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For THE CANADIAN ENGINEER.

FIRES AND FIRE ENGINES IN THE OLDEN TIMES.

BY WILLIAM PERRY, HYDRAULIC ENGINEER, MONTREAL.

(Continued from last issue.)

The oldest sketch of a complete set of apparatus for extinguishing fire that I have seen is a cut representing the interior of a laboratory or smelting furnace, in the *De Re Metallica* of Agricola. The implements are a syringe, a sledge hammer, two fire hooks, and three leathern buckets conveniently arranged against a wall. The syringe itself was not generally used in Europe till late, for it was not till the close of the 16th century that "hand squirts," as they were named, were introduced into London. Previous to that time watchmen, buckets, hooks and ladders, only were in use. Cutting away with axes and throwing water from buckets are mentioned by Petronius and Gervase of Canterbury. The owners of houses or chimneys that took fire were fined, and men were appointed to watch for fires and give the alarm. In 1472 a night bellman was employed in Exeter to alarm the inhabitants in case of fire, and in 1558 leathern buckets, ladders and crooks were ordered to be provided for the same city; no application of the pump seems to have been then thought of.

Syringes continued to be used in London till the latter part of the 17th century, when they were superseded by more perfect machines. An account of them and the mode of working them would make a modern fireman smile. They were usually made of brass, and held from two to four quarts. The smaller ones were about two feet and a-half long and an inch and a-half in diameter, the bore of the nozzles being half an inch. Three men were required to work each, which they achieved in this manner; two, one on each side, grasped

the cylinder with one hand and the nozzle with the other, while the third one worked the piston. Those who held the instrument plunged the nozzle into a vessel of water; the operator then drew back the piston and thus charged the cylinder, and when it was raised by the bearers and in the required position, he pushed in the piston and forced, or rather endeavored to force, the contents on the fire. Some of these syringes are preserved in one or two of the parish churches of Venice. I have one syringe that was used in London at the great fire in the year 1666, in my possession.

It can excite no surprise that London should have been almost wholly destroyed in the great fire of 1666, when such were the machines upon which the inhabitants chiefly depended for protecting their property and dwellings. If the diminutive size of these instruments be considered, the number of hands required to work each, beside others to carry water and vessels for them, the difficulty and often impossibility of approaching sufficiently near so as to reach the flames with the jet, the loss of part of the stream at the beginning and end of each stroke of the piston, and the trifling effect produced—the whole act of using them appears rather as a farce, or the gambols of overgrown boys at play, than the well-directed energies of men to subdue the raging element.

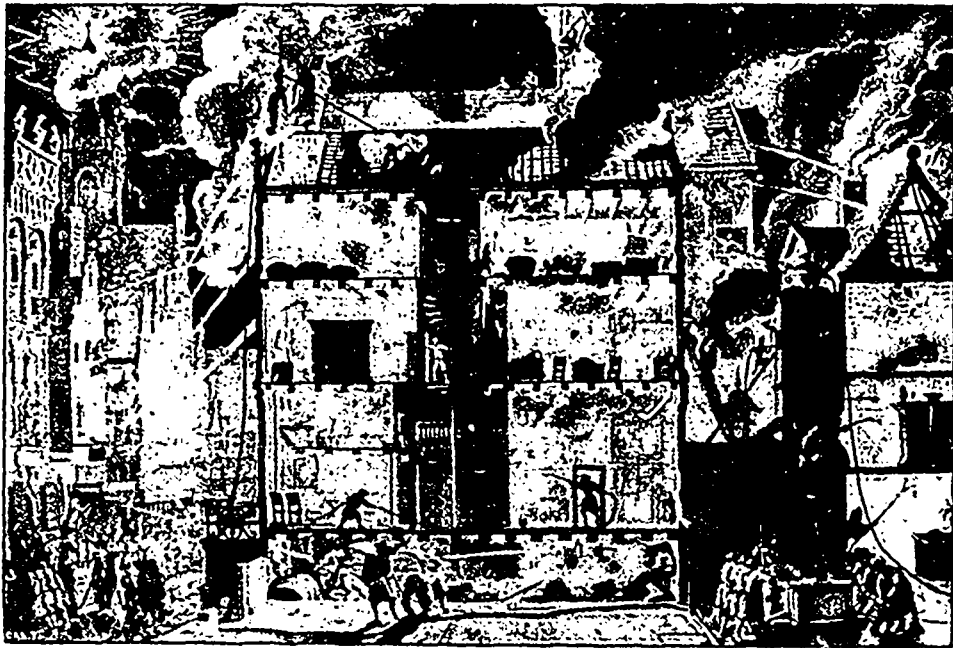
In Asia syringes have probably been always in limited use. They are the only instruments of the pump kind now known there, if China be excepted. Very effective engines on the European plan are made by the Chinese.

The fire engines of the Turks are an improvement on the syringe, but not much more effective. The author of "Sketches of Turkey" observes, when speaking of fires in Constantinople: "Indeed, when we afterwards saw the machines used by the Turks to extinguish fires, we were not surprised at the feeble resistance which they could oppose to the progress of the devouring element. The engines, in fact, are not larger than those employed with us to water gardens. They have but a single chamber, which is about eight inches long by three or four in diameter; they are readily carried about by hand." Commodore Porter, in his interesting account of "Constantinople and its Environs," says their fire engines "are like those we use in our gardens for watering the beds and walks, and deliver about as much water as a good large syringe. When an alarm of fire is given, a man seizes on one of these and runs to the spot indicated, with the engine on his shoulder; another brings a skin of water, pours it into the reservoir and they pump away." A characteristic anecdote is thus facetiously related by Commodore Porter: "They had heard of the fire engines and fire companies in the United States—how half a shingle could be burnt and the engines save the other half from the flames. They could not understand it. Mr. Eckford fortunately arrived with his beautiful ship, having one of our engines on board, requiring some twenty men to work it. The Capudan Pacha heard of it. 'Mash Allah! let us see it,' exclaimed the old man. The engine was brought on shore and placed

in the Navy Yard; a short suction was fixed to it and put into the Bosphorus, men were set to work it, the Navy Yard was soon inundated and the Bosphorus begun to run dry. 'Mash Allah!' said he, 'very good, but it will require a sea to supply it with water. It won't do for us, for there is no sea in the middle of the city.' They, therefore, have thought best to stick to their squirts, and to let the fire spread until the wind changes, or is tired of burning.

Sandys, in the beginning of the 17th century, visited Constantinople, and speaks of the frequency of fires in that city; he observes: "It is not to be marvelled at, for the citizens dare not quench the fire that burneth their own houses, because officers are appointed for that purpose." He is silent respecting the instruments then used.

and the consequently incessant repetition of the operation and interruption of the jet, and the difficulty of directing it on the flames with certainty or precision. Besson (if he was the inventor) therefore greatly enlarged the capacity of the cylinder, making it sufficient to contain a barrel, or more, and as a matter of necessity, placed it on a carriage. To eject the water uniformly, he moved the piston by a screw, and when the cylinder was emptied it was refilled through the funnel by an attendant, as the piston was drawn back by reversing the motion of the crank. When recharged, the stop-cock in the pipe of the funnel was closed and the liquid forced out as before. As flexible pipes of leather, the "ball and socket" and "goose-neck" joints had not been introduced, some mode of changing the direction of the jet of this enormous syringe was necessary. To



This picture represents the new inventions of the Van der Hides, two brothers in Amsterdam, Holland. The inventions are of date 1679 and show new styles of fire pumps, flexible hose pipes, etc. From an old copper plate in possession of the author.

When the useful arts began to excite attention, the defects of portable syringes were too apparent to be neglected, hence in the early part of the 16th century several attempts were made to remedy them, by those noble spirits who burst through the prejudice that had so long consigned the subjects of practical mechanics to the mere makers of machines as one unworthy of a philosopher's pursuit, and from the cultivation of which no distinction, save such as was allied to that of a skilful artisan, could be derived, a species of fame from which professors of philosophy shrunk, like Plato, with feelings of horror. To render the syringe an efficient fire engine would seem to be impossible, except by converting it into a forcing pump, and in that case it would be no longer a syringe. As long, therefore, as such an idea did not occur to engineers, they had no resource but improve the "s squirt" as well as they could, and however hopeless the task may now appear, it was not only attempted, but to a certain extent accomplished, and with considerable ingenuity too. It is described in Besson's "Theatre," and must, therefore, have been invented previous to 1568, the date of the permission to print his work.

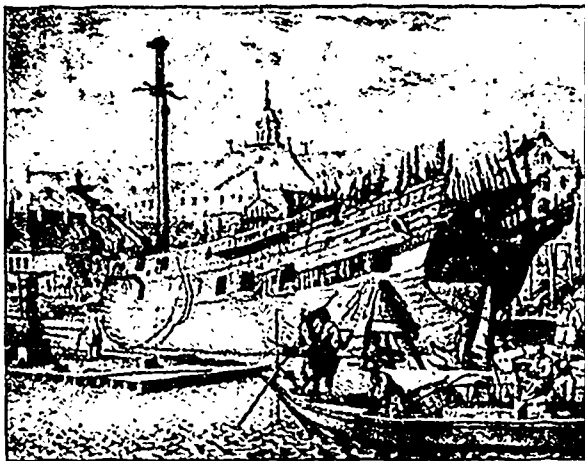
In this engine several defects of the "hand squirts" are avoided, as the necessity of inverting the instrument to refill it by plunging the nozzle into the vessel of water, the small quantity contained in the former

effect this, it is represented as suspended on pivots, which rest in two upright posts; to these are secured two semi-circular straps of iron, whose centres coincide with the axis, or pivots, on which the syringe turns. A number of holes are made in each, and are so arranged as to be opposite each other. A bolt is passed through two of these, and also through a similar hole in a piece of metal, that is secured to the upper part of the open end of the cylinder, and thus holds the latter in any position required. The iron frame to which the box or female part of the screw is attached, is made fast to the cylinder, and it is through a projecting piece on the end of this frame that the bolt is passed. By these means any elevation could be given to the nozzle, and the syringe could be secured by passing the bolt through the piece just mentioned, and through the corresponding holes in the straps. When a lateral change in the jet was required, the whole machine was moved by a man at the end of the pole. To the frame jointed feet were attached, which were let down when the engine was at work. "In the middle ages during fires women used to fetch water in brazen pails to assist."

Considering the age when this engine was devised and the objects intended to be accomplished by it, it certainly has the merit of ingenuity as well as originality. It will be obvious to every practical mechanic that engines of this kind, of large dimensions, must

have been at best but poor affairs. To make the piston work sufficiently accurate and tight, and to keep it so, must have been a work of no small difficulty.

The Germans were proverbially in advance of the rest of Europe in the 15th, 16th and 17th centuries, in almost every department of the arts. "The excellency of these people (observes Heylin in his *Cosmography*) lieth in the mechanical part of learning, as being eminent for many mathematical experiments, strange water works, medicinal extractions, chemistry, the art of printing and inventions of like noble nature, to the no less benefit than admiration of the world." As early as A.D. 1518, some kinds of fire engines were used in Augsburg, being mentioned in the building accounts of that city. They were named "instruments for fires," and "water syringes useful at fires." Their particular construction is unknown, but from a remark in the accounts respecting wheels and poles, they are supposed to have been placed on carriages; they were probably large syringes and mounted like the one previously represented.



This engraving represents a Dutch East India Co.'s ship in front of their docks at Amsterdam. Fire was discovered at 2.30 p.m., May 14th, 1690. As all the people were attending the Feast of Pentecost, it was an hour and a half before the hand pumps arrived. The engraving, which is reproduced from an old copperplate, shows the ship after the fire.

The oldest pump engines of modern times were certainly made in Germany, and about the close of the 16th or beginning of the next century. The first one noticed by Beckman is that of Hautsch, which the Jesuit Schottus saw tried at Nuremberg, in 1656. In giving an account of it, Schottus remarks that the invention was not then new, it being known in other cities, and he himself remembered having seen a small one in his native city (Konigshofen) forty years before, consequently about 1617. We are not informed by either the professor or Jesuit of the particular construction of this small engine, but there is a book extant that was published in 1615, which contains a figure and description of a German engine of that time, and which furnishes the information desired. This book is the "Forcible Movements" of Decaus, a work which, like "The Theatre des Instrumens of Besson," escaped the notice of Beckman. I have cuts photographed from the engine in my possession.

This machine is named "A rare and necessary engine, by which you may give great relief to houses that are on fire." I give the whole of the explanation: "This engine is much practiced in Germany, and it hath been seen what great and ready help it may bring, for although the fire be 40 feet high, the said engine shall there cast its water by help of four or five men lifting up and putting down a long handle, in the form of a

lever, where the handle of the pump is fastened. The pump is easily understood; there are two suckers (valves) within it, one below to open when the handle is lifted up, and to shut when it is put down, and another to open to let out the water; and at the end of the said engine there is a man which holds the copper pipe, turning it to and again to the place where the fire shall be." In other words, this was a single forcing pump, and secured in a tub. For the convenience of transportation the whole was placed on a sled, and dragged to a fire by ropes. The bore of the forcing pipe seems to have been small compared with that of the pump cylinder, a circumstance, combined with the long lever and number of men employed in working the latter, that contributed to increase the elevation of the jet. This machine exhibits a decided improvement on the primitive syringe, and constitutes a great step towards the modern engine. In the short angular tube to which the jet pipe is attached, we behold the germ of the more valuable goose-neck.

Continued in next issue.

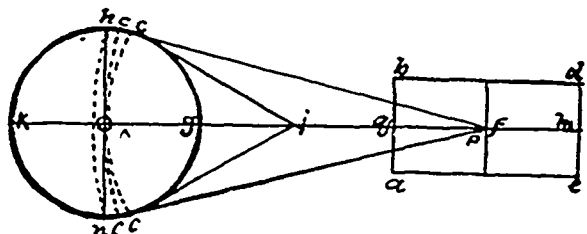
For THE CANADIAN ENGINEER.

THE PISTON PROBLEM.

BY C. BAILLAIRGE, CITY ENGINEER, QUEBEC.

At page 40 of the issue of this journal for June, 1894, is an answer by G. Sinclair Smith, of the McGill University, to a query by a "London Subscriber" as to whether a piston of a "steam engine that is connected in the usual way by crosshead and connecting rod to a crank plate, travels faster in one end of the cylinder than in the other, the fly-wheel running at a regular speed?"

Mr. Sinclair has solved the problem in a no doubt elegant, but scientific manner, and of which not one mechanical engineer out of ten or a hundred can do more than see the result arrived at, to wit: that with a connecting rod, fg , equal in length to 4 times that of the crank, og or oc , the first half, fm , of the cylinder in the forward stroke will be travelled over in $\frac{4}{100}$ of the whole time of transit of piston from end to end, mq , of the cylinder, ad , leaving $\frac{4}{100}$ of the time to travel over the remaining or second half, fq , a total difference of $\frac{4}{100}$ or $12\frac{1}{2}$ per cent. and that the difference will



be greater proportional to length of connecting rod, and *vice versa*.

Everyone likes such a demonstration of any problem, when possible, as his eye can take in and follow up and the mind grasp and lay hold of; while only the eye of faith can be relied on either by the author himself or the reader of an abstruse algebraic solution like that of Mr. Smith.

Let, then, ad be the cylinder and f its centre, or the middle of its length of stroke of piston. The connecting rod $gm = 4og$, or of whatever length it may be. When the piston has arrived at f , the connecting rod gm will occupy the position $cf = of$. Now cf in the isosceles triangle is less, by ch , than the hypotenuse hf in the right angled triangle hof , and the piston has already arrived at half its stroke; therefore, the

peripheral crank velocity being, like the supposed velocity of the fly wheel, uniform, the respective times of the first and second halves $f m$, $f g$, of the whole stroke, will be as the arc $c k c$ to the arc $c g c$; and with a less length, $f c$, of connecting rod, the corresponding velocities will be as $c k c$ to $c g c$. Q. E. D.

P. S.—I would add that this difference in speed between the far and near half of the stroke, or corresponding to the far and near position of the crank, is apparent to any close observer of the relative velocities.

For THE CANADIAN ENGINEER.

A COMPOUNDED ENGINE.

BY CAPT. J. WRIGHT, MONTREAL.

The accompanying combined diagram is in conformity with Rankine's system.

————— "LUCANIA" —————

Triple Compound Engines. 2 off.

H.P. Cylinders 37" X 69". 4 off.

I.P. " 79" X 69". 2 off.

L.P. " 98" X 69". 4 off.

Single equivalent H.P. Cylinder. 6' 2" diam.

" " I.P. " 9' 3 3/4" "

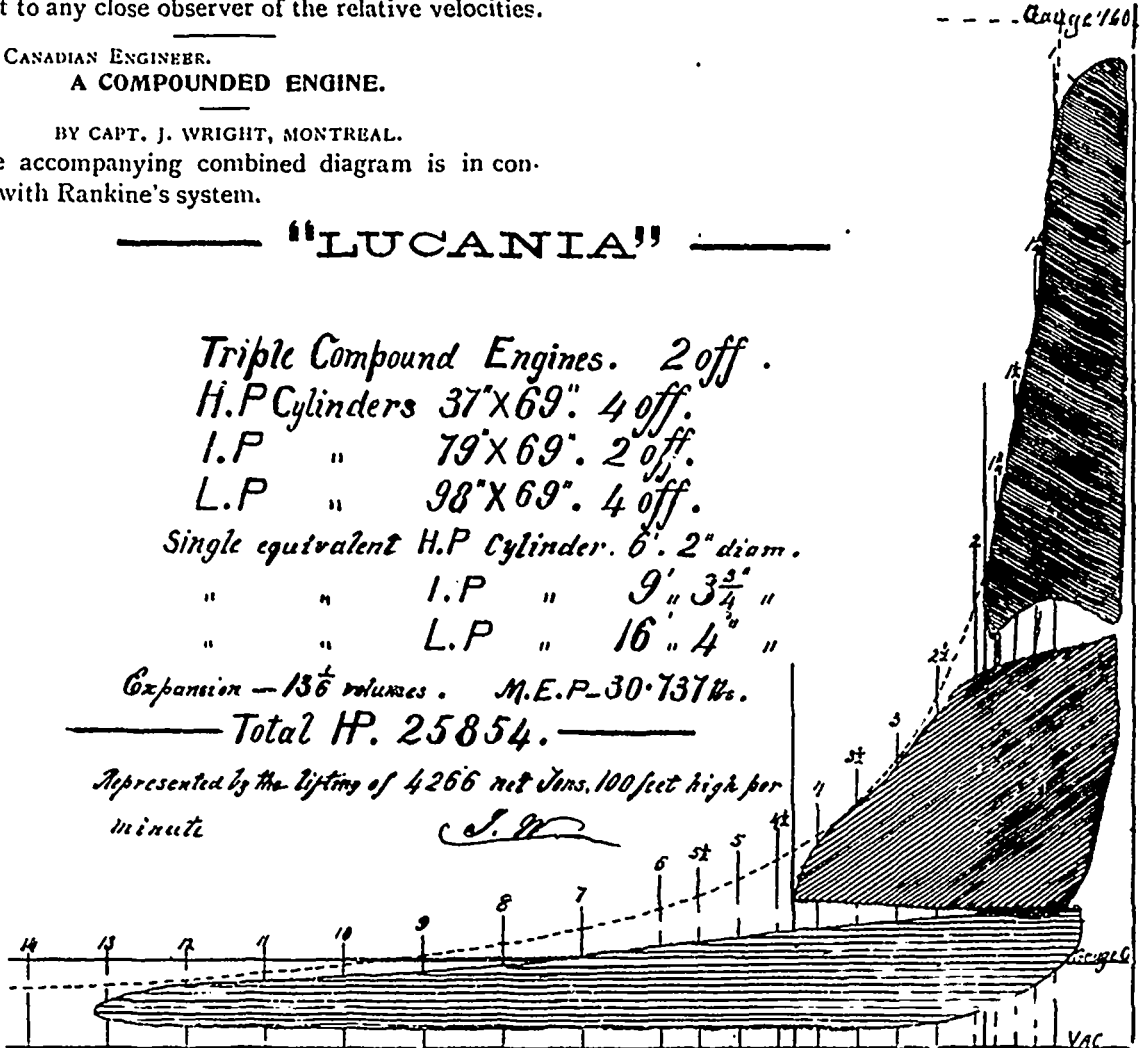
" " L.P. " 16' 4" "

Expansion — 13 1/6 volumes. M.E.P. — 30.737 lbs.

————— **Total H.P. 25854.** —————

Represented by the lifting of 4266 net tons, 100 feet high per minute.

J. W.



The lengths of the diagrams are in the ratio of the volume swept per stroke of their respective pistons, and the pressures on the original diagrams are plotted to a uniform scale.

In engine with duplicate cylinders, the high-pressure cylinders are treated as one cylinder, with an equivalent area of piston. The same is done with the intermediate and low-pressure cylinders. In this case it is immaterial whether each engine is treated by itself, or the two as one engine. For simplicity, the last method is adopted.

A further simplification is effected by combining or Rankinizing to a uniform scale of pressure and volume a set of the original diagrams, the intention being to produce a diagram that would have been obtained had the steam performed the same work by going through the same changes of pressure and volume in one cylinder. And in compound engines of any description this must be the low pressure cylinder, or their equivalent, which in this case would be 16' 4" diameter.

As previously stated, in Rankinizing diagrams from compound engines, the lengths are as the piston displacement of the respective cylinders. In this engine the ratios are, beginning with and relative to the H. P. cylinder, 1—2.279 and 7.015. After selecting a

convenient length for the H. P. diagram, the others are found by using the ratio as a multiplier.

Clearance must not be neglected, or the results would be erroneous. In the absence of any reliable information about the amount, 5 per cent. is adopted, or its equivalent 1/20th of the length of each diagram.

The scale of the original L. P. diagram is generally, but not necessarily, the scale of the Rankinized diagram. As originally plotted the scale was 16, and

the H. P. diagram 1 1/2" long. This per ratio makes the I. P. diagram 3.42", and the L. P. 10.52" long.

On a vacuum line as a base erect a perpendicular to bound the clearance. Three other lines are drawn parallel to the above, and at distances equal to the ratio length of the respective diagrams, plus the percentage of clearance. These lines define the end of the stroke of the H. P. and I. P. cylinders, on the scale of the L. P. cylinders, and the beginning of the stroke is the ratio length of the diagram (not including clearance) measured from their respective terminal on a perpendicular towards the clearance.

The points bounding the position and length of the diagrams having been found, the length of each is divided by equidistant ordinates into at least 10 divisions. The same is done with the originals, and, the pressure measured on their ordinates by the original scale from either the vacuum or atmospheric line, are plotted on the corresponding ordinate on the Rankinized diagram, and to the uniform scale adopted. When completed the diagram is formed by tracing a line through the pressure points on the ordinates in following order on the steam and exhaust line.

In this manner diagrams from compound engines are reduced to one equivalent. In power results the

originals and the Rankinized are the same. But Rankinizing goes further, and gives results unattainable by the original diagrams, besides exhibiting the working of the engine as a whole.

Taking the engine as a whole, the work done

By the four H. P. cylinders = 7702 H.P.

By the two I. P. cylinders = 8264 "

By the four L. P. cylinders = 9888 "

A total of 25,854 H.P., with a mean effective pressure of 30.737 lbs. per square inch; this is a little over 841 H.P. per pound of mean effective pressure. The stroke ends with a pressure of 10 lbs. above a vacuum, with a consumption of 11.8 lbs. of steam, accounted for by indicator, per H.P. per hour.

The above proves that this engine was then working close to her most economical rate, with a boiler pressure nearly 160 by gauge. If cut-off had taken place 8 inches further in the stroke of the H.P. cylinders, the H.P. would have risen to 30,000. But the cost per H.P. would have been greater. The theory of the compound engine is simple. By theory is meant a generalization of the facts of the case. In the above diagram an expansion curve in dotted line is described from the point of cut-off in the H.P. cylinders. Taking clearance into consideration, the expansion at the end of the stroke is $13\frac{1}{2}$ volumes. The losses, principally due to unresisted expansion of the steam in the passage between the cylinders, the gaps as they are called, are clearly defined by the curve, amounting in this case to over 4,000 H.P. If a series of expansion curves be drawn in order on the same sheet, corresponding to cut-offs, from $\frac{1}{4}$ th to $\frac{3}{4}$ ths of the stroke of the H.P. cylinders, the necessary action of the engine under different circumstances is made visible, and valuable data is obtained from curves described in conformity with different pressures in the boiler, say from 150 to 75.

Contrary to what is often heard in discussions about compound engines, the so-called back pressures in high and intermediate cylinders is not a loss. It is restored on the piston of the following cylinder with a bonus of over one hundred per cent. The back pressure due to the condenser is a necessary loss common to all condensing engines.

