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ACADIAN DIKES.

Almost every visitor to the "Land of Evangeline" has been struck by the sylvan beauty of the diked lands of the Annapolis valley and other parts of Nova Scotia, but few of those who have not studied the records of the Acadians know the story of their origin, and fewer still know anything of the system of construction of these dikes, or what transformation they have made of many sections of Nova Scotia and New Brunswick. Thousands of acres of what are now the most fertile lands on the continent were once the sport of the powerful tides of the Bay of Fundy, and might have remained so till now but for the patient skill and industry of the French Acadian settlers. Readers of "Evangeline" naturally place the first construction of these dikes in the Annapolis Valley, or about "the lovely basin of Minas," but the county of Cumberland was really the scene of the first dike building by the Acadians.

Under the grant to De Monts a number of peasants from the neighborhood of Rochelle and Poitou, in France, came out to Acadia in 1671, and reaching the Bay of Fundy, came up into Chignecto Bay, coasting along till they came to the low narrow neck of land which joins Nova Scotia to New Brunswick. Upon the marshes spreading away beyond the reach of the tides deer were grazing in thousands among the mild marsh grass, and here the peasants determined to build their homes. Was it instinct or the hand of Providence which led these peasants from Rochelle and Poitou, the dike lands of France, to the very spot in all the whole

continent best suited for establishing diked farms in America? They began at once to erect the dikes and reclaim the land from the sea at the extreme limits of the tides, and by 1786 the settlement at this point numbered 127 souls, who had 476 acres diked about and possessed thousands of cattle. In the course of time, following the experiments in Cumberland county, settlements were made on the marsh lands of Annapolis, Hants, Kings and Pictou counties in Nova Scotia, and Westmoreland and Albert in New Brunswick. Longfellow has made the scene at Grand Pré familiar in the opening description of the valley where Evangeline dwelt:

Dikes that the hands of the farmer had raised with labor incessant, Shut out the turbulent tides; but at stated seasons the flood-gates Opened, and welcomed the sea to wander at will o'er the meadows.

The work of the humble and industrious Acadian farmer has been carried on until over 60,000 acres of land formerly made waste by the impetuous tides are now under cultivation, making farms unequalled for richness. These lands will one day be known as the Holland of America, for owing to the saline nature of the sea-made soil, no grub, or worm, or insectivorous pest, to which inland farms are liable, ever ravages crops here, while for raising all kinds of vegetables such as cabbage, kale, cauliflower, etc., it seems precisely adapted. As for the marsh hay, the saccharine qualities of the natural grass of these regions puts fat on a horse or cow the moment the animal begins to eat it. One remarkable thing is the vast depth of the soil. Ages of the daily silting action of the tides has stored up the soil here till in some places, as at Misquash, it has attained a depth of 50 feet; and when it is stated that two inches of this marsh mud spread over ordinary land will manure it for twenty years, one may form some conception of the fertilizing power stowed away in these flats. Some of these lands, we are informed by Judge Morse of Amherst, who has made a special study of the subject, have been cropped every year for the past 200 years without a particle of manure, and producing 1½ to 2 tons per acre of rich marsh hay. In the fall and winter farmers come from many miles inland to purchase this mud as a manure, for which they pay 20 cents a load; and no doubt in future it will be used over a much greater region of country when the farmers get to know its value. The lower strata of these deposits consist of a blue clay, known chemically as a proto-sulphate of iron. When exposed for a time to the action of air it changes its color to a reddish mud, caused by oxidation. This change of color may be, and is, reversed, the change back to blue being caused by the action of vegetable acids such as those in grass and moss. Strange to say, no chemical analysis yet reveals the true secret of the richness of this peculiar soil, and it is thought by some to be a mechanical combination.

Through the courtesy of B. E. Paterson, editor of the Amherst Press, and of Judge Morse of Amherst, both of whom have paid much attention to the subject, the writer was shown the method of construction of these dikes. It is worthy of noting, at the commence-

ment, that the successors of the Acadian farmers have never been as successful at the work as the original dike builders here, and to this day the farmers of British extraction usually go to some old Acadian diker when such work is to be done. And yet the work does not apparently require any high degree of engineering skill. These sea walls are of two kinds, one called an "Abatteau" or "Abattue" for cutting off the tide from the upper reaches of a stream or for walling out the sea altogether, and the ordinary dike, which serves both to wall out the sea and wa!! it in when required. Our first sketch shows a cross-section of a



Section of Dyke

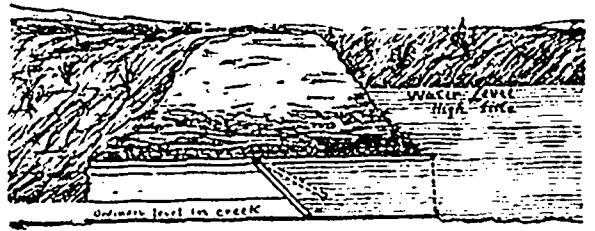
common dike. These are built from 4 to 8 feet high, according to the height of tide to be kept out, and are made of earth sodded over in the rounded form shown. The dikes may be seen marking out the course of some winding stream, or intersecting the country in parallel ridges like hedge fences on an Ontario farm. In many cases these have been formed by degrees, the first dike being built at the limits of the tide in the old days, and then fresh fields being made by new dikes built farther down towards the sea, and built higher if required by a lower level of land. So the realm hitherto controlled by the tide is still gradually being invaded, and new land formed. At times it is necessary to renew the soil and obtain moisture in dry times, and to do this a tidal canal is made by dikes, or the banks of a stream are diked along as the sea is invaded. Sometimes these streams are diked by nature by a ridge of mud formed along the shores. To let the tide in a cut is made in the dike, and at high tide the land is flooded with the muddy water. It is remarkable how quickly the mud settles. The tide may be stationary for a few minutes, or at most less than half-an-hour, but during this time fully two inches of mud will be found to have settled on the land and very little gets back to the sea. It is thus that great tracts of land have been formed under the action of the enormous tides of the Bay of Fundy, which in places rise and fall 50 to 60 feet, being unique in the geography of the world. To show the effect of these deposits, Judge Morse mentions that lakes of fresh water 15 feet deep have been completely filled and have been turned into marsh farms within his own memory. Some spots may be filled to the depth of several feet in a single year; and he has himself filled up six lakes by leading the tides in.



CROSS SECTION OF "ABATTEAU."

The two sketches here shown illustrate the construction of the abatteau. The first is a cross section showing the bed of the bottom of the river. In the bottom is the sluice gate and box containing it. It is formed of plank, and is like a sluice way, with a plank gate swinging from the top, and made longer than the depth of the box, so that when fixed in it stands as shown in the last sketch. Its hinges may be of iron, or may be a simple extension of the top plank inserted in a hole in the top plank of the side planking. The box is fixed in at low tide on the bottom of the stream, and is covered over with trees and limbs which are

weighted down by stones, and these in turn are covered over with earth up to the top level of the banks as shown. Now when the tide



SIDE VIEW OF ABATTEAU AT HIGH TIDE.

is out the sluice gate is opened by the ordinary flow of water in the stream, as shown by the dotted lines; but when the tide rises above this level, and the tide water begins to press back upon it, the gate closes, holding the water out. This, simply, is the construction of the abatteau. It is of course of special use as a defence against tidal waters, and to save diking on the higher lands, but it would be of service in any situation where, by the backing of water from a freshet, lands might be flooded. The value of such works in the situation we have referred to may be estimated when it is known that these marsh lands thus reclaimed from the sea are worth \$100 to \$200 per acre. It should be explained that where such lands are irrigated and rejuvenated by means of artificial canals, these canals must be kept open by fresh water streams, otherwise the deposits of mud will soon choke them up.

The marsh lands of the Maritime Provinces are under the governance of a commission, guided by a code of regulations which amounts almost to a separate government. The voting on this commission is governed by the acreage of land owned, there being one vote allowed to each acre of land, on questions of land improvement. Each district of marsh land is known as a "body." In Belgium, Holland and France, where sea-reclaimed lands are so extensive, the Government maintains the outer sea dikes, but it is not so in Canada. Here the man who owns the farm next to the sea has to keep the sea wall in repair. Towards these repairs the marsh land owners inside contribute not a cent, though they are completely protected by the labors and expenditure of the man next the sea. The man with the sea wall may appeal to his inland neighbors in case of extra repairs or accident, only to be laughed at; and the only way in which he may punish his neighbors' indifference is to repeat the heroic recklessness of Samson of old when that worthy, by pulling down the pillars, brought destruction alike upon himself and his enemies. So the sea-wall farmer might let the tide pour in a broken wall, but his own crops would be destroyed with his neighbors'. Either the Government ought to maintain these outer walls or a tax should be levied on the owners of the whole "body" of marsh lands, or otherwise the Government might contribute an amount equal to that raised by the owners of the lands benefited.

The Minister of Marine was waited on at Ottawa not long since by a deputation which asked for the establishment of a school of navigation at Kingston. Several speakers pointed out the advantage of imparting technical education in the matter of the navigation of the great lakes. Sir Hibbert Tupper, in reply, intimated that the Government would carry out the suggestion, perhaps not this year, but certainly at a later date. THE CANADIAN ENGINEER holds up both hands in favor of the scheme.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS.

The twenty-ninth annual meeting of the American Society of Mechanical Engineers will be held in Montreal this month, beginning on Tuesday, the 5th, and ending on Saturday, the 9th. The convention promises to be an unusually interesting one, and citizens of the commercial and manufacturing metropolis of Canada will feel honored in having their city selected as the gathering place of so important a body of men. Canada has as yet no society exclusively devoting itself to mechanical engineering, though the idea of organizing one has been mooted from time to time in recent years. The convention to be held this month will awaken fresh interest in this subject, and no doubt the outcome will be the formation of such a society for Canada, perhaps in affiliation with the American Society. Meantime quite a number of Canadians have the honor of belonging to the American Society, and we are sure that not only they, but the large number of other citizens interested in mechanical engineering, will take a hearty interest in the convention, and will do what they can to make the visit of our American friends pleasant and profitable. Montreal has a large number of industrial establishments, which will prove well worthy of a visit, while those who are fond of the picturesque, the quaint and curious, will find in or around Montreal plenty to entertain them for a few days.

The following gentlemen have been appointed a committee for the reception and entertainment of the delegates: P. A. Peterson, C. H. McLeod, F. L. Wanklyn, Edgar McDougall, John Kennedy, E. P. Hannaford, H. T. Bovey, F. R. Redpath, W. Laurie, R. Atkinson, K. Blackwell, T. C. Keefer, G. C. Cunningham, A. Davis, J. Hersey, John Dyer (of the Caledonia Iron Works), Robt. Gardner, Geo. Brush, Wm. Kennedy, jr., Prof. Cox, P. W. St. George, J. T. Nicolson (secretary), and Herbert Wallis (chairman).

A detailed report of the proceedings at the convention will appear in our next issue.

The following is a programme of the chief events of the convention:

TUESDAY AFTERNOON, JUNE 5TH.—Informal drive for those who have reached the city, round Mount Royal Park, leaving the hotel at 3.30 p.m.; or a visit to the Art Gallery, as may be preferred.

TUESDAY EVENING.—Opening session in the Molson Hall, McGill University, at 8.30 p.m. Addresses of welcome by J. O. Villeneuve, Esq., M.P.P., Mayor of Montreal; by Hon. Sir Donald A. Smith, LL.D., Chancellor of the University; by Professor H. T. Bovey, LL.D., Dean of the Faculty of Applied Science; and by Herbert Wallis, Esq., Chairman of the Local Committee. Response by Mr. Eckley B. Coxe, of the society.

WEDNESDAY MORNING, 10 A.M.—After the preliminary business of reports of tellers, etc., professional papers will be taken up as follows: A. K. Mansfield: "Notes on the Theory of Shaft Governors." Albert F. Hall: "Head Units and the Specifications for Pumping Engines." W. H. Bristol: "A New Recording Pressure Gauge for Extremely High Ranges of Pressure." Frank Richards: "A Note on Compressed Air." A. W. Robinson: "The Relation of the Drawing Office to the Shop in Manufacturing."

WEDNESDAY AFTERNOON.—By the courtesy of the G. T. R., a special train will take the delegates to Lachine wharf, where they will tranship into a steamer,

furnished by the Harbor Commissioners, for a trip down the rapids. They will land on Isle au Heron, where afternoon tea will be served. The party will afterwards view the dredgers' operations in the harbor, and will finally land at the entrance to Lachine Canal.

WEDNESDAY EVENING.—A general reception to the members and their ladies will be extended by Hon. Sir Donald A. Smith, to be held at his residence, 1157 Dorchester Street, beginning at 9 p. m.

THURSDAY MORNING, 10 A.M.—*McGill University.*—Professional papers as follows:—R. H. Thurston, "The Theory of the Steam Jacket;" "Current Practice." D. S. Jacobus, "Results of Experiments with a 50 H. P. Single Non-conducting Ball and Wood Engine to Determine the Influence of Compression on Water Consumption." Frank H. Ball, "Cylinder Proportions for Compound Engines, determined by their Free Expansion Losses." F. M. Rites, "A New Method of Compound Steam Distribution." Jesse M. Smith, "Tests of a Small Electric Railway Plant." W. S. Aldrich, "Power Losses in the Transmissive Machinery of Central Stations."

This morning session will adjourn in season to permit the members to assemble for luncheon at the Montreal Street Railway Company's Power House. After luncheon and an inspection of the power plant, the party will visit the shops of the Grand Trunk Railway, situated at Point St. Charles.

THURSDAY EVENING, 8 P. M.—Professional Papers as follows: M. P. Wood: "Rustless Coatings for Iron and Steel." James McBride: "Corrosion of Steam Drums." C. W. Hunt: "A New Mechanical Fluid." F. R. Hutton: "First Stationary Steam Engines in America." DeCourcy May: "Cost of an Indicated Horse Power." John R. Freeman: "A New Form of Canal Waste Weir." Topical Discussions.

