on government public works, for a term of four years.

His next employers were R. G. Reid & Co. on the new Lachine Bridge, where he took charge of an electric light plant, which, by the way, was the first in Canada to be run under water. From there, Mr. Edkins went to Lambton Mills on the C. P. R. construction work. At the completion of work there, he returned to A. F. Manning & Co. for a while. After that, he was employed for some time as engineer to the Lambton Woolen Mills, and afterwards to the Pure Gold Manufacturing Co. (A. Jardine & Co.), Toronto, the generosity of which firm he remembers to this day. For the following two years he was the chief engineer of Messrs. T. Eaton & Co.'s steam and electric light plant in Toronto. He then left that firm to fill the position he now occupies, as inspector to the Inspection and Insurance Company of Canada. Mr. Edkins has always identified himself very closely with the interests of the Canadian Association of Stationary Engineers, and has labored long and energetically in order to increase its well-being and its usefulness. Indeed, next to those of his employers, the interests of the C. A. S. E. have always occupied in his mind the foremost place. He has occupied in that association the positions of secretary, vice-president, and president (two years) of Toronto No. 1, and (in the executive council) the offices of secretary and president, he being now a past-president. At the present time, also, he is president of the Ontario Association of Stationary Engineers. We may mention that Mr. Edkins in 1888 married Miss Emily Butcher, of Toronto, and has one child living.

#### CANADIAN SOCIETY OF CIVIL ENGINEERS.

The first meeting of the Canadian Society of Civil Engineers took place in their rooms at Montreal, on Thursday, October 12th, Mr. MacPherson, member of council, being in the chair. There was a good attendance. In connection with the nomination of officers for the coming year, the following ticket was presented by the Committee of Nomination:—

President—P. A. Peterson.

Vice-Presidents—H. Wallis, Alan Macdougall, and P. W. St. George.

Treasurer—K. W. Blackwell.

Librarian—W. McNabb.

Secretary—Prof. McLeod.

Alan Macdougall read a paper on Domestic Sanitation.

The second meeting took place on October 26th, President E. P. Hannaford in the chair. The attendance was fair.

A draft report was submitted by the committee on professional status, in which the following suggestions were made: That land surveyors should be prevented from practising as civil engineers, unless they belong to the Canadian Society of Civil Engineers; that an appeal should be made in each province to have members of the Canadian Society of Civil Engineers recognized as professional men, with right to collect fees; that no practitioner shall be entitled to designate himself as a civil engineer unless he belongs to the Canadian Society of Civil Engineers.

A full discussion of these points was postponed till the next meeting.

A. S. Going then read a paper on the "Port Crescent Breakwater."

#### MECHANICAL ENGINEERS' ASSOCIATION.

Montreal, 6th Nov., 1893.

Editor CANADIAN ENGINEER:

SIR,—Your recent article referring to Mr. Hunt's idea of organizing a Mechanical Engineers' Association for Canada, is noted. I approve of the idea and will do all I can to assist Mr. Hunt in this undertaking.

Yours very truly,

J. A. GRENIER.

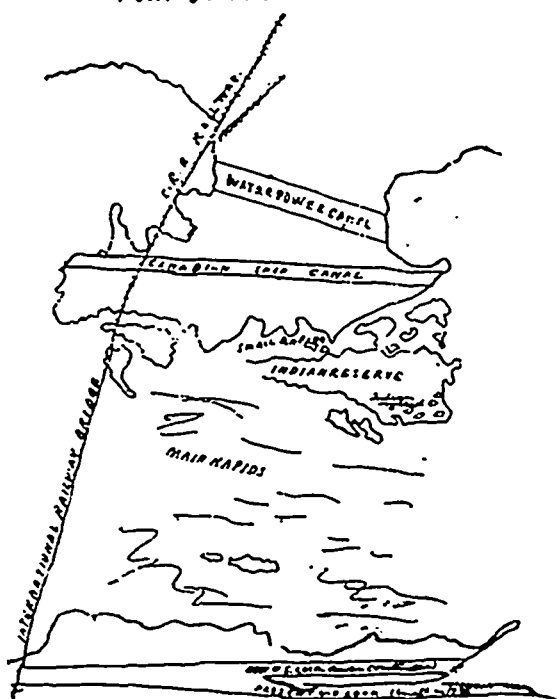
## THE SAULT STE. MARIE SHIP CANAL.

The River St. Mary, flowing a distance of sixty miles, carries the waters of Lake Superior into Lake Huron. It runs its noble course in varying width from about one hundred feet at one point to four miles at another, and forms in its main channel part of the international boundary. As it passes between the Canadian town of Sault Ste. Marie and the Michigan city of the same name, it rushes over a rocky bed in shallow rapids of half a mile in length, with a difference of nearly nineteen feet between the upper and lower levels. To overcome this impediment to navigation, there was built on the Michigan side a canal, which was completed in 1855. Another canal was built parallel and close to this and completed in 1881. In 1889, the United States Government commenced work on a new canal on the site of the one of 1855, now demolished to make room for the new one, which is likely to be finished next year. Our neighbors will then have two canals to accommodate the immense and growing traffic which now presses very hard on the canal of 1881, at present the only one in use.

The project of a Canadian Ship Canal has been suggested at different times, and as early as 1851 an attempt was made to form a company for its construction. This company did not become incorporated owing to the opposition of the late Sir Francis Hincks, then Prime Minister. The action of Sir Francis was made the subject of grave charges against him, which, however, were fully disproved on an investigation by a select committee of the Legislative Council in 1855. But even earlier than the time of Sir Francis, and earlier than anyone now living can remember, a canal and lock had actually been constructed and used on the Canadian side. No trace of this canal was visible until, when excavations were being made in May, 1889, for the water power canal, the timbers of the old canal were unearthed. It was built in 1797 by the North-West Company—in its time a rival of, but afterwards amalgamated with, the Hudson Bay Company—and was destroyed by the United States soldiers in the war of 1812. The curious reader can obtain fuller details of this canal at page 25 of the Canadian Archives of 1886.

The need of the Canadian Ship Canal has been specially felt on two memorable occasions. The first of these was when the United States Government refused to allow Sir Garnet Wolseley to go through the Michigan canal with the Canadian troops on their way to quell the first Riel rebellion. The other was during the canal toll excitement of last year. Every Canadian would have been better pleased if the Government had then been in a position of independence. It would have been so, and the Washington Treaty, too, would have been different in terms, if our ship canal had been built twenty years ago. Apart from these political considerations, however, the growth of Manitoba and the North-West and the consequent increase of lake traffic require the building of this work.

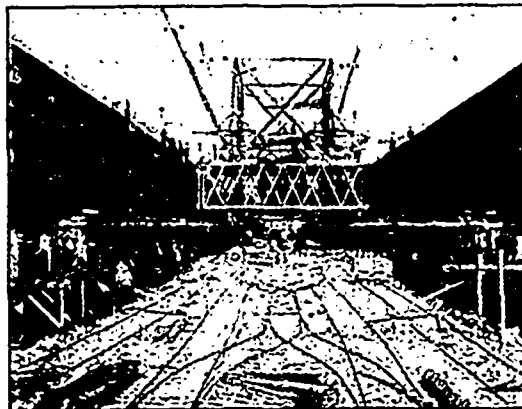
TOWN OF SAULT STE. MARIE, ONT.



Work was commenced on the 1st May, 1889, by Hugh Ryan & Co., the contractors. The whole of the work will be completed in the summer of 1894.

Before ground was broken, the neck of land shown in the map

was a wild and beautiful piece of nature. There were many small streams where the fishermen caught fine specimens of speckled trout, and plank bridges thrown across these streams afforded a means for the strolling tourist to reach the Indian fishing village, which is still on the banks of the main rapids. There are now left but two of the streams, the construction of the ship canal and of the water power canal having destroyed the others.



LOCK PIT WALLS.

The general formation of the ground consists of an upper stratum of sandy loam mixed with boulders, and below this red Potsdam sandstone of varying hardness. The work of excavation gives employment to about four hundred men on an average. The facing or cut stone comes from Amherstburg, while the backing stone comes from Meldrum Bay on Manitoulin Island. The quarrying of the stone gives employment to upwards of two hundred men in the two quarries, and a fleet of vessels is required for the transportation of the material. It takes about two hundred stone cutters and masons to do the work of the lock-pit walls. There are also numerous machinists, carpenters, etc., and no fewer than eighteen blacksmiths. The magnitude of the operations being carried on may be better conceived from the statement that there are fifty-three teams of horses and ten miles of railroad track. The bottom of the canal is now like a railway yard, and is a scene of constant activity; tram cars, carrying stone and concrete, being constantly moved and switched.

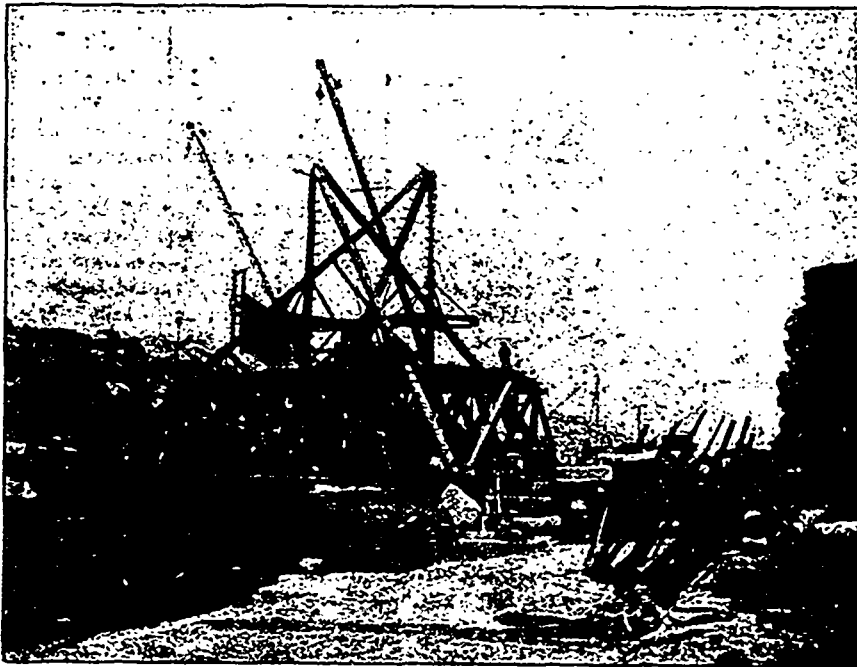
The stone is all brought to this railway yard and hoisted by three travelling derricks stationed at points convenient for the work as it progresses. These derricks are each built on a truss reaching from one wall to the other, and carried on a track of a gauge of forty-eight feet six inches. The walls on which these derricks rest are the walls of the culvert, the bottom of which is twelve feet below the bottom of the lock wall. They project below the lock-pit, thus making a channel under the basin or floor of the lock: a narrower channel will be used for culverts to convey the water into and out of the lock. After the masonry is completed and the derricks are taken away, a timber covering will rest on the walls, which project as above described. The derricks are so built that they have hoisted the stones that are laid in the lowest course, and will hoist the coping stones, which will lie on top, forty-four and one-half feet higher. Each derrick has four masts, two for each wall. The engine on each derrick drives five sets of drums, four being for hoisting and the fifth for locomotion of the derrick on the tracks.

The various pieces of machinery for hoisting, pumping, drilling, stone-crushing and other purposes require a large amount of power. Water-power has been utilized, and one thousand horse-power obtained. This both drives the air compressor and transmits power by cable to various machines on the work. The compressor is here used for the first time in Canada on a public work, though it is also used, I believe, in mining. The great merit of air compression is that the power can be transmitted a long distance without loss, unless by a possible leakage. On this work it is used for some of the rock drills and hoisting derricks. Others of these drills and derricks are driven by steam-power. The total number of derricks is forty. The cable runs the pumping engine which keeps the big ditch dry, and also transmits power to a stone-crusher 1,300 feet away. There are two stone-crushers, one with a capacity of fifteen or thirty tons per hour, and the other able to crush from twenty five to forty tons in the same time.

The work is mainly carried out for the contractors by one of the three members of the firm, Michael J. Haney, who is well known as a civil engineer. In the course of four years of construction but one man has been killed; his death was caused by the breaking of a derrick.

The length of the canal from water to water will be 3,700 feet. The masonry walls will be 1,106 feet on each side; the length between the gates will be 900 feet, and the width of the lock 60 feet. There will be but one lift to overcome the eighteen and three-quarters feet of fall between the upper and lower levels. There will be twenty-one feet of the water above the mitre sill, taking the lowest recorded water level. In this connection it is to be observed that the level of the water has a variation of about three feet in a season, and depends on the effect and direction of the wind. On the 2nd of August, 1883, after a wind storm, the water was three inches from the top of the wall in the Michigan Canal; it is usually five feet below this.

The filling and emptying of the lock will be accomplished by means of the four culverts beneath the floor of the lock. In this floor there will be 152 openings through which the water will flow up or down as may be required. The old way of letting water through a sliding valve in the gate itself or through the walls around the gates was found objectionable, for the reason that the force of water driving the boats to the lower gates and breaking their lines, often causes damage to both boats and lock. This will be avoided by the method to be adopted, as the boats will be lifted rather than shoved.