For THE CANADIAN ENGINEER.

MACADAM STREETS IN TORONTO.

BY ALAN MACDOUGALL, M. CAN. SOC. C. E.

The report of the city engineer of Toronto on the reconstruction of several cedar block paved streets which are now worn out, was adopted by the City Council, and in it are given many estimates of the cost of renewals in the several materials now finding favor as permanent surface-materials, and a recommendation is made in favor of renewals with cedar block paving. The comparatively low cost of this class of roadway, and the stringency of the times, has apparently induced the engineer to consider the pockets of the ratepayers. The policy adopted by the City Council in making no repairs on the streets improved under the local improvement system has been fatal to all prospects of a good surface; no street left to itself can be expected to be decently passable after being laid for two or three years; the cedar block roadway shaving had no repairs made on them, the surface did not take long to become well nigh impassable, whilst the condition of the roadway was sometimes worse than a mud road. The experience of the citizen as ratepayer and traveller over these surfaces, enables him to form a just estimate of this policy, and should induce him to call for some system of maintenance in the future. There is in the

city a considerable mileage of a class of roadway which can be maintained with a small yearly outlay, which has the advantage of improving under proper maintenance, and forming a firmer and finer surface the more it is cared for. There are at present about 36 miles of macadam roadways in the city. This class of roadway has fallen from public favor during the cedar block era. Many miles of streets have been torn up and replaced by cedar block, which would have been in splendid form to-day, if the cost of the cedar block paving had been expended in maintenance, during the period appointed under the by-laws for payment of the cedar block improvement. Every city engineer, during the past twelve to fourteen years, has urged the council to maintain in efficient condition the macadam roads; each in turn has again and again pointed out the advantages to be obtained by proper methods of maintenance, and has urged the council to purchase a steam road roller; as yet their efforts have not met with much success. We notice an advertisement calling for tenders for a steam road roller, and trust, now that the council has gone so far, it will act on the engineer's advice and purchase a serviceable roller.

The macadam road suffered from its rival, the cedar block, for many years. One ground of objection taken was the dusty and unhealthy condition of this class of roadway. The experience gained from cedar block streets should set ratepayers thinking and make them look into the wear and conditions of macadam surfaces, before they condemn more of this class of roadway. With examples of well rolled metalled (or macadam) surfaces on the streets of Montreal and Ottawa, and the experience of both cities directly favorable to the use of a steam road roller, and also opportunities of seeing the same class of work in many places close by us on the other side of the border, there should be no hesitation now in following the advice of the city engineer. Under existing circumstances, the metalled streets are necessarily dirty, ill-conditioned and fair samples of the "awful example." Under the treatment of a good steam road roller, and a good clean, hard wearing material on the surface, these streets will rapidly rise in favor. Every year's maintenance will improve them, the material placed on them will compact the body of the surface; each year they will make a better return for the care bestowed upon them, whilst the lessened cost for repairs and renewals will make glad the heart and lighten the pocket of the ratepayer.

CEMENT TESTING.

BY CECIL B. SMITH, MA. E., A.M. CAN. SOC. C. E.

(Concluded from last issue.)

The writer, speaking of other tests, considers that compression tests, though valuable, are not needed, because compression strength varies regularly with tensile strength, and is so great that we need to concern ourselves with it. Moreover the strength of mortar in thin joints is much greater than in cubes. The machinery for such tests is not generally available. Transverse tests have often been advocated, but are objected to because the co-efficients of rupture do not indicate the tensile strength of the outer layer of fibre, and because a slight flaw, such as a bubble, would vitiate the test. It is also known that if tested upside down from position moulded, the results are higher than when tested as moulded.

FROST TESTS.

This series consisted of various investigations into the strength of mortars when mixed with different con-

ditions of water and under different exposures, reference being particularly made to frost. All tests were made in quadruplicate:—

The 1st set was submerged, after 24 hours, in water of laboratory tanks;

The 2nd set was kept on damp boards in a closed tank for the whole period, and never allowed to dry out;

The 3rd set was allowed to set in the laboratory, and then exposed to the severe frost and left in open air for the whole period;

The 4th set was exposed in from 8 to 10 minutes to the severe frost, and left there for the whole period, except to take them out of the moulds when they were set or frozen.

ocular evidence; that their structure was injured, and the test-pieces broke most irregularly, while the other exposures at about 0° F. gave no evidence of any injury at all. Coming to the natural cement mortar in the 5th and 6th lines, we find much different results. The first one is decisive, and is that this particular cement mortar cannot be laid in zero weather. The first set were all blown to pieces (except the cube), which surprisingly stood 1,390 lbs., while the 2nd set, although not quite blown to pieces, all showed extreme injury.

The most peculiar result is that this same cement, neat, if given a few hours to set in the temperate air, will on exposure to the frost attain a strength highest of the 4 conditions; this is quite remarkable, that while

Mixture.	Age.	Tensile Strength.				Compressive Strength.				Dates of Exposure.	Temp. of Exposure for 3.	Temp. of Exposure for 4.	Time from Mixing till Exposure	Natural time of set	No. of tests.	Remarks.
		Water test. (1)	Damp air test. (2)	Exposure after setting. (3)	Exposure before setting. (4)	1	2	3	4							
No. 11 Portland Neat.	2 mos.	602	471	282	334					Dec. 6 to Feb. 6	+23°F.	+22°F.	30' (3) 12' (4)	25'	16	
1 to 1.	"	377	276	194	233	3200	1780	1600	1900	Dec. 11 to Feb. 11	+5°F.	+3½°F.	40' (3) 8' (4)	35'	20	
2 to 1.	"	168	150	105	111	800	720	660	440	Dec. 12 to Feb. 12	-½°F.	0°F.	40' (3) 10' (4)	37'	24	
3 to 1.	"	104	86	92	97	300	520	230	300	Dec. 13 to Feb. 13	-5°F.	-6°F.	1°27' (3) 10' (4)	1°25'	24	Nos. 3 and 4 showed irregular and injured factures.
No. 1. Natural Neat.	"	226	221	349	0	1600	1500	2300	1390	Jan. 12 to Mar. 12	+2°F.	+5°F.	4°15' (3) 11' (4)	4°15'	24	No. 4 tension completely blown in fragments.
1 to 1.	"	125	229	187	44			0	800	Feb. 5 to April 5	+18°F.	+1°F.	8°0' (3) 10' (4)	8°00'	22	Some of No. 4 tension and all of No. 3 compression injured.
Neat.	"	250	281	159	94	2800	2000	3300	1390	Feb. 13 to April 13	+13°F.	+5°F.	6°0' (3) 10' (4)	6°0'	24	Mixed with water at temp. 122° F.
1 to 1.	"	129	170	80	117					Feb. 14 to April 14	+9°F.	0°F.	3°0' (3) 8' (4)	2°50'	20	Mixed with water at temp. 113° F.
Neat.	1 m.	155	278	217	249					Feb. 26 to Mar. 26	+17°F.	+7½°F.	7°0' (3) 9' (4)	7°0'	20	Mixed with 2 per cent. brine.

It will be noticed that these tests were purposely made in cold snaps, so as to make the tests as severe as possible.

It would appear improbable that mortar immediately exposed to severe frost would become stronger than that allowed to set in a warm atmosphere, but the results of all the Portland cement tests, both in tension and compression (with one exception) assert it; and also that those allowed to set in the laboratory, and then exposed continually, are the weakest of all the four conditions treated of. This would go far to dispute the advisability of covering up mortar laid in frosty weather.

The next deduction from the Portland cement tests is that laboratory tests made with briquettes submerged give higher results than can be expected in open air work, and therefore that engineers should add to this the various other degenerating contingencies, such as bad mixing, dirty sand, etc. A deduction not much evidenced in the table is that it is not safe to lay Portland cement mortar below 0° F., because the 3rd and 4th series of 3 to 1 Portland exposed at -6° F. gave

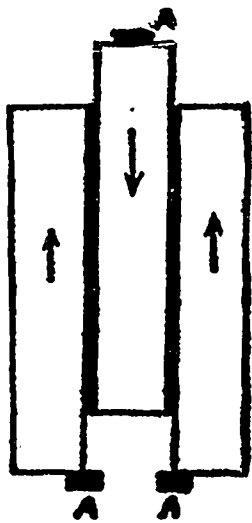
the Portland cement was strongest when submerged, the natural cement was stronger in damp air and strongest in frost. Indeed, the Portland cement, in air, for 1 to 1 mixtures, was very little stronger than the 1 to 1 natural.

All of the natural cement specimens exposed to frost showed a disintegrated layer on the outside about ¼" thick; underneath this the structure was quite sound, and doubtless much of the variations in tests is due not so much to a weakening through the whole mass as to a reduced sectional area.

The last series made with 2 per cent. brine in mild weather for 1 month (exposed at +7½° F.) showed that salt increased the strength, making them as strong as others were at 2 months, when mixed with fresh water, and also again emphasized the advantage to this natural cement of open air tests. It would seem that either hot water or salt are therefore very strengthening in their effect.

This series of experiments was carried out with a view of obtaining more information on the shearing

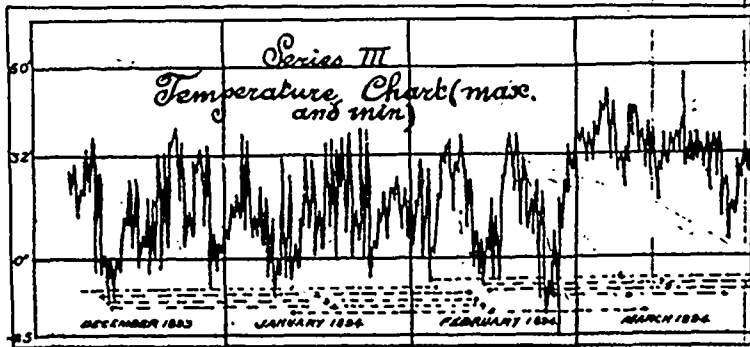
strength of mortar. The method adopted was as follows:—



Three bricks placed, as shown in sketch, were cemented together, and tested at the end of one month. It was found that by placing pieces of soft wood at A.A.A., an action as nearly as possible a shear was obtained, and gave very satisfactory results, the pressure being practically concentrated along the two mortar joints. No side pressure was applied, because the desire was to obtain minimum results where friction was not assisting.

The combined effect of adhesions and friction can easily be computed if the adhesion and super-imposed load are known.

The results are divided into lime mortar, natural cement mortar and Portland cement mortar, also into $\frac{1}{4}$ " and $\frac{1}{2}$ " joints, also into flat, common, unkeyed bricks and pressed Laprairie brickkeyed on one side. (1) The lime mortar was mixed 1 lime to 3 of standard quartz sand, by weight; (2) natural cement mortar was mixed, 1 of No. 2 natural cement to $1\frac{1}{2}$ standard sand; (3) Portland cement mortar was mixed, 1 of No. 5 Portland cement to 3 standard sand. (See exhibits of bricks with mortar attached.) The test pieces were chiefly allowed to stand in the laboratory at a temperature of 55° to 65° F., but one set of natural cement mortar and two of Portland cement mortar were duplicated by immersing in water for 29 days, after setting in air 24 hours before submersion.



These results point out many interesting facts: (a) the first fact noticeable is that the results are independent of the thickness of joint; this is true of lime and cement waters. (b) The next one is not evidenced to any extent in the table, but was quite apparent in the testing, viz., that the adhesion of the mortar to the brick was greatest when the mortar was put on very soft, and least when the mortar was dry. This will largely uphold the use of soft mortars by masons, albeit their reason is a purely selfish one, the mortar being easy to handle. The tensile tests of cements made very soft are lower than when the mixture has the minimum amount of water for standard consistency. But for adhesive tests the case is evidently the reverse. It may be here mentioned that in these tests all bricks were thoroughly soaked with water before the joints were laid. (c) Coming now to the tests on lime mortar, the shears were through the mortar, except in the 4th experiment, and therefore they are quite independent of the key of the pressed brick on the surface of adhesion. This would point out the fact that keyed bricks are superfluous in lime mortar joints, and the shearing strength per square inch

averages about $10\frac{1}{2}$ lbs. per sq. inch. The tensile strength of the same mixture at the same age was 30 lbs. per sq. in. and the compressive strength 102 lbs. per sq. in. (d) The natural cement mortar showed distinctly that its adhesive strength was not as great as its shearing strength, which is the reverse of the lime mortar tests. It also showed that the keyed brick aided in some unknown way, for the results on them are 3 times as great as with the common flat brick. Of course this may have been, and probably was partly due to the different surface of adhesion. In 5 tests out of 21 made on the natural cement mortar, the mortar sheared through, and the average of these 5 was 97 lbs. per sq. inch, which gives the shearing strength proper, while the average adhesive strength of the 13 tests in air which came loose from the bricks was 26 lbs. per sq. inch in common brick, and 48 lbs. per sq. inch on Laprairie pressed brick, and 38 lbs. per sq. inch on Laprairie pressed brick for three tests submerged in water for the whole period.

This would show that the adhesive strength is nearly twice as great on pressed brick as common brick, and that submersion in water had a rather harmful effect than otherwise, on the adhesive strength, and was certainly of no benefit.

The tensile strength of the same mortar at the same age was 132 lbs. per sq. inch; the compressive strength was not obtained, but would have been about 1,000 lbs. per sq. inch. The hints to be taken from these tests are that pressed brick keyed on both sides will give much higher results than flat common bricks, and would probably place the shearing strength of such joints at 100 lbs. per sq. inch, and make it largely independent of the consistency of the mortar. Also that the shearing strength is very much higher in proportion to the tensile strength than was the lime mortar shearing strength to its tensile strength, but about the same proportion to its compressive strength, i.e., 10 to 1.

It becoming evident that the thickness of joint had no appreciable effect, the Portland cement mortar tests were made all $\frac{1}{2}$ inch thick. The results are surprisingly low. The adhesion on the common brick is about the same for air drying or submersion in water, and is slightly less than half that of natural cement mortar tests, of $1\frac{1}{2}$ to 1. This is a significant fact, for while a neat tensile test of No. 2 natural cement four weeks old is 268 lbs., the No. 5 Portland is 459 lbs. for the same age, and a 3 to 1 No. 5 Portland is 82 lbs. for same age. Thus while any test of this cement would show that a 3 to 1 mixture of the latter would be nearly equal to a $1\frac{1}{2}$ to 1 test on the former, yet in their adhesive properties to common brick the heavily dosed sand mixture was only half as strong as the natural cement mortar with a smaller dose of sand; we might easily have expected this, but the main point is: is it taken account of in considering the comparative values of these mixtures, that the adhesive strength of a Portland cement mortar heavily dosed with sand is low as compared with a weaker, but richer, mixture of natural cement mortar? The shearing of Portland mortar shows that the adhesion to pressed brick is greater than to common brick, but not in such proportion as in natural cements, being $1\frac{1}{2}$ or 2 to 1 in place of 3 to 1 in the latter. But here again comes out the advantage given to Portland cements by testing them under water, the submerged

specimens are stronger than open air ones, while in natural cements the reverse is the case.

STRENGTH OF MORTAR IN COMPRESSION IN BRICK MASONRY.

All engineers realize that the strength of mortar is much less, tested in cubes, than in thin layers, but just what proportion they bear to one another is not very well known. The following table shows the results of tests made:—

Strength of Mortar per sq. in.		In joints.	In cubes.	In tens'n.	Loads released at 17,500 lbs. set observed per lineal foot.	
235	40	17				1 week old, mortar, 1 lime, 5 sand.
469	57	20	.01"	3	"	" " " " 1 " 5 "
406	57	20		3	"	" " " " 1 " 5 "
237	21		.05"	1	"	" " " " 1 " 3 "
968	250			1	"	1 natural cement, 1 1/2 sand.
755	311	43	.00	1	"	1 Portland "

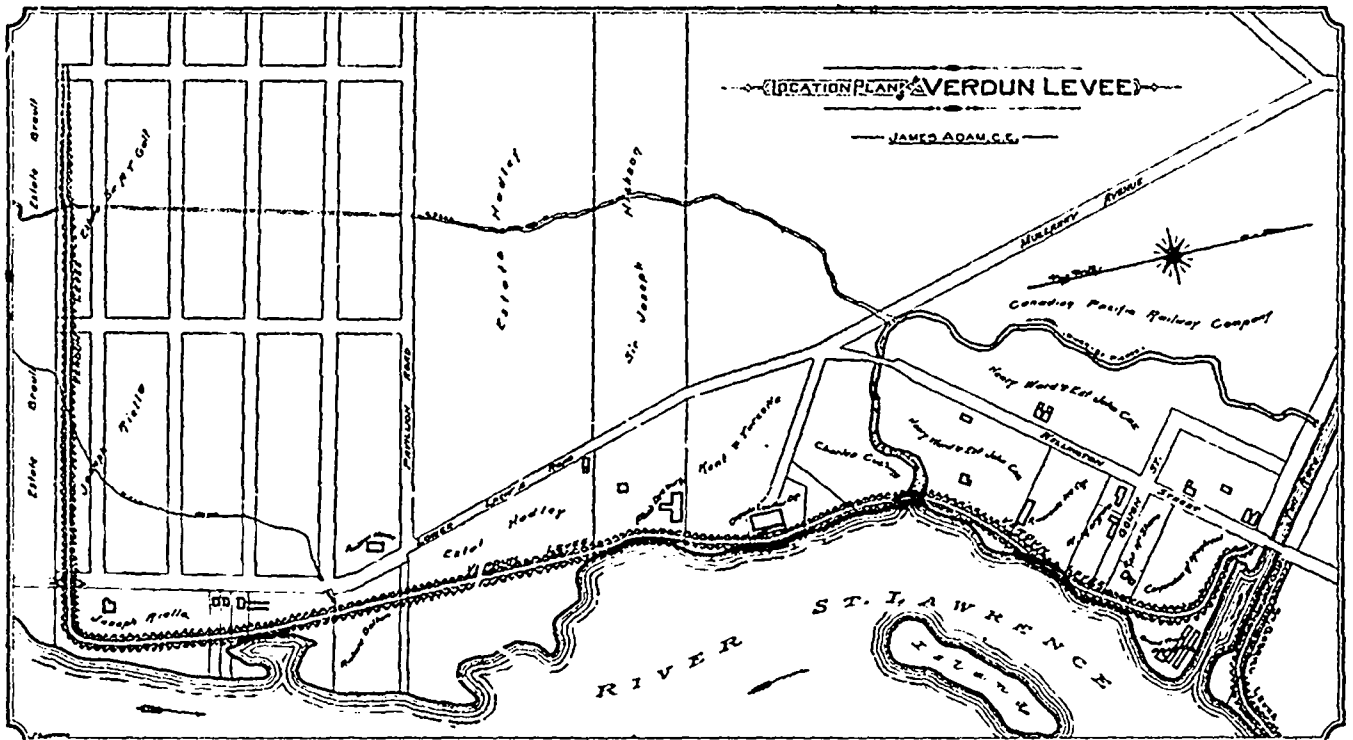
Roughly speaking, the lime mortar at 1 week 5 to 1 is 6 times as strong; the lime mortar at 1 week 3 to 1 is 14 times as strong; the natural cement mortar at 1 week 1 1/2 to 1 is 4 times as strong; the Portland cement mortar at 1 week 3 to 1 is twice as strong, as the same mortar tested in cubes, at the same age.

Referring to the amount of compression in Table VII., it will be seen that the amount of compression per foot is much less according as this ratio is less—i.e., the less yielding the mortar the nearer does the strength

elapse before the maximum load might be put on a brick wall, and when it is remembered that these joints were less than 1/4" thick. The amount of compression in a high brick wall under a load of 80 or 90 lbs. per sq. inch is seen to be very great, and under a load of 300 to 400 lbs. per sq. inch, a brick wall 50 feet high in lime mortar would not only fail, but compress from 2 to 6 inches in doing so—the compression practically all taking place in the mortar, as in the unyielding Portland cement mortar the compression is seen to be very small.

THE VERDUN DYKE.

The Verdun Levee is being built along the bank of the River St. Lawrence, from the tailrace of the Montreal Water Works at its junction with Wellington street in a southerly direction, for a distance of about one mile to the boundary line between the property of Joseph Rielle and the Estate Brault; thence in a westerly direction along the property of Joseph Rielle and the Estate Galt, for a further distance of about one-half mile until the high land is reached. The Verdun Levee is a continuation of the St. Gabriel Levee, which was built by the corporation of Montreal about eight years ago—and which has been the means of populating the large district now known as St. Gabriel Ward—which previous to the building of the levee was annually subject to inundation. The total area of land which will be acquired by the corporation



in cubes approach to the strength in joints; this is to be expected, because the more yielding substances will be at a much greater disadvantage when unsupported at the sides than if enclosed in a thin masonry joint.

In the 2nd, 3rd, 4th and 6th tests—at 17,500 lbs., the load was released, and the permanent set observed was as given in the 5th column of the preceding table. It seems probable from this, therefore, that the lime mortars must have yielded to an injurious extent before there were any external signs. But whether this was the case or not, it is impossible to say, because the compression was quite uniform up to and in many cases much past the points of evident failure.

It seems fair to suppose that 1 week and 3 weeks are about the minimum and average times which would

of the village of Verdun for the construction of the levee will be close upon one million superficial feet, and the area of land to be protected from inundation by the levee, will be about six hundred acres, and will extend from the River St. Lawrence to the Montreal Water Works Aqueduct. The levee is built of selected clay and will be a thorough water-tight embankment. It will have a width of ten feet on top with a slope of 1 1/2 horizontal to 1 vertical, and will have an average height of fifteen feet along the river bank. The top of the levee will be two feet above the high flood of the 18th April, 1886. The greatest height of the bank will be about 23 feet, and the least 4 feet. The amount of material used will be about 83,500 cubic feet.