FRIDAY MORNING, 10 A.M.—Professional Papers as follows: G. W. Bissell: "Effect of Varying the Weight of the Regenerator in a Hot-air Engine." W. R. Roney: "Mechanical Draft for Boilers." R. C. Carpenter: "The Saturation Curve as a Reference Line for Indicator Diagrams." Denton-Jacobus-Rice: "Results of Measurement of the Water Consumption of an Unjacketed 1,600 H. P. Compound Harris-Corliss Engine." F. B. King: "Notes on the Corrosion of a Cast Steel Propeller Blade." Topical Discussions, Concluding Business. Adjournment.

FRIDAY AFTERNOON.—After luncheon the party will visit the C. P. R. works or Canadian Rubber Factory; and at 4.30 they have been invited to attend a garden party at Mrs. J. H. R. Molson's, Piedmont Hall.

SATURDAY.—This day will be devoted to an all-day excursion to Ottawa by special trains on the C. P. R., leaving the Windsor Station at 8 a.m. and returning about 4 p.m., so as to reach Montreal in time for the outgoing trains for Boston and the East, and for New York and the West. The points of interest in Ottawa will include Mr. J. R. Booth's Saw Mills, the Street Railway Company's Power Station, the City Water Pumping Station, and the Timber Slides. In addition to the points which will be visited by the Society as a whole, the local committee of arrangements have received invitations from a number of firms, at whose works special parties of those specially interested will be welcomed.

The Professional Sessions will be held at the Engineering Building of McGill University, and the hotel headquarters will be at the convention office, Windsor Hotel.

A PISTON PROBLEM.

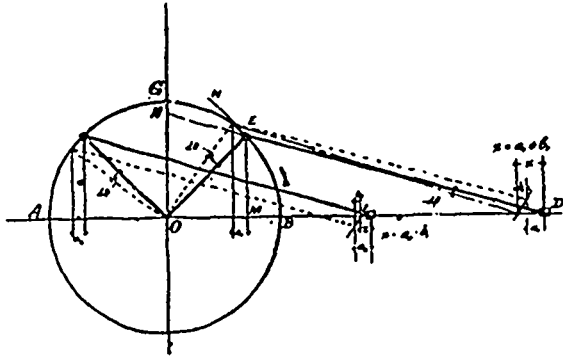
Editor CANADIAN ENGINEER :

DEAR SIR.—Will you kindly answer the following question: Does a piston of a steam engine that is connected in the usual way by crosshead and connecting rod to a crank plate, travel faster in one end of a cylinder than in the other, the fly wheel running at a regular speed? Yours truly,

A LONDON SUBSCRIBER

G. Sinclair Smith, of McGill University, answers this question as follows:—

To simplify the figure, though it does not affect the reasoning or result, suppose the piston rod to be omitted, and the piston at D simply attached to the end of the connecting rod ED.



Also suppose the crank to rotate uniformly, as stated, in direction of the arrow. Let the length of the crank be taken as unity and the connecting rod as n cranks in length. Suppose the forward stroke to start from B, then G is the end of the first quadrant and A that of the second.

The motion of the piston consists of two parts, one (a) due to the motion of the crank through an angle $d\theta$, and the other (b) due to the motion of the connecting rod through an angle $d\phi$. Until the connecting rod occupies its position of maximum obliquity these two quantities are additive, as shown in the accompanying figure; after that, until the position of maximum obliquity in the return stroke, they are subtractive.

The speed of the piston would be exactly the same at similar positions on each side of the vertical centre line, if the connecting rod were infinitely long [as, e.g., in some steam pumps where a slotted crosshead and sliding block take the place of the connecting rod.]

The ordinary short connecting rod, however, induces, as we see, a want of symmetry in the motion; the outward swing producing an increase, the inward a diminution in the speed of the piston.

Thus the piston starts from rest at the beginning of the stroke, and gradually increases its speed until it attains a maximum, when the connecting rod and crank are approximately at right angles. It then gradually falls off until the piston again comes to rest, when the crank pin reaches A.

Let us now examine this analytically and find the actual velocity of the piston for any position of the crank.

Using the same figure as before with the dotted position of the crank, call the angle that the crank makes with the line of centres θ , and that which the connecting rod makes α . Suppose we let v represent the piston velocity and V the crank-pin velocity, then since the direction of motion of V at E is tangential along EN and the connecting rod ED is rigid, the resolved velocity of V along ED must equal the resolved velocity of v along ED, that is,

$$\begin{aligned} V \cos NEH &= v \cos \alpha \\ \text{or, } V \sin HE0 &= v \cos \alpha \\ \text{or, } V \sin (\alpha + \theta) &= v \cos \alpha \\ \therefore \frac{v}{V} &= \frac{\sin (\alpha + \theta)}{\cos \alpha} \\ &= \frac{\sin \alpha \cos \theta + \cos \alpha \sin \theta}{\cos \alpha} \end{aligned} \quad (1)$$

$$\text{Now since } \frac{\sin \alpha}{\sin \theta} = \frac{OE}{ED} = \frac{1}{n} \therefore \sin \alpha = \frac{\sin \theta}{n} \quad (2)$$

$$\text{and } \cos \alpha = \sqrt{1 - \frac{\sin^2 \theta}{n^2}} = \frac{1}{n} \sqrt{n^2 - \sin^2 \theta} \quad (3)$$

Substituting in (1) values of $\sin \alpha$ and $\cos \alpha$ from (2) and (3),

$$\text{we get } \frac{v}{V} = \frac{\frac{1}{n} \sin \theta \cos \theta + \frac{1}{n} \sin \theta \sqrt{n^2 - \sin^2 \theta}}{\frac{1}{n} \sqrt{n^2 - \sin^2 \theta}}$$

$$\text{or, } = \sin \theta \frac{[\sqrt{n^2 - \sin^2 \theta} + \cos \theta]}{\sqrt{n^2 - \sin^2 \theta}} \quad (4)$$

$$\text{or, } = \sin \theta + \frac{\sin^2 \theta}{\sqrt{n^2 - \sin^2 \theta}}$$

Suppose that n here = 4, which is a common ratio of connecting rod to crank, then by substituting this and the value of θ for any desired position of the crank, the speed v of the piston can be found in terms of V the speed of the crank pin. Suppose we take similar positions of the crank at both ends; 1st, at 5° —substituting this in the formula (4), we get $\frac{v}{V} = .1089$, or the piston

moves at about $\frac{1}{10}$ of the speed of the crank pin at this point. Now at 5° from the other end, that is, at 175° from the beginning of the stroke, we find $\frac{v}{V} = .0655$, or

the piston moves at about $\frac{1}{15}$ of the speed of the crank pin at this point. Again, taking positions of the crank at 10° from each end of the stroke, we find that at the inner end the piston moves at .2164 times the speed of the crank pin, while at the outer end it moves at .131 times the speed of the crank pin. From this it is seen that the piston moves much faster in the first part of the forward stroke than in the second part, and *vice versa* in the return stroke.

Now, since the piston moves faster in the first part of the forward stroke than in the last, it evidently gets to the middle of its stroke before the crank pin has reached the end of the first quadrant. This evidently occurs when the distance from centre O of crank shaft to crosshead is equal to the length of the connecting rod. In the figure drop a perpendicular EM from E to OD. Now, the distance OD must equal the length of the connecting rod, that is, equal n .

Now OD = OM + MD = $\cos \theta + n \cos \alpha$ but

$$\cos \alpha = \frac{1}{n} \sqrt{n^2 - \sin^2 \theta} \text{ from (3)} \therefore OD = \cos \theta + \sqrt{n^2 - \sin^2 \theta}$$

$$\text{or, } n = \cos \theta + \sqrt{n^2 - \sin^2 \theta}$$

$$\text{or, } n - \cos \theta = \sqrt{n^2 - \sin^2 \theta}$$

$$\text{or, } n^2 - 2n \cos \theta + \cos^2 \theta = n^2 - \sin^2 \theta$$

$$\therefore 2n \cos \theta = \sin^2 \theta + \cos^2 \theta$$

$$= 1$$

$$\text{and, } \cos \theta = \frac{1}{2n}$$

or, the piston is in the middle of its stroke when $\cos \theta = \frac{1}{2n}$. Taking as before $n = 4$, then $\cos \theta = .125$

and $\theta = 82^\circ 50'$. Thus the first half of the forward stroke is made in $\frac{82.8}{180}$ or about $\frac{46}{100}$ of the time in

which the whole stroke is performed in an engine where the connecting rod is four times the length of the crank. As the value of n increases, the fluctuation in the

speed of the piston diminishes until, if it were possible to have a connecting rod of infinite length, we should have both halves of the piston stroke performed in the same time.

It is, perhaps, not very generally known that the acceleration of the piston, which is the quantity determining the balance or want of balance in an engine, is considerably greater at the head than at the crank end of the stroke. Engines are built, such as the Wells, which profess to be perfectly balanced because they have two pistons of equal weight on the same centre line, on the same side of the crank, and which act on cranks set oppositely to each other. This is not the case; such an engine is out of balance at the ends of the stroke by the amount $\frac{MV^2}{gr} 2n$, where the symbols have the same meaning as above and M is the mass of either piston.

For THE CANADIAN ENGINEER

ROAD ENGINEERING.

BY W. H. BREITHAAPT, M. AM. SO. C. E.

The social and commercial well-being alike of modern communities depends on the facility of communication. The cost of every ton of goods or produce brought to a town is dependent on the quality of the road over which it is hauled. The construction and maintenance of roads require special skill and care, and yet no department of public works has in times past been so frequently slighted.

The question of first cost is usually the great impediment in the way of obtaining good roads. It is difficult to convince the average taxpayer of the fact that a road, of which the first cost is comparatively small, but of which the maintenance amounts, every few years, to as much as the first cost, is more expensive, besides being much less serviceable, than a properly built road costing little to maintain. The road, or pavement, which is truly the cheapest, is that which gives the best returns for the money expended on it. The maintenance, together with interest on first cost, of a good pavement, will generally amount to less than the like charges on a poor one. From this point of view the question should be considered.

The relative merit of different road-coverings has been made the subject of much experiment and study. The vast difference between good and poor road surface is shown by the following table, which joins the average cost of transporting one ton a distance of one mile over different surfaces:

Asphalt pavement, good condition.....	2.7 cents.
Broken stone (Macadam)	5.2 to 14 "
Earth dry and hard	16 "
Earth ruts and mud	39 "
Gravel loose.....	42 "
Gravel compacted	12 8 "
Sand wet	32 "
Sand dry	64 "

As compared with the above, it will be interesting to note that the average cost of transportation by railways is now six-tenths of a cent per ton per mile.

Could the average cost of wagon transportation be reduced to say five cents a ton per mile, it would mean an annual saving of millions of dollars, and bring into market many tons of produce that cannot now be moved with profit.

In some European countries it is common to haul on country roads three tons, and in the cities from three to five tons, with one horse. On such roads the cost of

wagon transportation is less than one-third of what it is in general in America.

The following table gives the tractive force, say in number of horses or horse powers, required to move a given load on a level on different road surfaces as compared to asphalt pavements.

Asphalt pavements, good condition.....	1
Gravel loose.....	16
Gravel common road	8.2
Gravel best, hard rolled	4.4
Turf wet	16.6
Turf dry and hard.....	7.3
Earth ordinary road	13.3
Earth dry and hard.....	4.4 to 6
Macadam ordinary	3.8 to 5.3
Macadam best	1.9
Sleighs on snow, temperature 26°.....	4.4

The increase of tractive force due to grades is shown in the next following table, which gives the resistance, in pounds per ton (2,000 lbs.), due to gravity, on different grades. Per cent. of grade is the number of feet rise in a distance of 100 feet.

Per cent. grade	5	3½	2½	2	1½	1¼	1
Rise in ft per mile	26¼	176	132	105	88	66	52
Res. in lbs per ton	110	66	50	40	34	25	20

To these values must be added the tractive force on a level to obtain the entire tractive force required. On good macadam, for instance, the tractive force required is 36 lbs. per ton. The required tractive force on a one per cent. grade would then be 56 lbs. per ton, on a two per cent. grade 76 lbs., &c.

The loss of tractive power in grades is greater than these figures show, for the reason that the power of a horse is much diminished by fatigue in long ascents. A horse can, however, for a short time, exert more than twice his average pull. So long, therefore, as the incline is short, and not too steep, it is not very detrimental. A steep grade, or a long uninterrupted one, is particularly objectionable on an otherwise good road, in that it determines loads which, but for it, could be several times as large. In France, the country pre-eminent for the excellence of its roads, having a special government organization for their care, and a corps of engineers, styled engineers of bridges and roads (Ingénieurs des ponts et chaussées) who devote their whole time to the construction and maintenance of the public roads, the maximum grade adopted for highways is 5 per cent.

The kind of vehicles used on a road has much to do with its endurance. Springs decrease the hammering of a wagon. Broad tires and large wheels distribute the load over a greater area, and thus diminish wear of the road-surface. For heavy hauling wheels with tires 2½ inches wide, for instance, cause double the wear of wheels with tires 4½ inches wide. The proper width of tire is dependent on the load to be carried. In a number of European countries this width is strictly regulated by law. It varies from about 4 inches to 6 inches for freight wagons, the latter width being for four wheeled wagons carrying six tons. In France it is usual to have the gauge of the rear pair of wheels larger than the front pair, so that the rear wheels run about an inch outside of the line of the front wheels. This distributes the wear over twice the surface, and prevents ruts. On account of their irregular twisting motion, two-wheeled carts do much more damage to a road than four-wheeled wagons, carrying the same load per pair of wheels.

A properly constructed road consists of two distinct parts, the road-bed and the final surfacing. The road-bed is made by bringing the natural surface of

the ground to the desired grade by excavation or embankment, and on this forming a foundation course more or less substantial. It should, like the foundation of any structure, be practically permanent, and constitute the main stability of the road. The surfacing is a comparatively thin wearing surface laid on the road-bed, and must be renewed from time to time. The road-bed must be kept dry, by sub-drainage if necessary, and should be given as hard and unyielding a top finish as is practicable. For city pavements, for instance, it has now long been established that 6 in. of Portland cement concrete is the best foundation for all classes of pavements. Stone block, brick, asphalt, or even wood block surfacing, all wear best on a good even layer of concrete.