A TRAVELLING DERRICK.

There are to be three sets of gates at the eastern or lower end; one is to be a guard gate, and will be used only when it is wanted to empty the lock for repairs. Of the other two gates, one is a spare set to be used in case of accident to the other, which will be the outer gate and in constant use. At the west end there will be a main gate and a guard gate.

The width of the walls will be eleven feet at the top and twenty feet at the bottom, but there will be a uniform width around the gates of twenty-five feet carried the whole way up. There will be altogether seventy-five thousand cubic yards of masonry in the work.

The manner of opening and closing the gates will be by electricity. This power will be generated from the water power. The water will be supplied by means of a pipe running back of one of the walls, and turbine wheels will be used.

There have been a great many changes in the design of the canal and lock since the plans and specifications were first made, but in the main, the plans are those of the late John Page, who was chief engineer of the Public Works Department at Ottawa. The resident engineer in charge on behalf of the Dominion Government is W. J. Thompson.—*J. J. Kehoe, in Canadian Magazine.*

#### TO CORRESPONDENTS.

G. T. M., RED ROCK, ONT.—There are many books published on engineering. Which branch are you interested in—civil, sanitary, electrical, stationary, or mechanical? On hearing from you we shall be pleased to give you titles of some works.

E. D.—We are sending you the names of makers of slate quarrying machinery, and shall be glad to hear your quarry is a success.

#### THE EXHIBIT OF FRIED. KRUPP.

Perhaps the most wonderful of all the exhibits at the World's Fair has been that at Krupp's Pavilion. The main hall of this building is 197 feet long by 82 feet wide and 43 feet high, and the entrance hall 137 feet by 24 feet. From the exhibition catalogue, for a copy of which we are indebted to Jas. W. Pyke & Co., Montreal, the representatives of the firm for Canada, the enormous extent of this exhibit at Chicago may be estimated from the fact that a bare enumeration of its items occupies 210 of its pages. Besides this, it contains several well-executed diagrams and an appendix. The larger portion is occupied by descriptions of guns, together with ballistic data and information regarding projectiles and armor-plates. Interspersed with the descriptions of guns, gun-carriages, etc., are diagrams, showing at a glance the average number of hits made at a distance of 2,000 or 2,500 metres. Other portions of the catalogue are devoted to forgings, castings, articles of steel pressed in dies, tires and wheels. In the last-mentioned department are bogies and springs, sets of wheels, etc., made by Krupp and used in constructing the cars and engines shown in the transportation department.

Under Section G there are various articles indicated, such as hoisting shears, field railway plant, rolling machines, etc. A very interesting portion of this wonderfully complete catalogue consists of statistical data concerning the firm and its works. From this we see that in the cast-steel works at Essen the average amount of coal and coke used per working day is 2,410 tons, and that in the outlying works and in their steamers the annual amount is 530,276 tons. The list of departments of the Essen Works alone occupies nearly four pages, and besides these there are coal and iron mines, dwellings and hospitals for workmen, iron works at various places, etc., etc. There are also some historical data concerning the personnel of the firm, and from this we see that Peter Frederick Krupp, the founder of the firm, was born in 1787, that it was established in 1810, and that in 1847 was turned out the first finished piece of artillery in cast steel. The catalogue, which, by the way, is an admirable example of the printer's art, is further embellished by a series of plans of the various exhibits as they are placed at the World's Fair.

#### PROGRESS IN OFFICE FITTINGS.

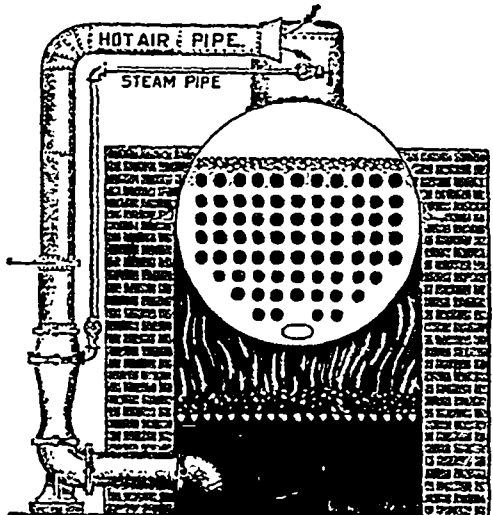
There is little excuse for a man to have an untidy or ill-kept office, with the convenient desks and other appliances that have come into use within the last ten or twenty years. A representative of THE CANADIAN ENGINEER, on looking over the show-rooms of the Canadian Office and School Furniture Company Co., of Preston, was struck with the conviction that it should be almost impossible for a man to have a slovenly office with an outfit such as this firm can furnish. To be fitted out by their desks and office furnishings must indeed be a temptation for any man starting business. Mr. Stahl Schmidt, the founder of this business, may be called the king of office furniture manufacturers. This position he has gained not only because of his numerous inventions and improvements in school, bank and office furniture, but because of the special machinery he has developed for producing these goods and for the quality of the work invariably turned out. The writer believes he is safe in saying that in all the work turned out from this factory, not a single piece of really defective furniture has ever been received by a purchaser. The Preston furniture factory is a model of its kind, and all parts of the furniture are made by machinery, so that imperfect work is almost an impossibility. The wood-working department of the factory is fitted with large tubes through which the dust and shavings are drawn from the air and good ventilation is insured. The engine-room has recently been provided with a feed-water heater of a new type, which purifies the water and prevents scale from forming in the water. The factory is lighted by electric light produced from its own dynamo, and has recently been fitted throughout with automatic sprinklers. Water is supplied to the works by a Northey pump with a capacity of 800 gallons a

minute. Among the banks which this company are now fitting up are the banks at Pembroke and Smith's Falls. It may not be generally known that for some time this company have had a reputation beyond the confines of the Dominion, and have shipped goods regularly to Great Britain and some of the colonies. They have just fitted up the Commercial Bank of St. John's, Nfld. The selling agents in Toronto for this company are the Toronto Furniture Supply Co, King street west, who are this month opening up an office in Montreal in the premises occupied by the late Henry Nightingale, 7 to 11 St. John street.

ONE of the finest exhibits at the Montreal Exhibition was the one made by Robin & Sadler, Montreal, who showed what is said to be the widest leather belt in use in the world. It is 53 inches wide. Another interesting oak tan belt was that made for the St. Jean Baptiste Electric Light Company, 125 feet in length and 46 inches wide. This firm also exhibited a belt oil or dressing which, by rendering the leather soft and pliable, goes a long way towards causing it to come in close contact with the pulley, without saturating it with greasy gum. This firm was also well represented at the Toronto Exhibition.

**EARLE'S STEAM AND AIR INJECTORS AND EXHAUSTERS.**

A new invention, which should be of interest to engineers, firemen, and all interested in steam plants, is Earle's Steam and Air Injectors, Exhausters, etc. Fig. 1 shows the machine (Combined Air Injector and Exhauster) set in the side wall of a brick set tubular boiler, with the air pipe running over the top of boiler to take



the hot air and inject it underneath the grate bars. The ash-pit doors are hermetically closed, and no air is admitted to the furnace except that supplied by the machine. The commingled steam and air promotes better combustion than the air alone, and has a beneficial effect on the grate bars. These machines are being extensively used throughout the Dominion, as well as in the United States. They make very little noise in working, and have many advantages over fans and other devices, and are of great service where there is poor chimney draught and for waterworks. They are of special benefit when the fire has been cleaned and the steam dropped, as they will cause the steam to run up on the gauge at once. They are independent of machinery, and are of great service on boilers used for steam heating buildings. With them the waste coal, screenings, etc., can be used, thereby making a great saving in the cost of fuel, which is of great importance, as economy in fuel is of the utmost importance to the engineer as well as the proprietor

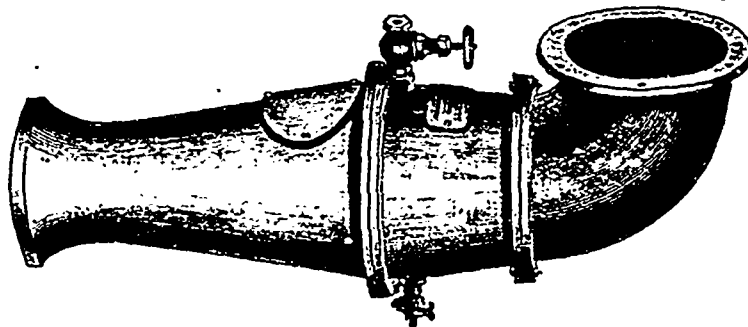


FIG. 2.—HORIZONTAL COMBINED AIR INJECTOR AND EXHAUSTER.

These machines can be arranged to suit any style of boiler, and will be found an excellent machine for removing the vapor from drying rolls in woolen mills, paper mills, etc., working gas, producers making fuel, gas, etc.



FIG. 3 — UPRIGHT COMBINED AIR INJECTOR AND EXHAUSTER

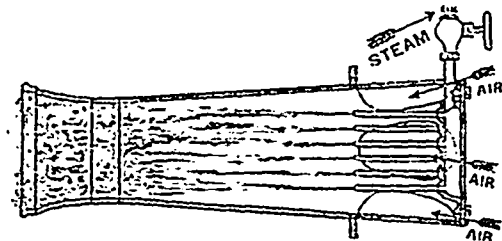


FIG. 4.

SECTIONAL VIEW OF STEAM AND AIR INJECTOR.—These machines are made to give a good, strong blast, and make very little noise in operation; and where little room can be spared, they can be used without any trouble, as they project out from the boiler only eight inches. The steam nozzles, in all the machines, are made of brass, and are arranged so they can be readily and easily examined. For fuller description, any one addressing the patentee and manufacturer, S. R. Earle, Belleville, Ont., or 110 North Fitzhugh St., Rochester, N.Y., will be furnished illustrated catalogue.

It will interest our readers to know that this invention, the product of a Canadian brain, was shown at the World's Fair, where it not only attracted a great deal of attention from American engineers, but carried off the diploma awarded for such appliances.

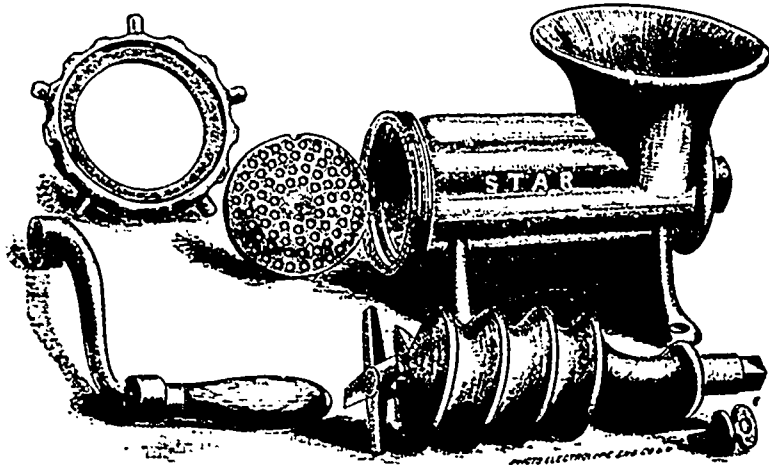
**A PROSPEROUS ELECTRIC LIGHT COMPANY.**

It is less than six months since the St. Jean Baptiste Electric Light Company was formed, taking over the business of a private firm in the St. Jean Baptiste ward of Montreal. When the new company was formed, O. Morin was chosen president, and S. Z. Leboeuf general manager, and under their able auspices the company has made remarkable progress in the extension of their incandescent lighting work through the northern and central part of Montreal. The amount of this extension has, in fact, gone beyond their present capacity, and they are now increasing their power to keep up with this development. Three new engines of 500 h. p. each have been contracted for, and one of these has this month been installed. When these new engines are erected the company will have five in all, of an aggregate capacity of 1,750 horse power, and capable of running 17,500 lights. They will then have seven dynamos running, and all these improvements are to be completed this winter. The works of the company are situated at the corner of Rachel and Montain streets, where the company have a large block of land, to which they have added another piece of ground to be used at an early date in the erection of a power house to run independently of the lighting system. The smoke stack of the lighting house towers to a height of 126 feet, and the main engine room is 140x94 feet. The new dynamos

are of the well-known Westinghouse make, supplied by Ahearn & Soper, of Ottawa, under the superintendence of C. F. Medbury. The incandescent lighting system of this company is extending steadily and rapidly throughout Montreal, the light being reported as remarkably even.

#### STAR MEAT CHOPPER.

Wm. Butler, who has recently established himself in business at corner of James and Colborne sts., Hamilton, as a diemaker and machinist, is working up a good trade. We give a cut of the Star Meat Chopper, one of the many useful and novel articles which he manufactures. It is adapted for chopping, grinding, or mashing



any meat or vegetable quickly and uniformly fine. The parts are few and simple and may be taken apart and cleaned in a few seconds. The chopper and cylinder are combined, the latter containing the screw which carries the meat forward. A four-bladed steel knife is attached to the end of the screw, revolving with it. A steel plate perforated with small holes is held against the knife by a ring which regulates it.