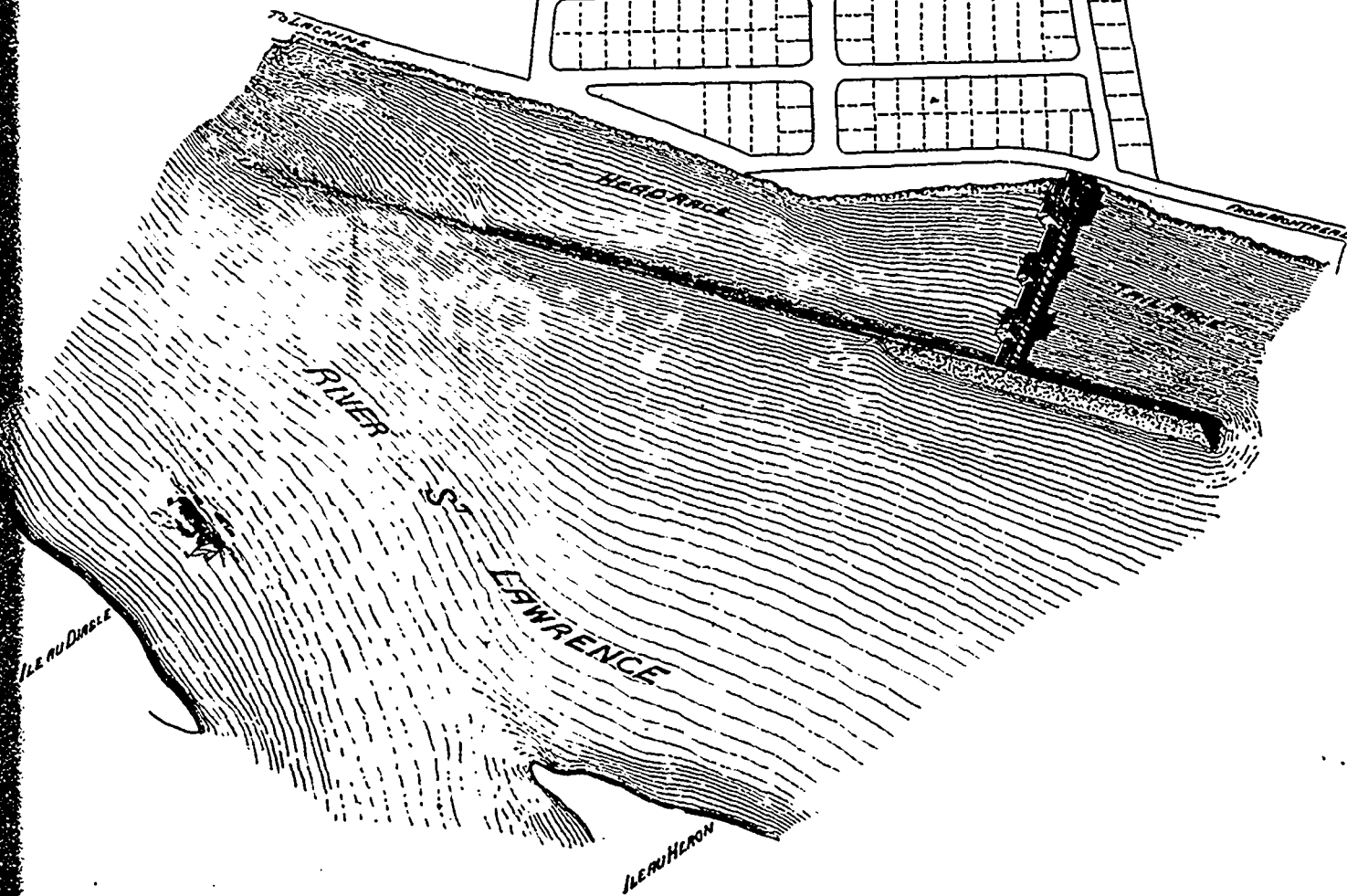
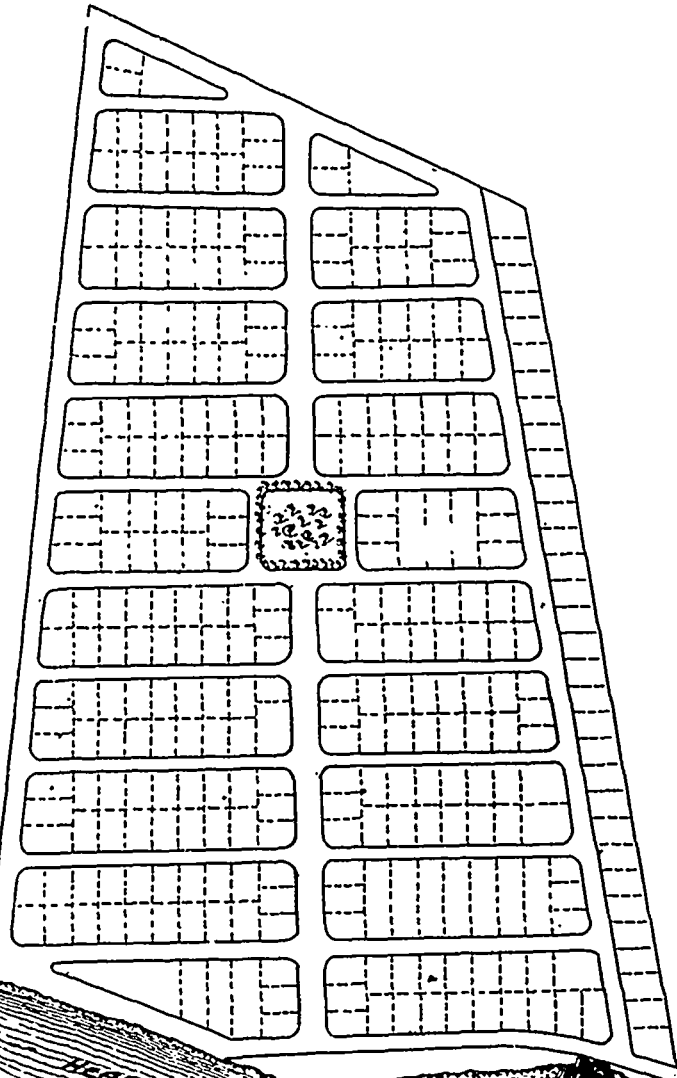
It may be mentioned that arrangements are now being made by the council of the village of Verdun for the running of the electric cars along the levee—one line going out as far as the Protestant Hospital for the Insane, and the other, a circular line to go through Cote St. Paul and connect with St. Henry. Pegnem & Doheney, of Montreal, are the contractors, and James Adam, C.E., is the engineer. The contract price of the work is \$27,000, and the dyke is to be finished by 1st October.

fender, consists of isolated piers of masonry, and made to form the flumes to take the turbine wheels and shafting which generate the power. On these piers will be located the dynamo houses, three in number, and shaft sheds to protect the same from the weather. There will be sixty-six 60" turbine wheels working under a minimum head of eight feet. The shafting will be horizontal, and each generator or dynamo will be attached to six wheels by direct coupling,

LACHINE WATER POWER SCHEME.

The accompanying sketch gives an isometric view of the proposed Lachine Rapids Hydraulic and Land Company's project for the utilization of the waters of the Lachine Rapids to generate electric power for commercial use in the city of Montreal and its suburbs. The proposed work consists in making an artificial canal, so to speak, on the north shore of the St. Lawrence, situated at a distance of about five miles from the city. The wing-dam is constructed of crib work filled in with boulders, with a cut stone ice fender at the upper end, and triangular piers sunk at six feet below water, to take up the fall that exists above the head-race.

The main dam, which is constructed at about 3,500 feet down stream from the ice



and give 729 H.P. to each generator, making in all 7,920 horse power. They will all be connected to one switch-board, and the power carried under high voltage to Montreal, where by rotary transformers it will be again reduced to straight current ready for use.

Below the dam will be a guard pier above the level of high water to prevent the ice entering and blocking the wheel pit. At the head of the head-race will be a boom 800 feet long to guide off floating bodies and throw the same clear of the dam.

The work is, perhaps, the largest undertaken in Montreal for some years, necessitating the removal of about 250,000 cubic yards of rock; the construction of about 3,500 running feet of crib-work 20 feet wide and about 10,000 yards of masonry and concrete, besides the construction of a water supply, drainage system, electric light plant, macadamizing streets and making cement sidewalks for the property on the shore, and which is included in the undertaking.

W. McLea Walbank and T. Pringle & Son, civil and hydraulic engineers, are the promoters of the company, backed by some of Montreal's influential and wealthy citizens and one Chicago capitalist. The engineers above referred to have given the matter careful study since 1891, and have taken close soundings, revealing the bed of the Rapids, the velocity of the water, and have the records of the state of the river since 1875. They have taken into consideration the action of anchor and frazil ice, and are satisfied that the means they have adopted in constructing the dams and head race will be satisfactory and free from this trouble. Frazil, which is a great bugbear to all people having to do with water powers in Canada in winter, is never known to form in still water or under ice. As the proposed headrace will freeze over during the winter, it is believed no frazil will be formed in it. Therefore, only the frazil formed in the river above will have to be contended with. It is a well known fact that ice, when it gets into still water, will float to the surface, and in this case the dams and headraces will be arranged so as to take full advantage of this physical condition and that the power will consequently not suffer from it. Owing to the peculiar formation of the shore, and the position of the dam in regard thereto, the current tends to strike the dam at an angle and with great velocity, due to the rapids above. The water approaches the headrace—which will be made of very much greater capacity than would be actually required were there no anchor ice to contend with—at a very great velocity, and continues thus over the overflow of the dam, carrying with it the floating anchor ice. The water thus moving into the headrace at a slow speed, creates no suction and carries no anchor ice with it, the result being that a sort of water-dam will be formed at the intake.

Tenders are already being asked for the construction of the work.

CORRECTION.

Editor CANADIAN ENGINEER:

SIR,—With reference to my article entitled "Screw Steamer and Steel Tow-Barge Efficiency," which appeared in your last number, I find that by a clerical error the diameter and stroke of cylinders of the "Pathfinder" are expressed in feet instead of inches. Please note that her cylinders are 23, 37 and 62 inches diameter, respectively, and the common stroke of piston 42 inches.

Respectfully yours,

JOSEPH R. OLDHAM.

Cleveland, O., May 15th, 1895.

DEATH BY FIRE.

Editor CANADIAN ENGINEER:

SIR,—It is generally conceded that few, if any, more horrible forms of death can be endured than that by fire.

In ordinary cases death comes after protracted illness, when the vital forces have been greatly exhausted; but death by fire has mostly for its victims the wage-earning men and women, who in their full vigor are slowly or rapidly roasted, or else, should they jump to save themselves, in many instances die an agonizing death from injuries sustained, or, if they survive, go through life permanently injured.

My purpose, in this letter, is to draw attention to the criminal carelessness, or want of humanity, shown by many employers in their care of their employees, and to ask "those in authority" to see to it that no firm be permitted to erect or occupy a factory that is not fully equipped with fire-escapes—which is the exception at present—and further, that once in three months fire-drill be made compulsory, so that we may have less of the sad details to read which invariably follow as the result of large factory fires.

Without fire-drill, the best fire protecting devices may fail; an ample proof for this statement being found in the fire which recently took place in McDonald's tobacco factory.

Employers and all "those in authority" in the matter referred to, should remember that by the crime (for such it is) of knowing what is right to do and neglecting to do it, they contribute to the death of their fellows, and are truly responsible for such loss of life, and all the suffering it entails.

EBLANA.

Montreal, 27th May, 1895.

A CLEVER PIECE OF WORK.

Editor CANADIAN ENGINEER:

DEAR SIR,—Agreeably to your request, I send you a few details of the miniatura engine referred to in the last number in the notes of Montreal Branch C.A.S.E. It was made by one of the firemen in the Board of Trade Building named James Willson, who has only had about two years' experience as such, and was never employed in any machine shop. The engine is of the horizontal type, with plain slide valve, and runs splendidly under steam, turning about five hundred revolutions per minute. There is no part of it that was made outside the boiler room, except a few small stove bolts. The diameter of the cylinder is $1\frac{1}{4}$ and stroke $2\frac{1}{2}$ in., and was made as follows: He first made a wood pattern for the cylinder and steam chest, and then moulded it in a mixture of Portland cement and sand, which was then set away to dry; this being done, a quantity of old lead, or rather tea chest lining, was melted up in a plumber's pot, and the cylinder was cast complete in every respect, with its lugs, flanges, steam and exhaust ports, etc.; the valve was also cast of the same material, but on the first steam trial it stuck so firm to the face that the eccentric rod pulled out. Not to be outdone, he then covered both faces with sheet brass thoroughly soldered on, then filed and ground them to fit steam tight. For a main shaft he cut a few inches off the engineer's brass packing hook. The fly wheel is made of lead, he having taken the wheel off one of the steam valves and used it for a pattern. The main bearings are made from pieces of an old electric light switch. The guides are made from some other scrap.

The engine was then mounted on a portion of a marble tile which had been thrown out. The cylinder was then covered with asbestos wool and laid with narrow strips of pine, which are held in place by neat brass bands. The only tools used in all this work were those usually found about an engine room, supplemented with an old razor and a pocket knife. All those who have seen it are surprised to see such good work turned out under the above conditions. It is really wonderful. Wishing your paper every success,

JOHN J. YORK,
Supt. and Chief Engineer,
Montreal Board of Trade Building.

Montreal, May 31, 1895.

A POINTER ON SAFETY VALVES.

Editor CANADIAN ENGINEER:

SIR,—Re Mr W. G. Blackgrove on "Safety Valves": For the benefit of your readers, I wish to correct an error under which this gentleman labors, as many others have done before him; this I pointed out in an English mechanical journal many years ago.

Mr. Blackgrove states as follows in his winding-up paragraph on safety valves: "Sometimes the lever is extended backwards beyond the fulcrum and fitted with a small weight at the end, so

as to cause the lever to balance exactly about the fulcrum; when such is the case the weight of the lever may be neglected in estimating the pressure on the valve." When the small weight is placed on the end of safety valve lever outside of fulcrum the weight is all on the top of the fulcrum pin. As soon as the regular weight is placed on the lever the pressure is transferred to the underside of the pin, the conditions being quite different; the only effect the small weight would then have would be to take its own weight from the underside of the pin and transfer it to the valve, in no degree taking the weight off the lever of the valve.

I am quite satisfied that Mr. Blackgrove will see the error in this matter, as others have done before. It was a common thing many years ago to see these weights on safety valve levers, but they were soon done away with. In a future number I will, if all is well, show your readers a remarkably simple and absolutely correct way of allowing for the weight of levers on safety valves.

J. H. KILLEY.

Hamilton, Ont., May 30, 1895.

THE R. & O. FLEET.

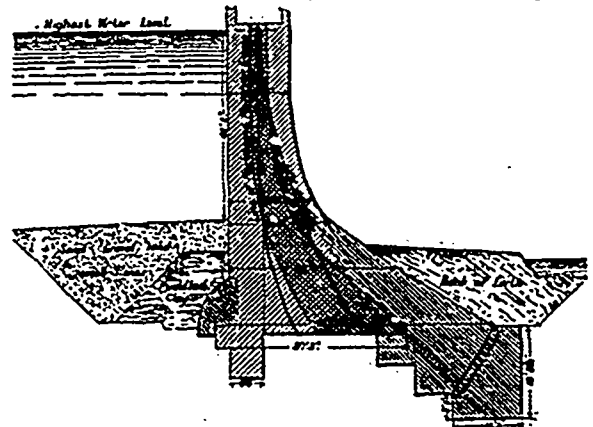
The following is a list of the captains and chief engineers of the Richelieu & Ontario Navigation Company's fleet of steamers for the season of 1895:

Steamer.	Captain.	Engineer.
1. Quebec.....	Nelson	F. Gendron.
2. Montreal	Roy	F. X. Hamelin.
3. Berthier .	Boucher.....	E. Arcand.
4. Cultivateur.....	Paul	M. Dion.
5. Longueuil ...	Jodoin ..	N. Braudet.
6. Boucherville	Renaud	X Mathieu.
7. Island Queen	Labelle	J. Matte.
8. Hochelaga	Mandeville ...	F. Chapelaine.
9. Laprairie.....	Coursel	Chas. Gendron.
10. Terrebonne	Laforce	M. Sheridan.
11. River du-Loup	Faubert	P. Elingburg.
12. Spartan	Grange	C. J. Taylor.
13. Columbian ..	Murray	
14. Hamilton....	Vaughan	T. O'Reilly.
15. Algerian	Dunlop	John Matte.
16. Passport	Craig	H. Noel.
17. Corsican	Esford.....	C. McWilliams.
18. Carolina	Riverin	M. Latulippe.
19. Saugenay.....	St. Louis....	W. Lacroix.
20. Three Rivers	St. Louis	A. Lafleche.
21. Canada.....	Baker	E. Denis.
22. Chambly.....	Tranchemontagne	P. Birard.
23. Sorel.....	Gouin	G. Gendron.
24. Mouche-a-Feu	Crepon.....	P. Boucher.
25. Hosanna	Paul.....	

FAILURE OF THE BOUZEY DAM.

The news that on the 27th April a masonry dam of recent design had given way with disastrous results on the headworks of the Eastern Canal of France, was received with something like consternation by hydraulic engineers, particularly as the reputation of the profession in France for works of this class stands at a high level. The failure of an earthen embankment is always intelligible, and most of the old dams in India have been swept away one after the other, owing to bye-washes insufficiently large to pass exceptional floods. A full investigation into the circumstances of the Bouzey disaster, however, tends to allay the first feelings of alarm, as the structure in question is one for which English engineers would hardly care to be responsible. The dam was intended for supplying water to the summit level of the Eastern Canal, and was situated near Epinal, in the valley of the Avrière. When it gave way the impounded water, amounting to 7,100,000 tons, rushed down the valley, destroying everything on its path as far as Chatel, some ten miles to the north. From the contours, it would seem that the Avrière valley is very narrow, though at intervals it widens out somewhat, closing in again later on. The fall in the ten miles between the bottom of the reservoir and the River Moselle at Chatel is about 430 feet. Hence there was a fall of over 40 feet per mile, which is, of course, excessive for such a body of water as that set free by the failure of the dam. This latter was built of dressed stone laid in lime mortar, the material being a sandstone conglomerate having a crushing strength of from 295 to 550 tons per square foot in different specimens. The tensile strength was, however, comparatively low, amounting to only eleven tons per square foot. The specific gravity of the materials used is stated to be about 2.0. The profile of the structure, as originally built, is shown by the dotted line outline in cut. In plan the structure

is quite straight, and is 1,705 feet long. It was founded on the same conglomerate rock as that used for building it. The upper layers of this rock were, however, greatly fissured, and to save expense it was determined not to carry the foundation down to impermeable material, but instead of this a "guard wall" was sunk below the dam, as shown in the figure, the bottom of this wall being 3 feet below the top of the sound rock. On attempting to fill the dam, however, serious disturbances took place, the structure bending horizontally for a length of 440 feet, the deflection at the centre being 1'22 feet, and the dam also sheared off from the guard wall; in short, it slid down the valley several inches. It was thereupon determined to empty the reservoir and strengthen the structure. The alterations made are well shown in the figure. The lower portion of the dam was increased in width from 37.5 ft. to 57.3 ft., and abutted on a heavy bressummer sunk down to solid rock. The thickening, however, was not carried up to sufficient height to avoid the objectionable tension on the up-stream face. As the figure shows, the line of resistance lies considerably outside the middle third of the section. There would thus be a tension on the up-stream face tending to open the joints there, and to admit water to the middle of the masonry. The mortar used was apparently not very hydraulic, as to make the dam water-tight the whole of its up-stream face had been rendered with a layer of Portland cement 1 3/8 in. thick. This rendering must have been considerably cracked during the shifting of the dam; but apart from this, the tension already referred to would also tend to crack it. In all probability, therefore, the structure was water-logged, and during the very severe frost of the past winter, this water, in freezing, would tend to disintegrate the



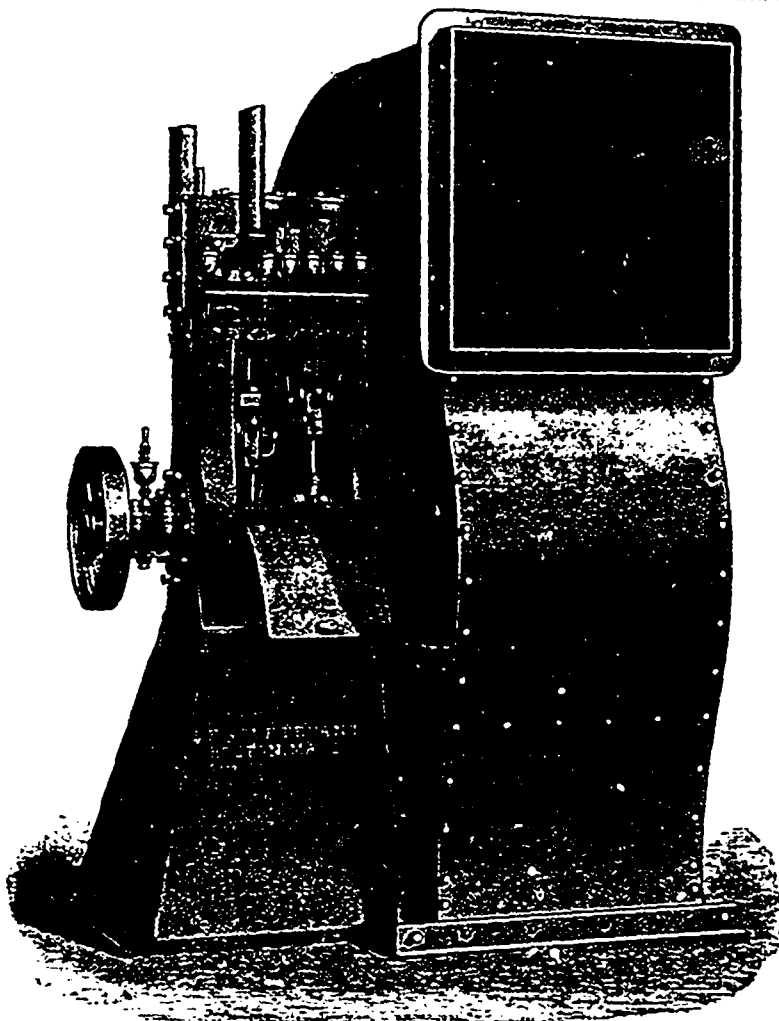
structure, rendering it liable to fail on the first opportunity. An examination of the débris would show whether this view of the matter is well based.

French engineers are not great believers in the theory that the line of pressure of a dam should lie within the middle third of its cross-section. It is perfectly true that existing masonry arches are standing perfectly well, although this line falls well without the middle third, and in the case of the Furus dam there is also some tension on the masonry, but only, if we remember aright, when the dam is empty, the tension being on the down-stream side. It certainly seems advisable, however, to avoid tension on the up-stream face of a dam, as any tendency to the opening of joints there is to be avoided, the more particularly when the cement used is non-hydraulic. When good Portland cement is used, the matter is no doubt less important, but the precaution is at any rate a reasonable one, and we have yet to learn of a failure of a dam in which the line of resistance has been confined to the middle third of the section in accordance with this view of the matter. The safety of a large reservoir dam should not be compromised by the omission of any reasonable precaution, as repeated experience has shown how disastrous such accidents may be. There is also much to be said in favor of curving a dam in plan. It is true that no great advantage can be shown to exist from a theoretical point of view, and the stability of the famous Bear Valley dam has never been quite satisfactorily accounted for. Nevertheless, quite apart from the support derived from any arch action, the curved plan has an advantage in the fact that there is then no tendency for fissures to form on the down-stream side. When the structure is straight in plan matters are different, and though experience shows that with suitable material very little trouble may be expected from cracks of this nature, the tendency to form them is there, and may just as well be avoided. The difference in the quantity of material in the case of a straight dam and curved dam of the same section is insignificant in practice, as the arc and chord subtending an angle of 30 deg., say, only differ by 4.6 per cent., and this increase might without danger be avoided by slightly reducing the area of cross-section in the case of the curved dam.—Engineering, London, Eng.

MECHANICAL DRAFT.

Though but little more than a quarter of a century has elapsed since the idea of a mechanical draft for the engine room began to take hold of the minds of engineers and power plant owners, the progress of its adoption as an improvement on chimney draft has been steady and continuous.

The manufacturers of the Sturtevant Blowers appear to have been the pioneers in the introduction of the steam fan for burning slack and otherwise waste fuel, but so great has been the extent of their use, and so varied their present applications, that some special reference to this system will be interesting to the reader. For marine work especially this method of draft production was first



fully developed, and its adoption has been so general that more than three-quarters of the steam vessels in the United States Navy are now equipped with Sturtevant Blowers. The merchant marine, as well, relies on forced draft above all else to make possible its remarkable speed records, and here the Sturtevant Fans have been generally adopted. Their success on ship board has directed the attention of stationary engineers to their advantages on land engines, with the result that they are coming into increasing request for sugar refineries, electric light plants, and for many classes of land work, which reliance was formerly placed on the chimney draft.

The drawbacks to the chimney draft are that its first cost is heavy, its capacity is distinctly limited, and its drafts cannot be regulated to suit all conditions, but it is claimed for the fan draft that it gets over all these difficulties, while with its use cheaper grades of fuel may be used.

In a catalogue just issued by the B. F. Sturtevant Co., of Boston, the following points are claimed. The adoption of the fan as a practical substitute for the chimney reduces the expense therefore to that necessary for the stack of low stature, avoiding expensive foundations, and providing a means by which the draft may be instantly changed to suit altered conditions. A means, in fact, which is positive, yet flexible, at all times and absolutely independent of climatic changes. This is most evident in electric traction work where the greatest demand for steam is made on those stormy days when the draft of a chimney is at its worst. The chimney is reliable only up to its minimum capacity. The fan meets the maximum requirements instantly.

The temperature of the gases necessary to secure sufficient

draft with an ordinary chimney can usually be lowered from 200° to 300° when a fan is substituted, and with resulting economy in coal consumption. Further, the fuel economizer, so advantageous under proper conditions, but so often worse than useless with the ordinary chimney, may be operated at its maximum efficiency when the draft is produced by a properly designed fan. In practice the gases entering the economizer at 500° or 550° are thus enabled to heat the water to about 300°, and yet escape at a temperature of 250° to 300° without impairing the mechanical draft.

In its earlier application for producing draft, the fan was so installed as to force the air beneath the grates, thus producing what is familiarly known as *forced draft*. This arrangement is successful when the air pressure produced within the ash-pit is not excessive; otherwise there is a tendency to blow holes through the fire at certain points and to promote outward leakage of the gases, particularly when the fire doors are opened. This latter trouble has been obviated with some applications of the closed ash-pit system, by an arrangement of doors and dampers such that the draft is shut off as the doors are opened. In marine work, the closed stoke-hold system has to a large extent obtained, the air being simply forced into the enclosed boiler-room at a pressure sometimes as high as 2½ ounces per square inch, and thence allowed to escape only through the fire.

Later and more advanced practice is, however, looking very generally to the application of the fan in such a manner that it serves more distinctly as a substitute for the chimney, drawing through it and discharging to the atmosphere the gases as they come from the up-take or the economizer. There are illustrated this month a number of fans of the types requisite for this method. The fans, constructed of steel plate, are thoroughly, yet somewhat flexibly stayed, to allow for expansion without distortion when subjected to the direct heat of the gases passing through them. In all cases the journal boxes supporting the shaft are provided with special chambers through which cooling water may be caused to flow.