In estimating grading, allowance must be made for the shrinkage, or increase, of the material from its bulk before excavation, to that after it is settled in the embankment. Shrinkage of the different materials ordinarily encountered is about as follows:—

Gravel	8 per cent
Gravel and sand.....	9 "
Clay and clay earths..	10 "
Loam and light sandy earth	12 "
Loose vegetable soil.....	15 "
Puddled clay	25 "

Rock increases in bulk on being excavated, depending on the size to which it is broken, by an average of about 50 per cent., sometimes as much as 80 per cent.

An embankment or excavation will generally be stable when its transverse slope is the natural slope of the material, *i. e.*, the slope at which it remains at rest. The inclination of this slope with the horizontal is called the angle of repose of the material. However, in practice it is found preferable to use a slope somewhat under the angle of repose. The inclinations generally given, for various materials, are as follows, in the usual terms of horizontal to vertical projection:

Loose earth, loam, and gravel.	1½ to 1
Sand	2 or 2½ to 1
Soft greasy clay	3 to 1
Rock, sound.....	¾ to 1

Slopes of sand are best protected by sodding, but this is often difficult and impracticable.

Slight moisture in earth tends to increase its stability; but any considerable amount of moisture acts as a lubricant, and diminishes stability, until with excess of moisture the material is reduced to mud, and its stability is entirely destroyed. It is evident therefore that the frictional stability of material depends largely on the ease with which the water which it may take up can be drained away. Broken rock, shingle, gravel and clean sand allow water to pass through readily, and are the safest materials for embankment. The cleanest sand may, however, be rendered completely unstable if it is contained in a basin of material which does not allow water to drain away. It then becomes quicksand. Clay alone is better than a mixture of sand and clay. In such a mixture the sand allows entrance of water, and the clay prevents its escape.

In the drainage of roads separate provision must generally be made for sub-surface and surface drainage. Sub-surface drainage has for its object the keeping dry of the road-bed, by the removal of underground water. Surfacing placed on a wet, undrained road-bed, liable to destruction by both water and frost, will always be troublesome and expensive to maintain. Surface drainage provides for the prompt removal of all water falling on the surface of the road.

Provision for proper drainage, both sub-surface and surface, is one of the most vital essentials in good road construction. No road, however well made otherwise, can endure, or give good service, if it is not thoroughly drained, but allows water, the most potent of all road destroying agents, to collect and remain on it.

Sub-surface drainage by special provision, is necessary only with certain soils. Natural soils are of the following classes: Silicious, sandy or gravelly; argillaceous, clayey; calcareous, containing lime; rock, swamps, and morasses. Silicious and calcareous soils, sandy loams and rock, are not retentive of water, and therefore require no under-drains. Argillaceous soils and marls retain water, are difficult to compact, and are very unstable under the action of water and frost. Sub-drainage of these soils in a road-bed is effected by transverse drains, or by longitudinal drains with occasional transverse outlets, to the side ditches. Transverse drains are placed, not at right angles to the road, but in form of an inverted V with the apex directed up grade. Sub-soil drains are best made of unglazed circular tile, not less than 3 inches in diameter. The joints are made by means of short sections of larger pipe, forming loosely-fitting collars. These sub-drains should be laid to a depth of 18 inches below sub-grade, *i. e.*, below the top of the road-bed, before surfacing is put on. In very wet soil they should be about 15¹/₂ ft. apart, when not so wet 25 ft. spacing will do. They require a fall of about 1 inch in 5 ft. Their outlets from the side of the road-bed should be blind drains extending back 3 or 4 ft. These blind drains may be of field stone, laid to line.

Surface drainage is effected by having ditches, gutters, or closed drains at the sides of the road, and having the road surface of such form that the water rapidly drains off. The cross-section of the road should be kept so that there is a regular fall to the sides, uninterrupted by hollows or ruts. Side ditches should be sunk 2 or 3 feet below the surface of the road. They are given such cross-section and fall as to readily carry away all the water that comes to them. Where open ditches are objectionable, paved gutters may take their place. These should, at proper intervals, empty, through gratings, into closed drains. Or the ordinary ditch may have a strong, loose jointed, tile drain in the bottom, or a box drain made of flat stones, and be then filled up to the ground surface with loose stones. A drain of this kind in the middle of the road covered by the surfacing, also makes a good sub-drain. Ditches on inclines on which the velocity of water, after heavy rainfalls, would be greater than the nature of the soil can withstand, are improved by having weirs built across them at intervals. These weirs are of stone, in sufficient quantity, laid dry. They arrest the flow of the water, and so prevent destructive scour of the ditches. A velocity of 30 ft. a minute is not detrimental; 40 ft. per minute will move coarse sand; 60 ft. per minute will move gravel; 120 ft. per minute will move round pebbles, and 180 ft. per minute will move angular stones 1¾ inches thick.

(Concluded in next issue.)

COMMENTING on the bounty offered by the Ontario Government for iron ore produced in the Province, the *Hamilton Times* wisely advises people not to lose their heads over a mining craze. Such enterprises should be undertaken by experienced men; and better for them still, if they invest their own and not other people's money.

MINERAL PRODUCTIONS OF CANADA.

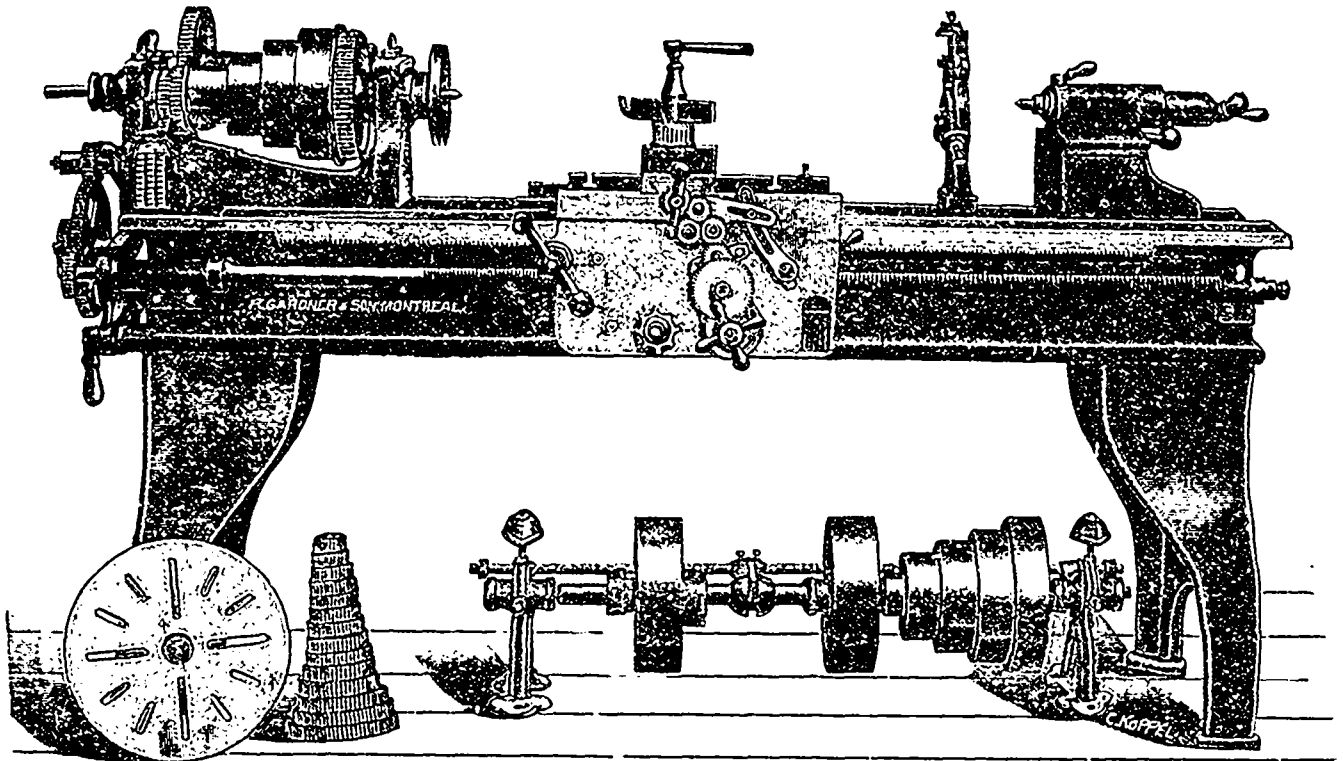
We give below in schedule form the amount and value of the mineral production of the Dominion since 1886. These totals were prepared by Elfric Drew Ingall, Mining Engineer in charge of this division of the Geological Survey Department, of which Prof. A. R. C. Selwyn is the Deputy Head and Director.

PRODUCTS	1886		1889.		1892		1893		
	Quantity.	Value	Quantity	Value	Quantity	Value.	Quantity	Value.	
METALLIC.									
Copper	lbs	3,505,000	\$ 354,000	6,800,752	\$ 885,424	7,042,95	\$ 821,589	8,109,856	\$ 875,864
Gold	ozs	70,879	1,330,442	72,328	1,295,159	49,085	900,184	51,009	927,244
Iron ore	tons	69,708	120,982	84,181	151,640	103,248	254,206	124,702	298,018
Iron ore, Chrome	"	60	945						
Lead	lbs			165,100	6,604	1,205,420	49,422	2,135,023	80,996
Nickel	"					6,057,482	3,513,339	3,992,982	2,076,351
Platinum	ozs			1,000	3,500		3,500		1,800
Silver	ozs		209,090	383,318	343,848	305,026	264,510	414,075	321,423
Total value, metallic		\$ 2,021,459		\$ 2,686,175		\$ 5,807,049		\$ 4,581,696	
NON-METALLIC									
Antimony ore	tons	665	\$ 31,490	55	\$ 1,100				
Arsenic	"	120	5,460						
Asbestos	"	3,458	206,251	6,113	426,554	6,042	388,462	6,473	313,866
Coal	"	2,091,970	5,017,225	2,719,478	5,584,182	3,290,897	7,181,61	3,719,170	8,422,249
Coke	"	35,390	101,940	54,539	155,043	56,135	160,249	161,709	61,078
Felspar	"					175	525	575	4,525
Fire clay	"			400	4,800		9,567	540	700
Graphite	"	500	4,000	242	3,160	167	3,763		
Grindstones	"	4,020	46,545	3,404	30,863	5,179	50,350	4,600	38,379
Gypsum	"	166,000	202,742	213,273	205,108	226,568	225,260	192,568	196,150
Limestone (flux)	"			22,122	21,900	22,067	21,492	27,797	27,519
Manganese ore	"	1,789	41,499	1,455	32,737	115	10,250	228	14,458
Mica	lbs	20,361	29,068	36,529	28,718		100,923		69,622
Mineral Pigments.									
Baryta	tons	3,864	19,270			315	1,260		
Ochres	"	350	2,350	794	15,280	380	5,050	1,070	17,710
Mineral water	galls			424,600	37,360	640,380	75,348	725,096	108,347
Molybdenite	lbs	150	156						
Moulding sand	tons			170	850	175	700		1,000
Petroleum	bbls	486,441	137,797	639,991	612,101	779,753	982,489	798,406	\$34,331
Phosphate	tons	20,495	304,338	30,988	316,662	11,932	157,424	8,198	70,942
Precious stones	"						1,000		1,500
Pyrites	tons	42,906	193,077	72,225	307,292	59,779	179,310	58,542	175,626
Quartz	"								
Salt	"	62,359	227,105	32,832	129,547	45,486	162,041	62,324	195,926
Soapstone	"	50	400	195	1,170	1,374	6,240	717	1,920
Structural Materials									
Bricks	m	139,345	\$37,600	200,561	1,273,884	199,266	1,217,715	205,000	1,275,000
Building stone	c. yds	165,777	642,509	341,337	913,691	219,097	608,381	220,000	510,000
Cement	bbls			90,474	69,790	102,408	120,693	134,045	201,583
Flagstones	sq. ft	70,000	7,875	14,000	1,400	13,700	1,700	40,800	3,487
Granite	tons	6,662	63,369	10,197	79,624	18,202	64,951	22,521	94,393
Lime	bush	1,535,959	283,755	2,948,249	362,848	2,260,610	411,279	2,400,000	440,000
Marble	tons	501	9,900	83	980	340	3,600	590	5,100
Miscellaneous clay products	"		112,910		239,385				
Pottery	"						239,044		180,467
Roofing Cement	tons					800	12,000	951	5,441
Sands and gravels	"	124,865	24,226	283,044	52,647	298,364	85,635	329,116	121,795
Sewer Pipe	"						367,660		194,462
Slate	tons	5,345	64,675	6,935	119,160	5,180	69,070	7,112	90,825
Terra cotta	"						97,239		55,704
Tiles	m	12,416	142,617	10,526	134,265	15,689	199,857	16,000	191,000
Whiting	bbls	400	600						
Total value, non-metallic		\$ 9,096,719		\$11,162,110		\$13,234,267		\$14,391,291	
" metallic		2,021,459		2,686,175		5,807,049		4,581,696	
Estimated value of products un-									
specified or not reported		\$81,822		651,715		458,684		276,543	
Grand Total		\$12,000,000		\$14,500,000		\$19,500,000		\$19,250,000	

In the above table it may be remarked that the value of Nova Scotia and Ontario gold is computed at \$19.50, that of Quebec at \$18, and that of British Columbia and Yarker district at \$17 per ounce. The whole amount of coke came from Nova Scotia. Of the iron ore, in the year 1892, 96,948 tons were converted into pig iron, producing 42,443 tons, valued at the furnaces at \$637,431. In 1893, 124,053 tons were converted into pig-iron, producing 53,947 tons, valued at \$790,283. The amounts of mica mentioned represent exports plus the quantity sold to Canadian electrical works and stove founders.

LATHE WITH TAPER ATTACHMENT.