#### EXHIBITION NOTES.

OUR notes of the late Exhibitions in Toronto and Montreal have been unavoidably crowded out in the last two issues, and, owing to press of other matter, are now given in greatly condensed form.

THE Canadian Mineral Wool Company were to the fore at both exhibitions with their celebrated mineral wool, engine packings and asbestos goods, their exhibit being the best in this line.

BENNETT & WRIGHT had at the Toronto Exhibition a very fine exhibit of sanitary and electrical appliances, including two or three of the famous Eddy motors for which they are the Canadian agents.

RICE LEWIS & SON (Ltd.) showed at Toronto a large pyramid tastefully formed of tools and hardware of all kinds. The size and variety of the exhibit made by this old established hardware firm formed a striking feature of the Machinery Hall.

T. W. NESS & Co. had at both Exhibitions a remarkably fine display of electrical machinery and appliances. A sample of every appliance and requisite used in electrical work was here displayed, and the Toronto exhibits especially were strikingly arranged.

THE Kay Electric Works, of Hamilton, whose name is already very familiar to our readers, exhibited at Toronto their dynamos and motors in operation, and their display attracted a great deal of favorable notice. The Kay motors have made great progress during the last few years in Canada, and are now used in every Province.

THE Canadian Office and School Furniture Co. were represented as usual with their office and school furniture. The exhibit of this firm was an ornament to the Toronto exhibition, and should have had a more prominent place than it had in the Main Building. More extended reference to this company's work will be found elsewhere.

THE Dodge Wood Split Pulley Co., Toronto, had a very fine exhibit of all kinds and styles of their wood split pulleys. They showed them in motion and in pyramids, power being supplied them by an illustration of their patent system of rope transmission. The same firm had a very creditable exhibit at Montreal, under the superintendence of their Montreal agents, Miller Brothers & Toms.

THE Garlock Packing Co. of Hamilton had a good display of their engine packings, which are rapidly becoming popular among engineers throughout Canada. In connection with exhibitions, it will interest our readers to know that the engine packings made by this company were used exclusively on the machinery at the World's Fair.

THE NORTHEY MFG Co. showed at Toronto some of the pumps for which that company are now so well known throughout Canada. This company, to cope with their increasing business, have built large new works near the subway in the West end of Toronto. These works contain a very complete equipment of machinery, which we hope to describe in an early issue of this journal.

ROBERT GARDNER & SON, the well-known machine tool makers, of Montreal, showed at the Montreal Exhibition a sample of their new taper-attachment lathe, which was recently described in THE CANADIAN ENGINEER. The authorities of the Engineering Department of McGill College were so impressed with the importance of the improvements shown in this lathe, that they purchased this exhibit to add to their unique outfit of modern engineers' tools.

WHIPPLE & COOPER is a name new in the engineering realm of Canada, but one which, we venture to say without fear of contradiction, will become widely and favorably known throughout the Dominion. This firm, whose works are in Hamilton, and who manufacture brass goods of all kinds and babbitt and other metal, had an exhibit which attracted a great deal of attention from machine men, and will no doubt do much to introduce their name to the trade.

THE Bell Telephone Co. of Canada was another exhibit of more than usual interest in the electrical line. All the newest appliances connected with telephone work were here shown, and these exhibits in themselves constituted an interesting history of recent developments in this branch of electricity. Among other features of this exhibit was a police patrol and fire alarm system. The variety and excellence of this exhibit was frequently commented on by visitors, the Lieut.-Governor, among others, paying the company a compliment upon their display.

JOHN BERTRAM & SONS, Dundas, Ont., exhibited at the Toronto Exhibition five machine tools of their latest and most improved design, consisting of a 6 ft. 24 x 24 in. iron planer, which is in operation, and judging from the manner in which it takes a half inch cut from a block of iron, it cannot be equalled for power and smooth operation. The feeding device, which is patented, can traverse the tool from zero up to half inch at each stroke. They also showed a shaping machine, 15 inch stroke, both it and the planer have the power transmitted to the tool by worm or tangent gearing, which has more power than ordinary gearing, and produces absolutely smooth planed surfaces. This firm also exhibited a standard gap lathe 12 ft. bed 24 in swing, having their latest improved saddle, which has very long bearing on the ways; the cones and driving gear are powerful. A milling machine with 24 inch table of the plain type is another tool represented, as also their justly famed 1 1/2 inch bolt cutter of the Acme pattern; this machine is the most perfect and durable cutter made; the dies, of which there are four for every size, have large caps bearing on steel surfaces; it has oil pump and tank for distribution to the dies. All the above machines are picked from their wareroom, but judging from the beautiful, smooth finish of the castings which compose their get up, they can well compare with the finest American built tools.

## Personal.

A. LAURIE, Forest, has sold his hardware business to D. C. McIntyre.

GEO. C. MEADER, superintendent of the Ingersoll Waterworks Co., has resigned and returned to Boston.

THE late John Morrisette, of Gillie & Morrisette, Cornwall, carried on the foundry business in that town for over 20 years.

DONALD KENNEDY, one of the best-known contractors in Guelph, Ont., was killed last month owing to the fall of a stone wall upon him.

P. EAGAN'S saw mill at Lac la Hache, B.C., which has just finished the sawing of 100,000 feet of lumber, will be removed to the 108 Mile-House.

A. D. BENJAMIN, hardware merchant, Toronto, has come into a large fortune by the death of his father in England.

R. SIMPSON, manager of Drummond Colliery, Westville, N.S., has accepted an important position at Lethbridge, N.W.T.

MCADAMS & HAMILTON, Kamloops, have the contract for building the new road between that town and the Horse Fly mines.

THOS. PINKMAN, Windsor, had his arm amputated as the result of an accident in McGregor's boiler works a week ago.

CECIL LITTLEBALES, of Hamilton, was severely injured last week by an explosion caused by dipping a damp ladle into a mass of molten lead.

ENGINEER SMELLIE has been surveying between Brockville and Morristown for the projectors of the talked-of international bridge.

JOSEPH LESSARD has been appointed inspector of factories for the district of Montreal, and chief inspector and president of all the inspectors in the province.

H. WILBEE, a relative of Mr. Ament, whose stove mill at Brussels was burnt lately, was killed by the falling of the dry-kiln which some workmen were tearing down.

ARENOT ANGSTROM, naval architect and constructing engineer to the Cleveland (O) Shipbuilding Co., has resigned, and has accepted the position of general manager to the Bertram Engine Works, Toronto.

JOHN BERTRAM, head of the firm of John Bertram & Sons, machine tool builders, Dundas, Ont., was on the train which suffered so in the Battle Creek accident. Providentially Mr. Bertram escaped injury.

LOUIS COSTE, Chief Engineer of the Department of Public Works, has returned from a trip to Europe, where he has been inspecting various docks, cement works, etc. He also investigated the methods in use there of creosoting wood for use in salt water.

WE are sorry to learn that Thos. Barber, son of Chas. Barber, proprietor of the Georgian Foundry, Meaford, has been the victim of a painful accident, by which he lost the fingers of his left hand and injured those of his right.

PROF. HOECH, Royal Prussian Engineer, of the German embassy, Washington, is in Canada studying our system of canals and waterways, and other public works. He has visited Toronto and Montreal, and attended the meeting of the civil engineers' society in the latter city.

WE notice that W. Y. Soper and T. Ahearn, of the well-known electrical firm of Ahearn & Soper, Ottawa, were present at the convention of the American Street Railway Association, held at Milwaukee last month. Mr Soper was elected one of the Executive Committee for the coming year.

THOMAS CAUDLEY, the oldest railway mason in the Maritime Provinces, died recently at Debert, N.S., at the age of 82. He was the builder of several large bridges, including the one over Sackville River, at the head of Bedford Basin, and the Windsor and Annapolis Railway bridge at Windsor.

W. R. SMITH, contractor, Woodstock, Ont., is dead. He engaged chiefly on railway work, and at the time of the construction of the C. P. R. had charge of a large portion near North Bay. He also undertook the line from Victoria to Nanaimo. Mr. Smith, at the time of his death, was aged 49.

## Brief, but Interesting.

A NEW wire for telephones is being tested. It consists of an aluminum-bronze core covered with a copper-bronze coating.

LEADVILLE silver and lead mines are recovering from the depression, a number of mines having resumed operations, though on a small scale.

LLOYD's report better prospects for Clyde ship building, as more ships are now ordered, but not commenced, than at any time for last eighteen months.

WHAT will literally be "a castle in the air" will soon be on exhibition at Antwerp, Belgium. A sort of raft has been designed made of bamboo canes, and steel and aluminum piping, and will be held in the air 500 feet above the ground by means of captive balloons. On the raft there is to be a handsomely-fitted restaurant. A regular system has been devised for supplying the balloons with gas, and the "castle" at night will be illuminated by an enormous electric light.

THE great draw span of the new bridge over the Missouri at Omaha is the largest and heaviest in the world, being 1,390 tons in weight, 520 feet long, and 100 feet high. The bridge will be opened Nov. 1st.

THERE is in use at the Old Bridgeport mines a coal-cutting machine of peculiar construction. Its name is the "Stanley," and it can make a 35 feet forward circular cut, six feet in diameter, in a day. The coal is broken as the cutter advances.

THE U. S. Congress has passed the bill giving to the New York and New Jersey Bridge Company the right to construct a bridge across the Hudson. It provides that it shall be completed within ten years. The famous Brooklyn Bridge will be far surpassed by the new bridge, which will be at least twice as long.

BLISS, the Palestine excavator, has a theory that the hot air blast furnace, which is called a modern improvement in iron manufacture, and was patented in 1828, was known B.C. 1400. He bases this theory upon the fact that furnaces have been excavated in Palestine bearing strong evidence of being intended to heat blasts by outside air, which were then forced through the passages of the furnace to a central chamber.

### INDUSTRIAL NOTES.

THE axe factory at Three Rivers was damaged by fire to the extent of \$10,000 on the 14th ult.

AT Arthur, Wellington Co., Ont., A. Brownlee's threshing engine was completely destroyed recently by the explosion of the boiler, which had been pronounced unsafe.

AT a meeting of the Ottawa Car Company, T. Ahearn was elected president, W. W. Wylie, vice-president and superintendent; J. D. Fraser, secretary-treasurer, and H. Pratt, solicitor.

THE brass manufacturers recently in session in Toronto decided to ask the Government for relief from the duty of 10 per cent. now imposed on brass materials, as it prevents successful exporting.

A FIRE in the Star Collar and Box Co., paper-box makers, Montreal, did damage last month to the extent of \$22,000, of which damage about \$15,000 is in machinery. Insurance, \$9,000. About 80 hands are thrown out of work.

THE new Dominion Government building at Port Arthur, Ont., was opened Oct. 20th. It will be occupied by a post-office, custom house, inland revenue office, fisheries inspector, harbor-master, inspector of weights and measures, Indian agent and meteorological office.

AT the annual meeting of the Lake of the Woods Milling Co. this month the following officers were elected: Robert Meighen, president and managing director, John Mather, vice-president; W. A. Hastings, general manager, G. V. Hastings, general superintendent, and S. A. McGaw, Winnipeg, manager.

THE city engineer of Toronto is charged by the Ontario Water Meter Co. with slander, with defamation of character, with breach of contract, and conspiracy to injure the company's business. The company consider themselves most unfairly dealt with in connection with the water meter service and have now brought their case into court.

APPLICATION is made for incorporation by letters patent, of Messrs. T. W. Dobbie, of Tilsonburg, E. Mercer, Fred. Mercer, and E. E. McDowell, of Alliston; G. Schultz, N. Howell, S. Hewitt, of Brantford, manufacturers, as the Mercer Mfg. Co., Ltd., to deal in agricultural machines. The head office of the company is to be at Alliston, and the capital is placed at \$120,000.

THE Norwood Bridge, says the *Manitoba Free Press*, was open for traffic on Oct. 14th. It is a fine structure, having stone piers and abutments, and an iron superstructure in three spans of 140 feet, and a draw of 250 feet. The iron work is by the Dominion Bridge Co., and like all their work is pronounced first-class. The contract for the masonry, which rises 35 feet above the water, was taken by W. G. Reid, Montreal.

THE firm which is constructing the engines to supply power for the Street Railway Company's new power house on William street, Montreal, are also casting and building six immense fly-wheels to accompany each of the six eight hundred horse power engines. These wheels, which are said to be the largest and heaviest built in the Dominion, are each forty tons in weight, 23 feet in diameter, and when running at full speed revolve 68 times per minute. The use of these wheels will keep up a steady power and prevent sudden fluctuations when extra cars are needed.



REVIEW OF THE METAL TRADES.

Montreal, Nov. 9th, 1893.