For forced draft the simplest arrangement is shown in the last cut, the fan being placed upon the floor and discharging directly into an underground duct which extends in front of the boilers and connects with each ash-pit, wherein is placed a damper, operated from the front of the boilers. For large plants the three-quarter housing fan (as shown in cut) is most convenient. High pressures may be best obtained by the use of the double engines for driving the fans.

For induced draft it is necessary that neither bearing of the fan should be exposed to hot gases. Hence the double engine, being self-contained, is particularly adapted, as it permits the fan wheel to be overhung.

In the most complete plants the throttling governor valve on the fan engine is specially designed to regulate the steam admission relatively to the draft requirements, more steam being admitted to the engine as the steam pressure falls, thereby maintaining practically constant pressure on the boilers. Wherever contingent accidents have been considered and provided for in surplus boiler power, duplicate engines and the like, it is advisable that the mechanical draft apparatus be likewise installed in duplicate, but so arranged that both fans operating at moderate speed, or one fan at its maximum speed, will produce the required draft. This duplicate or duplex form of apparatus is shown in several of the illustrations.

In application, such duplex fans are usually so arranged side by side that the gases enter the space between them and pass through one or the other, according to the position of damper. A similar damper should be provided for the outlets of the fans, so that one may be entirely shut off for repairs, if desired.

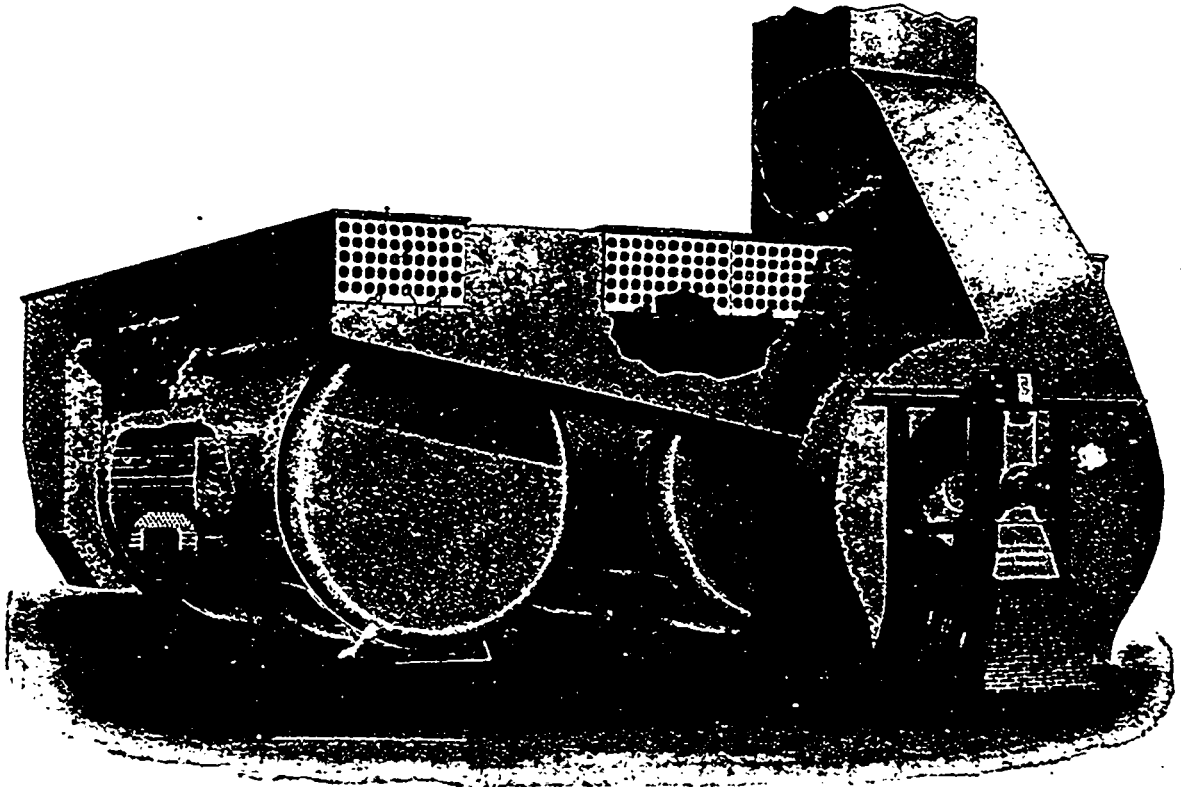
The B. F. Sturtevant Co., of Boston, who have offices in N. York, Philadelphia, Chicago and London, Eng., make designs and lay out plans to suit the special requirements of any power plant or manufacturing establishment. It will be of interest to know that they have already a number of their forced draft and induced draft plants in successful operation in Canada. Among the more prominent of these are the plants at the Canada Sugar Refinery, Montreal, the Montreal Street Railway, the Riordan Paper Co., which has a plant of 400 horse power, and the St. John Street Railway Co., which has a 1,000 h.p. plant.

DISCUSSION ON CEMENT.

The recent paper on cement by Cecil B. Smith, of McGill College, Montreal, read before the Canadian Society of Civil Engineers, gave rise to interesting discussions which were continued through three meetings. The following is a summary of the debate:

Mr. Perley (by correspondence) stated that experimenters and men of science had not yet, in spite of all their tests, discovered a real test that could be quickly and accurately carried through by contractors. The latter often suffered from want of time in which to carry out a long system of testing. If a cement were found to be unsound, the best plan to adopt was to return it to the manufacturer with a request to him to find out what was wrong. In Canada, contractors often thought that the imported cements were very superior to the native article. But much of the cement which was prepared in Europe for exportation to Canada and elsewhere was not up to the mark. It was often brought over to serve as ballast for the ship bringing it, and it could not be expected that vessel owners would purchase any, but the cheapest article procurable for such a purpose. Engineers should specify that the cement was to be purchased by weight—so much per cubic foot—and it then should be put up in bags, which were convenient to return. If a series of tests could be designed which would be accurate in result and speedy in action, it would be a very good thing for all concerned.

was doubtful whether an engineer would be warranted in condemning a cement merely on the ground of its specific gravity. The advisability of sand tests might prove doubtful, owing to the constant improvements going on in the manufacture of cements. It was probable that there was a definite relation existing between the neat and sand tests. There was so much difference between sand found in the laboratory and ordinary commercial sand, that much of the importance of the sand test was done away with thereby. Not much importance could be attached to the tension test. All cements should certainly show a certain minimum amount of tensile strength. The longer a cement was allowed to set before being put under pressure, the better, and the longer time it will have in which to become thoroughly established and water-tight. There was one field of investigation which had been left comparatively untouched. There was no doubt that hot cement mixed with hot water should mix, even in freezing weather, but the question was, could they be made to mix properly without the agency of any heat either in the water or in the cement? Some thought that the addition of salt had proved a success in this direction. The difference in prices of cements was entirely due to transportation charges. Canadian cements were often condemned off-hand, and this was no doubt due to their variability, and they would never come into general use until the manufacturers divided their grades properly. In the United States, however, there were several makes of cement



INDUCED DRAFT APPARATUS AT AMERICAN LINE PIER, N.Y.—See page 40.

Mr. Spalding (by correspondence) said there could be no doubt but that sand tests were good, but there was a difficulty connected with the use of them, owing to the great differences existing in the quality of various sands. No short time test could be thoroughly satisfactory: durability was a great element in the quality of a cement, and this of course required weeks to be able to judge satisfactorily. He thought that a direct pressure of about 100 lbs. per square inch should be used. A pressure of 30 or 40 lbs. had been found to give very variable results. Different grades of cements were very variable in their respective actions when mixed with hot water. Mixing with hot water and then letting it be exposed to cold weather, was a very different thing from mixing with cold water and then submitting it to heat. Results of experiments at Cornell University recently showed that the outcome of hot water mixing could not be depended on, as it varied so very greatly.

Mr. J. G. Kerry paid tribute to the careful, painstaking manner in which Mr. Smith had carried on his long series of experiments. The quality most wanted in cements was durability. It was disappointing to find that the blowpipe test was not really so valuable as had been thought. The absolute importance of specific gravity tests was somewhat questionable. It was an indirect test, and it

fully as good as those manufactured in Europe, and Canadians ought to be able to keep up to their example.

President T. Monro read the results of some tests on several varieties of cement used on the canal at Coteau Landing, Que. The general results showed that in situations where the water was to be turned on shortly after the laying of the cement, natural cements were not to be relied on.

At the meeting on March 28th the discussion was resumed.

Mr. Irwin made a few remarks on the similarity between the behavior of a solution of certain crystals and that of cement when setting. For instance, Glauber's salt, when in its usual crystalline form, dissolved in hot water easily, but when it was in the form of a powder he observed that it set at the bottom of the glass as a hard mass. This was a side issue, but it perhaps threw light on the behavior of cement when setting under certain conditions. It was not good for cement to be mixed with hot water in cold weather, and perhaps this had something to do with the adjustment of the crystals. The proper setting of cement depended to a large extent on the amount of hydrated silica it contained. The best cement the speaker had ever used was a finely ground Danish cement. Some Canadian cements, which he had tested with hydrochloric acid, had thrown up a quantity of steam and smelt somewhat of sulphuretted hydrogen—a bad sign—whereas the Danish article

had given a clear jelly, showing only a very few traces of insoluble residue. This seemed to be an admirable speedy test, viz. the amount of insoluble matter.

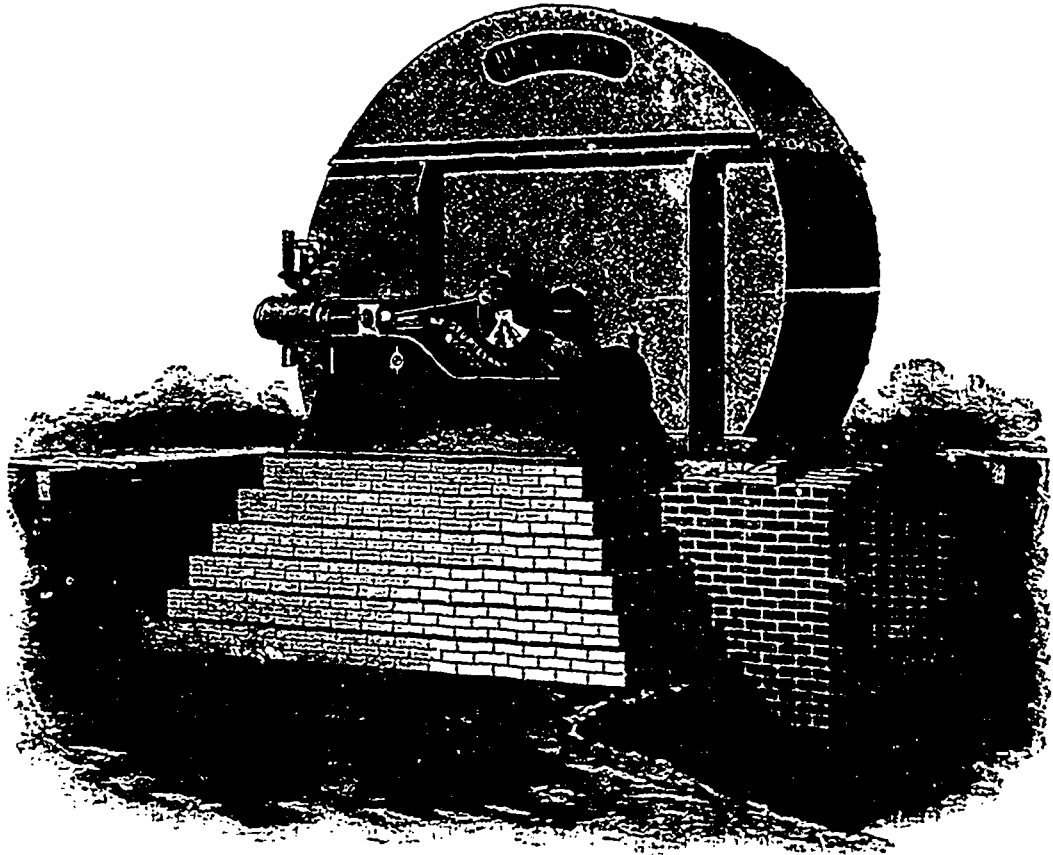
Mr. Smith remarked that he did not know whether the previous speaker thought the insoluble matter was pure sand or not.

Mr. Irwin said that the residue which would not be dissolved by hydrochloric acid was just valueless. The ordinary residue in cement was, no doubt, always fine enough to be dissolved; it was simply insoluble.

Mr. Smith thought that, perhaps, the presence of silica interfered with the action of the acid on the residue. Probably it was silicate of lime which gave to cement its combining strength. The question of temperature was a very important one. It seems certain that hot water damaged the strength of cement. On the other hand, the presence of salt almost invariably increased the strength. One Canadian cement which he had tested, set remarkably quickly, but a lower temperature of even 4 degrees increased the time required for setting in a remarkable manner. He thought probably it was due in this case to the fact that the sample had only just come from the factory.

order of merit, as he regards them, he would place the blowing test first. This, as far as evidence can be adduced, is a severe test of the soundness of a cement to be used under water, and this test can be made in one day. The next tests should be those of fineness and specific gravity combined, which can both be made in one hour, at most; also the time of set can be obtained in a few hours. Thus we can find out, practically, all that we need to know of a sample in one day. The strength is, after all, of relatively little importance when these three are satisfactory, although the knowledge is in itself valuable. Because, if these three are up to the mark, many experiments show that the strength will be also. Surely twenty-four hours, with apparatus costing \$5 to \$15, cannot be considered very exacting. Mr. Perley's remarks regarding the slaughtering of inferior brands of foreign cement on our markets should incite engineers to be more particular in their specifications and in *actually having* tests made, the day is past when the brand is a sufficient guarantee of quality.

The idea of shipping in bags is not new. The American natural cements are largely shipped in 75 lbs. paper bags, and the Owen



STEEL PLATE STEAM FAN WITH $\frac{1}{2}$ STEEL PLATE HOUSING.—See page 40.

Mr. Kennedy asked whether it was really a set to which Mr. Smith had referred, or merely a drying?

Mr. Smith replied that it was a true set, though for a certain period the cement did not grow harder than at first.

Mr. Wilson said that it was always dangerous to use newly ground cement. This fact was recognized in England, where they always took it out of the barrel and allowed it to be in the air for a day or two.

Mr. Smith observed that Canadian manufacturers ought to learn this lesson. He thought that, perhaps, this peculiarity of new cement was due to the presence of an overplus of caustic alumina.

At the meeting of the society on the 11th April, when the "Cement" discussion was resumed, Mr. Smith said he wished to express his gratification on reading the many interesting and instructive discussions which his paper had brought out; this should be one of the chief aims of any paper, to draw out the opinions of practical men, by which more may often be learned than from the paper itself. These discussions had, however, brought up some points that might bear further mention. Mr. Perley had referred to an insufficiency of time for practical men to judge quickly of the relative merits of a cement. This certainly would be a serious objection if it were deemed absolutely necessary to know the tensile strength of a cement at various periods ranging from three days to four weeks and longer, but if the writer were to range the tests in

Sound Portland Cement Co., if so desired, will ship in sacks. The suggestion is, however, doubtless a wise one, and would, besides, effect an actual saving of the world's store of energy.

As an authority on cement testing, Mr. Spaulding's remarks are worthy of attention, and his criticisms seem, in the main, just ones. It is probable, however, that he overestimates the variations in results attributed to using different samples of *standard sand*. There is one thing on which all countries seem practically agreed, *i.e.* that this angular quartz sand, caught between 20 and 30 mesh sieves, has very little variation and gives uniform results. Experiments made by the author on sands of varying fineness, all, however, being within the standard, corroborate this belief. The question of light or heavy pressure per sq. inch is not one of expense or difficulty. It is an endeavor, on the part of the author at least, to determine the *least* load which will make good 3 to 1 briquettes of uniform density with soft mortar such as the masons use. The percentage in variation obtained in groups of five has been very satisfactory at 20 lbs per sq inch, and 20 per cent. of water; and more pressure would merely give higher results, and lead us away from actualities, where mortar sets under dead loads of only 3 to 4 lbs per sq inch.

The question of hot water is a very serious one, for its use is somewhat common amongst builders in cold weather. Since presenting his paper to the society the author has tested briquettes made from 2 natural and 3 Portland brands, which were mixed with

hot water, cold water and salt water. Both in the laboratory and in frost tests he has found that hot water weakened the Portlands and strengthened the naturals, the reverse being the case with salt water.

Mr. J. G. Kerry has made plea for chemical analysis, and doubtless this is a very necessary thing for some one to make, but it seems probable that as a test it will always be confined, in practice, to the manufacturer. *Apropos* of this is Mr. Perley's quotation from a letter of the late Henry Faija, which will make the point clear. Mr. Kerry objects to placing any positive value on sp. gr. tests, and later on he would seem to place little reliance on strength tests, but we really must cling to something. It will not do to tear down without building up. In what way are we to satisfy Mr. Perley's demand for expeditious tests and Mr. Kerry's rejection of two of those in most common use? Fineness alone is no criterion. It is necessary to specify either sp. gr. or strength. It is probable that either one of them, when coupled with fineness and soundness, is sufficient guarantee of quality. The value of 3.10 proposed for sp. gr. is such as will insure strength if fineness and soundness are satisfactory, because we cannot get a highly burnt cement, so overlaid as to be weak, which will not fuse in the kiln before getting burnt to a density of 3.10. Mr. Kerry's ideas on hot water and salt water are not in accordance with the results of many tests, which, as Mr. Spaulding states on the authority of

CANADIAN SOCIETY OF CIVIL ENGINEERS.

A meeting of the society was held on the 9th May, President Thomas Monro in the chair.

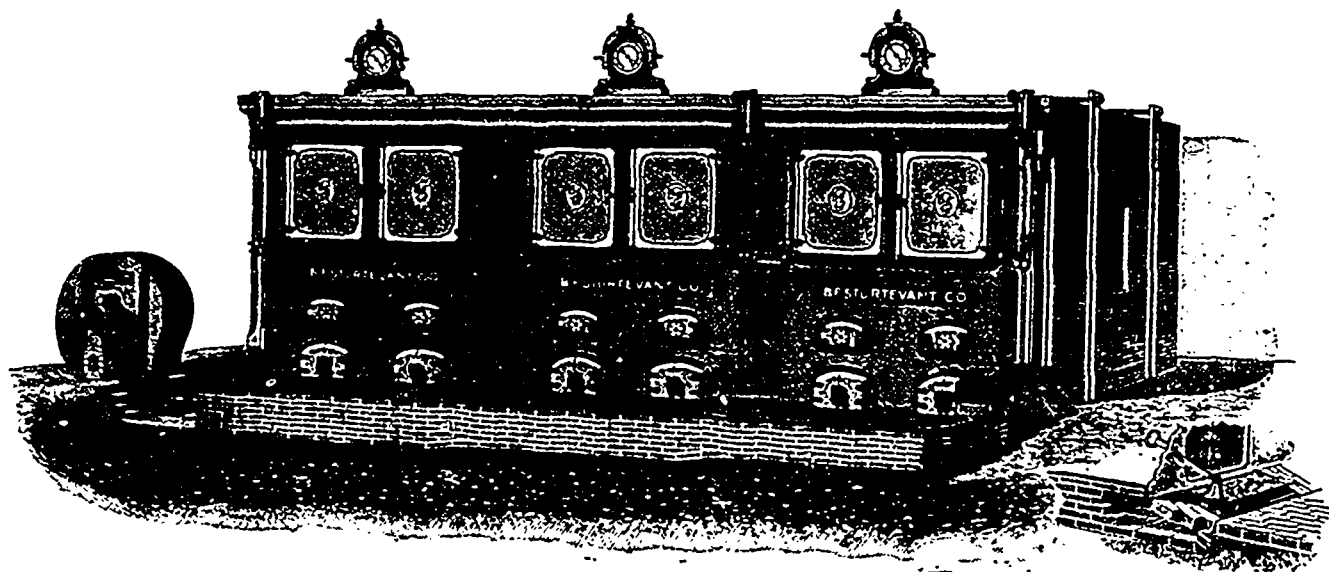
Mr. Chapman's paper, read at the preceding meeting, was discussed.

A communication from Mr. McCready, on Mr. Thompson's paper, "A Micrometer Attachment," was read and discussed.

A letter from Mr. Chiswick gave details of a vernia (?) to which he attached much value. Mr. Chiswick offered to permit any members of the society to construct an instrument from the drawings submitted, if they thought it would be of value to them.

A letter was then read from Mr. Webster, in which he urged the advisability of having some amendment made to the North-west Irrigation Act which was passed last session at Ottawa. It seems that the Act permits surveyors to undertake certain work in connection with irrigation, which is in reality in the province of civil engineering.

To remedy this, Mr. Webster suggested that two members of the society resident in Ottawa be deputed to watch the bill and do all in their power to obtain for the civil engineers a due share of the work in the North-West, independent of the work done by surveyors.



TYPICAL PLANT FOR FORCED DRAFT.—See page 40.

W. W. Maclay, is injurious in case of the former (which the author has verified). It would seem best to leave it severely alone, whereas salt water seems actually to be a benefit.

In answer to Mr. Kerry's question as to the strength of single bricks similar to those used in the pier tests, the average of six separate tests on single bricks bedded in plaster of Paris tested on their flat, was as follows:—

1st signs of cracks 1,210 lbs. per sq. inch.

Final collapse.... 1,860 " " "

Mr. Allison's very full exposition of the methods of testing adopted on the Soulages Canal cannot but be useful to members of the society, as embodying good practice, but when Mr. Allison goes into $\frac{1}{2}$ in his determination of density, he is open to the accusation of hair-splitting, because two determinations of this on the same sample will vary as much as $\frac{1}{8}$ or more. Speaking of the Faija mechanical mixer, the author has found it to possess one weak point, the revolving vanes will drive the mortar more or less into the corner; to remedy this an advance scraper, throwing the mortar toward the centre in front of the revolving vanes, has been found to be successful. The shrinkage of cement in a tube in air is to be expected. The most delicate determinations by the American Cement Committee showed that the soundest and best cements shrink slightly in air and expand under water.

The question of natural and Portland cements, dealt with by the president, Mr. Monro, seems to be rapidly solving itself in Canada by the construction of Portland cement works. The reason seems to be not that natural Canadian cements are always poor, but that they are sometimes good and sometimes bad. The United States natural cement product is, on the other hand, holding its own, the reason probably being that the immense quantities made at a given spot allow such thorough mixing as to give a uniform product, whereas intermittent burning of rock, on a small scale, is liable to produce a different quality at each "burn," depending on the exact spot from which the cement rock is taken.

Mr. C. T. Keefer, of Ottawa, joined in the discussion that followed; nothing definite was decided upon.

A paper on "Special Trackwork for Electric Street Railways" was to have been read, but as the copies of it had not been received from the printer, Mr. Stone, the author of the paper, was obliged to defer the reading until next meeting.

The subject of Federation then came up. Mr. Sproule said that for the last two years he had at every opportunity urged the necessity of a confederation of the various branches of engineers. This, he said, was the only way to obtain any power as a body.

After some discussion a resolution by Mr. Sproule, seeking to bring about a Confederation of the Civil Engineers' Society and all kindred societies in Canada, was laid over for consideration at the next meeting.

Another meeting, the last of the season, was held on Thursday, May 23rd, with P. A. Peterson in the chair.

Mr. Sproule's motion, that the society should make modifications in their constitution which would induce all classes of engineers to become active members of the society, was discussed. Mr. Sproule believed that the term Civil Engineers was too exclusive a name for the society, and was calculated to keep out other engineers who, if the name was more generic, would be likely to join.

The chairman thought that the term Society of Civil Engineers was sufficiently inclusive, as embracing every class of engineer except military engineer.

After some general discussion it was decided to leave the matter over until after the holidays, but in the meantime to appoint a committee of two to interview and get the opinions of the various mechanical engineers on the subject, and to report to the society at the first meeting of next session.

Mr. Sproule and Mr. Marcer were appointed a committee.

E. A. Stone read an exhaustive and excellently illustrated

paper on special track work for electric street railways, especially referring to the Montreal and Toronto systems.

At the close of the reading the chairman spoke on the particular utility of papers such as the one which had just been read, as they were the outcome of practical experience.

A vote of thanks was then passed in favor of Mr Stone.

ONTARIO ASSOCIATION OF STATIONARY ENGINEERS.