The lathe here illustrated is manufactured by Robert Gardner & Son of Montreal, and has been patented in the United States and Canada. Every one who is conversant with lathe turning knows the difficulty of producing taper work, and the time lost in accomplishing or rather attempting to make a taper plug or shaft to fit a corresponding taper aperture or hole. Before the era of taper attachments as applied to self-acting or engine lathes, the old-fashioned slide rest was used, the moving head of lathe set away off the centre of lathe—the centres all wore on one side. The device before us differs from any taper attachment used, and, as may be inferred from the illustration, its action and work are positive. A series of gears are affixed to the apron or rest, and in conjunction with the ordi-



nary feed, which produces the parallel or straight turning. The cross feed is at the same time working cross ways, the taper being altered at will by placing the proper gear on the series of gearing. An index is provided showing the gear to be used, similar to the screw cutting index used on all modern lathes, therefore to produce any desired taper a reference to the index shows what gears are to be used.

This is a machine well suited for a tool room in any well regulated establishment, or for ordinary use when tapers are required, and where is it they are not?

One of these lathes has been selected for use in the engineering building of McGill College, Montreal.

BOILER INSPECTION LEGISLATION.

The subject of inspection of steam boilers has recently had the attention of the Legislatures of the Provinces of Quebec and Manitoba.

In Quebec, the Factory Act was amended a few years ago, and one of the amendments made it compulsory for the owners of such steam boilers as were under the Act, to have them inspected each year by some *competent person*.

This worked satisfactorily so far, except in the one

point that it was left open to the Factory Inspector to have something to say as to the meaning of the term "*competent person*."

In order to get over any difficulty on this point the Legislature during last session passed an Act providing for the appointment of a Board of Examiners to examine and grant certificates to persons acting as inspectors of boilers in the province. They also made provision for a better understanding of what was meant by *inspecting* steam boilers.

These new arrangements are now in force, but apply only to boilers in premises which come under the Factory Act. There is nothing arbitrary or unduly stringent in these arrangements, and no doubt they will be found to be in the interests of the general public, as well as for the protection of the employees in factories.

In Manitoba, in March last, "The Steam Boiler Inspection Act" came into force.

Under this Act *all* steam boilers in the Province come under inspection of Government inspectors.

Some of the provisions of the Act have the appearance of being rather arbitrary, and it reads as if prepared by some one who was quite satisfied that he was able to instruct engineers, and tell them how to build steam boilers and how to use them.

Section 12 says: "Every person who constructs a boiler or steam pipe of iron or steel plates known to be faulty or imperfect; or who drifts any rivet hole to make it come fair; or who delivers any such boiler for use knowing it to be imperfect in its flues, flanges, riveting, bracing, or in other of its parts, shall be liable to a fine of two hundred dollars."

Boiler makers had better beware; if *drifting* a rivet hole costs two hundred dollars, the price of boilers will surely have to be advanced. The provisions for the duties of the Government inspectors are in keeping with this. Then if an inspector says he thinks a boiler unsafe, the owner must at once cease to use it; but if he does use it, he is to pay one hundred dollars.

According to this, using a boiler pronounced by the inspector to be unsafe, is only half as bad as drifting a rivet hole while making a new boiler!

In Great Britain the Boiler Explosion Acts of 1882 and 1890 regulate the use of steam boilers.

The main feature is that every accident of the nature of an explosion must be reported to the Board of Trade Department within twenty-four hours of its occurrence. A preliminary investigation is made by some engineer at the Government's request.

If deemed necessary, a formal investigation is held and the owner of the boiler is called upon to show that his boiler had been properly inspected, and that he employed a competent man to take charge of it.

The investigations are very complete, and twelve years' experience has proved that it is one of the most effective measures ever devised to compel owners to take care of their boilers.

In one of the first cases investigated, in 1882, the senior partner of a firm was fined one hundred pounds, and sent to jail for twelve months, for having neglected to have a boiler repaired, and which, as a result, exploded and killed several people.

Under this Act makers of boilers, owners of boilers, users of boilers, and boiler attendants have been fined or punished for neglect. In some cases persons who professed to understand boiler making, and who were proved to be mere pretenders, have been fined for giving advice about matters which they did not understand.

If this Act could only be transferred into Canada, the framer of the Manitoba one would need to migrate.

FOR THE CANADIAN ENGINEER.

CIVIL ENGINEERING IN INDIA.

BY R. S. DOBBS, C.E.

In British India there is a grand organization known as the Department of Public Works. This has been in existence from fifty to sixty years, and, under its auspices, a vast deal of work has been carried out. It is controlled directly by the Government, and was originally officered by men from the corps of engineers, from the Royal Artillery, and from the staff corps, also by professional civil engineers and young men trained at Roorkee College, in the North-west Provinces, or at the C. E. College in Madras; of late years reinforcements have been largely drawn from the students turned out from Cooper's Hill, London, England. It was my good fortune to belong to this organization for a period of nearly twenty years. My work during that period was very varied. In India a civil engineer has to be a "Jack of all trades." He should be somewhat skilful in designing, and afterwards in construction. He must be a master of the language, and have tact in the management of natives, with whom he must arrange for supplies of materials, stone, bricks, lime (known in India as *chunam*), charcoal, sand, etc., etc., and will require to display not a little diplomacy in his handling of large bodies of work people, many of whom are very uncouth and absolutely illiterate. He must also be resourceful and ready to suggest ways and means of carrying out work promptly, expeditiously, and with the least expenditure of labor. The department is divided into three classes, "Roads and Buildings," "Irrigation," and "Railways." Although I carried out a great deal of work to "Tanks" (artificial lakes), for irrigation, I nominally belonged to the first class, "Roads and Buildings." On looking back, my recollections dwell most fondly on one particular work, a short account of which I purpose here giving—the construction of a *Ghaut*

(Hill) road, which I was permitted to carry out from its first inception to its completion, a privilege rarely enjoyed by any engineer, as he is generally transferred to some other district, leaving his ideas to be materialized by some one else. It was about the year 1875 that the district in Berar, to which I was attached, was threatened with famine, and the order went forth that, as a relief work, the road between Mulka-poor (a station on the Great Indian Peninsular Railway) and the headquarters of the district, Booldanah, was to be at once carried out. The total distance was 28 miles, and as Booldanah was perched on a hill 700 feet above the plains immediately below, it would be necessary to regularly grade the road up to that place; the gradient was not to exceed 1 in 25, or 4 vertical to 100 horizontal. After some little prospecting I decided on a favorable line, pegged it out, sectioned, surveyed, and ultimately estimated the probable cost. All was in due time approved of and sanctioned, and I was ordered to go ahead. As it was a relief work, my instructions were to employ all who came to me, and such a nondescript crew did come! The most numerous were the *Bunjarras*, the professional thieves and grain-carriers of the country. These were stalwart and swarthy, very picturesque in their dress, and with eyes as sharp as any fox. The women wore a profusion of bangles on their arms, and anklets on their limbs, and tradition declared that they never changed their clothes till they fell off in rags!

I had a large number of Government tools which I supplied to these *Bunjarras*, but the large gangs of regular earth-workers (*Wudders*) preferred using their own country-made tools. Pitching my tent, my people constructed huts all round me, thus forming a village, which took its name from me, and I was known as *Dobbs-gaum*, "gaum" meaning a village.

Knowing the evils and disadvantages of "day" work (egregiously displayed recently at the Curran Bridge, near Montreal), I determined to have nothing but "task," or "petty contract" work, to which I found a large number of my followers were vehemently opposed. However, after a little persuasion, I induced them to comply with my wishes, and, in a few months, my road was finished to the satisfaction of my superior officers. It was not all hard work, however; we had play sometimes. The *Bunjarras* were experienced hunters; they kept a breed of fierce dogs, with which they hunted the wild pig, and they threw sticks with such accuracy as to knock over hares running at full speed, and partridges on the wing; occasionally we had a day's sport, and never returned empty-handed.

Two sporting incidents I will relate: One day a native came into camp with the news that a tiger was lying asleep in a ravine not far off. Shouldering my express rifle, I started off, and on the animal, which I at once saw was a hyena and not a tiger, being pointed out to me, I fired with fatal effect; it was dead before I got up to the spot where it lay. On another occasion a full-grown live tiger, on a cart, was brought into camp, and the owner said if I would provide a bullock he would let the tiger loose and allow him to kill it. I was very reluctant at first for fear of accident, there were so many people about: however, on his assuring me there was no real risk, I consented. A suitable place having been chosen, the bullock was tied to a tree, while I, with my rifle in hand, took post on a hillock adjacent, determined to shoot at once should there be any necessity for it. The tiger on the cart was

facing to the back, and while his full attention was given to the bullock his ropes were loosened; soon he was free, and with two bounds he was on to the bullock, which, poor beast, did not seem to realize its doom till the very last moment. By its sheer weight it seemed to bear the bullock down to the ground, when it seized it by the throat, but before it could do much execution one of the owners ran in, and seizing the long rope attached, dragged the tiger off his victim, when another man "hullal-kuroed it," i.e., cut the throat of the bullock, thus making it lawful food, so that they themselves, being Mussulmans, could eat the flesh. The tiger, which was a large-sized, handsome animal in good condition, growled savagely at the treatment he was subjected to, but to my amazement he made no real resistance. With a little manœuvring he was got on to his cart again and was again secured without any accident having happened.

Next day they took the animal to Booldamah, where they wished to repeat the experiment, but Capt. Bullock, the deputy commissioner (was there anything in the name!!), refused to grant the necessary permission.

QUEBEC LAND SURVEYORS.

The eleventh general meeting of the corporation of the Land Surveyors of the Province of Quebec was held at the Parliament House on the 11th and 12th April, and officers were elected as follows: President, Ant. Painchaud (re-elected), Quebec; first vice-president, W. McL. Walbank, Montreal; second vice-president, Horace Dumais, Lake St. John; secretary, C. E. Gauvin (re-elected), Quebec; and syndic, George Roy, Quebec.



W. McL. WALBANK, B. A. Sc., M. CAN. SOC. C. E.,
Vice-President of the Provincial Land Surveyors' Association, and
Member of the Board of Examiners

It is an ill wind that blows nobody good. While the great strike is on in the American coal regions, the mining companies in the Maritime Provinces are in clover. Nova Scotia coal is at the present moment being used in a number of Ontario industries and by vessels on the upper lakes which never used it before. Large contingent orders from New York and Boston have been placed with the Cape Breton and Pictou

county collieries, while from St. John shipmen are being made of Springhill coal to American ports. As local reports show, however, a number of Ontario industries are at present shut down, owing to short supplies and to the inability of the railways to get coal for their own transportation purposes.

AMONG the articles in preparation for the next number of THE CANADIAN ENGINEER is an illustrated account of the remarkable landslide last month between St. Anne de la Perade and St. Alban's. The principal article will be by the Rev. Prof. Laflamme, of Laval University, than whom no one is more competent to give a scientific opinion and at the same time a popular description of this remarkable phenomenon. Mgr Laflamme was deputed by the Government to make an inspection of the great landslide, and his account in THE CANADIAN ENGINEER will be the first comprehensive description of an event unique in the geological history of Canada.

THE Pittsburg Reduction Company have forwarded to J. & H. Taylor, engineers' supplies, Montreal, a sample of nickel aluminium which shows remarkable lightness and strength. The sample consists of a strip $1\frac{3}{4}$ inches wide, $\frac{1}{4}$ inch thick and 18 inches long, and weighs only 13 ounces, whereas a piece of steel the same size would weigh over two pounds. It possesses a remarkable degree of resistance in ordinary temperatures, but the weak point about it for certain purposes is that it begins to lose strength at a temperature of 400 degrees. It has other valuable properties, however, as is shown by another sample in which a bolt two inches in diameter was drifted in without the sign of a crack.

THE Toronto *World*, fortified by the result of Engineer Keating's inquiries on the subject, strongly urges the city authorities to own its own electric lighting plant. The great advantage possessed by this plan is, of course, its greater cheapness. Cities in the United States which are lighted by private companies pay on the average \$114.58 per lamp per annum, whereas the cost to those which do their own lighting is only \$57.88 per annum. Then again the city need not have constantly dangling before its eyes the bogey of dividends for shareholders, and it can raise capital at 2 per cent. less than a private company. According to what the city engineer says, the establishment of a city plant would reduce the cost of lighting from \$108 per lamp to \$81, which makes the very respectable difference of over \$30,000 per year. Other advantages mentioned by the *World* are that private consumers would, under the new regime, at least secure justice, and there would be probably a very considerable saving effected in the cost to citizens of electricity for power and lighting purposes. The city would then begin also to have control of its own streets. Then again, there is the practical certainty, looming in the near future, of a substantial reduction in the cost of the electric current, and the city ought to own its plant so that it will be able to reap the full benefit of this when it comes.

THE development of gold mining in South Africa is one of the marvels of the last quarter of a century, and surpasses anything that is recorded of the most flourishing periods of mining in California or Australia. In 1886, Johannesburg, in the Transvaal, was simply a farmhouse. Now it is a city of 80,000 inhabitants, with fine public buildings, and all the paraphernalia of an old-established city. A South African friend sends us a copy of the Johannesburg *Star*, a large daily paper

which gives verbatim reports of local public meetings and detailed statistics of mining progress. It appears from this paper that the output of gold for the month of March was 165,372 ounces, and it is expected that before the close of the year the monthly output will reach 200,000. At the current price of gold this will give a yield of, at least, \$40,000,000. What remains to be developed in the regions of Mashona and Matabeleland, which are supposed to be the realms of the ancient Queen of Sheba, it is difficult to say. But should they prove to be as rich in gold as is imagined, the upper plateau of South Africa, with its mild climate and fertile districts, will be one of the most attractive quarters of the world. It is very satisfactory to know that all this great region and many hundred thousand square miles beyond it, is part of the British Empire, and that the day is close at hand when the colonies and states of South Africa will be joined together in a confederation similar to that of Canada.

COMPLAINTS are often heard of irregularity of trains in the winter, but very few, except those actually engaged in railway work, have any conception of the difficulty of keeping schedule time in many sections of country liable to heavy snow falls. The accompanying engraving is from a photo showing a snow blockade which occurred last winter near Fort Mulgrove, N. S., on a branch of the Intercolonial Railway. In some places the snow was on a level with the top of the engine as the plow rammed through.



SNOW BLOCKADE.