A special feature of the steel trade this fall is the close competition of the American with the English steel. This is more marked now than it has ever been before. In the United States, the depression in trade generally has made orders scarce, and the American steel manufacturers are coming into Canada after business with considerable avidity. They are also making heavy cuts in prices, and are taking a large quantity of business from the English steel manufacturers. On the other hand, in England the cost of producing steel has been enhanced very much by the scarcity of fuel; and this, coupled with the fact that the Americans are aching for orders to keep their works running, puts the English manufacturers at considerable disadvantage, while the consumers of steel in Canada are reaping the benefit. There are some classes of steel that no manufacturers elsewhere can compete with England in, but there are a great many in which the Americans not only hold their own, but apparently are gaining ground yearly as their experience increases. They are offering now, in this market, classes of steel that they have never before been able to compete with Sheffield in, and at lower prices. This shows that with the increasing ability of the Americans to turn out first class steel, in the same ratio English steel is shut out from this country. In mild steel, however, the German makers are able to meet all other prices, and in this we may mention that the prices have, we believe, never ruled as low as at present.

In pig lead most all the requirements this fall are being purchased in the States, and there is scarcely any English lead being imported.

There are no interesting features in other metals to record. In the English market, as the miners' strike is being settled to some extent, there appears to be a feeling of relief. The depression that has so long affected the iron and metal trade is in a more satisfactory condition and there appear to be indications of an improved demand from some foreign markets.

Generally speaking there cannot be said to be much change in this market.

METAL IMPORTS FROM GREAT BRITAIN.

The following are the values in pounds sterling of shipments of metals, etc., from Great Britain to Canada, as shown by the British Board of Trade returns for September and the previous eight months:

|                                | September. |          | 9 months ended Sept. |          |
|--------------------------------|------------|----------|----------------------|----------|
|                                | 1892.      | 1893.    | 1892.                | 1893.    |
| Hardware and Cutlery . . . . . | £ 9,879    | £ 11,704 | £ 71,737             | £ 75,295 |
| Pig iron . . . . .             | 21,803     | 6,577    | 60,258               | 39,119   |
| Bar, etc. . . . .              | 2,569      | 2,317    | 27,099               | 21,881   |
| Railroad . . . . .             | 71,281     | 43,688   | 300,714              | 467,757  |
| Hoops, sheets, etc. . . . .    | 13,080     | 7,431    | 58,630               | 47,851   |
| Galvanized sheets . . . . .    | 4,772      | 9,099    | 41,285               | 51,294   |
| Tin plates . . . . .           | 12,464     | 12,086   | 148,527              | 138,221  |
| Cast, wrought, etc., iron ..   | 9,720      | 10,954   | 80,297               | 94,471   |
| Old (for re-manufacture) ..    | 13,481     | 11,019   | 64,956               | 89,861   |
| Steel . . . . .                | 13,478     | 12,843   | 97,579               | 101,028  |
| Lead . . . . .                 | 6,135      | 2,150    | 24,555               | 12,721   |
| Tin, unwrought . . . . .       | 2,172      | 4,368    | 24,577               | 21,884   |

The same report shows that Canada exported to Great Britain in September, 1893, copper ore to the value of £1,720, and, during the nine months ending with last September, £16,657. The figures for September, 1892, and for the nine months ending with September, 1892, were £8,478 and £24,939 respectively.

A new process of drilling by means of steel shot, which is expected to supersede the expensive diamond drill, has been invented. The shot is poured inside the drill pipe, and into a ring in the rock made by a few revolutions of the pipe. The pipe bears on the shot, and when the drill revolves the shot also revolves, cutting the ring deeper. *Popular Science* reports the putting down of a test boring 8 inches in diameter, and 390 feet deep.

When a wire rope rests against the sides of V-shaped grooves, the lateral pressure will ultimately injure the best rope. It is necessary, therefore, to construct the pulley with grooves so wide that the rope rests on the rounded bottom of the pulley. The wear of the rope is greatly diminished, and at the same time the frictional resistance to slipping may be increased by lining the bottom of the groove of the pulley with gutta percha, wood or leather.

Fine Electric Street Cars

Our Specialty.

We also Manufacture

HORSE and TRAIL CARS

of every description.



PATTERSON & CORBIN

ST. CATHARINES, Ont.

The Bell Telephone Co.

of Canada, Limited

MONTREAL

Manufactures and has for sale every description of

Telephonic and other Electrical Apparatus  
Line Material and Supplies

Will furnish tenders for supplying Warehouses, Public Buildings, Hotels and Dwellings with

Private and Local Telephone Systems, Burglar Alarms, Hotel, Elevator and other Annunciators, Hotel Room and Fire Calls, Electric Bells, Push Buttons, etc.

Will also furnish tenders to cities, towns and villages for

FIRE ALARM AND POLICE PATROL SYSTEMS

Catalogues will be furnished on application.

|            |  |
|------------|--|
| SALES      | MONTREAL—Bell Telephone Building, 367 Aqueduct St.       |
|            | TORONTO—Bell Telephone Building, 37 Temperance St.       |
|            | HAMILTON—Bell Telephone Building, Hughson St.            |
|            | OTTAWA—Bell Telephone Building, Queen St.                |
|            | QUEBEC—Bell Telephone Building, St. John and Palace Sts. |
| DEPARTMENT | WINNIPEG—Forrest Block, Main St.                         |

Bellhouse, Dillon & Co.

30 St. Francois-Xavier Street

MONTREAL . . .

Wholesale Dealers in

Cement, Acids, Chemicals, etc.

WM. BUTLER

Die Maker and Machinist

Cor. James and Colborne Sts., HAMILTON, Ont.

Manufacturer of Canadian and American Specialties in Iron, Steel and Brass.



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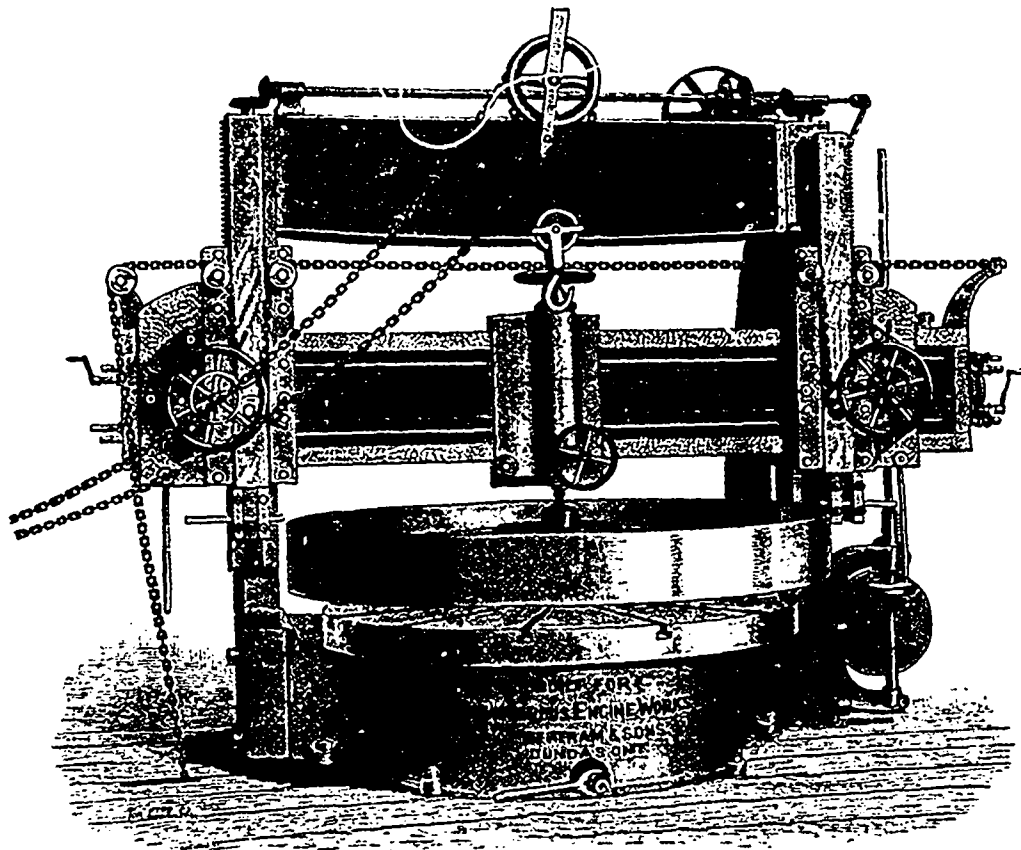
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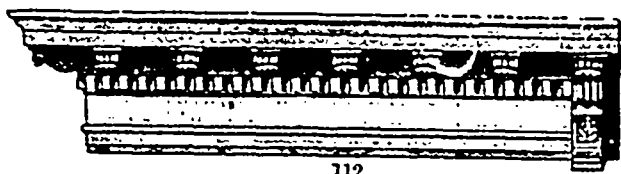


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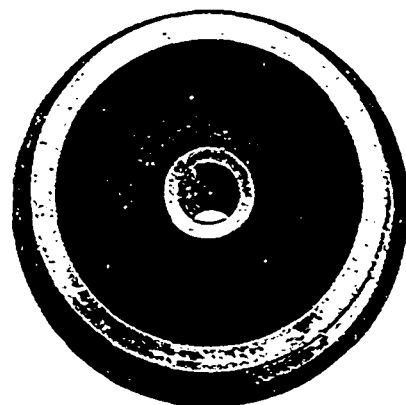


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## Industrial Notes.

THE new bridge at Cookshire, Que., is completed.

THE Cookshire Mill Co. have put in a new engine.

AT Granby, Que., a tool factory is to be established.

NO. 3 Mill, Upper Capelton, Que., is now being fitted up.

A BRIDGE will be built across Silver Creek at Malahide.

THE Ingersoll Hedge Fence Company has been incorporated.

TENDERS are called for building an isolation hospital at Lindsay, Ont.

PORTAGE LA PRAIRIE is sued for a refund of \$500 by a paving contractor.

THE C. P. R. elevator at St. John has been passed by the city council.

DR. BENDER proposes to establish a dead meat packing house at Sorel, Que.

GEO. FLEWELLING has opened a machine shop in Bridge street, St. John.

HOBBS' Glass Works, London, suffered from fire loss to the extent of \$5,000.

QUIGLEY'S grist and saw mills, St. Peter's Bay, P. E. I., were burned recently.

D. C. McCAIG is building an addition to his planing mill at Portage la Prairie.

STARCH manufacture will probably be the next new industry at Waterloo, Que.

THE Rock Island, Que., Whip Company are improving and extending their factory.

INKSETTER & McCORMICK are building a hub and spoke factory at Copetown, Ont.

THE new water tower being built for Montreal in Chicago, is now ready to be shipped.

A GRINDSTONE weighing over 3,000 lbs was recently placed in the Almonte file factory.

MICKLE, DYMONT & SON, Gravenhurst, Ont., are building a new mill at Severn, Ont.

THE typhoid fever outbreak at Carleton Place has led to an agitation for waterworks.

F. R. ROBINSON has re-opened his pork-packing establishment at New Westminster, B.C.

THE saw mill operated by the Dominion Bank at Novar, Ont., was lately destroyed by fire.

S WHITE, an employee of Gilmour & Co., Trenton, was fatally crushed between a log and the carriers.

A. HARRIS is starting a factory at Brantford, Ont., for the purpose of manufacturing a new lawn mower.

THE Wm. Hamilton Manufacturing Co., Peterboro, have just exported a large pulverizer to Liverpool, Eng.

WM ASH and J. Ash, under the name of Ash Brothers, Montreal, have formed a partnership as contractors.

J. SMITH, Berwick Corners, N.B., is building a grist mill to take the place of one recently burnt near that town.

HENRY OLIVER, an employee of the Columbia Flouring Mills, Vernon, B. C., was caught in the driving belt and killed.

LISTOWEL council has approved of the plans for Gilles & Martin's new foundry, and the work of building will begin at once.

THE McCormick Manufacturing Co. will probably locate at Walkerville, Ont., that town having offered the best inducements.

DUN BROS., Grand Bay, N.B., will shortly begin building a large gang saw-mill in place of the one burnt down some time ago.

CHRISTIE & CO.'S new trunk factory at Amherst, N. S., is practically in working order. Several large orders have already been taken.

THE contract for the Smith's Falls post office has been awarded to Robert Cameron, Almonte, who built the new public buildings at Carleton Place and Almonte.

THE Gurney-Massey Co., Montreal, are supplying four of their largest Oxford heaters (total capacity, 24,000 lineal feet) to the Hotel Grande, Yarmouth, N.S.

THE Dominion Horse Shoe Nail Company's works at Montreal have been burned down, together with some valuable machinery, worth \$5,000. Partially destroyed.

FERDINAND GAGNON AND ZEPHIRIN PRUDHOMME, Montreal, have formed a partnership as contractors, under the name of Gagnon & Prudhomme.

THE Minister of Militia was recently in Kingston in connection with the building of the new drill shed and the selection of a site for "A" Battery barracks.

IF the Ontario Government grant permission, large mills will be erected in the Algonquin Park by the American company who have bought the Madawaska limits of Pattee & Perley.

JOHN DOTY, Frank H. Doty, and Frederick Doty, till recently with the Bertram Engine Works, have this month started on their own account as engine builders at 15 York street, Toronto.

ALD JOHN HALLAM and a company of Toronto and other capitalists are applying for incorporation as the Canadian Meat Packing Company, Toronto. The capital stock is to be \$250,000.