The annual meeting of this association was held at Brantford on the 27th May. The reports showed that 450 certificates had been issued, the total income being \$699.10 and balance in hand \$14.50. The fees for renewal of certificates were reduced to \$1 for 1st class, 75 cents for 2nd class and 50 cents for 3rd class. A resolution was passed condemning the practice of some brass foundries who coned out brass blow-off cocks till they were dangerous to use. The following officers were elected for the ensuing year: President, A. Ames, Brantford, vice-president, F. G. Mitchell, London; registrar, A. E. Edkins, Toronto; treasurer, R. Mackie, Hamilton. The next meeting will be held in Galt.

RISING SUN PACKING.

Engineers and others who use steam or hydraulic packing will be glad to know that the celebrated product of the Cancos Manufacturing Co can now be obtained in Canada. J. Emile Naud, of Montreal, has been appointed agent, and already quite a sale of their great Rising Sun Packing has been built up in Canada through his efforts. As this packing has the reputation of being one of the best, its success is unquestionable. It is made with round and oblong cores, and a fair trial will commend it to all who use this class of goods. It is made of selected material and manufactured with the greatest care, and is guaranteed. The Cancos Manufacturing Co have a unique way of making their Rising Sun Packing popular. In each 5 lb. box, or 10 lb. box, there are coupons, varying in value with the value of the box, entitling the holder to choose various articles of use and ornament from a list which will be sent on application. Rising Sun Packing will be sent to any address, express prepaid, so if your dealer does not have it, write to J. Emile Naud, mfrs.' agent, Montreal.

ELECTRIC LIGHT INSPECTION ACT.

The following is a summary of the Act providing for the inspection of electric light in Canada, which is now in operation. Section 1 defines the title of the Act.

Section 2 defines the various terms used in the wording of the Act. Of these it is only necessary to say that the word "contractor" means the person undertaking to furnish electricity to any purchaser for lighting purposes, and the word "purchaser" means the consumer of electric light.

Section 3 declares that the commercial unit of supply of electrical energy shall be one thousand watt-hours, or the equivalent thereof in ampere-hours.

Section 4 provides that in supplying light to a purchaser the contractors shall declare the constant pressure at which they propose to supply the electrical energy; and the variation shall not at any time be more than 3 per cent. from the declared constant pressure, no matter what the cause, unless it is an accident to the generating plant, or by the uncontrollable state of the elements.

By section 5th contractors are held responsible for maintaining in proper condition all lines belonging to them or under their control.

Section 6 provides that if it is suspected that a dangerous connection with the earth exists on the purchaser's premises, the contractor may, at any reasonable hour, on giving an hour's notice, enter on the purchaser's premises to test the wires, or, if necessary, disconnect his service.

Section 7 provides that if, on such tests, a connection with the earth is found to exist having a resistance not exceeding 5,000 ohms, and if the purchaser fails to give facilities for such testing, the contractors may cut off the supply till the difficulty is remedied.

Section 8 stipulates that if the purchaser is not satisfied with the mode of test or the action of the contractors, he may apply to the department of Inland Revenue, under which the Act is carried out, and have an official test.

Section 9 provides that if the contractors make default in complying with any of the foregoing provisions, they are liable to a fine of not more than \$20 per day.

Section 10 states that any person who maliciously or fraudulently abstracts, causes to be wasted or diverted, consumes or uses any electricity, shall be deemed guilty of theft and punished accordingly.

In section 11 it is provided that the inspector may in writing authorize any officer of the contractors to inspect premises and examine the wires, instruments, etc., or where the supply is no longer required, the wires, etc., may be disconnected, the contractors repairing all damage caused by such entry.

By section 12 it is stipulated that though the inspector of weights and measures or of gas may be an inspector of electric light, he shall not be a seller of electricity, nor shall he repair or adjust any meter inspected or verified by himself.

Section 13 gives the purchaser the right to have a measurement of the total amount of electricity supplied to him, and whenever a reading of a meter is taken by the contractor to establish a charge on the purchaser, the contractor shall leave a duplicate of such reading with the purchaser.

Section 14 states that no electric light meter shall be fixed for use which has not been verified and stamped.

In section 15 it is provided that the dials of all meters shall plainly indicate the amount of current passing. Electrolytic meters at present in use may be continued unless objected to by the purchaser, but the number of such meters shall not be added to, and all renewals of meters shall be made by the substitution of the direct-reading types. The capacity in number of amperes or watts shall be marked upon each meter.

Section 16 forbids the stamping of any meter which varies more than 3 per cent. from the legal standard, whether in favor of purchaser or contract.

Section 17 leaves to the Controller of Inland Revenue the nature of the stamp to be fixed on a meter.

Section 18 provides for verifying and stamping every meter at least once in five years.

Section 19 permits a meter to be taken from one place to another within the five years without re-verification, but the purchaser or contractor may at any time, at the cost of the party in fault, require the verification of a meter.

Section 20 requires the owner to keep the meter in good repair.

Section 21 states that the testing of meters shall be in accordance with this Act and with any further regulations of the department not inconsistent with the Act.

Section 22.—The contractors shall provide electricity and wiring and all other reasonable facilities for testing, free of charge, at such places as are agreed upon between the contractors and the department.

Section 23.—If any dispute arises between the contractor and the purchaser, or between the contractor and the inspector, respecting the correctness of such meter, the inspector shall, if required by any person dissatisfied, refer such dispute to the department for final decision. The purchaser may at any time, on payment of a fee to be fixed by the Governor in Council, call on an inspector to test the pressure of the electricity supplied by the contractor, and to furnish a certificate thereof.

Section 24 obliges the inspector to give to either party a certificate of inspection, with particulars, the certificate bearing a stamp representing the fee charged.

Section 25 provides that the contractor's book of names and addresses of purchasers shall be open to the inspector, during office hours, under a penalty of \$50 in default.

Section 26 provides that the fees shall be determined by the Governor in Council, and published in the *Canada Gazette*. (These will be referred to in next issue.)

Section 27 leaves the preparation and design of the stamps to the Governor in Council.

In section 28 it is provided that the accounts shall close on the 30th June each year.

Section 29 provides a penalty for counterfeiting the stamp, or selling a fraudulently stamped meter, not exceeding \$250 in the former case, and from \$20 to \$200 in the latter.

For tampering with a meter, a penalty of from \$50 to \$250 is provided, besides liability for damages or to criminal indictment.

Section 31 provides a penalty of \$25 for putting up an unverified and unstamped meter.

Section 32 declares that any inspector who stamps a meter without testing it, or who neglects or refuses to test it, or otherwise neglects the duties provided in the Act, shall be liable to dismissal and a fine of \$10 to \$50.

Section 33 provides that the penalties shall be recoverable in an ordinary court or in a summary manner before a justice of the peace, or before two justices if the penalty exceeds \$20.

Section 34 provides that any action or prosecution must be taken out within three months after the offence.

By section 35 the contractor is required to take out a certificate of registration from the Department of Inland Revenue, each certificate being renewable yearly, on the 30th June.

Section 36 fixes the time for proclaiming the Act in force.

The last section, 37, gives the Governor the right to establish rules and regulations: (a) For the testing of the electric light lamps for illuminating power; (b) For instituting tests to determine what style or make of meter shall be used to measure the quantity of electrical energy supplied; and (c) Such other regulations as are necessary for giving effect to its provisions, and for declaring its meaning in cases of doubt.

LITERARY NOTICES.

The "Great Lakes Register of Shipping" is published by Joseph R. Oldham, naval architect and engineer, Perry Payne building, Cleveland, O. The Register for 1895, now before us, makes a book of 59 wide pages, and gives not only the registration of American shipping on the great lakes, but a mass of tables and formulae of great value to those interested in the construction of steamers. The statistics concerning the construction, dimensions, machinery, etc., of all the steel, iron, and composite steamers on the north-western lakes with names and addresses of owners, will be found of much value for reference. This is the only register of the classification of steel lake vessels published.

The 1895 edition of the "Electrical Trades Directory," published by George Tucker, of the *Electrician*, London, Eng., shows the compiler to have a broad idea of the work and most thorough method in carrying it out. It is practically an electrical directory of the world, and gives not only the electric light, power, railway, and other corporations using electricity, but gives an elaborately classified directory of all the makers of and dealers in electrical supplies, and the trades in which electricians are directly interested. It contains an almanac and calendar, a summary of electrical progress during the past year, biographical and obituary notices, information on patents, designs and trade marks, digest of the laws relating to electric lighting, etc., useful tables relating to electrical work, and a list of institutions associated with electrical trades. It makes a volume of about 1,000 pages, and the price is only seven shillings and sixpence. The publishing office is Salisbury Court, Fleet street, London, Eng.

A useful work on the construction, operation and history of the centrifugal pumps, under the title of "Centrifugal Pumps," is edited by John Richards, and published by the Industrial Publishing Co., 40 California st., San Francisco. Mr. Richards, who is the author of the "Manual of Machine Construction," gives in the present work a good idea of the progress of science as applied to centrifugal pumps, and gives an interesting account of the various types in use. To this is added an appendix describing various waterworks and establishments using this class of pumps. It makes a book of 68 pages, and contains 23 illustrations.

"Geyer's American Paper Trade Directory" for 1895 contains 274 pages, and besides giving a general directory of the paper mills of the whole continent, contains some new features embracing separate lists of the sulphite fibre mills, the soda fibre mills and ground wood mills; also lists of the paper pulp mills by States. A new list also gives a classified directory showing the various kinds of goods made, with lists of lithographers, blank book manufacturers, book binders, etc. Published by Andrew Geyer, 63 Duane st., New York.

The Britannia Co., of Colchester, England, have issued an instructive and handsomely bound book of 208 pages on the subject of screws and screw making. The writer gives an account of screw making in all its branches and describes the more recent methods pursued in various countries, with 95 illustrations enlightening the reader on the details of the work. It compares the systems of screw making in Switzerland, the United States and Great Britain, and gives a variety of useful tables and formulae. The work is highly spoken of by the British mechanical press.

The latest trade exchange coming to our table is the *Engine and Boiler Room*, published at 226 La Salle st., Chicago, by S. K. Munroe and edited by T. P. Pemberton and A. Bement. It is in magazine form and the first number contains 18 pages of very interesting reading matter for stationary engineers and firemen. It is neat in typographical appearance. Published monthly at 50 cents a year.

The *Metall-und Eisen Zeitung*, of Chicago, will henceforth be published entirely in German under the title of the *Deutsche Industrie*, and the *Holzarbeiter* has been incorporated with it. It makes a fine paper, devoted to furniture, machinery and electricity.

The B. F. Sturtevant Company of Boston, Mass., have issued a very attractive catalogue of their automatic upright engines for electric light and high grade work. In the preface it is mentioned that over 3,500 of these engines have been sold since the present designs were perfected.

The Metallic Roofing Company of 84 to 90 Yonge street, Toronto, with branch offices at 706 Craig street, Montreal, give in their large new catalogue a great amount of useful information on the special sphere of structural work included in their products. They are makers of steel shingles and tiles, steel siding plates and clapboards, crimped roofing, cap roofings, corrugated iron for structural work, embossed ceiling and wall material, fire proof lathing, and a great variety of other specialties fully detailed in this catalogue.

The new catalogue of the Robb-Armstrong Engines is quite a gem of art as well as a valuable budget of information on high speed engines, with beautiful illustrations of the special types made by Robb Engineering Co., whose head offices and works are at Amherst, N.S.

The report of the Montreal Sanitary Association for the past year shows that 120 annual examinations were made, and 270 visits and tests were made, including visits to works in progress. It appears from the report of the engineer, R. P. Fleming, that quite a number of fire clay drain pipes were broken by the earthquake shock last year. The income of the association last year was \$2,993.

The work of the Royal Canadian Humane Association, which was inaugurated a few days ago by the distribution of awards for bravery in saving life during the past two years in Canada, is worthy of every praise and encouragement. A ninth class of awards for attempts at life saving has been added, viz., accidents from lightning and dynamic electricity (live wires, etc.). The association makes an appeal for funds, which should not go without response. Those who wish to become life governors may do so on payment of a fee of \$50, or may be yearly governors at \$5. Major Henry McLaren, Hamilton, is treasurer, and J. George Hodgins, of the Education Department, Toronto, is secretary.

The calendar of the Kingston School of Mining and Agriculture for the third session has been issued, and gives full particulars to all enquirers. It is neatly printed at the office of the *Whig*. Address Wm. Mason, School of Mining, Kingston, Ont.

The papers read by the engineering students of the School of Practical Science, Toronto, have been published in book form, and make a creditable volume of 253 pages. Many of the papers are illustrated by diagrams and the work is well compiled.

We have received a booklet giving an account of the dedicatory exercises of Webb's Academy and Home for Shipbuilders, which was founded by Wm. H. Webb, who gave nearly half a million dollars to establish the institution. It is situated at Fordham Heights, near New York.

Charles Baillairge, city engineer, Quebec, has published a valuable pamphlet dealing with the extent and resources of Hudson Bay, and the question as to how it should be reached and opened up by railways. The area of Hudson Bay, the author says, is 397,000 sq. miles, or five times the area of all the great lakes, or three times that of the Caspian Sea. Its resources are vast and but little known to the average Canadian.

"The Silver Question" is the title and subject of three or four essays on the burning problem of public finance by different writers. Sir Henry M. M. Thompson is the promoter of these treatises, which are under one cover, and the publishers are Effingham & Wilson, Royal Exchange, London.

BRITISH METAL TRADE WITH CANADA.

The following are the values in sterling money of the shipments of metals, hardware and cement from Great Britain to Canada for April and the four months ending April of this and last year:—

	Month of April, 1894	1895	Four mos. end'g April, 1894	1895
Hardware and Cutlery	£7,161	£4,258	£24,333	£16,766
Pig iron	2,133	1,510	4,499	2,753
Bar, etc.	2,907	920	7,240	3,748
Railroad	24,781	2,274	33,318	3,174
Hoops, sheets, etc.	3,832	1,762	8,818	6,286
Galvanized sheets	7,267	8,037	13,274	13,886
Tin plates	18,181	8,703	56,962	31,894
Cast, wrought, etc., iron	8,981	3,764	21,722	10,700
Old (for re-manufacture)	1,380
Steel	8,631	4,107	25,835	12,957
Lead	1,070	1,212	1,658	3,821
Tin, unwrought	2,796	630	7,291	6,098
Cement	3,772	897	6,694	1,557

NEW STYLE OF INCLINE RAILWAY.

An esteemed correspondent sends THE CANADIAN ENGINEER the following description of the new incline railway now building at Lake George:—The Otis Engineering and Construction Co. are building an inclined railway at Lake George for the Horicon Improvement Company. Construction began in January, and the work is being pushed along rapidly to be ready for the summer's business by the first of June.

The railway ascends Mount Prospect, from which a magnificent view is to be had of Lake George, the northern Adirondacks, White Mountains, Green Mountains and Catskills. Total length of the incline is 6,800 feet, with a rise of 1,600 feet, and steepest gradient 37.7 per centum. The gauge is 3 feet.

Among the peculiar features of the road is the counterbalanced grade by which the greater length of cable attached to one car when near the bottom is balanced by the steeper grade toward the top, on which the other car is travelling. This principle has also been used on the Catskill incline constructed by Otis Co., the well-known elevator builders of New York. The grade is, therefore, a vertical curve.

The Lake George incline is unique, I believe, among Canadian roads in having curves in its alignment as well, of which the least radius is 3,600 feet, and also in having a single track—the two cars crossing at the turnout in the middle, the two centre rails of the turnout having slots into which the cable drops to allow the other car to pass

PRAISES FROM THE PEOPLE.

PARRY SOUND, May 23rd, 1891.

I am well pleased with your paper, and shall do all I can to help it in Parry Sound, for I think every engineer should have it.

WM. IRVINE.

I must compliment you on the get up of THE CANADIAN ENGINEER. "Excelsior" seems to be its motto.

R. S. DOBBS, C. E., Kingston.

In reproducing an article from our February number, "Progress," of St. John, N.B., says: "The following article, from THE CANADIAN ENGINEER, concerning "Water in Boilers," will be read with interest by St. John people, because of the recent fatal explosion at King's mill. The article is pronounced by some of the city's engineers to be a much better article than one which recently appeared in the *Scientific American* on "Grease in Boilers."

A trade journal that has every appearance of success, and that has filled a "long-felt want" in Canadian journalism is THE CANADIAN ENGINEER.—*Truro Daily News*.

WESTVILLE, N.S., 15th Feb., 1895.

Find enclosed \$1 to pay for THE CANADIAN ENGINEER for 1895. I am very much pleased with your paper, and hope you are getting lots of subscribers

A. J. CAMPBELL.

SIR,—Please send me another copy of your late issue containing article on "Bribery in Business." This article of yours should be reproduced in every paper of the Dominion, and its teachings would be valuable beyond the line of 45°. C. BAILLAIRGE, City Engineer, Quebec.

REVIEW OF THE METAL TRADES.

MONTREAL, June 4th, 1895.

Since last month prices have fallen off in some grades of iron, but business is fairly brisk. Bar iron has advanced in price considerably, and will probably remain firm for some time. Pig iron generally has experienced a drop of about 50c. Canada plates have advanced a little. The following are current quotations:—Summerlee, \$19.50 to \$20; Eglinton, \$18.50; America, \$17.50 to 18; Carnbroe, \$18.50; Ferrona, \$16.50 to 17; Siemens' No. 1, \$16.50 to 17; wrought scrap, No. 1, \$14.50 to 16; bar iron, \$1.60 to 1.65; tin plates, cokes, \$2.75; I. C. charcoal, \$3.25; Canada plates, \$2 to 2.10;terne plates, \$5.50 to 6; galvanized iron, 4 to 5c. according to the brand. Orford copper, 9¾ to 11c.; ingot tin, 15½ to 16½c.; lead at \$2.90 to 3; spelter, \$4.50 to 4.75; cut nails, \$2.10.

A LARGE deputation of carriage makers, blacksmiths and hackmen waited upon the mayor of Quebec the other day to protest against the construction of the electric railway, as dangerous to life and ruinous to their trades. Mayor Parent heard them out, and then told them candidly, but kindly, that the railway must go on, or Quebec would be out of the current of modern progress altogether. Although surprised, the deputation at length thanked the mayor for his frankness to them.

Industrial Notes.

THE Collingwood Marine Hospital will have a new wing, 48 x 34 feet.

THE Alberni, B.C., paper mills are to be re-started under a new organization.

ALEX. GIBSON's large new steam saw mill at Blackville, N.B., is nearly completed.

THE blast furnace of the Londonderry Iron Company is now running 20 hours per day.

LEAMINGTON is to spend \$16,000 to construct works to supply the town with natural gas.

IT is estimated that there are 7,000 steam boilers in use in Ontario for power purposes.

YARMOUTH, N.S., water committee intend purchasing several thousand dollars' worth of water pipes.

THE public school board of Kingston propose building a \$20,000 new school in Frontenac ward.

THE Kingston city engineer is preparing estimates of the probable cost of completing the waterworks system.

JAMES FLEMING, engineer, St. John, is building new boilers for S. T. King & Son's mills at Kingsville, N.B.

WATERWORKS extensions to the amount of \$15,000 are contemplated at Ottawa, chiefly in new mains and hydrants.

THE Mac Machine Company have shipped a Peerless drill to Manning & Macdonald, contractors, Coteau du Lac.

TILLEY & DRURY, St. John, have the contract for a cold storage warehouse, 38 x 80 feet, for Dr. Walker, of that city.

THE C.P.R. are arranging to put a switch into the proposed rolling mills of the Norway Iron and Steel Co at Guelph.

THE case of the Auer Incandescent Light Co. vs. O'Brien, for alleged infringement of patent, is before the court at Ottawa.

A FOUR story building is to be put up at Sherbrooke, Que., this summer, to be occupied by Geo. Long as a sash and door factory.

PLANS are being prepared by Gamdin & Huot, architects, Montreal, for a carriage factory for the Montreal Carriage Company.

THE new passenger bridge at Burlington, Ont., will be pushed forward as rapidly as possible. The bridge will cost over \$30,000.

THE big boiler which the Robb Engineering Company shipped to the Dominion Coal Co. at Glace Bay, the other day, weighed 20 tons.

THE Robb Engineering Company are shipping three large Robb-Armstrong engines to the T. Eaton Co. and the Grand Trunk station, Toronto.

NASH's new sawmill at South Edmonton has been completed and put in operation. Walters & Humberstone's mill at the same place will soon be completed.

A. CUSHING & Co.'s large saw mills at Union Point, St. John, which were burnt last month, are being rebuilt. These mills cut nearly twenty million feet of lumber a year.

STETSON, CUTLER & Co.'s and King's sawmills at Indiantown, N.B., are having a large amount of new machinery put in from the Wm. Hamilton Manufacturing Company, Peterboro.

THE Central Railway of N.B. is to build a 15-mile branch from Chipman to the Colonial Iron & Coal Co's coal fields. The furnace to be erected at St. John is to have a capacity of 100 tons of pig iron per day.

THE Forbes drainage scheme at Tilbury East, Ont., has been completed, and 8,000 acres of useless marsh have been turned into valuable land. There are eight miles of main drains, each twenty-seven feet wide. The work cost \$65,000.

THE Jesuit Fathers have accepted plans for the completion of the Church of the Immaculate Conception in Montreal. There will be no columns in this large temple, the roof being supported by iron arches concealed in the walls and plaster. The cost is estimated at \$100,000.

F. B. ROBB, manager of the Robb Engineering Company, Amherst, N.S., whose Robb-Armstrong engines and Economic boilers have already become celebrated in the West, as well as in the Maritime Provinces, was in the city recently, and while here made arrangements with Mr. J. S. Currie to represent them in the city and vicinity for the sale of the engines, boilers, and other steam appliances and machinery.—*St. John Telegraph*.

WINNIPEG may spend \$65,000 for new schools.

COLLINGWOOD, Ont., is talking of a sewerage system.

YARMOUTH, N.S., has borrowed \$25,000 to complete the water system.

THE Queen's Own Rifles of Toronto will erect a \$30,000 mess room.

THE new Deaf and Dumb Institute now building at Halifax will cost \$50,000.

HAMILTON has decided to go on with the proposed new city jail, to cost \$36,000.

BERLIN, Ont., is talking of erecting a \$10,000 market building and purchasing new fire hose

FIFTY thousand dollars has been voted towards the drainage of the Dalhousie Ward, at Ottawa.

JOHN BYRNE's steam saw-mill at Passakeag, N.B., was destroyed by fire. Loss heavy; no insurance.

MILL COVE, N.B., will have a pulp mill if exemption from taxation for fifteen years can be secured.

SOUTH RENFREW has been granted \$1,000 to construct a swing bridge across the Madawaska at Combermere.

THE sawmill of S. Patterson, of Shanklin Settlement, was destroyed by fire. Loss, \$5,000. No insurance.

THE Dorrien Plating and Manufacturing Co. of Toronto has been incorporated with a capital stock of \$10,000.

THE Auburn Woolen Co., of Peterboro, is being turned into a joint stock company with a capital of \$200,000.

\$19,000 will be given in prizes at the North-West Territorial Exhibition, which opens in Regina on July 29th.

THE B. C. Iron Works of Vancouver will commence the manufacture of concentrator machinery in a short time.

THE Government have granted \$4,000 towards constructing a swing bridge at Rosa, six miles south of Peterboro.

ADAM SMITH, a man 72 years of age, was killed by a circular saw in Degeer's mill at Binbrook, Ont., last month.

THE Collingwood Meat and Canning Company of Orillia are about to enlarge their premises at an expense of \$12,000.

THE Digby, N.S., Canning Co. have commenced operations. The factory has been newly fitted up and a new boiler put in.

THE Baptists of St John, N.B., are to erect a \$16,000 church. The city will erect a new school, also to cost sixteen thousand.

THE new building to be erected in Toronto for the general offices of the Independent Order of Foresters will cost \$130,000.

LAST year bicycles and tricycles to the value of \$333,473 were imported into Canada. A tax of \$100,040.41 was collected on them.

A LARGE oatmeal mill and elevator is to be built in South Edmonton for Brackman & Ker, of Victoria and New Westminster.

HALIFAX, N.S., will spend \$150,000 for sewerage, pavements, water extension, purchase of new chemical engine, new engine house, etc.

WORK on Hoegg & Co.'s new canning factory at Fredericton, N.B., is being rapidly pushed along. It is to be completed by the 1st of July.

SIR W. VAN HORNE is at the head of a company entitled the Windsor Salt Company, which is applying for incorporation. Capital, \$200,000.

FIRE at Aylesford, N.S., destroyed the agricultural implement store of L. O'Neilly & Co, also James Cochrane's pump factory. Loss, \$10,000. Insurance, \$2,000.