A MOVEMENT is on foot in the United States having for its object the education of people as to the more ordinary plumbing processes. It is thought that if the average citizen knew how to stop a gas leak, repair a burst water pipe, etc., etc., and could meet such a catastrophe with his own unaided resources, a considerable amount of good would accrue to the community. No doubt a more general knowledge of how to stop a roof from leaking, for instance, might often save serious damages to the walls and contents of a house; for professional plumbers are often not within easy walking distance, and even when called they are often not so much impressed with the necessity for immediate action as the owner of the leaky roof would like. However, some people seem to think that the proposed alteration may develop into a new source of competition for the trade. Still it is a matter of opinion whether, after all, the constant repairs which are necessary in many houses and which are due as much to the ignorance of the general public with regard to plumbing matters as to any other cause, really pay for the time expended on them, and perhaps, as a writer to one of our American contemporaries suggests, the best way to bring about a boom in the trade is to fit up houses with really good, high-class fixtures, and then let the public become as knowing as it chooses and take thorough, intelligent care of them.

By a parliamentary paper which has just been issued embodying returns of the shipping passing through the Suez Canal, it appears that the net tonnage for 1893 decreased 52,960 tons, as compared with the previous year, and 1,039,709 tons compared with 1891. The number of vessels which passed through the canal was 4,207 in 1891, 3,559 in 1892, and 3,341 in 1893. The percentage of vessels carrying the British flag also shows a slight decrease, though, of course,

the preponderance in favor of Great Britain is still enormous, the number having been 76.47 per cent. in 1891, 72.52 in 1892, and 71.98 in 1893. Next to Great Britain comes Germany with a percentage of 8.14 in 1893; the figures for 1892 and 1891 being 8.20 and 7.56 respectively. The number of French vessels also increased somewhat, the percentage being 4.07 for 1891, 4.89 for 1892, and 5.69 for 1893. The greatest increase, however, is shown in the case of Holland, the percentage of vessels sailing under the Dutch flag having increased from 3.49 in 1891, to 4.97 in 1892, and to 5.33 in 1893. Other nationalities remain about stationary. It may be remarked that while the tonnage and number of vessels have decreased, the volume of trade has increased in a highly satisfactory manner. During the years 1881 to 1891, the average net tonnage was 6,179,848 tons, and the average transit receipts 63,459,028 francs, while in 1893 the net tonnage amounted to 7,659,068 tons, and the transit receipts to 71,667,331 francs. In 1880 the number of passengers carried

through the canal was 98,900, in 1892 it was 183,912, while in 1893 the number was 180,432. The longest passage made last year by any vessel was 44 hours 37 minutes, while the shortest was 18 hours 33 minutes; the passage being accomplished in the latter case by both day and night. The number of vessels which use the lights permitting them to pass on in the night is constantly increasing. Indeed, last year, out of 3,341 vessels, as many as 3,082 were undeterred by the coming of night, and proceeded on their way. The saving of time ensuing from this practice, and its effects on the commerce of the world, must be enormous.

A MINERAL spring of remarkable properties has been discovered under rather peculiar circumstances at the Radnor Forges of the Canada Iron Furnace Co. The water used for drinking purposes by the employees of the company had the effect sometimes of causing eruptions on the skin, said to be due to the combination of iron with other properties of the water, and it was the desire of the company to obtain a supply so far below the surface as to be unaffected by these impregnations. After sinking one artesian well and spending considerable money, the experiment seemed a failure, but they decided to make one more effort to obtain a pure water supply. After sinking the well several hundred feet deep, they penetrated the bed of gneiss rock, and to their surprise came upon a spring having a strong flow of mineral water which proves on analysis to have qualities almost identical with the German seltzer. Prof. Donald, who made the analysis, found in one imperial gallon 100.480 grains of chloride of sodium, 1.473 grs. chlorate of potash, 1.470 grs. sulphate of sodium, 8.835 grs. sulphate of magnesia, .560 grs. bromide of sodium, 11.850 grs. bicarbonate of sodium, 20.570 grs. carbonate of lime, 1.015 grs. silica, with

slight traces of iron. Those who are acquainted with the constituents of mineral water will see that this water ought to have valuable properties, and it would be a poetical reward for a good motive if the company, in seeking to promote the health of their employees, should find a source of profit in this mineral spring second only to that of their iron mines.

OUR CIRCULATION.

OFFICE OF MONETARY TIMES PRINTING CO.

This is to certify that we have printed and mailed TWO THOUSAND copies of THE CANADIAN ENGINEER for the month of May.

MONETARY TIMES PRINTING CO.

OF CANADA (LIMITED).

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

Toronto, June 1, 1894.

MINERAL PRODUCTION OF THE UNITED STATES.

For the following table showing the mineral production of the United States for the years 1892 and 1893, we are indebted to Richard P. Rothwell, editor of the *Engineer and Mining Journal*. It was compiled for Vol. II. of "The Mineral Industry: its statistics, technology and trade."

PRODUCT.	1892.		1893.	
	Metric Tons	Value at Place of Production	Metric Tons	Value at Place of Production
Asbestos.....	97	\$5,000	109	\$6,000
Antimony ore.....	771	51,000	771	41,000
Asphaltum and asph't rock.....	42,675	254,016	31,701	174,720
Barytes (crude).....	25,833	142,380	24,161	133,160
Bauxite.....	8,891	49,000	10,105	55,250
Borax.....	5,677	940,365	3,946	62,425
Bromine.....	172	64,512	158	87,100
Building stone.....		44,589,500		40,000,000
Cement, hydraulic.....	(a) 8,211,181	5,999,150	(a) 7,503,385	5,182,797
Cement, Portland.....	(a) 547,440	1,153,600	(a) 596,531	1,152,899
Coal, anthracite.....	47,352,606	89,727,982	48,818,356	93,091,670
Coal, bituminous.....	116,069,045	124,230,532	115,253,204	118,595,834
Coke.....	12,204,203	23,421,117	9,949,986	14,688,490
Cobalt oxide.....	3,900	6,450	1,766	3,500
Copperas.....	12,021	110,272	14,515	95,440
Copper sulphate.....			24,492	1,822,500
Corundum.....	1,364	139,994	1,585	141,589
Chrome Ore.....	1,677	16,500	1,646	16,000
Feldspar.....	16,258	80,000	17,274	85,000
Flint.....	37,596	185,000	38,612	190,000
Fluorspar.....	8,105	54,000	8,800	63,070
Grindstones.....		304,800	41,350	345,920
Gypsum.....	232,458	695,492	226,799	562,500
Infusorial earth and tripoli.....	1,200	41,950	1,550	46,800
Lime.....	6,350,257	3,500,000	5,443,164	30,000,000
Limestone for iron flux.....	4,633,416	2,097,600	3,810,375	2,250,000
Magnetite.....	1,272	9,814	8,000	60,000
Manganese ore.....	19,425	129,586	9,297	60,000
Marls.....	113,400	65,000	99,792	55,000
Mica.....	34	100,000	34	103,000
Millstones.....		20,000		18,000
Mineral paints.....	59,805	650,000		546,000
Natural gas.....		14,800,000		14,000,000
Onyx.....	(b) 3,500	40,000	(b) 2,175	23,750
Ozokerite, refined.....	59	7,800		
Petroleum.....	7,000,982	30,229,128	6,978,403	30,223,505
Phosphatic rock.....	917,257	3,322,021	997,140	3,434,600
Plumbago, crude.....	816	3,500	1,365	7,500
Plumbago, refined.....	634	87,902	406	39,593
Potters' clay.....	457,349	1,000,000	399,327	830,000
Precious stones.....		188,000		200,000
Pyrites.....	109,957	357,000	96,256	285,000
Salt.....	1,542,133	5,900,000	1,452,388	5,717,743
Slate, for pigment.....	3,085	21,000	2,721	18,000
Slate, for roofing.....	(c) 953,000	3,396,625	(c) 871,500	2,781,600
Slate, other kinds.....		750,500		737,400
Soapstone.....	21,054	423,449	18,235	366,825
Soda, natural.....	2,994	16,500	2,268	12,500
Soda, natural sulphate.....	1,524	8,400	82	450
Sulphur.....	1,656	54,750	1,219	26,880
Talc, fibrous.....	38,034	472,485	33,113	337,625
Venetian red.....	3,815	89,335	3,475	81,425
Whetstones.....	(d) 1,090,000	107,580	(d) 900,000	105,925
Zinc, white.....	24,946	2,200,000	22,678	1,875,000
Total non-metallic.....		\$396,610,582		\$371,376,935
METALLIC.				
Aluminum, value at N.Y.....	134	191,750	142	202,800
Antimony, value at San Fran.....	181	36,000	318	63,000
Copper, value at N.Y.....	147,647	36,716,400	146,324	34,677,940
Gold, coining value.....	* 49,652	32,997,071	* 54,091	35,950,000
Pig iron, value at N.Y.....	9,122,413	134,668,035	7,150,782	93,883,309
Lead, value at N.Y.....	186,548	16,450,400	175,931	14,467,029
Nickel, fine.....	* 43,614	57,601	* 11,745	12,429
Platinum, crude.....	* 11	1,750	* 9,300	9,300
Quicksilver, value at S.F.....	971	1,119,720	1,046	1,108,527
Silver, coining value.....	* 2,022,195	84,038,503	* 1,881,732	78,220,450
Spiegeleisen and Ferroman.....	182,015	6,647,290	82,424	2,893,229
Tin.....	65	29,827		
Zinc, value at New York.....	76,279	7,785,993	69,178	6,214,782
Total metallic.....		320,740,427		267,707,795
Est. products unspecified.....		7,500,000		6,000,000
Grand total.....		\$724,821,009		\$645,084,730

(a) Barrels of 300 to 400 lbs. (b) Cubic feet. (c) In squares. (d) Gross pounds. * Kilograms.

It will be seen that in the year 1893, the mineral and metal production, as compared with 1892, has not declined in quantity as much as might have been expected from the financial depression, but it does show a material decline in values, amounting to over \$79,000,000. It is a noteworthy fact that the mineral production alone, while almost one-third greater in value than the metal product, decreased only one-half as much. Of the total decrease, over \$30,000,000 was in the decreased production and shrinkage of values in pig iron; \$9,000,000 was in coke, and \$6,000,000 in bituminous coal, both of which were largely due to the decline in pig iron production. In silver the decrease in value amounted to \$6,000,000. In but few cases was there any increase. Anthracite coal gained \$4,000,000 in value, thus partly offsetting the decline in bituminous, and gold increased \$3,000,000.

The growth of the mineral industry in the country has been phenomenal. In 1864 the United States, with an output of 22,860,000 metric tons, stood third among the coal-producing nations, Great Britain leading with over 90,000,000 tons, Germany 26,000,000. In the thirty years since that time Great Britain has a little more than doubled its output. Germany has trebled, but the United States has increased eight times, and produces now almost as much as Germany and all the rest of the world taken together, excepting only Great Britain. In the production of pig iron its growth has been even more remarkable. In 1855 the pig-producing countries ranked with Great Britain first, then France, Germany and the United States, Great Britain alone producing almost six times as much as the United States. But in 1892 the United States output was more than eleven times as much as thirty years before, and almost half again as much as Great Britain; as much as Germany, France, Belgium and Austria-Hungary all together; or, as Great Britain, France and Austria-Hungary; in the second half of 1893 the iron production suddenly dropped enormously.

A NEW BATTERY PLANT.

H. Morgan & Co., the large dry goods firm of Montreal, have made a new departure in the Canadian practice amongst private lighting plants.

They have, for some time past, followed the usual custom of generating their electrical current for lighting purposes during the greater part of the day; but until recently, they received all the current required for night purposes through a small transformer. But their electrician, Mr. McMurtrie, soon conceived the idea that this cost could be greatly discounted by means of a far better arrangement.

Throughout the day steam has always been used in this store for elevators and other purposes, in addition to the necessary basement lighting, therefore to generate a trifle more current during that time would have no appreciable effect on the coal bill, and would need no increase whatever in the generating machinery or labor required.

He, therefore, suggested that a small battery should be added to their present equipment, that could be easily charged during the day time, and would be sufficient to entirely dispense with the services of the local lighting company at night, thus crediting their monthly bill against simply the first cost of the battery.

This, perhaps, sounds very nice on paper, but Canadians have already learnt how very treacherous are many of the storage batteries that flood the market. Mr. McMurtrie was also well aware of this fact, but he wisely did not judge "all batteries by some batteries," neither did he make any hasty conclusion before a complete investigation.

The various periodicals soon told him that Europe had been successfully handling batteries for some time past, and that in the "Old Country" there are many installations similar to the one he was requiring, and further, that their success was amply proven by the annual increase of their number and size. When companies are willing to spend \$75,000 on batteries alone, there surely must be a considerable advantage in them?

The Crompton-Howell E. S. Co., of London, England, have made several sales to that extent, and so H. Morgan & Co., through their electrician, soon decided to put equal confidence in that company's goods, and purchased, in the autumn of last year, a battery of sufficient capacity for their purpose.

This plant commenced its work during January last, and has given complete satisfaction ever since that date. It easily carries all the night load that is required, and it is re-charged again by such machinery as is always running during the day hours.

There are other and special advantages also gained by this improvement, as it is now possible to switch on without running any special machinery; and this, at seasons of special work, must

always be a great convenience. Another important item is that if a break-down unexpectedly occurs to their machinery, the battery is at hand as a reserve, and can carry no less than 200 amperes for a considerable period. Engineers of any experience are fully aware of the value there is in this factor of safety.

The characteristics of this type of battery are its high efficiency, its great durability, its low cost of maintenance, and its capability of standing such high discharge rates; it is perfectly safe and practicable to discharge these batteries at times within an hour and at a rate of 3½ times as great as the normal discharge rate.

The result of this "step in the right direction" has been that the owners of many other similar plants in Montreal are considering like improvements, and some have already erected other Crompton-Howell batteries.

The advantages to be obtained from such plants vary more or less in each individual case, and it is extremely easy to form erroneous ideas of the size required for any one installation. It is therefore wise to always get advice on this matter while considering it, and the above-named company are very willing to give any assistance in such directions, feeling, as they do, that it is to their best advantage that all patrons should buy the article which will give the greatest satisfaction. We might add that this plant is being charged from a Crompton straight-current dynamo which they have in use,

the complete installation of battery and dynamo being all of Crompton manufacture.