THE business formerly carried on at James Bennett's plaster mill at Windsor, Ont., has been purchased by a company styling itself the Windsor Plaster Co., who will develop it to its fullest extent.

AMONG the awards of honor to Canadian firms at the World's Fair, none were better deserved than that given to Brown Bros., Toronto, for their splendid exhibit of blank books and account books, and for their specimens of book binding.

ROBIN & SADLER, leather belting manufacturers, Montreal and Toronto, are now filling an order from the Montreal Cotton Co. for nine large belts. These run from eighteen to thirty-six inches in width, and are made two and three ply. They are to be used in the new extensions of the mill now in progress.

IN connection with the description of the Sault Ste. Marie Canal in this issue, it will interest our readers to know that the cement used in this great work is Canadian, being supplied to Hugh Ryan & Co. by the Battle cement works at Thorold. Eleven thousand barrels of this cement were used there, and it is highly spoken of by the contractors.

AMONG the new industries of Peterboro is the foundry of John King & Son, who started business about four months ago. Mr. King, sen., has been in the business from boyhood, having been the first apprentice of the Wm. Hamilton Manufacturing Co. Mr. King started with only some one or two men, and now employs eight moulders. Among the work he now has on hand are castings for the new waterworks at Rochester, N.Y.

M. BEATTY & SONS, manufacturers of contractors' plant, Welland, recently shipped a large dredge to British Columbia for the Kootenay river. This dredge is being used for the purpose of reclaiming land along the river. This is the second order received by this firm from that district, and another dredge has lately been supplied by them to the Weddell Dredge Co. for work on the Morrisburg Canal. They have also supplied plant for work now being carried out at Lakefield under the Dominion Government.

THE steamship "Tiber" recently brought a cargo of 1,900 tons of pig iron from Pictou, N.S., to Montreal, consigned to Drummond, McCall & Co. This is a new departure in the iron trade and is of considerable interest as indicating the development of the mines in Nova Scotia. The iron is from the Ferrona furnaces, near Pictou. A number of shipments of iron have been made to Montreal by rail, but this is only the second cargo to come by water. It is found that it is cheaper to transport the iron by water, and it enables the mines to compete more successfully with Scotch and other pig iron brought to Canada.

THE Dominion Leather Board Co., of Montreal, make a specialty of friction board for the face of pulleys. This board is made by special processes of which the company have made a study, and they have succeeded in producing an article which is not only cheaper than any in use, but lasts much longer. It is used extensively and recommended by such firms as the Waterous Engine Works, Brantford; Carrier, Lane & Co., Levis; the Dominion Cotton Mills Co. in their various factories, and similar large firms. Those who have trouble with pulleys will find surcease from profanity by seeking the offices of this company.

THE Wm. Hamilton Manufacturing Co. of Peterboro are shipping a Crawford ore crusher to England. The company have grown from small beginnings to a rank among the most extensive industries in Canada, and have attained especial pre-eminence in the manufacture of water-wheels, the sales in this department being larger than those of any other firms in Canada. They make wheels from the smallest size up to a diameter of 68 inches. One of these large wheels has just been made for the Peterboro Waterworks' Company, for whom they are also making two sets of pumping machinery of a capacity of 2,250,000 gallons each.

NAPOLEON TAILLEFER, contractor, St. Henri, Que., has assigned. Liabilities \$7,000

SICKLES & Co's machine shop at Strathroy, Ont., was burnt. Loss \$1,500; partly insured

McRAE Bros. have purchased W. C. Caldwell's plant at Wilbur, to replace their saw-mill burned at Calabogie.

THE Canadian Foundry and the Trollier Axe Factory, recently burnt at Three Rivers, are in course of reconstruction.

AT L. H. Kendall's, machinists, Montreal, the building was damaged by fire and water to the amount of about \$8,000.

JAMES McDONALD'S planing mill at Oakville, Ont., was completely destroyed last month. Loss about \$3,000; insured.

THE appearance of Cornwall, Ont., will shortly be improved by the laying of some of its streets with granolithic pavement.

THE Phoenix Foundry, London, Ont., has been sold at auction to William Yates, of the London Machine Tool Company, for nearly \$10,000.

THE Hobbs Hardware Company, London, Ont., lost \$5,000 the other day by a fire, which was said to have its origin in spontaneous combustion

THE passenger bridge over the railway at the foot of York st., Toronto, will be commenced as soon as the question of cost is settled

THE Napanee, Ont., Paper Mills are in liquidation. The business will be continued for a time under the management of a receiver.

COTE ST ANTOINE has secured an interim injunction against the Montreal Gas Co preventing them from laying pipes in that municipality.

GILMOUR & HUGHSON and the E. B. Eddy Co. are having galvanized iron roofs put on their buildings by McKinley & Northwood, Ottawa

THE Carp (Ont.) flour mills will be refitted with the most modern machinery. The new owner, Mr. McElroy, will also build a 50,000 bushel elevator.

CITIZENS of Moncton have appointed a committee to confer with the city council as to the city assuming control of the water and light plants.

THE Toronto City Council have recommended the laying of a new asphalt pavement on Queen street, from Yonge to River street. The estimated cost is \$75,000

THE B. C. Iron Works are making a hydraulic hoist for the custom house, and also have the contract for the iron work of the new Hudson Bay warehouse at Vancouver.

JAMES CLARKE, in charge of Canadian machinery department at the World's Fair, informs us that the engine of the Robb Engineering Co has been awarded a medal and diploma

THE shingle mill of Goupil & Bruneau at St. Anne du Sault, near Athabaska, was wrecked the other day by a boiler explosion, which killed Mr. Goupil and a workman, and severely injured three others

GEO. T. SEELEY will rebuild his saw mill at Black Rock, N.B. It will be fitted with a rotary edger, lath machine, shingle machine, planer, lathe, etc., and there will be facilities for making berry boxes

A BRIDGE is being agitated for across the Tobique River at Perth, N.B., so as to connect the new Tobique Valley Railway with the C. P. R. The bridge would probably be about three hundred feet in length

AT Pembroke, Ont., the County Council by-law to borrow \$17,500 for the purpose of paying off the floating debt and putting a system of hot water heating into the county buildings, has received its final reading.

H. E. EASTON, chief organizer of the International Association of Machinists, visited Ottawa last month for the purpose of organizing a branch of the society. E. A. Connell, President of the Trades and Labor Council, occupied the chair.

THERE are prospects of a mechanical pulp mill being started at Chatham, N.B. If this is carried out, Chatham may become a paper manufacturing centre, as it already has a sulphite fibre mill, the products of both mills being necessary in making ordinary white papers.

JNO. N. LAKE, formerly of Toronto, proposes, says the *Times*, to organize a company to build a second incline railway up the mountain at Hamilton. The intention is to run the line from the head of Wentworth St., and an engineer is working on estimates of the scheme which will cost \$23,000

THE new pulp mill at Milton, N.S., will cost \$30,000.

A LARGE annex is to be added to St. Michael's Hospital, Toronto.

A LARGER wheel is being put in at J. B. Fairfield's saw mill, at Mill Haven, Ont.

THE Wrought Iron Range Company, Toronto Junction, has resumed work.

H. ROSS & Co. have sold their saw-mill at Orford, Que., to H. Lovell & Son.

WAKEFORD BROS. are putting in new machinery at their mill at Battersea, Ont.

VALLEE & Co., Montreal, tender to construct waterworks at Hedleyville for \$49,500.

THE C.P.R. elevator at St. John, N.B., is now built, and will begin operations in a short time.

A PACKING box manufactory has been established at Rat Portage by W. Jordan, of Winnipeg.

THE proposed C.P.R. elevator at Winnipeg, which was to have been erected this fall, will not be built until next year.

MESRS. BOURK, St. Martins, N.B., are preparing to rebuild their saw-mill. Both steam and water-power will be used.

J. HANNEN, of Wottawa, N.J., was in Hamilton last month setting up the new fuel economizer at the pumping station.

HAYDEN & DUNBAR are rebuilding their moulding and machine shops, at Woodstock, N.B., which were burned down recently.

HUGH McPHEE, an employee of the Toronto Paper Mills Co., was badly scalded, owing to the sudden opening of one of the chemical boilers.

D. McPHEE, gas inspector, Hamilton, has gone to British Columbia, where he will instruct inspectors in the duties of their office.

THE contract for the Tobique Plaster Co.'s new mill at Plaster Rock, capacity 60 tons a day, has been given to Moore & Son, Woodstock, N. B.

It is stated that the Ontario Natural Gas Co. has secured a loan of \$75,000 from the Huron & Erie Co., to pipe the South Essex gas to Windsor.

NOXON BROS., implement manufacturers, Ingersoll, Ont., are suing Patterson Bros., Brantford, for infringing a patent held by them on a grain drill.

THE water committee, Montreal, have recommended the acceptance of Bobier & Wilcox's tender for the boilers for the new Worthington engine, at \$12,751.

THE British Columbia Jute and Cooperage Co. was burnt out on the 2nd inst. The fire started in the boiler room; loss \$30,000, covered by insurance.

SUDBURY, Ont., contemplates a new system of water works, sewerage and electric light, and a committee of the council has been appointed to collect information.

BALSDEN & TAYLOR have been awarded the contract for the Balaclava street sewer; and Hickson & McKellar, that for the improvements on Elgin street, St. Thomas

WILLIAM YATES has purchased the old Phoenix Foundry property, London, Ont., at about \$15,000. He will occupy the premises with the London Machine Tool Company's works.

THE town engineer of Lindsay has submitted a report on the sewerage, recommending a new main sewer and some branches. The proposed extensions make about 30,000 lineal feet and would cost \$50,000.

H. M. HIRSCHBERG, agent of Page's belt dressing for the Dominion, makes in the advertising pages of THE CANADIAN ENGINEER an offer whose boldness bespeaks confidence. Belt users can well afford to make the trial.

THE new dam on the St. Francis River at Richmond, Que., is completed. A large building suitable for manufacturing purposes has also been built, and the town offers a bonus to any suitable person who will establish some industrial concern there.

WE call our readers' attention to the advertisement of the Hamilton Facing Mill Co., of Hamilton, Ont., who are rapidly increasing their sales by producing a grade of goods which is always of uniform good quality. They import plumbago direct from Ceylon. In addition to the manufacture of foundry facings, this company supplies everything required in a foundry, with the exception of the fuel, and are Canadian agents for the Collian Cupola, Root's Positive Blower, and Woodruff's Patent Separator. Any one interested in the foundry business will do well by writing them.

WINNIPEG is being laid in many parts with stone sidewalks.

THE Lay Whip Company are establishing a wood-turning factory at Rock Island, Que.

THE work of erecting the new waterworks machinery at Pembroke, Ont., is going on quickly.

THE new Howe truss bridge over the St. Andrew River at Shubenacadie, N.S., is completed.

A. E. KURBY is rebuilding his carriage factory at Andover, N.B., which was burnt down recently.

THE American company which supplies Berlin, Ont., with water has passed into the hands of a receiver.

JOSEPH BONALMOUR and Joseph Deslauriers have formed a partnership in Montreal as contractors.

A wing will be added next year to the Hotel Dieu hospital, in Kingston, at a probable cost of \$30,000.

AT Price Bros.' saw mill, at Cape St. Ignace, Que., a man was struck in the neck by a flying board and killed.

A NEW bridge, probably of wood, is to be built at Westbrook, Ont., by the Catarqui Bridge Co. of Kingston.

THE Clinton Organ Co., whose building was burned down some weeks ago, will probably re-build their works at Elora, Ont.

A. VALIQUETTE, doing business under the name of E. Blanchard & Co., hardware merchants, Montreal, has assigned.

THE Mimico, Ont., Sewer and Brick Co. are now manufacturing vitrified paving brick, the first yet produced in Canada.

THE Canada Wire Mattress Company's factory at Toronto Junction has been badly damaged by fire. Loss about \$10,000.

ALMONTE'S new file factory is now well under way; a dozen hands, most of whom are skilled mechanics, are already employed.

F. X. LANGELIER and Gustave Boulanger will manufacture chemical products under the style of the Montreal Chemical Company.

L. B. MONTGOMERY & Co., dealers in asbestos, mineral wool and engineers' supplies, Adelaide Street West, Toronto, have again failed.

THE town council of Aylmer, Que., has passed a by-law for the erection of waterworks and a sewage system, which will shortly be submitted to the ratepayers.

MCRÆ & Co. have commenced building a stone and brick building in Ottawa for the manufacture of imitation walnut and mahogany out of beech and birch.

THE Dominion Bridge Co. are building a bridge to replace the one across the Richelieu River at Chambly, Que., which was burned down some little time ago.

THE Reid & Curry Iron Works, New Westminster, B.C., are in liquidation. It is hoped by those interested that a new company will be formed with larger capital.

WHITE, ex-treasurer of the Walkerville, Ont., Malleable Iron Company, charged with appropriating the company's funds, will be tried at Windsor. Bail was fixed at \$3,000.

THE new county academy building at Amherst, N.S., erected at a cost of \$35,000, is now pronounced complete. It is 130 feet long and 72 feet wide, three stories in height.