THE Elmwood Furniture Company's furniture factory and lumber yards at Elmwood, Ont., were wiped out by fire a few days ago. Loss \$40,000; insurance small.

CHAS. T. COTE, Quebec District Inspector of Manufactures, has received instructions from the Federal Government to institute an inquiry into the state of the Quebec manufactories.

A. W. MILNE & SON, of Don P. O., have just received one 28-inch Little Giant Turbine, with gearing and other machinery, manufactured by J. C. Wilson & Co., of Glenora, Ont.

THE Canadian Office and School Furniture Co., Preston, have put in a new four-foot sander, and made other additions to their plant that will enable them to make goods cheaper than ever.

J. C. WILSON & Co., of Glenora, Ont., have just shipped one 24-inch vertical Little Giant to the Granite Mills Co., of St. Hyacinthe, Que., which makes the fifth Little Giant this firm has ordered in the past two years.

ARNPRIOR is to have a \$7,500 post office.

A \$40,000 hotel is talked of for Petrolia.

STRATFORD's new fire hall will cost \$3,500.

NANAIMO, B.C., will build a \$15,000 school.

PORT HOPE will have a new \$10,000 high school.

PETROLIA, Ont., is to build a \$16,000 public school-house.

QUELPH Water Committee propose laying \$9,500 worth of 16-inch water mains.

J. ROWE's organ factory, at Aylmer, was burned recently. Loss, \$5,000; insurance, \$900.

STRATFORD and Perth, Ont., propose erecting a joint House of Refuge. Estimated cost, \$16,000.

W. B. BROWN & Co.'s flour mills at Simcoe were destroyed by fire recently. Insurance \$12,000.

THE contract for the waterworks at Chicoutimi, Que., has been awarded E. L. de Lavallée, of Montreal.

THE village of Killaloe, Ont., is offering a bonus of \$1,500 to any person who will build a roller mill there.

A COMPANY, entitled the Niagara Falls Printing and Advertising Company, has been incorporated. Capital, \$10,000.

ESSEX and Windsor are to build a joint court house and city hall to cost \$50,000. The building will be at Windsor.

THE Union Furniture Factory, Wingham, Ont., was destroyed by fire. Total insurance, \$13,600. Total loss, \$42,000.

MIDLAND, Ont., is undecided whether to build a \$2,000 fire hall, or a \$3,000 combined fire hall and council chambers.

THE White Cloud Novelty Co., of Michigan, are still on deck, asking various towns for bonuses to start a factory in Canada.

THE Lake of the Woods Milling Company will erect fifteen new elevators during the summer. The total cost will be about \$75,000.

THE new waterworks at Knowlton, Que., are being constructed under the superintendence of A. L. Husbands, C.E., of Cookshire.

JOHN BURNETT's sawmill at Breslau, Ont., was struck by lightning recently and burned down. Loss, \$3,000. No insurance.

THE KNOWLTON, Que., water works will cost \$10,000. Another \$4,000 will have to be voted, as \$6,000 was the estimated cost.

THE Havelock, N.B., Mineral Springs Co. are rebuilding their recently burnt factory, for which machinery has already been ordered.

A NEW bridge is to be built across the Nation River, at Caselman, Ont., in place of the one swept away by the floods last spring.

AT St. John, N.B., the Dominion Coal Company are making considerable improvements on the wharf, and are putting up new trestles and derricks.

THE school commissioners of St. Henri, Montreal, propose borrowing \$130,000 towards paying off their debts, and the building of two new schools.

POUPORE & FRASER, of Belleville, Ont., have contracted for 30,000 yards of stone for the Cornwall Canal, to be taken from the Point Ann quarries.

THE Kemp Manufacturing Co., Toronto, will locate their new granite ware factory on Bell st., near the present works. It will be the first factory of the kind in Canada.

THE Edson Fitch Co., of Etchemin, Que., have placed an order with J. C. Wilson & Co., Glenora, Ont., for one of their 33-inch Little Giant wheels, with a list of gears, shafting, bearings, etc.

THE Dominion Coal Company's coal handlers, at Montreal, who struck work because of the employment of non-union men, have gone back to work. The result was a victory for the coal company.

IN the year preceding April, 1895, Canada produced 46,526 tons of pig iron, on which the Government paid a bounty of \$93,046. In 1894, 46,000 tons of pig iron were imported, bearing a custom duty of \$180,000.

THE first casting in the new foundry of L. G. Holder & Co., St. John, N.B., was made last month. The molding shop is 50 x 35 and the machine shop 40 x 60. This firm are agents for the Burrill-Johnson Iron Co., of Yarmouth, N.S.

J. C. WILSON & Co., of Glenora, Ont., have just completed arrangements to have a siding laid down to their works, Glenora, and in future will have cars ferried to and from Deseronto. This will enable them to receive and despatch freight by rail and, save the extra cost and delay of transshipping by boat

HILTON & PENNY, Victoria Iron Works, Victoria, have resumed operations.

THE Free Masons of Winnipeg have selected the site for their proposed new temple

A SECOND condensed milk factory, with a cannery as an addition, is talked of for Truro, N.S.

THE contract for the building of the new rolling mills at Guelph has been let to R. DIXON, of Grand Valley.

THE Rubber Shoe Company of Port Dalhousie would move to Toronto if it obtained some special privileges.

FINDLAY BROS., stove founders, Carleton Place, contemplate removing to Ottawa, if they get exemption from taxes.

THE Massey-Harris Co. of Toronto are building a new factory in which they will manufacture bicycles next spring.

OWNERS of boot and shoe manufactories and wooden ware manufactories are asking for inducements to settle in Orillia, Ont.

MR. JOHN BREAKEY, Chaudiere Falls, Que. has received one large size Little Giant Turbine made by J. C. Wilson & Co., of Glenora, Ont.

THE Langmuir manufacturing works of King street, Toronto, were destroyed by fire. Damage \$15,000. Covered by insurance. The factory is being rebuilt.

MR. GEO. H. WILKINSON, of Buttonville, Ont., has just received one 21-inch Little Giant Water Wheel and a quantity of other machinery, manufactured by J. C. Wilson & Co., of Glenora, Ont.

THE Rogers oil refining company, of Toronto, has sent a communication to the Kingston city council asking it to modify its by-laws and permit them to erect store rooms within the fire limits.

THE Keewaytin Power Co.'s immense dam at Lake of the Woods, now under construction by Wm. Kennedy & Sons, of Owen Sound, is nearly completed. It will furnish 30,000 horse-power.

THE corporation of St. Lambert, Que., have visited Montreal Junction to inspect the drainage system. It is their intention to submit a by-law shortly to raise money for a drainage system for St. Lambert.

THE British Pacific Fertilizer and Manufacturing Company, with a capital stock of \$50,000, is being formed by Capt Walker, to manufacture oil and fish guano from dogfish at Quatsino Sound, British Columbia.

O. G. ANDERSON, of Walkerton, has purchased the furniture factory of the James Hay Company at Woodstock, and will remove his present business to that town. The Walkerton business employed 100 hands

THE George N. Oille machine shop and foundry, at St. Catharines, Ont., owned by H. Leggatt, of Montreal, and operated by Wright & Cunningham, was destroyed by fire last month. Loss, \$10,000; insurance, \$4,000.

MR. VIAU, contractor for the western portion of the new bridge over the Rideau at Cummings Island, has entered suit against the county and Ottawa city for \$2,393, which he claims is the balance owed him on his contract.

THE two contracts for Digby and for Westville, of iron water pipes, to be made by the Londonderry Iron Company, will aggregate 15 miles. Annapolis was the first town in N.S. to use the home-made pipes and they gave satisfaction.

THE council of Sudbury have awarded M. M. McCarthy, of Sherbrooke, and W. H. Plummer, of Sault Ste. Marie, Ont., the contract for putting in a system of waterworks, sewerage, and electric light in the town, at a cost of \$40,650.

IT is not improbable that a gypsum mine will be opened at Petitcodiac, N.B., in the near future. There are large deposits of gypsum in that locality, and New York capitalists who have visited the district aver that a great business could be worked up.

THE Ornamental Iron Works, Nazareth st., Montreal, of which John B. Rose was proprietor and T. J. Baldon manager, was seized and sold out by the sheriff last month; and now Mr. Rose's office furniture in the Board of Trade building is under seizure for rent.

THE sisters of the Holy Name of Jesus and Mary, whose convent is now at Hochelaga, Que., are about to build a new convent at Outremont, near Montreal. It will be six stories high, built of Canadian stone, with fire-proof divisions, and will cost about \$150,000.

THE contract for the bridge to be constructed over the St. Anne River, Quebec, under the direction of the Provincial Department of Public Works, will be given out shortly. For this work the Government has subscribed \$9,500, and the municipality, \$15,000.

ST. BONIFACE, opposite Winnipeg, has contemplated bonuses to the amount of \$35,000 to various industries this year, but some of these may be withdrawn.

THE Browne Manufacturing Co., selling agents for the "Leviathan Belting," have secured the order for a 28-inch main belt from the Laprairie Pressed Brick Co.

WORK has been begun on the waterworks at St. John's, Nfld., and about 600 men are employed. Work will be stopped after a month to allow the men to go fishing.

JOHN CAMPBELL, owner of the Erie Flour Mills at St. Thomas, Ont., has commenced the enlargement of his mills, and will spend \$16,000 to \$20,000 in new machinery, etc.

THE Provost bridge at Back River, near Montreal, needs re-newing, and the municipalities interested are trying to determine who should build a new one, which would cost \$5,000.

THE intake-pipe for the Longueuil, Que., waterworks will be lengthened from 500 to 1,000 feet in the St. Lawrence; and a trunk sewer will be built this season, to discharge below the town.

THE bill to enable a company of capitalists, under the name of the South Shore and Suburban Bridge Co., to construct a bridge over the St. Lawrence at Montreal, has been defeated in Parliament.

THE amalgamation of the Nova Scotia Steel and Forge Company and the New Glasgow Coal, Iron and Railway Company is announced. The new corporation is now known as the Nova Scotia Steel Company.

THE Portage la Prairie, Man., town council have decided on a scheme to turn the water of the Assiniboine into the Slough, which is close to the town, thus making a three mile course, 800 yards wide. A new bridge to cost \$30,000 is embraced in the scheme.

THOMAS ALLISON, for some years engineer of the Maritime Sulphite Fibre Co.'s mill, at Chatham, has formed a company, which will undertake the construction and operation of a chemical pulp mill at Chatham. The company is known as the Masterson Chemical Pulp Co.

J. & J. TAYLOR, the widely-known safe manufacturers of Toronto, have recently made shipments of their safes to South Africa. They had previously sent their safes to Great Britain, Australia, China, India, the West Indies and three countries in South America. Good for Canada.

THE Ontario Engine and Machine Company of Toronto have obtained the contract, through McQuillan & Co., for supplying the water works at Meaford with a pump. It will have a capacity of 700 gallons per minute. This company are obtaining a good reputation for their work.

THE proposed smelting works at Kingston, which have agitated the people of that city for the past two months, may not be erected, the American promoters not being satisfied from the investigations of their mining engineer, that the ore exists in quantities and of a kind suited to their work.

THE town of Cote St. Paul, Que., has taken action against the Axe and Harvest Tool Manufacturing Co. for breach of contract. In 1892 the company agreed to erect a factory, and to have it running in six months, for a bonus of \$10,000. No factory was erected and the suit is brought to get back the \$10,000.

A NEW Industrial School and principal's residence having a total frontage of 112 feet, is to be built at Mount Elgin, on the Muncey Reserve. The building will have a complete system of waterworks, fire protection and electric system for domestic use. Hawes & Matchett, of St. Thomas, Ont., are to be the contractors.

W. H. NOLAN, proprietor of the Canada Machinery Agency, Montreal, has moved from 347 St. James street to 321 the same street. The new premises have a floor area of 10,000 sq. ft., constituting the largest machinery depot in Canada. Mr. Nolan has recently been appointed agent for the Dodge Split Pulley Co., of Toronto.

THE Laurie Engine Co., of Montreal, are still adding machinery to their large new works in St. Catherine street east. They are now putting in a large lathe from John Bertram & Sons, Dundas, and a lathe of their own make for special heavy work. The latter will have a capacity for turning a piece of work 30 feet in diameter.

ENGINEER KEATING, of Toronto, and Haskins, of Hamilton, the experts appointed to examine the plans for the proposed filter beds, Victoria, B.C., have selected the plan of Mr. Jorgenson, of that city. The plan calls for downward filtration through sand, gravel and rocks. The capacity of the beds is two million gallons, and that of the reservoir 5½ million gallons. The cost is placed at \$60,000.

DANIEL MACPHERSON, foundryman, of Fingal, Ont., died last month.

AN employe in the mills at Shogomoc, N.B., was killed by the rotary saw a few days ago.

CHAS. CARNEY, of Amherst, N.S., is about to start a furniture factory at St. Mary's, near Fredericton, N.B.

W. R. TAYLOR & Co., of Halifax, are starting a shoe factory in that city, with W. Silver, jr., as superintendent.

THE plant and assets of the Royal Pulp and Paper Company, at East Angus, have been sold to a new company.

WM. STEWART & SON have taken out a permit for a new brick Sunday-school and alterations to the Centenary church, at Hamilton, at a cost of \$13,000.

THE Canadian Canoe Co. of Peterboro report a very busy season on canoes and boats. The work they are turning out now is better than ever before.

WORK will be commenced at once on the new intake at the settling pond of the Merriton, Ont., waterworks, at lock 25, new Welland canal. The work will cost \$2,000.

THE Rogers & Morris Co., Ltd., manufacturers of and dealers in oils, Ottawa, have moved their offices from Elgin street to larger premises in Sussex st., near the corner of Rideau.

THE Laughlin-Hough Co., referred to last month as about to start business in Guelph, will manufacture drawing tables. The machinery is being erected, and the factory may be in operation this month.

A GANG of men has been put to work on the new smelting works at Hamilton, which had been at a standstill for about three months. Mr. Moorhouse states that the works will be opened by October next.

RANNEY & INNES, engineers, of Peterboro, have prepared plans for a new drainage system for the village of Havelock, Ont. The main drain is 3,300 ft. long, and if the work is carried out, will cost about \$3,500.

THE Central Bridge and Engineering Co. of Peterboro have the contract for the structural iron of the new *Globe* building in Toronto. The steel bridge built by this company on Toronto Island is now finished.

THE Royal Society of Canada are issuing a bibliography of its members. From this it appears that Chas. Baillairge, city engineer of Quebec, has written over 70 books, pamphlets and articles for the engineering press.

JOHN WATSON, of Ayr, Ont., the liquidation of whose business was referred to last month, has since assigned to David Speers. Mr. Watson was for many years one of the best known manufacturers of agricultural implements in Canada.

THE Kingston Vehicle Company, whose new factory was mentioned in this paper last year, have had remarkable success with their buggies and bicycles. Their new bicycles are appropriately called the "Frontenac," and are proving to be splendid wheels.

THE attention of contractors is called to the notice from the Lachine Rapids Hydraulic and Land Company, appearing in our advertising pages, calling for tenders for the various works in connection with their proposed scheme, a detailed description of which appears in this number.

A GENTLEMAN, recently arrived from the lumbering districts, reports much brighter prospects for this season than have existed for some time past. Mill owners, who, on account of dulness in trade, had delayed putting in improved machinery, etc., are now placing orders for new plant, and preparing to otherwise extend operations.

THE Ontario Paving Brick Company, Ltd., capital \$50,000, has been incorporated. The company consists of S. G. Beatty, publisher, C. R. S. Dinnick, brick manufacturer, J. Mitchell, A. E. Kemp and W. A. Kemp, manufacturers, all of Toronto. Following close on the announcement of incorporation, came a fire in the company's works at North Toronto, by which a loss of \$5,000 was sustained.

A. & E. LOIGNON, bridge builders, Montreal, have finished the steel swing bridge over the Beauharnois Canal at Valleyfield. It is of the cantilever type, and is 90 feet long. The same firm have the contract for the structural iron on the new asylum for the aged and for poor children now being built by the Grey Nuns of Montreal. The building is 240 x 70 feet, with a wing, and is four stories, all of stone. It is to be finished in October. The work the firm is supplying for the new Laval University, Montreal, is nearly finished. The whole structure is to be ready for occupation next autumn.

JAMES MCGREGOR, who built the first mechanical cold storage plant in Chicago, had an interview with some Montreal business men at the Board of Trade on the 2nd ult., proposing to establish a big cold storage warehouse in Montreal. The cost of machinery and building is estimated at \$135,000, cost of land \$150,000, while it is said the establishment can be operated for \$15,000 and pay a dividend of 20 per cent.

THE Montreal courts have awarded the widow of the late Wm. Wilson \$3,000 damages in her action against the Montreal Rolling Mills. Wilson, who was stationary engineer in the mills, had been found dead one morning bearing marks of having got entangled in the machinery. The court held the company liable, seeing that it had resulted, from the evidence, that the fly wheel and the opening in the plank were not covered as required by law.

J. C. WILSON & Co., of Glenora, Ont., have shipped four Little Giant Turbine Water Wheels on order to London, Eng. They also have on order one Horizontal Little Giant, with large driving pulley, for J. F. Guay, of Quebec city, and two Horizontal Little Giants for the Montmorency Electric Power Co., Montmorency Falls, Que. This latter firm have now in use about twenty of their turbines, eight of which were furnished them two years ago, to develop a total of over 3,700 horse power.

THE closing exercises of the night schools under the patronage of the Council of Arts and Agriculture of Quebec were held in Montreal last month, when prizes were awarded in free hand drawing, mechanical drawing, architectural drawing, lithography, modelling, wood carving, plumbing, stair building, and boot and shoe pattern making. From 1872 to 1893, 23,575 pupils have attended these classes, which are held in 15 different cities and towns. The cost is about 33½ cents per pupil per year.

THE Montreal Water and Power Co. is in difficulties with the towns of St. Henri and St. Cunegonde, as well as with Montreal at St. Louis de Mile End. St. Henri owes St. Cunegonde \$100,000 on the waterworks, which are now in the hands of the Water and Power Co., but the latter paid by note and owes interest on the amount, the interest also being paid by notes, which the company want renewed. What with lawsuits and such matters, the company has not had a bed of roses since it came into being.

THE following tenders for the Westville, N.S., water system were accepted: Londonderry Iron Co. for cast iron pipes; J. D. Weir & Co., Westville, for the special casting, Robert Brown & Son, New Glasgow, for the hydrants; McDonald & McDonald, McKinnon & McLean, New Glasgow, for construction of the reservoir, trenching, engine and boiler-house, etc., and the Northey Manufacturing Co., of Toronto, for the pumping engine, 18-inch stroke. The total amount of contract, exclusive of engineering and land damages, \$40,299.

G. W. DAWSON, M.P., has built and started six cheese factories around Plevna this spring. The advantage of the Kingston Dairy School is fully recognized back there, and many cheese-makers who did not take advantage of it last winter will next. The river is to be bridged at Clyde Forks, and a station on the K. and P. R. built. This will be a great advantage to the people of that village and neighborhood. Peter Gray has added to his shingle factory machinery for manufacturing lumber. This will add much to the business of that place.—*Kingston Whig*.

THE troubles which have existed between the town of Chatham, Ont., and the waterworks company over the supply of water, appear to be as far as ever from a settlement. The town is preparing a by-law to submit to the ratepayers to purchase the works and plant of the company, whilst the latter has spent a considerable sum in introducing filtering plants. Water is now supplied to the inhabitants from the River Thames through the filters, and appears to be of good, pure quality; to make sure of this the company have employed J. J. Mackenzie, biologist of the Provincial Board of Health, to make a careful investigation and biological examination into the condition of the water.

THE Mac Machine Company, of Belleville, has placed in the Christi laundry of that city, a new improved ironing machine for cuffs, collars and shirts. In the old ironing machine, the table has to be reversed by moving the belt, thus taking up unnecessary time; in the improved ironer, the table is moved by means of friction pulleys and is reversed or sent forward by a simple arrangement operated by the foot. The roller is so arranged that it can be raised or lowered at will without the necessity of repadding the table; this cannot be done with the old machine. The heating apparatus for the roller is also improved, and is a special gas burner which admits equal parts of gas and air, giving an even distribution of heat and doing away with smoky rollers, which are such a source of trouble in machines of this class.

THE Wm. Hamilton Mfg. Co. of Peterboro have shipped the new Payne-Corliss engines they were to supply for the Prescott Elevator Company. This company are fitting out a saw mill 280 miles below Quebec, and are refitting with new machinery the recently burnt mills of Stetson, Cutler & Co., St. John. N. Kendall, late with the W. C. Edwards Co. of Ottawa, has charge of the construction work.

THE Cleveland Twist Drill Co., of Cleveland, Ohio, whose goods are widely and favorably known in Canada, have removed their New York office from 102 Reade St. to No. 99 Reade St., where they have placed in charge of C. I. Markham, a new and complete stock of their twist drills and tools, together with complete samples of their manufactures. By reason of their improved facilities and enlarged quarters, they will serve their eastern patrons more satisfactorily than ever before.

THE Canada Paper Co. at Windsor Mills have put in a siding on the Grand Trunk, in order to hasten the work of getting the material for the pulp mill on the ground. The dam, pulp mill and electric plant will be proceeded with energetically, and \$150,000 will be spent this summer in the enterprise. The pulp mill is to be finished this coming fall if possible, and its capacity will be fifteen tons of pulp per day. The dam will give a 3,500 horse-power. The total expenditure will, no doubt, reach the sum of \$200,000.

A LINSEED oil mill with a capacity of 50,000 lbs. of seed a day will probably be located at Sidney, near Victoria, B.C. The promoter is M. de Keyser Verbiest, who has interested Belgian capital in the undertaking. E. E. de Keyser Goethals, a relative of Mr. Verbiest and a large manufacturer in this business, has decided to move his establishment from Eccloo, Belgium, to Canada. Besides the making of linseed oil, oilcake, and other products, the manufacture of canvas for oil factories and cloth will be added to the mill, which, to begin with, will employ 25 or 30 hands.

THE new lumber refuse burner built at the mills of the W. C. Edwards Co. at Ottawa, and which has attracted some attention, may be described as a cylinder of steel plate, 20 feet in diameter and 83 feet high. It is lined half way to the top with brick. It is built on a stone foundation, and the top is covered with a strong wire bonnet, which acts as a spark arrester. Two doors are provided at the bottom for receiving the refuse, which is conveyed to the structure on a carrier worked by an endless chain. This burner is the first of its kind in Canada, and is built for the firm by the Wm. Hamilton Co., of Peterboro, who have erected a similar burner, 30 feet in diameter and 90 feet high, for the St. Anthony Lumber Co. at Long Lake, Ont.

ONE of the samples distributed at the Food Fair, recently held in Montreal, was a small cake of the "Master Mechanic's Extraordinary Soap." This soap is invaluable to those working among machinery. Iron rust, oil and grime are immediately removed by its use, leaving the skin white, soft and smooth. It is made of palm oil, which of itself is the most grateful remedy you can apply to a burn or scald. It also contains the requisite amount of medicinal carbolic acid to make it a perfect disinfectant, and at the same time retains its innocent nature. An important factor in its manufacture is "Fuller's Earth," such as mothers use on their infants when the skin is sore and scalded. Canada Balsam enters into its composition, which is the best skin maker known, but the "Pine Tar" in it is the all healer. It is made by the Albert Toilet Soap Company, Montreal.

THE plant and assets of the Ontario Forge and Bolt Co. were sold last month for a total of \$90,000. When the mortgage of the Canada Permanent Loan Co. is deducted, it will leave about 15 cents on the \$1 to the ordinary creditors, the secured creditors getting about 45 cents in the dollar. The amount is payable in six annual instalments, the first to be paid in May, 1896, but the ordinary creditors will get their dividend out of the \$10,000 realized on the sale of the chattels on hand in November last. The nominal purchaser was John Pennell, of Gananoque, but it is understood he is acting for Geo. Gillies, of that town, and John Worthington, of Toronto, the former taking the machinery and plant, and the latter the land.

JUDGE TAIT rendered judgment in the case of the Royal Electric Company against Alexander Wand. Wand undertook to erect a chimney for the company, but it was defective, and had to be demolished. The company sued Wand for the cost of demolition and reconstruction. Wand alleged that he erected the chimney according to the plans and specifications of W. McLea Walbank, the architect, and he alleged that those plans were defective, and consequently that Mr. Walbank should pay the cost of demolition and reconstruction, which amounted to \$1,281.04. Mr. Wand was originally condemned by the Superior Court, and this judgment

was confirmed by the Court of Review, to pay these costs. The action that he subsequently instituted against Walbank was dismissed by Judge Tait, on the ground that it was not proved that the architect's plans were defective.