The Canadian agent for this battery company is John Forman, of 650 Craig street, Montreal.

REVIEW OF THE METAL TRADES.

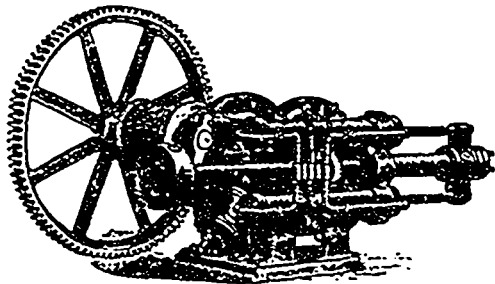
MONTREAL, June 1st, 1894.

The tariff relating to iron, hardware, etc., has, apparently, at last been put into its final shape. The improvement, however, that was expected to arise from the settlement of the tariff question, which has for so long had a "wet blanket" effect upon all business, has unfortunately not yet materialized. The closing down of the railway workshops, and the threatened closing down of some factories, is also exercising a very deleterious influence upon all branches of trade in this city. We cannot chronicle any brightness in the hardware and heavy metal business; values indeed are lower than ever, and there is a dismal prospect for business in these lines for the whole year.

The gas works at Chatham, N.B., were recently closed, as it was found the electric light works supplied all the illumination required for the town.

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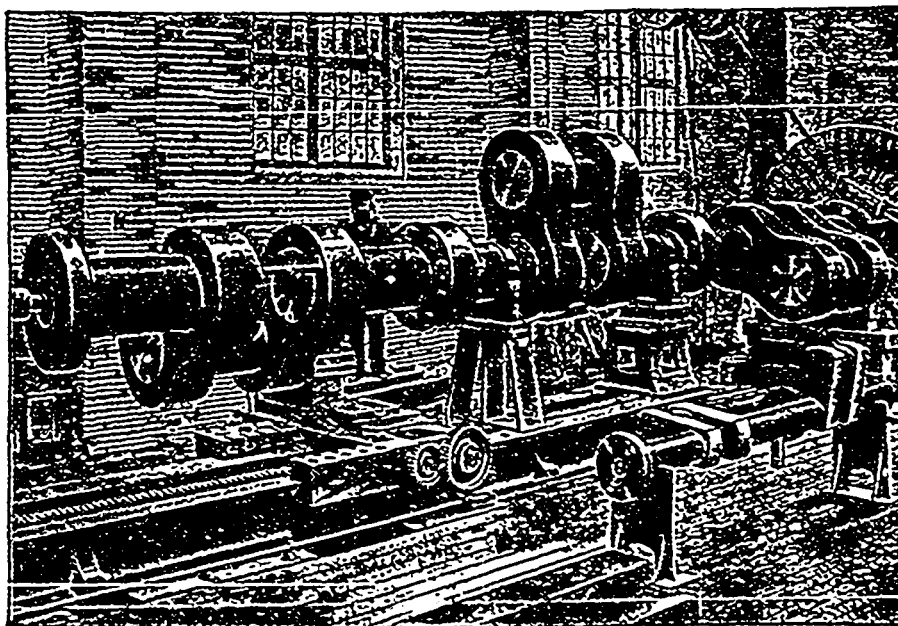
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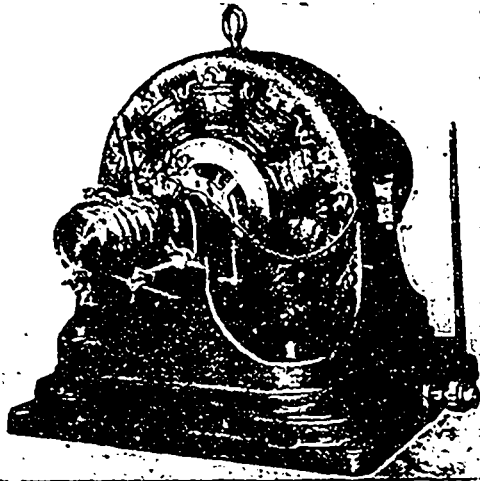
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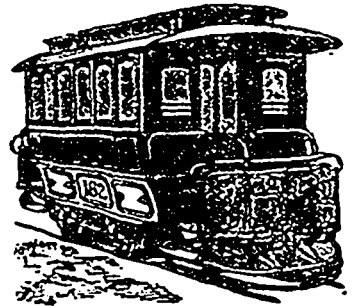
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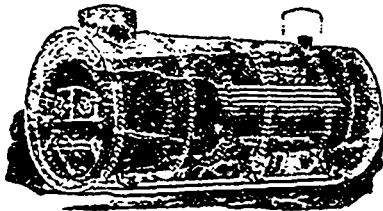
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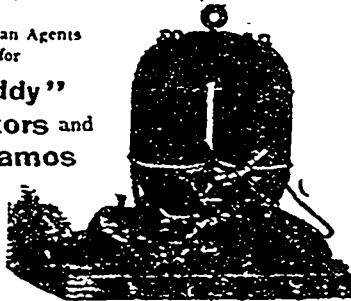
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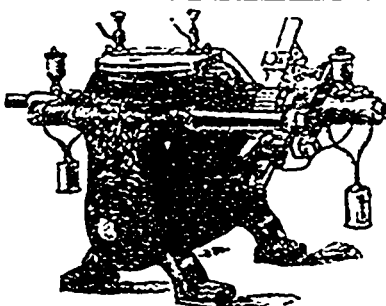
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Electrical Department.

SYSTEMS OF TRANSMITTING ELECTRIC POWER.

BY GISEBERT KAPP.

It is just twenty years ago that the reversibility of the dynamo-electric machine was discovered, and with it the transmission of electrical power. The machines then and until recently employed were of the continuous current type, but within the last few years transmission of power by some form of alternating current apparatus has come into use, chiefly because it enables us to carry power to a greater distance with a moderate weight, and, therefore, moderate cost of conductors. The reason for this economy lies in the fact that owing to the scheme of commutators, and the facility and certainty with which alternating current transformers can be insulated, the effective pressure at which the current is transmitted is much greater with alternating than with continuous currents. To put it in another way, with continuous current plant the voltage is limited by the difficulty of insulating the generating and receiving machinery. With alternating current plant there is no necessity of high insulation of generators or motors, but only of the step up and step down transformers, and since this type of apparatus can, by the use of oil or other means, be insulated to any desired extent, it is the difficulty of insulating the line, rather than the machinery, which limits the voltage that can be safely employed. In comparing the various systems of transmission as regards economy of material, we must put all on the same basis by so designing the plant that there shall be in each case the same stress on the insulation, or in other words, that the difference in potential between any two points in the circuit, or between any point and earth, shall not exceed the predetermined limit. The systems of transmission which have, as yet, been practically employed, and which alone can claim our attention here, are the following: single-phase alternating current transmitted by two wires; double-phase alternating current transmitted by four wires; double-phase transmitted by three wires; three-phase alternating current transmitted by three wires; continuous current transmitted by two wires. The last case, although practically impossible for extra high pressures, is here included because it gives us a financial standard of comparison for the other four methods of transmission. It is well known that in every circuit the different parts of which are equally well or equally badly insulated, the electrical centre of gravity remains always at zero potential, and it follows from these reasons that if the circuit carry an alternating current, the absolute potential of any point undergoes cyclical change, bringing it in turn above and below the potential of the earth by an equal amount. Thus, in a circuit carrying 10,000 effective volts, the greatest potential difference between two points will be 14,000 volts, and the greatest possible value of the absolute potential will be 7,000 volts, positive or negative. The insulation to earth will, therefore, be put under a stress not exceeding 7,000 volts; if, however, one point on the line was unearthened, the stress at every point would immediately rise to 14,000 volts. We can now compare the continuous and single-phase alternating current as regards weight

of copper required for the line, assuming in both cases the same total power and the same efficiency of transmission. Let us fix the greatest permissible stress at 7,000 volts from the earth, then it will be immediately clear that the effective voltage of transmission in the case of the alternating current is 10,000 volts, and in the case of continuous current 14,000 volts, and since the weights of copper for equally efficient conditions varies inversely as the square of the pressure, it follows that the transmission of power with alternating current requires twice as much copper as continuous. With two-phase currents, and completely duplicated circuits, *i.e.*, four wires in a line, the same holds good, as will be obvious on considering that each circuit half carries the power, but how does the case stand if we bunch two of the wires? In this case we have half the current in each of the external wires, and about 70 per cent. of the current in the middle wires, resulting apparently in a saving of copper, but this is a fallacy; not only is there no saving of copper, but we require actually more copper than with a single-phase system, on the four-wire double-phase system. The reason being that if we tied two of the terminals together, we forcibly displace the electrical centres of gravity of each circuit, causing the potential of the other terminals to vary between wide limits. To keep the stress on the insulation down to given limit, we must, therefore, lower the voltage of each circuit, and this means that we must use more copper in the line. Similar investigations made for the three-phase system show that the effective voltage in each circuit must be lower than with a continuous current, but may be higher than with a single-phase alternating current. I shall not occupy time by giving the mathematical investigations of the various cases previously mentioned, but will simply state the practical result. If we put all the systems on the same footing as regards efficiency of safety of insulation, we find the following: If for the transmission of a certain power over a given distance by continuous current, 100 tons of copper are required for the line, then the single-phase alternating and the two-phase four-wire system will require 200 tons, the two-phase three-wire system will require 290 tons, and the three-phase three-wire system only 150 tons. As far as the line is concerned there is thus a distinct advantage in the employment of the three-phase system.

VERSATILITY OF THE ELECTRIC MOTOR.

In a paper read at a late meeting of the Canadian Society of Civil Engineers, Fred. A. Bowman, C.E., of New Glasgow, gave instances of cases in which the superiority of electricity as a power-producing agency was most manifest. He gave hints as to the best position for the motor. In cases where floor space is valuable, or it is impossible to place the motor anywhere but directly under the shaft, it is better to place it, he says, on a platform slung from the ceiling by iron rods, at such a height that the motor shaft will be on a level with the shaft to be driven. The rods must be considerably larger than is necessary to support the weight in order to give the necessary stiffness to withstand the

pull of the belt. The platform must be wide enough to permit of a man standing comfortably alongside of one side of the motor, at least to tend and clean it. The switch and starting apparatus may be placed in any convenient location. A light iron ladder can be attached to the platform, and if necessary it can be made to fold up and be pulled up to the ceiling when not in use. The following examples from actual practice will show what sizes of motors have been installed to do certain kinds of work, and under what unsatisfactory conditions they will continue to do it. A motor of 35 horse-power in a large machine shop drives a grindstone, 18 planers, 8 by 2 feet bed, 3 milling machines "No. 3 Brainard," 12 by 28 inches bed, 1 speed lathe, 3 shapers 12 by 20 inches. The motor runs 1,150 revs. per minute, the driven shaft at the usual speed of line shafting for this class of work. The belt is an 8-inch double leather. The average distance from centre of motor pulley to centre of shaft is 20 feet 10 inches, making an angle of 24° with the horizon. In the same shop a similar motor of 10 horse power drives four 20-inch drill presses, one 12-inch ditto, one boring machine boring up to 6-inch hole, one speed lathe, one milling machine 12 by 18 inches bed, one splining machine 12-inch stroke, and one large slotting machine. It is on a platform such as has been described. The motor pulley is 8 inches diam. by 6 inch face with 1½-inch bore, and runs 1,600 revs. per minute. The driven pulley is 51 inches diam. by 8-inch face with 2 7-16-inch bore, and runs 245 revs. per minute. The distance from centre to centre of pulleys is 15 feet and the belt runs horizontally. The following case shows what a motor will stand. A 5 horse power motor was used to drive a No. 4 Sturtevant blower in blacksmith shop, with 18 fires. Both were on a platform slung from the ceiling, the motor shaft being coupled directly to the blower shaft and running at 1,800 revs. per minute. The platform was almost directly over a large tempering furnace. The heat, smoke and dust to which it was exposed can only be realized by those who have occasion to travel among the roof timbers of a large forge shop in full operation. The field coil and pole pieces on a hot summer's day were too hot to put your hand on. A 10 horse-power motor in the same shop was also mounted on a platform, but in a somewhat cooler corner. It drove a grindstone, a large pair of Beaudry shears, and a Bradley helve hammer. The motor pulley was 9 inches diameter by 6 inches face with 1½-inch bore, with a speed of 1,600 revolutions per minute. The driven pulley was 32 inches diameter by 6½-inch face, with 2 7-16 inch bore, with a speed of 442 revolutions per minute. The belt was 6 inches wide, with a distance between centres of 18 feet 7 inches, and running horizontally. In a carpenter and pattern shop a 20 horse-power motor drives eleven circular saws, two grindstones, eight speed lathes, one drill press 5-inch swing, one 8-inch swing, one jig-saw, one moulding machine, one mortising machine, three planers, two hand saws, one engine lathe 6-inch bed, one shaper 12-inch stroke. These machines are distributed over two floors, the motor being on the lower one. The motor pulley is 10 inches diameter by 7 inch face with 2 inch bore, and a speed of 1,300 revolutions per minute. The pulley on the line shaft is 48 inches diameter by 8½ inches face with 2 7-16 inches bore and a speed of 264 revolutions per minute. The distance from centre to centre of pulleys is 12 feet 6 inches at an angle of 57° with the horizon. An 8-inch belt is used.

The author concluded his very interesting paper (which was written from a civil or mechanical engineer's standpoint rather than from an electrical) by giving a resumé of some of the advantages of electric motors for working elevators and travelling cranes.

Electric Flashes.

THE Pembroke, Ont., Electric Light Company's plant was damaged during a thunder storm last month.

DURING a storm at Whitby last month the electric light station smokestack in that town was blown down.

THE Dominion Gas and Electric Co., Winnipeg, are applying for incorporation. Capital stock \$1,000,000.

W. H. McEvoy has a five years' franchise to put an incandescent electric light plant in at Amherstburg, Ont.

WINDSOR, Ont., street railway will be extended down the river as far as Turkey Creek and possibly to Amherstburg.