O. KILPATRICK is about to establish a last flock industry at Oakfield, on the Bangor & Aroostook railroad, and expects to give this line at least 250 car loads of freight per year.

VIAU & LACHAMÉ have been awarded the contract for the roadway approaches, piers, and abutments of the new Gatineau bridge near Ottawa at \$15,079, and the Dominion Bridge Company were awarded the superstructure at \$13,900.

F. McDONALD'S flour mill at Woodstock, Ont., which has been rebuilt to take the place of the Great Western Mill, destroyed by fire last year, is now complete. The expensive machinery with which the mill is fitted is all of the best type.

THE reconstruction of the Toronto water works pipes in the bay is proceeding satisfactorily. A. J. Brown is laying the six-foot extension pipe. Flexible joints are made, so that the pipe can lay on the bottom. A bell mouth is being built at the intake so that the supply of water will come in at 12 feet from the bottom. The well at the pumping station has been lined with steel, and the leaky foundation of the pumping house has been made right. The machinery at the pumping station has been overhauled, the valve chambers reconstructed, and the repair shops have been reorganized. Engineers Williams and Fellows have been made heads of the construction department, and Mr. Pink is chief engineer at the pumping house.

CLARK, SKILLINGS & Co., of Glasgow and Boston, will erect a mill for sawing spool wood at Newcastle, N.B. The engine will be of 100 horse-power. Their mill at Ox Brook will be pulled down.

J. T. HUBER, whose glue factory, at Berlin, was burnt last month, lost, it is said, about \$25,000 by the fire, his insurance having just run out. Mr. Huber has secured a building at Doon, Ont., and will re-establish himself there.

THE Guelich Silica Barytic Co., of Detroit, have disposed of their entire interest in Canada to a Canadian company. The head offices are to remain in Ingersoll. Walter Mills and Wm. Ewart, of Ingersoll, will still remain leading officials.

W. BOULTER & SON, canners of fruit and vegetables of Picton, Ont., have leased from W. F. Barrett, for five years, the old Jacques & Hay's furniture factory on the Esplanade, Toronto, and they will move there. They are now putting up a 200 horse-power engine, and they will employ from 150 to 200 men and girls.

## Mining Matters.

BODMAN'S Mine, Lake of the Woods, has been sold to some American capitalists for \$16,000.

THE Vanwinkle mine, near Lytton, B.C., has been closed on account of severe frosts cutting off the water supply.

THE East Kootenay Exploration Syndicate (Ltd.), Wild Horse Creek, has been registered. The capital is \$400,000.

THE machinery of the large crusher at Gay's River, N.S., is now being removed to the Memramcook Gold Mines.

A DEPOSIT of iron ore has been discovered near Chipman, N.B. Specimens are now being tested with a view to working mines.

MR. CARSCALLEN, M.P., is reported to have sold his gold mine in North Hastings for \$50,000, to a United States syndicate.

A TUNNEL is being excavated for the purpose of bringing fresh water from the river to the C.P.R. salt works at Windsor, Ont.

THE mining rights and equipment of the Lake Girard mica system have been purchased by Thomas J. Watters, of Ottawa.

THE chance of free trade in granite has caused some movement in New Brunswick properties and quite a number have changed hands.

D. F. BURK, M.P.P., Port Arthur, states that coal has been discovered in the bed of the Rainy River, near the international boundary line.

A BOULDER of high-grade galena, which was discovered last year in the Slocan and contains 125 tons of ore, will shortly be broken up and conveyed to Vancouver.

THE managers of the Hall mines, B.C., have decided to build a tramway (4½ miles) to Nelson, and are making extensive preparations for next season's work.

THE Slocan District is likely soon to supply all the ore required by the Selby Lead Works, San Francisco, it having been shown that ore from that country is free from arsenical and antimonial compounds.

COMPANIES are reported in course of formation for the purpose of developing the rich mineral regions of Rainy Lake and Lake of the Woods. It is possible that the Government will withdraw the lands from homestead entry.

THE purchase of gold amalgam at Edmonton, says the *Calgary Herald*, is one of the features of the banking institutions at that place, and brings \$15 an ounce. It is estimated that as much as \$10,000 worth of the precious metal was washed out of the bars near the town during the past season.

A RICH claim has been located by C. H. Abercrombie and Wm. Valentine near Holmes Creek, eight miles from New Denver, B.C. C. Wheeler, who is interested, states that there is a ledge of about eighteen inches of quartz which from three assays in Revelstoke and Spokane averages \$389 in gold to the ton. On one side of the quartz ledge is four feet of porphyry which assays \$242 to the ton in gold.—*Slocan Prospector*.

THE Slocan *Prospector* reports that considerable work will be done at the mines there this winter. At the Washington mine 30 men are at work and the force is to be increased in the winter. The owners of the Dardanelles mine are putting in hoisting and other machinery, and have 20 men cutting wood with a view to working the mine during winter. These and other mines have large quantities of ore on the dump and propose to extend operations.

A VEIN of copper has been located near Trout Lake, assaying 80 per cent.

J. K. PORTER has opened a new coal mine between New Glasgow and Westville, N.S.

THE *Nelson Miner* reports that four feet of ore have been struck in the Trail Creek district.

THE new east slope of the Joggins', N.S., coal mines will soon be opened, says the *Springhill News*.

THUNDER HILL MINING Co., B.C., has negotiated a loan of \$50,000 to assist in developing the property.

THE discovery of amethysts in paying quantities is reported from the township of Sebastopol, Renfrew county, Ont.

THE ore on the "Silver Cup" mine near Trout Lake, improves with depth. Some assays show 23 per cent. silver.

W. BEATTY, who has just made a township survey near Lake Wahnapihtai, reports the country as a good gold mining district.

THE Westminster Slate Co. have the order for all the slate required for the new North-West Mounted Police barracks, New Westminster, in course of erection.

THE Kootenay Hydraulic Placer Mining Company are ready to sluice a portion of their ground and will begin operations shortly. Their works are progressing satisfactorily.

THE Thompson River Hydraulic Co., B.C., is being incorporated, with John Hendry as president. It has acquired all the claims on Tranquility Creek from the former owners.

D. D. MANN, the Montreal contractor, and Geo. Attwood, the English mining expert who opened the Sudbury Mines, have been exploring some gold mines near Lake Manitou, which are said to be very rich.

THE following have been appointed directors of the Hamilton Natural Gas and Mining Co. (Ltd.): T. H. Pratt, John H. Parker, Dr. Louis Springer, John Milne, H. Carscallen, C. E. Newberry, and John H. Tilden.

THE work at the Memramcook gold mine is going on steadily. The company are about to erect a 50 stamp mill, which goes to show that the tests up to the present time have been entirely satisfactory.—*St. John Telegraph*.

OVER \$100,920 worth of mica was produced in Canada during 1892, being an increase over the preceding year of nearly \$50,000. A part of this (viz., \$68,460) was exported, mostly to the United States for electrical purposes.

THE owners of the Slocan Star Mine have incorporated under the name of the Byron H. White Mining Co., with a stock of \$1,000,000. The mine has a 50-foot ledge of rich ore containing 200 ounces of galena to the ton.

THE cement discovered on the farm of J. O'Neil at High River, near Calgary, is, so far as can be judged from the tests which can be supplied there, of a quality very nearly approaching the imported Portland cement.

AT the World's Fair claim of the Noble Five group, Kaolo-Slocan District, a six-foot vein of very high grade ore has been struck. An assay recently is said to have shown 16 $\frac{1}{4}$  oz. silver to the ton. It also contains antimonial copper.

ANOTHER gas well has been struck on the farm of William Fox, between Ruthven and Kingsville, Ont. When the vein was struck it blew the pipes and derricks high in the air. It is owned by Hiram Walker & Sons, who own several others in that district.

THE Lardeau correspondent of the *Kootenay Star* says: Some fine specimens of copper-bearing ore have been brought in lately from the further range. Curiously enough, the copper-bearing ore contains more silver than the clean galena, the general rule seeming to be reversed, and the more heterogeneous the ore, the greater the prospect of a large percentage of precious metal.

R. S. McCONNELL, who was sent by the Dominion Government to explore the sources of the Mackenzie and find if the gold range crossing the Omeneca River extends to the Findlay, has returned bringing samples of gold found in abundance for 250 miles along the Findlay River. The source of the Mackenzie is a narrow lake, thirty miles long, at head of the Findlay, called Tehutade by the Indians.

G. A. PIPPY has spent some time at Sandy Bay, ten miles from Cow Head, in the straits, where he has discovered petroleum wells, which, if worked, will prove a bonanza to all concerned. He showed samples of crude, lubricating and lamp oil, which are as good as any we have seen. The oil flows freely to the surface, and in one place the sea was covered for miles along the shore.—*St. John's, Nfld., Herald*, Oct. 11.

A FORTY-STAMP mill is to be put in the mine at Fairview, B.C.

A LARGE deposit of white mica has been discovered near Mattawa.

IN the Brush River district, B.C., four claims have already been staked.

THE C.P.R. are shipping ore from Kaslo to San Francisco by Nelson and Revelstoke.

J. L. MONTGOMERY has purchased a half interest in the Blue Bird Mine at Slocan for \$7,500.

THE Mullinahone Mine, near Nelson, B.C., has decomposed gold quartz assaying \$1,500 to the ton.

SHERIFF STUART has purchased the quarry at Bocabec, N.B., at which black granite was found recently.

A. C. JONES, of Boston, U.S., is forming a company to operate the copper mines in Inverness county, N.S.

A COMPRESSED air plant is to be put in to run the underground engines and pump at the Drummond mine, N.S.

A JOINT stock company is to be formed for developing the quartz and placer claims in the Alberni district, B.C.

THE directors of the New Westminster Slate Company report favorable progress in that young but thriving industry.

STEAMER "Topeka," on her last trip from Alaska, brought down a party of Yukon miners with \$60,000 worth of gold dust.

THE claims on Moyea Lake, Golden, are showing up well. The vein is exposed for a considerable distance and to a height of several hundred feet, it being on the slope of a steep mountain.

THE oil company at Gaspé are having five drills constantly at work. One well has already been sunk to a depth of 2,000 feet. Oil has not yet been struck, however, in paying quantities.

THREE hundred and eighty-five sacks containing 21,300 pounds of ore from Providence Mine, Boundary Creek, sampled a gold average of \$107; 4 per cent. lead, and 223 ounces of silver to the ton.

THE *Victoria Times* says the Silver Creek and Black Prince mines will be worked all winter. Walker, Downs & Co. are erecting a shaft-house and other necessary buildings at the Silver Cup.

THE boring of a deep well through the Trenton rock is contemplated at Ridgetown, Ont., fears being entertained that the supply of natural gas from the present shallow wells will not hold out much longer.

THE richest strike which has up to the present been made on the Kootenay Bonanza property was made recently, about 150 feet below the old workings. It is about forty-three feet wide and consists of grey copper.

NATURAL gas was struck while a well was being dug on the farm of D. Wilcox, near Chatham, Ont. The gas entered the house, and taking fire at the kitchen stove, caused an explosion which wrecked the house and seriously injured the inmates.

A NEW BRUNSWICK journal says there has been a great rush of applications for prospecting licenses of late, especially in Westmoreland county, where the applicants are all in search of gold. There are indications of asbestos in the vicinity of Magallowaic, York county.

AT the first meeting of McGill Mining Society for the current academic year, the following officers were elected: Hon. president, Dr. B. J. Harrington; president, W. A. Carlyle, M.A., M.E.; vice-president, A. A. Cole, B.A., Science, '94; secretary-treasurer, O. C. Hart, Science, '95. The papers promised for this year are very good, as some graduates who have been actively engaged in mining in the West, are in town and will take part. At the close of the meeting, Mr. Mathewson, '85, superintendent of the Pueblo Smelting and Refining Co., of Pueblo, Col., gave an address descriptive of his methods of smelting and refining gold, silver and lead ores.

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## Railway and Marine News.

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SOREL'S wharves are to be extended.

THE Canada Atlantic Railway are repairing their bridge at Valleyfield.

WORK is proceeding on the piling for the North Arm bridge, Vancouver, B.C.

THE Cumberland Coal and Railway Co. launched their new tug "Springhill" recently.

N. CONNOLLY denies that the Richelieu Co. intends building their workshops at Sorel.

THE by-law for building a breakwater at Phillipsburg, Que., passed after a close struggle.

AN all-the-year round steamship service is being agitated for between Toronto and Niagara.

A LARGE portion of the new C. P. R. hotel at Quebec is already furnished and ready to receive guests.

THE new station on the St. Lawrence and Adirondack Railway at Huntingdon is now complete.

NEW and heavier steel rails are being laid on the C. P. R. track between Chalk River and Carleton Place.

THE C. P. R. is expected to commence the construction of a new steel bridge over the Columbia next spring.

COTE ST. PAUL, Que., has granted the G. T. R. a bonus of \$10,000, and the town now has railway connection with Montreal.

THE formal opening of the Montreal & Occidental Railway between St. Jerome and Chute aux Iroquois, took place last month.

A TUNNEL 2.49 miles long is to be cut through the Rocky Mountain pass when the Great Northern line crosses the summit. The estimated cost is \$2,000,000.