R. H. BUCHANAN & Co., Canadian agents for the Blake & Knowles Steam Pump Co., New York, report the steam pump trade flourishing. They have recently sold the following pumps: Two to A. Gagnon & Co., Victoriaville, Que.; one Knowles Condenser to Conner, Laine & Co., Levis, Que.; two large Underwriter Fire Pumps to the Acadia Sugar Refining Co., Ltd., Halifax; one to Dominion Corset Co., Quebec; one to Portbriand & Son, Sorel; one to the Rathbun Co., Deseronto; one to Jamieson & Co., Kingston; one to Laprairie Pressed Brick Co.; one to Watrous Engine Works Co., Brantford; one to Toronto Paper Co., Cornwall; one to Granby Rubber Co., one to Edwards & Co., Ottawa; one to J. de L. Tache, Quebec. They have done a large amount of repair work on windmills, etc., etc. Deluge sets have been sold to the Fire Departments of St. Catharines and Walkerville, Ont. At a recent test at Cornwall, a 1-inch and 1½-inch nozzle of the Cornwall Fire Department was tested against a 1-inch and 1½-inch Perfection nozzle, and was outdone 20 feet. A 1¾ stream was thrown and beat the 1½-inch nozzle 35 feet, exploding the theory that the small nozzle can throw farther than the large one. One man held the nozzle on the deluge set. The pressure at the hydrant was 55 pounds; distance thrown by 1¾ stream was 160 feet horizontally.

Mining Matters.

GOLD in paying quantities has been discovered near Marbleton, Que., and J. Obalski, provincial inspector of mines, thinks the vein is a promising one.

THE Renfrew gold mine, operated by the Pictou Developing Co., is now the property of New York capitalists. The amount paid for the property was \$75,000.

THE citizens of Nelson, B.C., have subscribed \$25,000 to bonus an ore smelter, and their proposition has been laid before the directors of the Hall Mines Company.

MR. DICK, an expert mining engineer, was lately at Port Hood examining the coal fields. He is said to have been very favorably impressed as to quantity and quality of the mineral.—*Antigonish Casket*.

THE mother of the young man Archibald Gillis, who was killed by an explosion of dynamite at Glace Bay, B.C., last fall, has entered an action against the Dominion Coal Co. to recover damages, claiming \$10,000.

IT is reported that the War Eagle, Nelson, B.C., Company has contracted to supply 35,000 tons of ore to the Montana Ore Purchasing Co., in two years, and that the latter company will build a smelter at Northport to treat it.

THE R. E. Lec Maid of Erin mineral claims at Traill Creek, B.C., were sold by their owners, M. Sullivan and W. Dunn, to J. L. Wilson, W. C. Miller, and J. M. Burke, the price paid being \$36,000. The ore yields an average of \$20 to the ton.

THE prospectus of the Consolidated Gold Lake Mining Co., Ltd., has been issued. Capital stock \$400,000 at \$1 per share. Mr. J. B. Neily is president, W. A. Temple, vice-president, and James Reeves, secretary-treasurer, with H. C. Walker and G. H. Mackinley as directors. The property consists of 305 areas at Gold Lake, N.S., and 400 acres of land.

ROUSE & ADAIR, who were drilling for a syndicate on Judge Mackenzie's farm, Sarnia township, recently struck an immense flow of gas in the oil rock at the depth oil is usually struck. The gas caught fire, and in a few moments the whole derrick was in flames and all the woodwork consumed. The gas continued to burn, throwing up a flame twenty or thirty feet high, and at night illuminating all the surrounding country.

F. H. Mason, F.C.S., consulting metallurgist, chemist and assayer, of Truro, N.S., has decided on removing his office to Halifax, a more important centre for mining operations. Mr. Mason has obtained a wide reputation as a metallurgist, and in his new office, which is in the Queen Building, Hollis street, will have a fine laboratory, equipped for all kinds of analytical and assay work. He is able to treat small parcels of concentrates or refractory ore (say 100 lb. lots) by chlorination, bromination and cyanide of potassium.

THE wages of South Kootenay, B.C., are said to aggregate \$120,000 a month.

J. FRASER, of Petrolia, Ont., has bought the Barnes wells, oil fields. The price paid was \$15,000.

A LARGE number of claims have been located in the Boundary Creek, B.C., district, within the past few weeks, and free milling gold ore has been found in several places.

A LARGE party is being equipped at Spokane to prospect on the Similkameen river and its tributaries in British Columbia. One prospector claims to have discovered a rich vein of gold ore there last summer.

A NUMBER of miners who have been thrown out of work by the shut down of No. 2 slope at the Joggins mines, N.S., have gone to Lethbridge, N.W.T., to work in the mines there. A large number of those affected by the shut down have also gone to Cape Breton to work.

THE Dominion Government has received word from the party sent out last year to prospect the coal oil fields of Athabasca. Throughout a section of country about 300 miles by 100 miles there is every indication of rich deposits of oil. The party made a boring about 100 miles north of Edmonton, getting a good flow of natural gas, and oil, it is expected, will soon be struck in quantities.

THE Inverness Coal Mining Co., a new competitor of the Dominion Coal Company have purchased large coal areas in the Pictou region. They are making arrangements for starting work there, hiring a superintendent, erecting coalsheds, building a tramway, buying machinery, and procuring a boring outfit. They will probably establish an agency in St. John.

A NEW industry has been started in Nova Scotia, the object of which is the refining and marketing of infusorial earth, which is found at the bottom of several lakes in Colchester and Cumberland counties, N.S. The refined product finds a ready market in the United States, where it is used in the manufacture of dynamite, steam packing, etc. The works of the company are being erected at Bass River, N.S.

THE work of the Oak Island Treasure Co. deserves to be classed among the romances of mining. This company was formed for the purpose of digging up the treasure supposed to have been concealed in Oak Island, Mahone Bay, N.S., by the noted Cap. Kidd. About \$10,000 was spent last year in excavating at a point where a mysterious tunnel exists, the mouth of which is closed at all times, except during low tides. The company are getting a 30 h.p. engine ready to renew work this season.

THE biggest asbestos boom in many years has just made its appearance in Quebec, and the mines at Coleraine and Thetford in the Eastern Townships, which have many of them been closed up during the last two years, are now resuming old-time activity. The Bell Company is putting in three new machines for crushing the ore and separating the fibre from the rock, and the Jeffrey mine has been purchased for \$150,000 by a company which is erecting a factory for making asbestos tissue, and weaving it into cloth for the manufacture of stage curtains and scenery, the skirts of variety actresses, etc.

A REPORT to the Montreal *Herald* from the Eastern Townships of Quebec, says: "Chrome iron is to be found almost everywhere in Wolfestown township. The Wolfestown range of mountains are said to be very rich in this valuable mineral. A. Blanchard, of Garthby, is now working a very rich mine, situated in these mountains, a few miles from Coleraine. A company has been formed who will buy Mr. Blanchard's rights and operate the mine on a large scale. Hugh Leonard, of Garthby, who some time ago shipped several hundred tons of chromic ore to Liverpool, has received large orders from England and Belgium. Orders from the United States are above the present output, and Mr. Leonard will be forced to double the number of his men."

AMERICAN capitalists are having tested one hundred tons of gold-bearing rock mined on the Consolidated Gold Mining Company's property, in Marmora, Ont. The vein is known to be rich in gold, but the ore is of so refractory a character that hitherto all attempts made on a large scale to separate the precious metal from its matrix have resulted in loss. That the gold was there, however, was conclusively demonstrated by the fact that parties who worked over the tailings by hand process averaged \$10 per day. In the present instance the rock will be taken to Malone, and there crushed and worked over by Mr. Lawson, M.E., who will put it through the chlorination process. This process was tried on these ores several years ago, but failed, it is now believed, because of unskillful work or carelessness as to important details. The result of this experiment will be watched with great interest.

A find is reported on the gold mining property at Pleasant Lake, Barrons, N.S.

THE Golden, B.C., smelter property and appliances are advertised for sale for a claim of \$8,108.20.

THE Hall Mines Company, Nelson B.C., are about to build a tramway from the Silver King mine to the lake.

THE Kootenay, B.C., mines, Tip Top and Copper Jack, owned by P. Aspinwall, have been sold for \$75,000. The mines assay up to \$88 in gold.

Two new shafts have been sunk to a depth of 200 feet on the Weigand mine, Rainy River Lake Co., Ont., and as soon as sufficient development work is done, a mill will be erected.

A NEW oil and gas company has been organized at Tilbury, Ont., to test for oil and gas in Essex county. The new company is called the Peninsular Oil and Gas Co. and has a capital of \$20,000.

W. DE WALBRIDGE, president of the American Coal Company, and J. Mulholland, president of the St. George's Creek and Cumberland Railway Company, intend purchasing and working large coal fields in Nova Scotia.

THE production of nickel is making more satisfactory progress in the Province of Ontario than any other branch of the mining industry. The exports from Ontario, valued at \$388,000 in 1893, increased to \$808,000 in 1894.

THE Nova Scotia Steel Co. are making extensive preparations for working the hematite iron mines lately acquired by them at Conception Bay, Nfld., and expect to have some of the ore shipped to New Glasgow by about September.

THE Golden Lode Mining Co., at South Uniacke, N.S., are putting in a new duplex compound condensing pump of the Northey pattern. This pump is the first of its kind put in at the gold mines of Nova Scotia, and will deliver the water from a vertical depth of 400 feet.

A UNION meeting of the Mining Society of Nova Scotia, the Ontario Mining Institute and the Quebec Mining Association has been arranged to be held in Quebec city during the week commencing June 28th. B. P. A. Bell, of Ottawa, is secretary.

A LARGE coal basin has been discovered at Black Brook, C.B. It extends over three miles, and lying along the eastern shore of Sydney harbor there are five and a half miles of area rich in coal and prolific with seams. One seam, a large one, contains coal of a kind not hitherto mined in Cape Breton.

THE Lookout Mining and Milling Company, with headquarters at Spokane, has been incorporated. The capital stock is \$250,000, with Messrs. Kumpe, Talbott, Lindsey, and Pfunder as trustees. The company will operate the Lookout mine in the Trail Creek district of B.C., and carry on a general mining business.

J. L. SIMMONS, a former Cœur d'Alene miner, has recently discovered on a piece of land adjoining the Weigand gold mine in Rainy River Lake county, Ont., the richest ore he ever saw. The mine, according to his report, fairly blazes with gold, and samples taken to Rainy Lake went, it is said, \$500 gold to the ton.

THE gold fields in West Algoma are extending in area. Ferdinand Hille, M.E., has returned from Lake Shebandowan with some wonderfully rich samples of gold quartz. He pronounces the veins large, well defined, and well mineralized, and claims that one in particular will yield five ounces per ton, of which four ounces are for milling.

THE assay returns from the White Elephant, discovered by Hall and McCormick, are likely to cause a stampede in the direction of Stony Creek. The ore went \$28 in gold and 70 ounces in silver to the ton. It is not more than four miles from Rossland to where this bonanza was struck, and several parties have already hit the trail in that direction. The rock which gave such astonishing results is ordinary enough looking white quartz with galena and iron through it. There is no free gold visible to the naked eye. There is a strong vein of it on the ground.—*Rossland, B.C., Min. r.*

THE annual report of the British Columbia Minister of Mines states that the collieries in operation during the past year were the Nanaimo, Wellington and Union, the output amounting to 1,012,953 tons. The total coal exported in 1894 was 827,642 tons, and the home consumption 165,776 tons. In order to show the standing of British Columbia coal in the California market, the following returns are set forth:—British Columbia, 649,110 tons; Australia, 211,733 tons; English and Welsh, 157,562 tons; Scotch, 18,636 tons; Eastern, Cumberland, anthracite, 16,640 tons; Seattle, Franklin, Green River, 153,199 tons; Carbon Hill and South Prairie, 241,074 tons; Mount Diablo and Coos Bay, 65,263 tons; Japan, etc., 15,637 tons.

Railway and Marine News.

THE Red Mountain Railway Bill has passed its second reading in the Dominion House

EMERY SEWELL'S new tug "Quidly" ran aground at Akerley Point, N.B., on her maiden trip up last month.

JAS. PLAYFAIR & Co Collingwood, have bought the steam barge "W B Hall," for their lumbering business

THE C.P.R. is building a wharf at Rosebery, Man. When completed cars may be unloaded alongside the steamer

THE new R & O steamer "Hamilton" is now on her route between Montreal and Hamilton. She has 75 staterooms and is handsomely fitted up

JAMES BARNES, of Buctouche, who has the contract for the construction of the Central Railway from Chipman to Newcastle, is starting work this month.

THE tug "Lily," Capt. Ferris, and the schooner "Levuka," Capt. Fred Roberts, from Parrsboro, were both badly damaged by collision in St. John, N.B., harbor.

IT is the intention of mining capitalists to put steamers on the river near Ignace, Ont., to run between that place and the gold mines at the mouth of the Seine and Rainy Lake

CARTER BROS., Port Colborne, Ont., bought out the burned steamer "N. K. Fairbank" and her cargo for \$625. They pumped out the 50,000 bushels of corn cargo and sold it at 20c. a bushel.

LOCOMOTIVE engineers who secure the best speed with the least consumption of coal are now distinguished on the C.P.R. by neat printed cards fastened to the outside of their engine, and bearing the words, "Best Fuel Record."

THE Lake Erie and Detroit River Railway Co., lessees of the London and Port Stanley Railway line, are negotiating for the steamer "A. J. Tyron" to sail between Port Stanley and Cleveland this summer.

THE Richelieu & Ontario Navigation Company's steamer "Columbia" has been withdrawn from the Buffalo and Chippewa route, and transferred to Montreal as a spare boat for the St. Lawrence this summer.

ANDREW ONDERDONK has been at work for the past month with a large force of men on the Balsam Lake section of the Trent Valley Canal. This section is 5½ miles long. The work is in charge of Wm. Dennon, whose headquarters are at Kirkfield.

THE new Corliss valves put on the high pressure cylinder of the Richelieu and Ontario Navigation Co.'s steamer "Montreal" have improved her speed, while at the same time lessening her consumption of coal by 14 tons on the round trip between Montreal and Quebec.

THE Ottawa, Arnprior and Parry Sound Railway is to be finished next summer to Parry Sound, where docks and terminal facilities will be built. Preparations are being made this summer for the new docks. Mr. Booth, the chief promoter of the line, is preparing to build large car shops for this road at Ottawa.

THE Upper Ottawa Improvement Company are to build during the coming autumn a new steel side wheel steamer to replace the "Monitor" on the route from Quio Boom to the head of Lachine Rapids. She will be 134 feet long by 20 feet beam, and will have a gross tonnage of 332 tons, the net tonnage being 209. She is to be used as a tug, and will be ready for next spring.

THE Thousand Island Transit Company is incorporated. Its object is the purchasing, hiring or building and operating one or more steam yachts or other vessels on the St. Lawrence river, for the transportation of passengers and baggage. The capital is \$6,000. The directors named for the first year are: William C. Browning, James H. Oliphant, Edward W. Dewey, Henry K. Heath, Daniel C. McFwen, William McAlfee, Henry A. Laughlin, J. W. Jackson and William J. Townsend.

MR. PROVAND, M.P. for Blackfriars, Glasgow, and one of the directors of the Chignecto Marine Transport Railway, has returned to England. It is not known whether he has secured the consent of the Canadian Government for an extension of time to complete the enterprise. A difficulty has arisen as to the interpretation of "efficient working" of the railway. The company interprets the word "efficient" to mean simply having the railway completed and ready for traffic. The Government view is that it means the handling of a reasonable amount of traffic, and it is said the company will be required to carry a minimum amount of traffic, say, 1,000,000 tons of shipping annually, if the time is extended.

IT is reported that the G.T.R. divisional shops will be removed from Brockville and Belleville to Kingston, when the double tracking is completed from Toronto to Montreal.

MIDLAND, Ont., is making preparation for the construction of a dry dock large enough to accommodate the largest vessel on the lakes. The dock will be 400 feet long, 16 feet deep, and 50 feet wide.

THE employes of the Pontiac Pacific Junction Railway are said not to have received their wages for the past six months. The matter was brought up in the Dominion Parliament, with the result that a bill to protect railway employes is to be passed.

THE promoters of the Amherstburg and Lake Shore Railway have asked that the subsidy of \$3,200 that has been voted to that line be transferred to the Windsor, Amherstburg and Lake Erie Railway, which is to be built from Windsor to Amherstburg.

THE Milltown, N.B., and St. Stephen's Railway Co. are about to build the four and three-quarter miles of railway, and bridges to connect the Shore Line Railway with the St. Croix and Penobscot Railway. The company in order to gain the subsidy must begin work before August.

R. & T. JENKINS, of Toronto, on behalf of the company formed for the building of the Tilsonburg and Port Burwell Railway, have deposited the guarantee required and engineers are now laying out the route. Work is to be commenced about the 1st July, the line to be finished by the end of the year.

THE Peterboro' Navigation Company have elected the following officers for this year:—President, H. Calcutt; vice-president, T. E. Bradburn; secretary-treasurer, R. S. Davidson. The "City of Peterborough" this year will be in charge of Capt. Eden.

THE Upper Ottawa Improvement Co.'s towing steamer "Perley" was burnt to the water's edge on Chats Lake, on the 4th inst. The fire was caused by upsetting a lamp while the boat lay at anchor. The crew barely escaped with their lives. She was insured.

IT is said that when the Kaslo and Slocan Railway is completed, the Great Northern will build down the Kootenay River from Bonner's Ferry to the boundary, and that a line of steamers will be put on between Kaslo and the city that will spring up at the head of the lake, about 40 miles from Pilot Bay.

THE water in the Great Lakes is lower this year than for very many years past. The lower water in the St. Lawrence River and canals is causing difficulties with vessel owners, who are only able to take light cargoes. The water in Lake Ontario on the 6th June is 23 inches below the normal level, measured at Toronto.

THE new steamer "City of Toronto," designed and built by Capt. John Simpson, of Owen Sound, for the North Shore Navigation Company, was launched at that place on the 20th April. She is a side-wheeler, 162 feet long and 38 feet beam, and is intended for the Parry Sound route. She is commanded by Capt. A. Cameron. D. McQuade is chief engineer.

THE promoters of the Atlantic and Lake Superior Railway have signed a contract with W. G. Reid and W. Phillips, Montreal, for the grading, track-laying and ballasting of 115 miles from Sorel to Point Levis. There are four heavy bridges to be built over the Richelieu, Yamaska, St. Francis and Nicolet Rivers, which it is said will cost \$100,000 each. There are also a number of smaller bridges, including one at Becancourt; some men are at work this month.

SURVEYORS have been at Hawkesbury, Ont., locating a site for a bridge over the Ottawa river for the new Great Northern Railway, which is to connect with the Canada Atlantic Railway at Hawkesbury. The Great Northern is the road that is to run from Quebec city through the northern counties of Quebec, and by connecting with the Canada Atlantic and Parry Sound Railways, divert the trade that now goes from the west by the C.P.R. to Quebec. The Great Northern is purely a Quebec company.

THE new steamer "McDonald," built this season at Collingwood for M. McDonald, merchant, of Blind River, has made her first trip. She has been built for the fish and passenger trade on the Georgian Bay, with Collingwood as her port of call. The boat is propelled by a fine, new, up-to-date compound condensing engine, by J. H. Killey, of Hamilton; this engine is highly spoken of by those interested in the boat. Collingwood is now headquarters for a number of large steamers, the last one built there, called the "Majestic," will soon be ready for her station, she is a very fine steamer and of great strength of hull.

THE convention of the Brotherhood of Locomotive Engineers which is this year to be held in Quebec on the 26th and 27th June, promises to be a very successful one. There will be excursions and drives and a large crowd is expected from the States. W.

Leblanc is chairman, and Alex. Garipey sec.-treas. of the local committee of management.

T G BRIGHAM, of Ottawa, is now building an aluminum engine for a portable yacht. The whole craft, which is 18 feet long by 4 feet 3 inches beam, will only weigh 300 lbs. after the machinery is in. Her engines, shaft and wheel will only weigh 15 lbs., whereas if they were built of iron, they would weigh 58 lbs. Mr Brigham will use his new boat for going to the upper reaches of the Ottawa river, 700 miles from the city.

THE total number of wrecks in Canadian waters during the last fiscal year was 86, representing a loss of ten lives and \$322,225. The value of the registered tonnage of Canada is \$26,088,720. Last year 326 vessels, having a tonnage of 21,243 tons, were built, and there are now on the registry books of the Dominion, 7,245 vessels, representing 869,462 tons. Canada's marine is larger in numbers than it has been for ten years, and smaller in tonnage.

THERE are now 15,768 miles of railway completed in Canada. This is an increase of 448 miles over last year. The paid-up capital of these railways amounts to \$887,975,020. The gross earnings for this year are \$49,552,528.14, and the working expenses aggregated \$35,218,433. The net earnings were \$14,334,095. The various roads carried during the year 14,462,498 passengers, an increase of \$44,471 over the previous year. The freight traffic, however, fell off to the extent of 1,282,483 tons. The Intercolonial again shows a surplus, its earnings being \$2,987,510, and its expenses \$2,981,671.15, leaving a surplus of \$5,838. Canada has now spent on railways the sum of \$136,463,775. Of that sum \$97,075,338 has been expended by the Government in the construction of railways, and the balance in subsidies.

THE results of the changes ordered by Mr. Gildersleeve in the steamer "Terrebonne" of the Richelieu and Ontario Navigation Co have been gratifying, even beyond the expectation of the management. This boat, which runs between Montreal and Contrecoeur, was 138½ feet long by 24 feet beam, but 13½ feet was added to her bow, making it more tapering than before. The diameter of her wheel was lessened by about 15 inches and the buckets were made a little longer. Her boiler, which was shifted forward 7 feet to get the "trim," was covered with boiling covering, and some alterations were made to the grate bars. While these changes were in progress, a great many doubts were expressed by marine men as to the advantages; but the result is that the "Terrebonne" now makes three miles per hour more than she did before, with somewhat less expenditure of fuel.

Electric Flashes.

NELSON, B.C., is to have electric light.

A six mile electric railway is to be built at Oshawa.

It is proposed to put in an electric light plant at Sussex, N.B.

ROSSLAND and Vernon, B.C., are to have an electric light plant.

A STREET railway to the rapids is on the cards for Sault Ste. Marie.

THE electric railway from Berlin to Waterloo was opened on 17th May.

WORK will commence on the Halifax electric street railway in a few weeks.

THE electric railway line between Niagara Falls and Buffalo, on the American side, is nearly completed.

THE Lundy's Lane Electric Street Railway Co., limited, has been incorporated with a capital of \$50,000.

THERE is some talk of an electric railway from Kincardine, Ont., to Teeswater, a distance of about 10 miles.

PROSPECT Park, at Niagara, will probably be illuminated by electricity; it is also proposed to turn search lights on the Falls.

THE by-law for the proposed civic electric plant, as well as that for waterworks improvements in Toronto, was defeated by heavy majorities.

THE Canadian Niagara Power Company have already paid \$87,500 for the exclusive privilege of developing power in Victoria Park, Niagara, but they have not commenced work on the Canada side yet.

JAS A McMAHON, contractor of St Catharines, is suing the Richmond Hill Electric Railway Co. to recover the amount of a previous judgment, \$798, on a contract. Another action is pending against the same company by John Hartnett.

THE Kingston and Gananoque Electric Railway Co. has obtained incorporation.

THE Galt and Preston Street Railway Co. expect to have their extension to Hespeler running early in July.

THE Bell Telephone Co. have commenced work on their new long-distance system between Toronto and Montreal.

THE Selkirk Electric Company, Ltd., Selkirk, has applied for letters patent to increase the capital stock from \$10,000 to \$25,000.

THE Halifax Electric Street Railway Co. has ordered from the Robb Engineering Co. two 300-horse-power tandem compound engines.

THE owners of the Jeffery mine, Danville, Que., are seeking a franchise enabling them to run electric cars through the streets from the mine to the depot.

A LABORER named Moran received \$500 damages from the Hamilton Street Railway Co. on account of injuries received by being struck by one of their cars.

THE electric street railway between Berlin, Ont., and Waterloo is now in running order. The initial trip was made on the 17th May, and was quite successful.

IT is proposed to build an electric railway between Allandale and Barrie, Ont., and application will be made for a charter for a company, with a capital of \$20,000.

THE Island at Toronto will be lighted this summer by 120 arc lights and 250 incandescent. The engine-house and light station are already approaching completion.