THE Moncton, N.B., Electric Tramway Co. has changed its name to the Moncton Electric Street Railway Heat and Power Co.

THE Bell Telephone Co. are progressing with their new exchange building in St. Rochs, Quebec. A new dynamo is being put in for this service.

WM. REEVES, while coupling two electric cars, in Toronto, the other day, was crushed between the buffers and had three ribs and a collar-bone broken.

THE Yarmouth, N.S., Telephone Company are changing their lines to the metallic current system, a step made necessary since introduction of the electric cars.

SAMUEL J. HILL, a farmer, fell from his wagon in Toronto one evening on to the electric car track, and he was stunned. He was shortly afterwards run over by a car and killed.

TORONTO City Council have accepted the offer of the Street Electric Railway Co., to water their tracks. The company will have built three tanks with a capacity of 2,000 gallons each.

THE New Brunswick Telephone Company are discussing putting in a system for St. Stephen and Milltown, to be perhaps connected with the Calais system and ultimately with St. Andrews, etc.

WORK is being pushed on the Montreal Park and Island railway to Outremont. It is expected the track will be in readiness for operations by July 1st. This is part of the scheme to run the electric railway round Mount Royal.

THE Robb Engineering Co., of Amherst, N.S., have an order from the Canadian General Electric Co. for a combined steam and electric motor, the engine and dynamo forming one machine on the same base and coupled without belts.

THE Nanaimo, B.C., electric light company's power-house was destroyed by fire on the morning of the 6th May. Two or three other buildings were destroyed, the total loss being about \$100,000, with but little insurance. One fireman was killed and another dangerously hurt.

GEO. HUNT, Harry Nuttall, and J. J. York have been nominated a committee by the Montreal branch of the Canadian Association of Stationary Engineers to decide what steps will be taken towards welcoming the convention of the Canadian Electrical Association to be held in Montreal in September.

"LA COMPAGNIE DE TRAMWAYS ELECTRIQUES DE QUEBEC" is seeking incorporation. It proposes to run through St. Valier, St. Sauveur, Jacques Cartier, St. Roch, Montcalm, St. John, St. Lewis, Palace, St. Peter and Champlain Wards, all within five miles of the city limits. Capital stock, \$200,000. The applicants are J. W. Gregory, J. B. Laliberte, B. Leonard, P. Dumoulin, J. F. Guay and F. M. W. Pampalon.

ATTENTION is called to the card of M. D. Barr & Co., electricians and dealers in electrical supplies. Mr. Barr took hold of the business of the Edison Company (now the Canadian General Electric Company) when its operations amounted to a few thousands yearly, and when he left it the business amounted to a million a year. Mr. Barr has associated with him his brother, F. A. Barr, also for years with the Edison Company as practical electrician, and their well-known industry, enterprise and knowledge of the business will, we trust, assure them the success they deserve. The new firm have already been appointed agents for several leading electrical firms of the United States.

SMITH'S FALLS, Ont., is putting in an electric fire alarm system.

THE people of St George, N.B., are agitating for electric lighting

A. RAMAGE has installed a 600-light Westinghouse plant at Chesley, Ont.

THE Montreal Street Railway Co. are making arrangements for collecting the city mails.

AN electric railway ten miles in length, between Nanaimo, B.C., and Wellington, is proposed

A PROJECT is on foot to run an electric railway from Hazel Hill to Canso, N.S., a distance of three miles

It is also proposed to build a line from Liverpool to the pulp mill at Milton, a distance of six miles.—*Truro Daily News*.

THE Ottawa Car Company are making twelve finely-fitted cars for the St. John, N.B., new electric railway

THE new Robb Armstrong engine recently contracted for for Windsor, Ont., electric works, has now been installed

GEO. H. HARPER & Co. are engaged in erecting poles and stringing wire for transmission of power at Dundas, Ont.

A NEW BRUNSWICK company has been incorporated to build and operate a telephone between Canterbury and Woodstock.

THE Chambers Electric Light Company of Truro, N.S., will shortly add a 100 horse-power engine and a 500 light dynamo.

SUDBURY, Ont., town council are introducing a by-law to obtain \$35,000 or \$40,000 for electric lighting and other schemes

A NEW 100 horse power generator has been installed at the Consolidated Electric Company's building at St. John, N.B.

G. R. LONG, formerly of Brooklyn, N.Y., is new mechanical superintendent at the factory of T. W. Ness & Co., of Montreal.

THE work of amalgamating the Winnipeg electric and horse car lines has been completed, the former having bought the latter out.

THE telegraph line being constructed by the C.P.R. between Kingston and Ottawa, along the Rideau River, has been completed as far as Seeley's Bay

BARNER BROS., Georgetown, Ont., recently put in a large motor for transmitting power, the machine being purchased from the Kay Electric Works, Hamilton

THE Electric Light Company's power house at Nanaimo, B.C., has been destroyed by fire, together with its contents. Loss, \$50,000; insurance, \$12,000.

THE London Springbank Electric Railway Co.'s application for a charter has been refused on the ground that it would interfere with London's (Ont.) water supply.

THE Nova Scotia Telephone Co. is replacing its old spruce poles in and near New Glasgow with first-class cedar ones. Their business is growing very rapidly in this district.

THE Fenelon Falls, Ont., Electric Light Co. have purchased the plant installed by the Royal Electric Co., of Montreal. They have also put up five alternating arc lamps on the streets

J. F. GUAY, manufacturers of dynamos, telephones, etc., 524 St. Valier street, Quebec, has commenced the manufacture of Leclanché batteries. Mr. Guay informs the trade that nothing but the best material is used in these batteries, and they are to be placed on the market at very reasonable figures. He is prepared to deal with local agents in these and other electrical goods

HIS Excellency the Governor-General has bought an electric launch from the Electric Launch Co., of New York, for running on the Ottawa River. It is 35 ft. 10 in. in length, with a 6 ft. 2½ in. beam, and cost about \$2,000. The storage batteries, which can be charged from a trolley or lighting wire, are hidden under the seats. The maximum speed is 10 miles an hour, and the cost for electricity is a little more than 6 cents per hour.

THE council of the Montreal Board of Trade have sent a letter to the chairman of the railway committee at Ottawa objecting to the Island Belt Line scheme, on the grounds that it is not a work for the general advantage of Canada which in the bill it is claimed to be. That the company ought not to be given power to operate elevated or other railways in the city and adjacent municipalities without their consent; that the amount of capital to be paid up is insufficient as a guarantee of good faith; and, lastly, that the powers asked for are of such an inclusive nature as to enable the promoters to sell their charter to parties who will thereunder be able to prevent all other railway, telegraph, telephone, dock or elevator companies from obtaining similar privileges.

WORK has commenced upon the new electric light station, at Rock Island, Que., and will be pushed as rapidly as possible.

THE Carleton Place council has renewed its contract with Mr. Brown for sixteen electric street lights at the price of 19c per lamp per night

THE St. Croix, N.B., Electric Railway Co. have now ready for operation eight miles of track, twelve cars, and a fully equipped brick power house.

A CANADIAN electrician has just sailed for Honolulu in the person of W. C. Price of Toronto, who intends introducing motors and other electrical machinery.

THE Electric Light Syndicate, at Stanstead Plain, Que., are erecting their plant, and it is hoped the streets will be lighted by electricity in a very short time now.

THE Standard Light and Power Company will start work immediately on the construction of an electric railway from Montreal to Lachine via the Upper Lachine Road.

THE first electric launch built in Canada was completed at St. John, N.B., last month, under the superintendence of A. R. Bliss of the Electric Street Railway Company.

THE St. Martin's N.B., Telephone Company have elected the following as officers. President, John McLeod, vice-president, Walter Allan, and secretary, A. W. McMartin.

A COMPANY has been formed at Middleton, N.S., under the name of the Nictaux Electric Light and Power Co. Capital, \$50,000. The promoters are Dr. A. P. Reid, of Halifax, and Dr. S. N. Miller, of Middleton.

STREETSVILLE, Ont., village council have contracted with the Reliance Electric Light Co. for six arc lights at 15 cents per night, for not less than 250 nights in the year, for a term of three years. Work is to be completed by September 1st.

THE Kay Electric Works, Hamilton, have put in an arc-light plant for Joseph Chew's saw-mill at Chelmsford, Ont. The same firm have put in elevator motors at the establishment of Jas. Eaton & Co., McKendry & Co. and McWhillie Bros., Toronto.

A LAD named George Jones was run over and killed by a Toronto electric car on Queen street. At the inquest, the jury acquitted the motorman of all blame in the matter, but stated that the company had contributed to the boy's death by not providing a proper guard on the car

ONE of the latest applications of electricity is to the felling of trees. A platinum wire stretched between two poles is rendered incandescent and is then applied to the trunk of the tree, which it burns through in about one-eighth the time required for chopping or sawing

THE Stanstead, Que., Electric Light Company are applying for incorporation, with a capital stock of \$25,000. The applicants are Henry, M. B., Chas. A., and F. E. Lovell, all of Coaticook; M. F. Hackett, J. M. Le Moyne, A. N. Thompson, and H. E. Channell, all of Stanstead Plain, and G. F. Terrill, of Sherbrooke.

THE power house of the St. Stephen, N.B., and Calais Electric Street Railway, upon which work has started, will be of brick, 30 ft. x 40 ft., with a brick chimney 75 feet high. There will be a Ball engine of 150 horse power, and a Westinghouse generator. Forty-pound T-rails will be used. The road is expected to be in operation by August 1st.

A GENERAL meeting of the Galt & Preston Street Railway Co. was held on the 9th ult. at Galt. The contract for the electrical department had been let to the Westinghouse Co. for \$15,925, the building and laying of the track to J. Hartnett, of Toronto, and the contract for the cars to the Atlantic Avenue Railroad Co., Brooklyn. The total cost of the road, fully equipped, is not expected to exceed \$75,000. The following were elected directors: Thos. Todd, president; R. G. Cox, vice-president; W. H. Lutz, secretary-treasurer; Fred Clare, Hugh McCulloch, David Spiers, John D. Moore, directors. It is expected that the railway will be ready for passenger traffic by July.

DURING the parade of the Montreal Fire Brigade, before Lord and Lady Aberdeen last month, a fire broke out at the Royal Electric Works. It started owing to one of the fuses being blown out and the molten metal pouring on the oil-soaked floor. The big fly-wheel belt was soon burned, resulting in the wheel revolving for a moment with indescribable velocity and then flying off into space. The incandescent department was speedily destroyed, while the boiler-house and pattern shops were almost irreparably injured. Loss, nearly \$100,000, covered by insurance. The insurance companies interested have sent a statement to Chief Benoit, protesting against the custom of firemen and engines going on parade.

THE Ottawa Car Co have completed their new three-storey building for the manufacture of electric cars. A drum elevator is also being constructed for raising the cars. They have an order from the Montreal Street Railway Co for equipment for ten cars.

CAPT CARTER, of Deseronto, is making final arrangements for the construction of an electric railway in Oshawa, Ont. It will start from the G. T. R. depot, switches connecting it with the chief industrial concerns. Another branch will be laid between the harbor and town.

A YOUNG child named Adrien Rivet was killed by a Montreal electric car last month. At the inquest the jury found the motor-man guilty of criminal negligence, and stated it as their opinion that the company ought to procure means for the prevention of loss of life and that the speed of running cars ought to be reduced.

THE Lanark County Electric Railway Co (Ltd.) are applying for incorporation. Capital stock, \$100,000. They will build and operate a line between Perth and Lanark. The applicants are J. B. Riley, Plattsburg, Alex. Wendler, Carthage, N.Y., Thos. Henry, Montreal, and A. H. Edwards and Jas. Fowler, Carleton Place. The towns interested will probably lend pecuniary assistance.

THE Dodge Wood Split Pulley Co., of Toronto, has received the following letter, which speaks for itself: "In reply to your inquiry re Brown Friction Clutch, which we got from you about two years ago, I beg to state that it has been running a 50-arc light dynamo, and the clutch and pulley have given us perfect satisfaction. We are running clutch pulleys of different makes, but for ease of handling, and perfect running, without slip or trouble of any kind, none of them can equal the 'Brown' we got from you. In adding to our plant in future, we intend to use no other." JAMES STUART, Supt. Manitoba Electric and Gas Light Co.

LITERARY NOTES.

AMONG the papers read at the meeting of the Royal Society of Canada at Ottawa last month was one on "Technical Education of the People in Untechnical Language," by Chas. Baillargé, city engineer of Quebec. This has been reprinted in book form, making a pamphlet of 42 pages. The paper presents much food for thought by those interested in technical education, and in it the well-known reputation of the author is maintained.

We are in receipt of a pamphlet entitled "Canadian Probabilities," which contends that without a second Canadian Atlantic and Pacific Railway, in part built and building, including, it may be, the St. John Valley Railway and Moncton Branch, railway tunnel at Quebec, and other specified works, Confederation will be jeopardized. It argues in favor of St. John more especially as a sea port. The pamphlet contains five maps and is by C. W. Wetmore, 21 King Square, St. John.

THE Night Directory Co., of Toronto, Limited, are now taking information for their new issue of the Province of Ontario and Montreal Business Directory, which will be ready in August. The book is published every three years, and the previous issues have been found to be very complete. The coming issue will surpass in completeness any similar work of the kind. It will contain a description of every place, showing nearest railroad station, bank and post-office, population, assessed value of real and personal property, bonded in indebtedness, industries, etc. Special attention will be given the city of Montreal. The work will be indispensable to the manufacturer, wholesale dealer and professional man. The canvass of Montreal has commenced. As the canvass of the Province of Ontario is finished orders sent by mail up to August first will be accepted at the subscription price (\$5), after which the price will be \$7.50. Address, J. M. Night, General Manager, Night Directory Co. of Toronto, Ltd., 11-15 Adelaide street east, Toronto.