THE Richelieu & Ontario Navigation Co. are building two steamers for their Toronto-Prescott route. They will be of modern type, of steel, and with twin screws.

THE trestle work for the line between the Government Piers, St. John, and Ried's Point, is progressing satisfactorily, and it is expected will be completed this month.

THE Richelieu & Ontario Navigation Co. are not satisfied with the award of the arbitrators who fixed the sum to be paid by insurance companies for the burning of the S.S. "Corinthian" at \$20,000, and are appealing.

THE St. Clair & Lake Erie Ship Canal Construction Co. is incorporated under the laws of Wisconsin, capital \$4,000,000. Among the officers are: president, C. A. Towner, Duluth; constructing engineer, E. Arnett, New York.

IT is stated that the "Kingfisher," the fastest sailing vessel engaged in the Atlantic fisheries protection, will leave for British Columbia to engage in sealing next year, as soon as her charter with the Dominion Government expires.

IT is not improbable that before long there will be a railway from Matane, Que., to connect with the Intercolonial near St. Octave. The distance is about thirty miles, and \$106,000 has been already voted by the Dominion Government.

THE Canadian Australian Steamship Co. have chartered the steamer "Arawa" to take the place of the "Miwera," which was wrecked on the Island of Hawaii. The "Arawa" is a very superior vessel, of 5,026 tons gross, 430 feet in length, and 8,000 horse power.

A VERY remarkable feat in railroading was performed on the O., A. & P. S. Ry. near Renfrew a few days ago, when twenty men laid 9,200 feet of rails, or one mile and three-quarters of track in a day. The track laying now has reached Renfrew and the men are now engaged laying the diamond crossing over the Kingston and Pembroke line at that point.

IT is expected that the station at Arnprior will be completed in about a week or ten days. A number of men employed on it have left for Renfrew to begin the building of a station at that place.

THE Richelieu & Ontario Navigation Company have decided to rebuild their workshops at Sorel, Que., that city having offered exemption from taxes and a percentage on the wages paid by the company for the next twenty years.

TO CONFORM with the terms of their charter, the St. Johns and Sorel Railway Co. will have to grade ten miles this year. This has so far not been accomplished, and parties interested are trying to push the directors to begin the work at once.

NOTICE has been given that incorporation will be applied for by a company desirous of constructing a canal from Port Moody, on Burrard Inlet, B.C., to some point on Pitt River, cutting off the peninsula on which Vancouver and New Westminster stand.

THE *Stratford Herald* complains that the G.T.R. have broken their contract with that city by sending engines to Montreal and other places for repairs, whereas the agreement upon the terms of which the bonus of \$60,000 was given, stated that all locomotives running west of Toronto should be repaired at the Stratford shops. The *Herald* states that owing to this breach of agreement, many of the workmen are working on short time.

THE railway bridge at Weldon, N.B., is to be rebuilt next summer.

RUMOURS are current of a new C. P. R. line from Montreal to New York.

THE Bangor and Aroostook Railway will be open for traffic November 18th.

PLANS are being drawn for a large new boat for the Detroit, Belle Isle & Windsor Co.

THE work of building the railway between Sidney and Victoria, B.C., is progressing slowly.

TENDERS are to be asked soon for a new wharf in Toronto harbor between Yonge and Bay streets.

J. J. WICKSON is finishing the Government wharf and bridge at Lardeau, for which he has the contract.

Two hoisting engines will probably be purchased for use on the new wharf at Sand Point, Carleton, N.B.

THE North Bay & James Bay Railway has been completely surveyed and located as far as Lake Timagami.

THE C. P. R. now patrols its tracks near Quebec with armed men, owing to recent attempts at train-wrecking.

THE bonds for harbor improvements at Montreal were all subscribed for immediately they were advertised.

THE C. P. R. have been granted the use of Lowe street, Vancouver, for the purposes of the Lulu and Vancouver Railway.

A NEW steam launch is to be built for the revenue cutter "Constance," the one already sent for her being much too heavy for its purposes.

THE new bridge on the Harvey and Salisbury line at Turtle Creek is being rapidly completed. The cost will amount to about \$10,000.

THE laying of rails on the Philipsburg & Stanbridge, Que., Railway, is now finished, and work is beginning on the new depot at the former place.

THE Franco-Canadian line intend to establish a line of small steamers to ply between St. Pierre, Miquelon, Portland, Boston, Sydney and Halifax.

NEW tenders will probably be called for part of the work on the Soulanges Canal, some of the contractors having come to the conclusion that they tendered at too low a figure.

THE survey of the projected Restigouche & Victoria Colonization Railway will be commenced soon in the vicinity of Tide Head, near Campbelltown, and proceed towards Grand Falls.

J. A. CHARLEBOIS, of Quebec, who constructed the Northwest Central Railway, has claims against the line amounting to \$700,000, which are to be taken up in the Chancery Court this month.

THE South Shore Railway Co. are applying for incorporation. The object of the company is to build a railway from Levis to some place on the Canada Atlantic Railway near Valleyfield.

THE Stoney Creek bridge on the C. P. R. between Rogers Pass and Donald, B.C., which is supposed to be the highest wooden bridge in the world, being 296 feet high, is being converted into one of steel.

THE G. T. R. has leased the R. & O. Navigation Company's wharf at Quebec for a term of ten years, the latter company transferring their landing to the new wharf they have just built themselves.

THE new steamer belonging to Capt. MacMillan, of Charlottetown, P.E.I., is to be launched this month. She is 160 feet long, of 400 tons register, and is to be used in the coasting trade of Canada and West Indies.

THE large land derrick built for the Montreal Harbor Commissioners, at a cost of \$10,000, has collapsed, and operations on the guard pier are at a standstill. As the work is already a year behind there is talk of a governmental investigation.

AN English syndicate has agreed to furnish the money required for building and equipping the Nova Scotia Southern Railway. The work of construction between Shelburne and New Germany will be hurried on, so as to be completed next year.

THE cost of the proposed bridge between Ottawa and Hull, to give the Gatineau Valley railway entrance into the former city, is estimated at \$700,000. It will have, says Mr. Harris of the G. V. Ry., six spans and five piers, and there would be roadways for horses and pedestrians on either side. It will be 45 feet above high water mark, the main channel span being 500 feet. The charter under which the bridge will be built allows them until next July to commence the work, and until July, 1897, to finish it.



Work has begun upon the new east pier at Port Dalhousie, Ont.

The railways of the United States represent a capital expenditure of \$10,389,234,228.

The Kaministiquia River has been thoroughly dredged, and the channel is now 100 feet wide.

OPERATIONS on the Lake St. John Railway between Chambord and Chicoutimi will be resumed this month.

THE I. C. R. are constructing a water tank at Sussex with a capacity of 50,000 gallons, and fitted with steam pumping engines, etc.

THE wharves at the foot of Yonge and York streets, Toronto, will be extended 250 feet further into the Bay. The cost is reckoned at about \$55,000.

THE new Australian line have contracted for a complete system of refrigeration for the "Miowera" and "Warrimoo." The cost is to be about \$50,000.

CALGARY expects to soon have a cheap coal supply, as work is progressing favorably on the Knee Hill Railway, which is to bring in the coal from the mines.

GRADING on the Revelstoke and Arrow Lake Railway is being pushed forward. The line will be open to Green Side, where the steamboats can always come, before winter sets in.

## The Patent Review.

### RECENT CANADIAN PATENTS.

- 43,465 Henry Anwyl Jones, Brooklyn, N.Y., apparatus for deoxidizing, melting and puddling iron ore.
- 43,468 Samuel Edward Haskin, Avoca, N. Y., process and apparatus for vulcanizing wood.
- 43,470 Phineas Relton, Persia, Iowa, automatic car coupler and air brake.
- 43,472 John Wesley Roberts, Cleveland, Ohio, can crimping machine.
- 43,475 Louis Napoleon Singin, Walls, Penn., car coupling.
- 43,476 Herman R. Dore, Moultonville, N.H., car coupling.
- 43,477 Edouard Surprenant, Cohoes, N.Y., car coupling.
- 43,478 Frank Harvey, Renovo, Penn., car coupling.
- 43,479 Frank Benjamin Woodman, Cedar Rapids, Iowa, car coupling.
- 43,485 Wm. Mable, Fort Collins, Colorado, combined car and air brake coupling.
- 43,487 Frank Henry Cathcart, Philadelphia, Penn., power driven tool.
- 43,490 James Budd, London, Eng., improvement in process for printing glass, and apparatus therefor.
- 43,491 Daniel Phialeofsky, Beauharnois, P.Q., hay press.
- 43,494 Eben Perkins, St. John, N.B., improved nail.
- 43,495 James Morrison, Toronto, Ont., machine for heading water boilers.
- 43,497 Carl Weitenkampf, Heinrich Deininger, Berlin, Germany, apparatus for separating solid and fluid substances dissolved in alcohol, ether or chloroform, without evaporation of the solvent.
- 43,500 Carl John Ludstrom, Little Falls, N.Y., centrifugal liquid separator.
- 43,506 John George Smith, Montreal, P.Q., stop cock.
- 43,507 Wm. Forgie, Washington, Penn., improved tank.
- 43,509 James Douglas, New York, N.Y., process of separating copper from cupriferosus nickel ores.
- 43,513 Wm. Morrison, Toronto, Ont., improved plug.
- 43,792 Charles Lincoln Fitch, Brooklyn, N.Y., the process of manufacturing gas.
- 43,795 Hugh Webster Williams, Victoria, British Columbia, explosive engine.
- 43,799 Henry Eyster Smyser, Philadelphia, Penn., automatic weighing machine.
- 43,802 J. Wm. Sutton, Brisbane, Queensland, the separation of gold from its chloride solution.
- 43,804 James D. Dozier, Louisville, Kentucky, barrel and method of making same.
- 43,805 Henry Bragg, Cleveland, petroleum fluid burner.
- 43,805 Christian Loetscher, Dubuque, Iowa, chain tool mortising machine.
- 43,809 Nils Gustaf Hanson, Stockholm, Sweden, tool for exchanging percussion caps in empty cartridge cases.
- 43,810 John R. Brownell, Dayton, Ohio, boiler.
- 43,811 John James Price, Toronto, road bridge.
- 43,812 Thomas Davidson, Montreal, damper.
- 43,813 Caleb H. Booth, Dubuque, Iowa, hydraulic dredge.
- 43,814 Samuel Hughes, Lindsay, Ont., ventilating railway carriage.
- 43,815 Harry Bradley, Buffalo, N.Y., ventilating cap.
- 43,818 Edwin B. Sintzenich, Rochester, N.Y., balance slide valve.
- 43,820 Thomas Lloyds, Boston, burnisher.
- 43,821 James Constant McNabb, Montreal, stop cock.
- 43,822 Caleb H. Booth, Dubuque, Iowa, steam pump.
- 43,823 Frank Horsell, Leeds, England, lithographers' and printers' roller.
- 43,824 George H. Waring, St. John, N.B., steam engine.
- 43,826 Robert Newton, Providence, R.I., sewer trap.
- 43,827 John Laug Pope, Cleveland, Ohio, pulley block.
- 43,832 Wm. Corliss, Providence, R.I., burglar proof safe.
- 43,833 James Shaw Patten, Baltimore, Md., axle lubricator.
- 43,836 Richard James Hoidge, Toronto, unbreakable angle mould.
- 43,841 Thomas A. Briggs, Arlington, Mass., device for converting oscillating into reciprocating motion.
- 43,842 Thos. A. Briggs, Arlington, Mass., paper feeding machine.
- 43,844 James Canan, Owen Sound, dredge.
- 43,846 Charles H. Muckewhirm, Detroit, Mich., waste trap.
- 43,848 Henry Bland, Leichhardt, N.S.W., gear for driving small machine such as used for sheep shearing purposes.
- 43,851 Hermann R. Winkelmann, Philadelphia, Pa., steamer air connection for water elevator.
- 43,854 Mark Fawcett, Westminster, London, the construction of fireproof and ventilating floors, ceilings and roofs.
- 43,855 Edwin Sylvester Pratt, Parry Sound, monkey wrench.
- 43,860 George W. Hooper, Rochester, N.Y., trolley.
- 43,862 Edward Preston Usher, Grafton, Mass., battery plate.
- 43,863 Louis A. Hathaway, Kenyon, Minn., sash holder.
- 43,865 George Edward Nye, Philadelphia, knitting machine.
- 43,866 Henry Leggott, Leeds, England, connection with domestic fire range.
- 43,867 Joseph O'Brien, Boston, Mass., power hammer.
- 43,871 John Mullaly, New York, surface printing plate.
- 43,872 Oliver Hewlett Hicks, Chicago, rolled paper and fixture therefor.
- 43,873 Alfred Wells Case, Highland Park, Conn., screw propeller.
- 43,874 Oscar Brunler, Eritritsch, Leipzig, Germany, petroleum motor.
- 43,875 James Jones, Little Dawley, Eng., roller grinding mill.
- 43,876 George W. Hall, Georgetown, Colorado, regulatable electric lamp.
- 43,878 John F. Sterling, Le Mars, Iowa, bolting reel.
- 43,879 George E. Donistrophe, London, Eng., machine for scutching flax, hemp, reed, jute, or other like fibrous stems or plants.
- 43,880 Frederick Burns Wells, Montreal, wrench.
- 43,881 Parker Cogswell Choate, New York, art of producing metallic zinc.
- 43,882 John Lawson Ballard, Toronto, secondary battery.
- 43,887 James Lackee Morrison, Arlington, Mass., paper feeding machine.
- 43,888 Thomas A. Briggs, Arlington, Mass., feed machine attachment to printing machine.
- 43,889 Charles T. Chauncey, Woodbridge, Ont., perforating attachment for printing presses.
- 43,891 Herman R. Winkelmann, Philadelphia, water supplying device for locomotives.
- 43,892 James F. McElroy, Albany, N.Y., rotary engine.
- 43,894 James O'Donnell, Toronto, stone cutters' bush hammer.
- 43,895 The Bell Telephone Company of Canada, Boston, Mass., telephone.
- 43,896 James Martin, Gawles, South Australia, hydro-carbon motor.
- 43,897 Abraham K. Allis, Prattsburg, N.Y., oil stove.
- 43,900 Charles Wersley Hulling, Philadelphia, Penn., fire box and steam boiler.
- 43,902 August Marty, N.Y., boat and means for propelling the same.
- 43,905 James Yates, Sombra, Ont., machine for coupling hose.
- 43,906 Henry Van Hovenburgh, New York, unison apparatus for printing telegraphs.
- 43,907 Arthur Boyce, St. Louis, Missouri, steam boiler or water heater.
- 43,908 Christian Kerner, Hamilton, Ont., door holder.
- 43,911 Bruce Clark White, Chicago, brick press.
- 43,913 Leonhardt Kornder, Uffingheim, Bavaria, Germ., nail driving machine and apparatus.