HALIFAX is to have an electric street railway. All the necessary capital is said to be subscribed. The route will be 8 miles long and will be completed during this summer.

ONE of the best electricians in America, J. Hurd, is a convict in the Kingston penitentiary. He superintended the working of the electrical machinery at the World's Fair in Chicago.

THE strike last month of the employes of the Canadian General Electric Company to the number of about 300 has been settled, and the works are now running overtime in some departments.

WORK on the electric railway at Belleville, which is to be operated on a new system recently described in THE CANADIAN ENGINEER, is to commence this month, and material is now being got ready.

THE Royal Electric Co., Montreal and Toronto, have received the contract for six 7½ k. w. generators for the steamers of the Richelieu and Ontario Nav. Co., and will also put in a 5 k. w. generator in the steamer "Lakeside," plying between Toronto and St. Catharines.

THE city surveyor of Montreal has suggested altering the incinerator in St. Gabriel ward, so that the heat from the garbage consumed could be used as power for electric light machines. He shows that the city by this method could derive considerable revenue.

AN electric crossing alarm invented by John Phillips has been used by the G. T. R. at Brockville and has given much satisfaction. Mr. Phillips is now engaged making improvements on it which will cause a bell to ring automatically from the time a train comes within forty rods of a crossing until it has passed.

THE London, Ont., Electric Street Railway Co. are petitioning for the exclusive right to enter the water-works park as an electric railway. The company are asking for a thirty years right for which they are prepared to pay \$6,000. It is expected that the promoters of the radial railway will vigorously oppose this scheme.

THE annual meeting of the Ottawa Electric Company was held on June 3rd. The report for the year showed gross earnings of \$152,000. A dividend of 5 per cent. for the year was declared. The total number of lights in operation is, incandescent, 49,000, arc lights, 430; motors, 89. The following board of directors was re-elected: T. Ahearn, president; E. H. Bronson, vice-president; G. H. Brophy, W. Scott, C. B. Powell, G. H. Perley, J. W. McRae, D. Murphy, F. Clewov.

JOHN STARR, SON & Co. have just been awarded the contract for installing a complete telephone exchange for fifty subscribers at Campbellton, N.B., including switchboard, telephones, wires, etc. Messrs. Starr have also just received an order through their Quebec agents for five standard switchboards with the necessary telephones, etc. This speaks well for the superiority of the "Unique" telephones manufactured by them, as in both instances the above were secured in face of strong competition. This firm have made a specialty of telephones for some time, and their make are well and favorably known all over Canada.—Halifax Herald.

Work of construction has been commenced on the car and power houses for the Guelph, Ont., electric railway. The new line will be built at once.

THE Richelieu and Ontario Navigation Co has ordered five Robb-Armstrong engines for electric lighting purposes on their steamships.

HUNTINGDON, Que., proposes to have the electric light, and an offer was made through W. E. Forbes to supply 25 50-candle incandescent lamps at \$25 per lamp per year.

AHEARN & SOYER will have 30 miles of street railway in operation in and around Ottawa by the end of this year. It will be the longest in proportion to population of any street railway system in Canada, or perhaps the whole continent, as it is now considered the best managed.

At the next convention of the street railway men of America, to be held in Montreal from Oct. 15th to 18th inclusive, about 2,000 delegates and others interested in street railways are expected. There will be an exhibition of street railway appliances at the Victoria Rink during the convention.

THE Canadian General Electric Co has ordered three 100-horse-power Robb-Armstrong engines, with extension base and outboard bearing for direct connected dynamos. One of these is to be placed in the building of The T. Eaton Co., and the others in the Union Station of the G.T.R., Toronto.

THE St. John Street Railway Company is now in formal possession of the Gas and Electric Light Company's works of that city. Geo. R. Ellis, manager of the Gas Company, and H. P. Brown, electrical engineer of the Gas and Electric Light Company, are to continue in their respective positions under the new management. Both are good, competent men.—Sun.

ONE of the largest contracts ever given in Quebec city for the supplies for a private telephone system has been given to the Mechanics' Supply Co. Over a carload of wire will be used in its construction. The order includes five standard switchboards, which, together with the telephones, are being made for them by John Starr & Sons of Halifax, N.S.

THE Ingersoll Rock Drill Company have started an electric branch to their works at St. Henry, Montreal, and are manufacturing overhead material and electric railway specialties under the Canadian patents of Albert & J. M. Anderson, of Boston. The Andersons are perhaps the largest manufacturers and designers of this class of material in the States, and we are glad to see that our Canadian electric lines can now secure in Montreal all the latest and best designs.

THE first electric lighting plant of importance in England operated by water power was recently opened at Worcester. The plant also contains an auxiliary steam plant for use in times of drouth, when the supply of water is not sufficient to operate the dynamos. This station has been erected at a cost of some \$200,000. The water power, which is of from 300 to 400 horse-power during the most of the year, is located some two miles from the town. The alternating current system is used. There are 4,000 incandescent lamps, 27 arc lamps, and a number of motors operated by this station. The power-house is a substantial structure, two stories high, and built over the stream. The turbines are of the Victo type, and are located in the lower story.

THE engineer of the Montreal Park and Island Railway Company are making surveys for the company's new line between Montreal and St. Laurent. The line will comprise the following route: Park Avenue to Montreal Annex, up to Van Horne avenue (Outremont side), then following the C.P.R. track to a point near the lower end of Cote des Neiges road, through what is known as Brother Charest's village, near C.P.R. yards at Outremont, and then cross the C.P.R. at Cote des Neiges and proceed directly towards the village of St. Laurent, which will be crossed in its entire length to join the town of St. Laurent, and from there proceed directly to Cartierville and La Bord a Plouffe. The extensions that will be carried out this summer by this company are summarized below. From Park avenue, Montreal, to the village of St. Laurent, thence to Cote Vertue, Boisfranc and Cartierville (Bord-a-Plouffe) a distance of 7½ miles; from the present terminus of the Cote des Neiges branch round the mountain to Cote Ste. Antoine, 2½ miles; from Cote Ste. Antoine to Lachine, 7 miles, and from Sault au Recollet to St. Vincent de Paul, 2½ miles. These extensions will make about 35 miles of single track, as all these branches will be double tracked.

Brief, but Interesting.

A DROP of nitric acid placed on forged iron gives a white stain, on steel a brown stain, and on cast iron a rough, dirty stain. These are easy tests.

IN several parts of the States barbed wire fences are being utilized as telephone wires, and in Webster, Iowa, a company has been incorporated who make it a business to attend wholly to the "barbed wire telephone."

IN New York there is now in operation a plant for producing calcium carbide which gives what is said to be a gas of high illuminating power. It is claimed that the gas can be produced at a cost of 5c per thousand feet, and the calcium carbide can be manufactured for \$5 per ton.

A NEW substance called "cryotase" has been discovered by a German chemist, which has the singular property of becoming solid when heated and remaining liquid at a temperature below zero. It is made by mixing equal quantities of phenol, camphor and saponine together with a smaller amount of turpentine.

A NEW solvent for gold has been discovered, which is obtained by adding to a solution of potassium cyanide a small quantity of bromide of cyanogen. The inventor of the new process claims that the latter salt can be manufactured at about 35c. per pound. The new solvent is likely to prove an important factor in the treatment of gold ores.

A TUBULAR boiler 1,800 years old has been discovered at Pompeii. It is made of sheet metal, probably copper, in the shape of a large amphora or two-handled jar, with a hollow space running half way up the centre of the jar. In this space was placed a cylindrical fire-box, resting on five fire-bars, which are tubes three-quarters of an inch in diameter, connecting with the water space. The fuel seems to have been charcoal.

THE wonderful durability of Douglas fir is well shown by a piece that the Victoria city engineer now has in his possession. It is a part of one of the old wooden water pipes which were put in thirty-one years ago by Coe & Martin to bring down a water supply from Spring Ridge. When the contractors were excavating in front of the Delmonico on Government street, they came across the old pipe. The piece in question is entirely free from any signs of decay, the wood being as fresh in appearance as if it were just newly cut from a tree.—B. C. Commercial Journal.

Personal.

H. HOLTGATE has been appointed general manager of the Montreal Park and Island Railway.

A. G. WELLS, formerly of Guelph, Ont., is now general superintendent of the Atlantic and Pacific Railroad.

H. CANT has retired from the firm of Cant Bros. & Co. of Galt, but the business will be continued under the old style.

W. S. KINNEAR, divisional engineer of the M.C.R., has been appointed chief engineer of the Toronto, Hamilton and Buffalo Railway.

B. H. TEAKLES, of the department of Railways and Canals, is dead at the age of 51. He was one of the founders of the Ottawa Y.M.C.A.

JAMES CARR, late of Kingston, Ont., is now superintendent of the air brake works of the Missouri and Pacific R. R., situated at Little Rock, Ark.

ED. TINSLEY, G.T.R. locomotive engineer, of Hamilton, has been appointed Head Game Warden of Ontario, in place of the Mayor of Hamilton.

JOHN C. INNES, formerly city engineer of Kingston, has been missing from his home since the 21st April. He had been feeble in body and mind for some time.

H. G. PERCHARD has been appointed secretary treasurer of the Standard Drain Pipe Company, St. John's, in the place of J. L. Whatley. Nothing has been heard of Mr. Whatley's whereabouts.

ALANSON H. BALDWIN, a pioneer lumberman of the Ottawa district, is dead. Mr. Baldwin retired from business several years ago, his place being taken by his son W. H. Baldwin, formerly proprietor of the Baldwin foundry and planing-mill, and now mechanical superintendent of the Ottawa Electric Railway.

R. G. LECKIE, for the last five and a-half years manager of the iron works at Acadia Mines, has retired from that position and will devote his time to his large coal and iron properties in New Brunswick.

At a meeting of the Hospital Committee, at Hamilton, it came out that the engineer of the hospital worked from 16 to 18 hours a day, and received \$500 a year. A resolution was passed to engage an assistant engineer at \$300 a year.

MOSES MUNRO, an ex-member of the Newfoundland Legislative Council, and a delegate to the British Government on the French shore question, died on May 19. He was interested in a rope walk, lobster factories and other local industries.

N. KENDALL, who was for many years with the W. C. Edwards Co., lumber manufacturers of Ottawa, is now travelling in eastern Canada for the Wm. Hamilton Mfg. Co., of Peterboro. Mr. Kendall has had an experience of 27 years in Ottawa and of 6 years in B. C. in saw-mill machinery, and is considered one of the best men in this line in the Dominion.

As a result of a contention between Adolph Davis, superintendent of the Montreal waterworks, and his assistant Lafarest, Mr. Davis has been dismissed by the water committee, and is now suing the council for damages for wrongful dismissal. No appointment has been made to fill the vacant position, and it has been proposed in the city council to combine the water and roads departments under the supervision of Mr. St. George, city surveyor.

ONE of the largest funerals that ever took place in London was that of the late George Angles, G.T.R. engineer, who died May 17th. He had been suffering from a cold for about two months, but was able to continue his run from London to Suspension Bridge till near the time of his death. Deceased had been in the G.T.R. employ for nearly a quarter of a century, and was reckoned one of the best engineers of the system.

THE following are the officers of the Truro, N.S., Board of Trade for 1895: C. E. Bentley, president; E. E. McNutt, 1st vice-president; W. E. Bligh, 2nd vice-president; G. A. Hall, secretary-treasurer. Council: T. G. Mullen, P. McG. Archibald, R. J. Turner, S. M. Bentley, J. E. Bigelow, G. W. Smith, R. T. Craig, Wm. Craig, F. McClure, D. J. Thomas. The membership of this board is now 100. The business outlook for 1895 in Truro is encouraging. Two new industries, one manufacturing hats, another a woodworking establishment, have started with the new year. Three existing factories making (1) knitted underwear, (2) hats, (3) milk-condensing and canning, propose extensive additions. Some \$85,000 of building operations are projected for the coming season. Exceptional facilities are offered to manufacturers, by reason of the near vicinity of the great coal and iron deposits of N.S. Cheap electric power is also available for small establishments. Being the railway centre of the province, special advantages exist for the distributing trade. Truro has now fourteen manufactories and thirteen wholesale establishments, three weekly and one daily newspaper, nine hotels, eight churches, three banks, good water supply and fire service.

The Patent Review.

- 46,774 The Bell Telephone Co. of Canada, telephone transmission.
 46,775 S. J. Galloway, Santcain, Or., and N. P. Payne, Albany, Or., combined car and air brake coupling.
 46,779 E. B. Benham and H. E. Barlow, of Providence, R.I., and H. Howard, of Phoenix, R.I., grinding machine.
 46,780 Western Union Telegraph Co., New York, telegraphy.
 46,781 Max Backer, New York, fire proofing composition.
 46,782 J. W. Flowers and B. H. Barwick, both of Newport, Or., vise.
 46,783 Canadian General Electric Co., Toronto, system of electric conversion.
 46,784 G. D. Burton, Boston, Mass., mechanism for converting electrical currents and method of applying the same.
 46,785 Canadian General Electric Co., Toronto, system of electrical distribution.
 46,786 Bell Telephone Co. of Canada, plug for establishing electrical connection.
 46,789 H. Thomson, Thornton, Victoria, Australia, street hydrant.
 46,791 E. A. Hermann, St. Louis, Miss., automatic electric signaling device.
 46,792 P. C. Choate, New York, art. of producing metallic zinc.
 46,794 H. B. Cox, Hartford, Conn., thermo-electric generator.
 46,795 C. M. Allen, Butte, Mont., process for smelting and converting ores.
 46,796 J. H. F. Gorges, Berlin, Germany, electrical measuring instrument.
 46,801 Chas. E. Allen, Washington, D.C., electrical keyboard and circuit-closing devices.
 46,803 E. A. Hermann, St. Louis, Miss., automatic electric signaling device for crossings.
 46,804 Canadian General Electric Company, Toronto, brush supporter for dynamo.
 46,805 Canadian General Electric Company, Toronto, commutator connector.
 46,808 E. B. Baynton, West Newbury, Mass., electric car.
 46,809 E. E. Ries, Baltimore, Md., regulating socket for incandescent lamps, etc.
 46,810 F. E. Seagrave, Toledo, O., electric railway signal.
 46,814 Henry C. Porter, Chicago, electrode for secondary batteries.
 46,816 E. Woods, Sault Ste. Marie, Mich., feet for dredge.
 46,817 F. Canney, Detroit, Mich., buoy for locating wrecks and attaching cables thereto.
 46,818 C. S. Park, Montague, Mass., car coupler.
 46,822 C. G. Collins, Woodsburgh, N.Y., stone and ore crusher.
 46,826 H. S. Woolley, Paris, Ia., electric conduit system.
 46,827 Canadian General Electric Co., Toronto, electric mining machine.
 46,828 Canadian General Electric Co., Toronto, electric railway block system.
 46,830 Dr. Carl Hupfner, Gießen, Germany, process of extracting nickel and cobalt.
 46,831 M. C. Slusser and W. J. Slusser, of Slusser, Va., nut lock.
 46,834 E. Charrington, London, Eng., roller for reciprocating rods for railway points and signals.
 46,835 A. E. du Bois Raymond, Berlin, Germany, distribution of rotary electric currents.
 46,836 F. H. Sleeper, Coaticook, Que., alternating current motor.
 46,898 Richard Bow, McKeesport, Pa., furnace.
 46,974 G. Dickie, Hyde Park, Ont., wire tightener.
 46,977 F. M. Lechner and M. E. Gallimore, Columbus, Ohio, mining machine.
 46,981 P. W. Tillinghast, Edgewood, R.I., means for attaching pneumatic tires to vehicle wheels.
 46,983 W. H. McKay, Brantford, Ont., windmill.
 46,986 M. B. Schaffer, St. Louis, Mo., car truck.
 46,987 E. F. Goltra and Morse B. Schaffer, St. Louis, Mo., car truck bolster.
 46,988 Wilson Whiting Davis Oiling Co., Jersey City, N.J., lubricating system.
 46,991 D. W. Aylworth and N. B. Leslie, both of Cleveland, Ohio, clamp.
 46,992 W. C. Bourdette, Gunneson, Col., wrecking frog.
 46,993 Charles Thackeray, Montreal, incinerator.
 46,994 P. Reidel, Mannheim, Germany, pneumatic tire.
 46,995 G. A. Bartholomew and R. B. Mitchell, both of Maumee, Ohio, rail joint.
 46,998 H. Campbell, Baltimore, Ind., method of and machine for dowelling.
 46,999 E. W. McKenna, Milwaukee, Wis., method of renewing old steel rails.
 47,000 J. C. Donnelly, Philadelphia, Pa., match-making machine.
 47,002 J. C. W. Stanley, London, Eng., manufacture of block fuel, etc.
 47,004 H. B. Cornish, Hampton, Ia., carburetor.
 47,006 Walter Rowland, Montreal, railway switch stand.
 47,008 W. Smith Pendleton, New York, electric arc lamp.
 47,009 E. Bertram and E. Sanders, both of New York, linotype machine.
 47,010 J. H. Morrissey, Chicago, railway time table.
 47,012 Ingersoll Sergeant Drill Co., New York, rotating device for rock drills.
 47,013 Ingersoll-Sergeant Drill Co., New York, channeling machine.
 47,020 A. O. Collier, Manchester, Eng., variable driving gear.
 47,023 I. L. Ellwood Manufacturing Co., De Kalb City, Ill., barb-wire making machine.
 47,024 C. W. Gay and W. L. Brown & Co., Springfield, Mass., machine for making paper boxes.
 47,026 R. Bustin, Boston, Mass., J. R. McConnell, St. Mary's N.B., and J. A. Van Wart, Fredericton, N.B., safety attachment for cars.
 47,027 R. Bustin, Boston, J. R. McConnell, St. Mary's, N.B. and J. A. Van Wart, Fredericton, N.B., fire escape.

- 47,030 L. H. Schmitt, New York, tool handle.
 47,032 Jas. Weathers and J. R. Robbins, Indianapolis, Ind., combined vise, drill and anvil.
 47,034 M. McNulty, Samuel A. Collier and Wm. O'Neil, all of Norton, Va., car brake.
 47,037 Bell Telephone Co. of Canada, warehouse telephone system.
 47,040 A. Stromberg and Andrew Carlson, Chicago, Ill., magneto telephone apparatus.
 47,041 F. Beattie, Leets island, Conn., electric railway signal.
 47,042 Frank Hammond, Paris, Ont., bicycle brake.
 47,043 J. C. Henry, Westfield, N.J., regulator for electric machines.
 47,045 O. W. Ketchum, Toronto, electric wagon.
 47,047 J. C. Henry, Westfield, N.J., electro magnetic car brake.
 47,048 E. Partington, Glossop, Eng., treatment of sulphite pulp.
 47,049 J. Heard, Strathroy, Ont., mould for forming concrete into pipes for drains, etc.
 47,050 J. B. Hammond, New York, type-writing machine.
 47,051 Ernst Ruebel, St. Louis, Mo., electric switch.
 47,053 H. Trudel, Montreal, fire-box alarm.
 47,054 H. C. Beard and Oliver Beard, Parkhill, Ont., brick and tile machines.
 47,056 Joseph Bell, Troutdale, Or., feed water heater.
 47,058 R. H. Canfield, Corning, N.Y., switch stand.
 47,059 H. C. Michell, Toronto, boiler covering.
 47,060 G. Grossmann, Dortmund, Prussia, valve.
 47,062 C. Burns, Burnside, Pa., vehicle axle.
 47,064 L. Rosenfeld, New York, hoisting apparatus.
 47,066 J. C. Reilly, Brooklyn, N.Y., electric subway system.
 47,070 E. C. Heydenreich, Mount Clemens, Mich., elevator brake.
 47,071 Thos. Lee, Howe City, O., dust separator and spark arrester.
 47,073 E. F. Goltra and M. B. Schaffer, St. Louis, Mo., car truck bolster
 47,074 J. Bowles, Washington, D.C., saw and plauer.
 47,079 A. Frenzel, Brockville, Ont., auger bit.
 47,080 J. F. Beers and F. C. Beers, Elmira, N.Y., thermostatic regulator.
 47,081 Milton Wenger, New Holland, Pa., wrench.
 47,085 G. Brownless, Narracoorte, Australia, and R. C. Miller, Casterton, Australia, shaft coupler for vehicles.
 47,086 J. L. Campbell, Manitoba, smoke stack.
 47,087 W. W. Carey, St. Louis, Mo., hydrant.
 47,088 J. Peckover, Harrisburg, Pa., and J. E. Johnson, Philadelphia, Pa., stone sawing machine.
 47,089 F. S. Dobson, F. X. Martin and A. E. Beck, all of Chicago, mining machinery.
 47,093 A. P. Craig and H. Underwood, both of Michigan City, Ind., vehicle axle.
 47,094 Canada Switch Manufacturing Co., Montreal, safety device for railway crossings.
 47,095 J. J. McMahon and W. J. McMahon, Toledo, O., means for grading streets and road beds.
 47,096 E. P. Allis Co., Milwaukee, Wis., spiral conveyor.
 47,098 Westinghouse Air Brake Co., Pittsburg, Pa., spring compressing apparatus.
 47,100 Pneumatic Tire Company, Dublin, Ireland, pneumatic tire
 47,101 E. B. Sintzenich, Rochester, N.Y., thrust bearing.

- 47,102 O. B. H. Hanneborg, Urskony, Norway, ditching and tile-laying machine.
 47,103 T. E. Ayolte and A. A. Charbonneau, Montreal, art of making brick and artificial stone.
 47,105 T. Craney, Bay City, Mich., chamfering machine.
 47,106 R. Graham and G. B. Roe, both of Ottawa, method of making moulds for turbines.
 47,107 J. F. Finley, Union, N.J., valve.
 47,108 A. M. Butz, Chicago, thermostatic valve.
 47,111 W. N. Blakeman, Mount Vernon, N.Y., process for imparting drying qualities to oils.

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, D.C.:—
 Oscar Beaudry, assignor of one-half to C. Leblanc, Ottawa, device for operating switches.

- Frank P. Birley, Toronto, paper box.
 Frank P. Birley, Toronto, paper box.
 Ferdinand P. Bruneau, Lyster Station, Que., nut and screw tightening machine.
 Joseph Carter, Blyth, Ont., overdraw, check bit.
 Wm. A. Clark, Toronto, apparatus for purifying milk.
 Charles J. Lewis, Grimsby, Ont., mold-oiling device.
 William P. Cole, Montreal, machine for preparing shade-cloth.
 Thomas B. Dowsley, Owen Sound, Ont., carriage-spring.
 William T. Lacon, Toronto, life-saving guard for cars.
 George W. Mitchell, Lunenburg, Ont., lubricator.
 Thomas Parker, assignor of three-fourths to J. D. Wright, F. F. Stewart, and A. M. Colquhoun, Toronto, shipping device for bricks.
 William Phillips, Listowel, Ont., reference-book holder.
 William G. Trethewey and R. H. Brett, Mission City, B.C., pipe or hose coupling.
 John Youngson, Hamilton, automatic fire escape and elevator
 John Braithwaite, Winchester, Ont., oiler for loose pulleys.
 Francis N. Denison, Toronto, electric dental-motor apparatus.
 William J. Powers, assignor of one-half to H. E. Blake, Bedford, Que., thill-coupling.
 Charles A. Sullivan, Windsor, Ont., assignor of one-third to W. J. Curry and R. F. Sutherland, Windsor, lock for bicycles.
 Henry Vachon, Golden, B.C., rope-clamp.
 James D. Baker, Montreal, means for preventing spreading of fire through buildings.

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MONTREAL FIRE DEPARTMENT

Tenders for Fire Hose and Salvage Covers

SEALED Tenders, addressed to the undersigned and endorsed "Tender for Fire Hose," or "Salvage Covers," as the case may be, will be received in the City Clerk's office, City Hall, up to noon on THURSDAY, the 13th day of JUNE next, for 10,000 feet more or less of Fire Hose, with patent Couplings complete, and Salvage Covers.

A sample length of 30 feet with Couplings must accompany each tender for Hose.

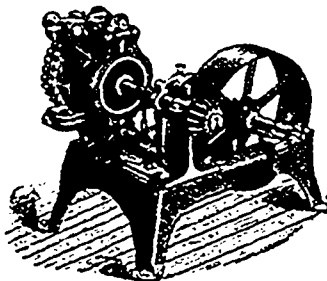
These lengths will be subjected to the test named in the respective tenders.

The lowest or any of the tenders submitted will not necessarily be accepted.

(By order)

L. O. DAVID,
 City Clerk.

City Clerk's Office,
 City Hall, Montreal,
 30th May, 1895.



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Variations in speed detected by fast-running, sensitive Governor Balls.
 Gate movement instantly set in operation by electric current.
 Quick and powerful action.

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