- 43.915 Wm Wins Clay, Paris, Ont., knitting machine  
 43.916 G. Edmund Donisthrope, Eng., machine or apparatus for breaking, scutching and decorticating flax, rhea (China grass), and similar fibres.  
 43.917 James M. McFarland, Virginia, Nevada, faucet.  
 43.918 Orrin Burton Peck, Chicago, centrifugal ore separator.  
 43.919 John J. Murphy, Toronto, ticket box.  
 43.923 David Caird, London, Eng., manufacture of metal barrel and other like vessels.  
 43.925 Stephens Henry Emmens, London, Eng., utilising water power for heating and smelting.  
 43.926 August Niewvenhyus, Brussels, Belgium, dioptric appliance for lamp  
 43.929 Wm Peter Bettendorf, Iowa, metallic wagon frame.  
 43.932 Carl Heinemann, Hammond, Indiana, device for suspending scaffolding.  
 43.933 Martin Ziegler, Nachterstedt, Prussia, manufacture of coke.  
 43.937 Orton C. Little, Menaska, Wisconsin, separable collar and pulley.  
 43.938 Wm. Mathieson, Toronto, dating stamp.  
 43.939 John J Magee, London, Ont., expansion drum.  
 43.940 Fessender C. Butterfield, Minneapolis, Minn., furnace for treating refractory ore.  
 43.941 Wm. Baxter Malcolm, Toronto, earthenware water tank.  
 43.942 Charles Maria Pielsticker, Harlesdon, London, Eng., extraction of gold and silver ore.  
 43.946 Asa Bruce Frame, Boyden, Iowa, water wheel.  
 43.948 George A. Peters, Toronto, process for forming mould.  
 43.949 John E. Leathers, Peterboro, N.H., nails and staples.  
 43.950 August A. L'Engelbach, Leadville, Colorado, apparatus for reducing and smelting sulphide ore.  
 43.951 Martin Warner, Muncie, Indiana, process for the reduction of sulphide ore in the manufacture of carbon bisulphide.  
 43.953 August F. Wilhelm Kreinson, Otlenson, Prussia, process for melting by electricity.  
 43.954 Thomas Duncan, Fort Wayne, Indiana, electricity meter for alternating, pulsating, intermittent and polyphase currents.  
 43.955 Lewis C. Butler, West Bay City, Michigan, desk attachment for telephone.  
 43.958 Farnham Maxwell, London, Eng., the production of chlorine conjointly with the purification of lead and the recovery of silver.  
 43.959 Frank Rodgers Hoyt, Watkins, N.Y., photographic shutters.  
 43.961 James Cook, Paris, Ont., bobbin fastener.  
 43.962 Thomas Leopold Willson, Leaksville, N. Carolina, the electric reduction of refractory metallic compounds.  
 43.963 Carl Kellner, Vienna, Austria, the process of preparation of cellulose for the manufacture of spun fabrics.

## AMERICAN PATENTS.

The following is a list of patents recently granted in the United States to Canadians. This list is specially furnished to THE CANADIAN ENGINEER by H. B. Willson & Co., Washington :

- Horace H. Bailey, Ottawa, Ont., apparatus for feeding hydrocarbon into stoves, furnaces, etc., No. 505,871.  
 James Canan, Owen Sound, Ont., dredger, No. 505,974.  
 John P. Collins, Yarmouth, N.S., thread-breaking device for spinning or twisting frames, No. 505,159.  
 Joseph Drader, London, Ont., vehicle pole, No. 505,820.  
 John T. Dwyer, Montreal, Que., internal stay for trunks, boxes, etc., No. 505,939.  
 David S. Henderson, Brantford, Ont., machine for sharpening clippers, No. 505,899.  
 James H. Paterson, Ingersoll, Ont., screw-cutting lathe, No. 506,068.  
 Mungo Turnbull, Toronto, Ont., dynamically arranged celestial sphere, No. 506,084.  
 Thomas H. Allen, Toronto, Ont., railway brake, No. 506,298.  
 Christian H. Dorenwend, Toronto, Ont., telephone attachment, No. 506,646.  
 The Goodyear Shoe Machinery Co., of Canada, assignee, sole channeling machine, No. 506,630.  
 Edwin Hill, Toronto, Ont., setting and holding plate glass for beveling, No. 506,401.  
 Hamilton A. Jukes, Winnipeg, Man., dry closet, No. 11,373.  
 George S. Karr, Toronto, Ont., saddle for velocipedes, No. 506,510.  
 Malcolm E. Robb, Knowlton, Que., vehicle spring, No. 506,546.  
 Alfred E. Ahrens, Stratford, Ont., securing dental suction valves to plates, No. 506,762.

- J. S. Corbin, Prescott, Ont., hardening harrow disks, No. 506,671.  
 Walter Greaves, Ottawa, Ont., fishing basket, No. 506,909.  
 Saul Laporte, Ottawa, Ont., dial fastening for watches, No. 506,824.  
 John D. McEachren, Galt, Ont., steam boiler cleaner, No. 507,030.  
 Samuel Murray and C. Epps, St. George, Ont., lard or butter cutter, No. 507,028.  
 Asa Mutchenbacker, Rosseau Falls, Ont., boom chain, No. 506,790.  
 Alfred J. Saunders, Port Arthur, Ont., bed for mortising machines, No. 506,945.  
 John H. Smale, St. Thomas, Ont., wagon bolster spring, No. 506,887.  
 Herman H. Brown, Montreal, Que., insulated wire, No. 507,257.  
 Cyrus S. Dean, Fort Erie, Ont., boiler flue cleaner, No. 507,421.  
 Thomas Fane and C. F. Lavender, Toronto, Ont., velocipede, No. 507,114.  
 Francis J. Freese, Montreal, Que., shoe sewing machine, No. 507,267.  
 Edwin Hill, Toronto, Ont., machine for beveling plate glass, No. 507,127.  
 Hamilton A. Jukes, Winnipeg, Man., water closet, No. 507,273.  
 Robert H. Laird, Toronto, Ont., process of and apparatus for deodorizing and refining crude oil, No. 507,230.  
 John McKnight, Fredericton, N.B., plane guide, No. 507,378.

## GERMAN PATENTS.

The following list of German patents is supplied exclusively to THE CANADIAN ENGINEER by Brockhues & Cie., patent solicitors, of Cologne (Germany):

- Class 6—Process for cooling or ventilating wort; C. A. Neubecker.  
 " 13—Water alarm for steam boilers; C. P. Heinrich Ochwaldt.  
 " 13—Steam-generator, consisting of a fore-boiler and a tubular-boiler; Wilhelm Schmidt.  
 " 15—Pneumatic sheet feed apparatus; Klein & Yorwerk.  
 " 20—Coupling of driving axles which can be placed radially to the curve in the line; Emil Neuhaus.  
 " 20—Side-coupling for railway vehicles; L. Bottcher.  
 " 23—Paste for impregnating leather belts; Bros. Klinge.  
 " 34—Apparatus for lifting curtain poles off their hooks; Julius Prehn.  
 " 49—Process for manufacturing chains from a profile rod; Ernst Hammespahr.  
 " 82—Roasting and drying apparatus; Georg Wilhelm Barth.  
 " 86—Apparatus for designing for fancy weaving; Gutton.  
 " 86—Gauze chain regulator for looms for the manufacture of fancy double-plush; Priestly.

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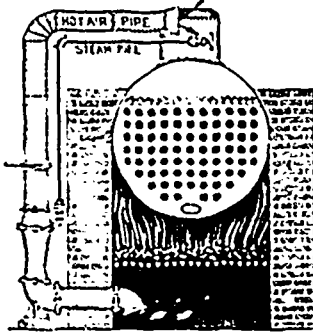
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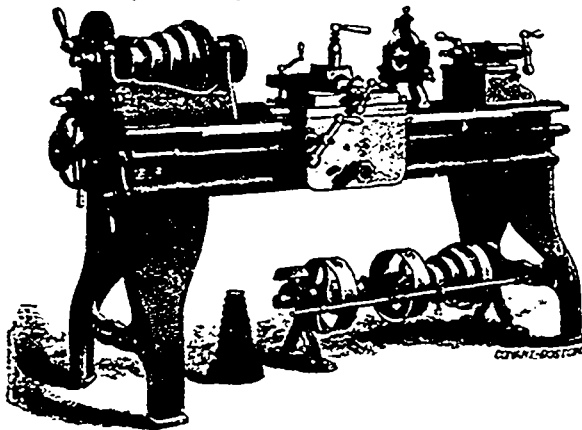
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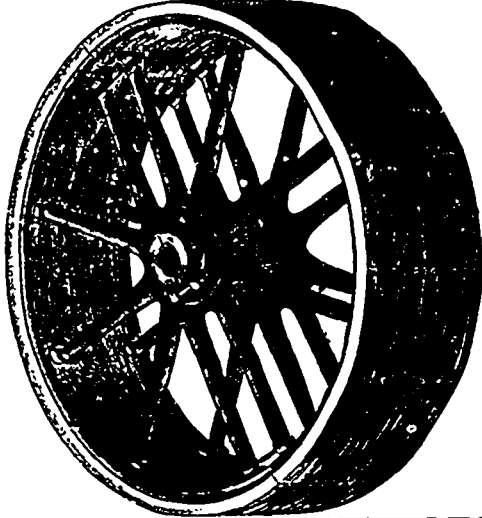


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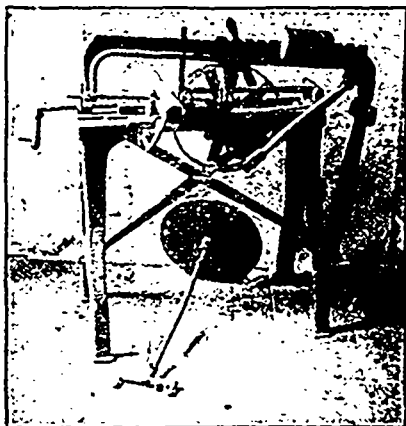
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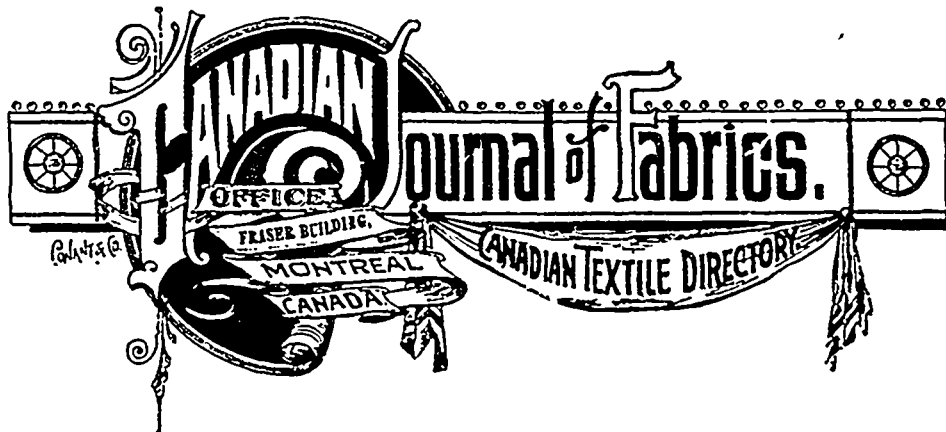
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