ONE of the finest machinery catalogues ever issued in Canada is that we have just received from the Canada Tool Works, John Bertram & Sons, proprietors, Dundas, Ont. It contains 190 large pages, and over 90 engravings of machine tools made by the firm. John Bertram & Sons have now been in business for 33 years, and the present dimensions of their great establishment, covering several acres, show the reputation they have made throughout the Dominion as machine builders. We say "throughout the Dominion," but it should be observed that this firm have made more than a local name, for many of their machines have been sold in the West Indies, South America and other distant countries in competition with the best builders in the world. They make tools for machine shops, brass and iron works, electrical

works, railway shops, rolling mills, steam forges, ship-yards, bridge works, and all shops where machine tools are used. This firm have carried off high honors at various World's Fairs, beginning with the Centennial Exhibition and ending with the Chicago Fair. We understand the catalogue will be mailed free to bona fide users of machine tools.

NEW GLASGOW ELECTRIC COMPANY.

The annual meeting of the shareholders of the New Glasgow Electric Company, Limited, was held in the company's office, New Glasgow, N.S., on May 8th, and was well attended. The old directors were re-elected.

The secretary's report showed a satisfactory increase in the number of lights, and the revenue also exhibited a decided increase. The interest on the bonds and the dividend on stock were, as usual, promptly paid. Considerable construction work had to be done during the year, as the old lines of spruce poles to Stellarton and Westville, which have been in since the company started in 1887, were in bad condition. These were replaced by 30 ft. cedar poles. The plant is now all in first-class condition. In the central station there are two Thomson-Houston Alternators, driven by Leonard-Ball Engines, and two 30-light arc dynamos, Thomson-Houston system, built by the Royal Electric Company, driven by one of J. Matheson & Co.'s engines. The boilers are by the same firm, the feed water heater by Leonard & Sons. Feed water is taken from the city mains, and is of unusual purity. A siding from the Intercolonial places the coal at the fire room doors. Culm is used, and is procured very cheaply from the neighboring collieries. Mr. Fred A. Bowman is superintendent and electrician.

This company lights the three towns of New Glasgow, Stellarton and Westville from its central station in New Glasgow, the line to Stellarton being two miles to the centre of distribution, and that to Westville four miles. Considerable attention was given to Westville during the past year, with the result of an increase of over 50 per cent. in lights in that district. Both the Acadia colliery of the Acadia Coal Company and the Drummond colliery of the Intercolonial Coal Mining Company, which are situated in this town, have their works above ground lighted with electricity. In the case of the Drummond colliery a private plant was discarded, having proved inadequate for the work, and the light taken from the electric company. Both these collieries pay by meter, this being the only system the electric company employs for any lighting except stores. About two years ago they adopted the meter system, using the Thomson Recording Watt meter, and the rapid growth of the business since then in lighting houses, lodges, halls, churches and factories attests the satisfaction given by it to both consumer and producer. They are now introducing them into the large stores.

THE Commercial Cable Co.'s new cable to be laid between Ireland and Nova Scotia is expected to be in readiness for operation by July 1st. It is guaranteed to give a higher speed by 33½ per cent than any other ocean cable. The weight of copper will be 500 lbs. per mile, against 350 lbs. in other cables. Its whole length will be about 2,100 miles, and it will contain over 1,100,000 lbs of copper, and more than 10,000,000 lbs of steel wire for armor. Every foot of it is to be tested with 5,000 volts before being shipped, the ordinary working power being 50 volts only.

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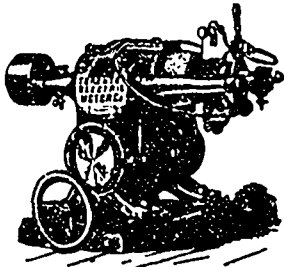
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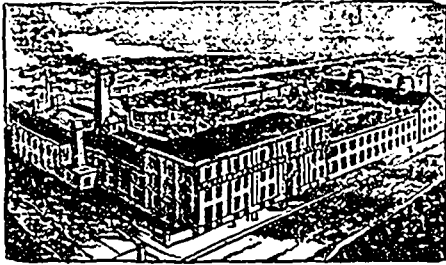
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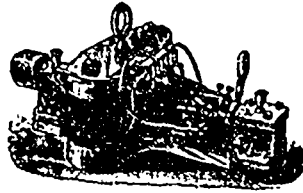
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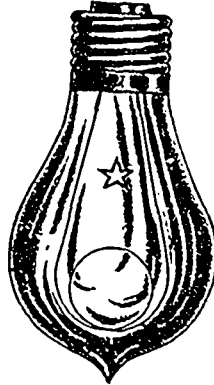
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THE PROPOSED ATLANTIC FAST LINE.

ST JOHN, N.B., May 4th, 1894

Editor CANADIAN ENGINEER

DEAR SIR,—I take the liberty of forwarding a copy of a resolution recently passed by the St John Board of Trade, in reference to the proposed subsidy for the fast Atlantic steamers. I think that your readers will perceive that the Board have made some very strong arguments against the granting of proposed subsidy, and think that these views will be in accordance with the majority of the electors of Canada, and how utterly absurd it would appear for our Government to enter into steamship business (as practically they must do if they grant this large subsidy) in competition with the old and thoroughly established lines of travel *via* New York. It will, no doubt, be in the memory of most of the people that when the original tenders were asked for the service, that \$500,000 subsidy was offered. The proposal was then made for a 15 or a 16-knot service, with a contract to run 20 years. If the subsidy had been granted at that time, what position would our Government be in, competing at the present time with a 22-knot service to New York? Our Government are now asking for a 20-knot service, which will not be able to compete with the faster steamers to New York, and they will bind themselves down to this service for a long term of years, whereas every effort is being made to secure increased speed for the New York lines, and, if the lower speed steamers are still to be accepted by our Government, it must necessarily throw our line out of competition for the passenger traffic, and make it simply a fast freight line. If we are going to have a freight service, much slower boats can be accepted and can be made to pay, therefore a very much lower subsidy would be ample. However, it seems quite evident that with the large majority which the Government have, it is altogether likely they may be able to carry this measure through. It is therefore in the interest of the Canadians generally to see that our best ports are utilized. From the accompanying reports and newspaper extracts, you will see the strong points of contrast made between the two leading winter ports. The St. John people now appeal to the spirit of fair play among the Canadian people to have their port given a fair trial. Without unnecessarily depreciating the fine harbor at Halifax, it is certain that St. John possesses a very great many advantages over it.

If the fast service is to be established, all that the St. John people ask is that they may at least have one winter's trial of the service in order to show how much more regularly and speedily passengers can reach the West through this port than they could through Halifax. The great difficulty in entering Halifax harbor in stormy weather, the large number of wrecks, the immense loss of life which has occurred along the coasts near the entrance to that harbor, the great risk of snow blockade of the only line of railway connecting with Halifax, the recent ice and fog blockade, the fact that steamers have been delayed outside of that harbor for three or four days, and for a shorter period on many occasions, contrasted with the fact that steamers can readily approach St. John in all kinds of weather, and in the most dense fog, without any danger—all these matters should be carefully weighed and given the best consideration before the country is committed to sacrificing the best winter port in America north of Baltimore for the sake of the strong Copper influence in favor of the Halifax harbor.

There is another matter which should be taken into consideration by the Canadian public, particularly with our legislators in dealing with this matter. They should remember that while the Halifax people have called upon the Dominion Treasury to construct the larger portion of their harbor improvements, railway extensions, etc., the citizens of St. John have shown faith in their own harbor by constructing all of these, including, with the aid of the Provincial Government, an extensive elevator, also giving the Canadian Pacific Railway a branch running into the city with extensive terminal facilities, have constructed a large amount of wharf and warehouse accommodation, without calling upon the Dominion Government for any assistance, excepting only such facilities as were necessary for the accommodation of their own road.

Yours respectfully,

WINTER PORT.

Our correspondent, as stated, also sends us some clippings from St. John newspapers giving information concerning the advantages of that city as a winter port. From these we condense the following —

In such a matter as the choice of a port for the winter terminus of a new fast line to Great Britain, local interests must of course submit to whatever is the best policy for the whole country. The interests of the C.P.R. are so intricately mixed up with those

of the country as a whole, that the Government ought to arrange the connection between that railway and the new line so that both shall receive the greatest possible benefit. A steamer coming direct to St. John would arrive there at about the same time as her mails and passengers could get there *via* Halifax and the railway, the time gained by fast travelling on the railway only compensating for what would be lost by deviating to enter Halifax. On the Halifax route, however, there is not only the ordinary risk of snowstorm or fog, but there is also the danger of delay caused by snow blockades on the 277 miles of railway to St. John, which have often necessitated the detention of outward-bound steamers at Halifax several days, waiting for the Canadian mails to get through. It is true that St. John has fogs and snowstorms just as Halifax has, but there is this difference in favor of the former city, viz., that while neither snow nor fog would hinder an ocean steamer from entering St. John harbor, the very reverse is the case at Halifax, the entrance to which harbor is so dangerous that no prudent captain would attempt to make an entrance there except in clear weather, and even mail steamers have been detained outside for three or four days, an occurrence unknown at St. John. In addition to this advantage, St. John has three lines of railway, viz., the Intercolonial, the Temiscouata, and the Short Line, connecting with Montreal, whereas Halifax, excepting *via* St. John, has only one. To take actual facts into consideration. The Allan and Dominion line steamers "Parisian" and "Vancouver" have found their winter passenger service *via* Halifax a failure, those steamers often having only ten or twenty saloon passengers, when New York steamers of the same class have two to four hundred. Should Halifax then be adopted as the port, the winter passenger business is doomed to failure. Most Nova Scotia interior towns could be served by the St. John steamship and railway connection almost as easily as if the steamers called at Halifax, and, indeed, last winter there were cases in which boats have been delayed outside Halifax long enough to come to St. John and send their mails and passengers there by rail. Looking at what has been done in England in such a matter, we find that while the fast mail steamers call off Queenstown and Moville to land their mails and a few passengers for Ireland, they then proceed with their cargoes and the majority of their passengers to Liverpool, which occupies the same position in England that St. John does in Canada. St. John people are sure that their port is the best one for preserving to Canada its own passenger and freight traffic, which has hitherto in winter passed chiefly through the United States. The St. John Board of Trade has compiled a list of some of the chief advantages which that port possesses over others, amongst which may be mentioned the fact that it possesses the only important harbor north of Baltimore which has never been known to be frozen over or impeded by ice. It has a harbor fully equipped for handling all classes of merchandise, elevator capacity of over 300,000 bushels, with ample deep-water wharf accommodation, and as Admiral Sir John Hopkins would corroborate, it has a sufficient depth, at all times of tide, to float the largest vessels in the British Navy. St. John has an important competitor with the railways in the shape of steamers connecting with Portland, Boston, and New York, and thus with the termini of all the leading trunk railways on the continent. These are some of the many reasons why her citizens desire the consideration of the Government for St. John as the winter port of the proposed new fast line.

MORE CONSTITUENCIES HEARD FROM.

THE FIRST NUMBER OF THE NEW VOLUME IS WELL RECEIVED

The May issue of THE CANADIAN ENGINEER contains an article by P. S. Archibald, C.E., Moncton, on the Old-rail Overland Bridges on the I. C. R., illustrated by a full-page series of drawings showing every detail of construction. This issue also presents a group portrait of the officers of the Canadian Society of Civil Engineers for 1894, including Mr. Archibald, and also Hurd Peters, C.E., of this city; and among the others are Prof. C. H. McLeod, professor of geodesy and superintendent of the observatory of McGill College, who is a Nova Scotian, P. W. St. George, C.E., Montreal, who was on the I. C. R. survey for several years; G. H. Garden, C.E., whose first work was done on the Woodstock, N.B., branch as a rodman in 1868; and H. A. F. McLeod, C.E., who was I. C. R. resident engineer in N.B. and N.S. from 1867 to 1874, and examined the proposed Northumberland straits route in 1878. Brief biographical sketches of these gentlemen also appear. This number also presents a half tone engraving of a granite lathe made by the Allan Foundry and Machine Works of this city, with description, and devotes a column to the Brownley Injector, made

by Stirling & Brownley of this city. Altogether the number is one of special as well as general interest to lower province readers.—*St. John Sun*.

A trade journal that has every appearance of success, and that has filled "a long felt want" in Canadian journalism, is THE CANADIAN ENGINEER, now just entering on its second volume. It has been twice enlarged since it started.—*Truro Daily News*.

We are in receipt of the May number of THE CANADIAN ENGINEER, published in this city. It is well printed on fine paper, and contains contributed articles from the pens of specialists on instructive and entertaining subjects to all interested in the science of engineering. Besides a number of attractive illustrations, it contains a supplement which consists of photogravures of the officers for 1894 of the Canadian Society of Civil Engineers. Judging from its advertising pages, and the remarks of the editor in his quaint circular address, we feel justified in congratulating the publisher on his encouraging success during the first year of publication.—*Merchant*

THE CANADIAN ENGINEER has an astonishing faculty for digging out smart items which everyone else overlooks.—*Canadian Colliery Guardian*.

Kingston, Ont., May 7th, 1894

DEAR SIR,—The copy of the May CANADIAN ENGINEER has reached me. I must congratulate you on its improved appearance. I now send you a P. O. for one dollar for renewal of subscription.

R. S. DOBBS, Civil Engineer.

I am most favorably impressed with the appearance of your journal, and consider it supplies a want in furnishing a public medium for engineers of all branches in Canada. Your classified news columns are just the thing.

R. F. TATE,
Civil Engineer, Toronto.

Berlin, Germany, Blumenthalstr. E., April 24, 1894.

I remit to-day by postal order subscription for THE CANADIAN ENGINEER, begging you to provide me with your very interesting journal. My attention was directed to your paper a few days ago by a friend. On receipt of this please mail the first issue of the second volume.

H. JURENZ.

Kincardine, May 7th, 1894

SIR,—I fill the position of engineer and superintendent of water-works here. I will try and get some more subscribers for your valuable publication.

JOS. H. WALKER.

Rat Portage, Ont., May 4th, 1894.

SIR,—I have received through a friend a copy of THE CANADIAN ENGINEER, and am very glad to see such a paper printed in Canada. Enclosed please find \$1, for which send me the paper for one year to my address, "Rat Portage, Ont."

THOS. R. DEACON,
Civil and Sanitary Engineer, Land Surveyor, etc.

Montreal, May 10th, 1894.

SIR,—Kindly allow me to congratulate you on your issue of May, 1894. It is equal in all its details to *Fire and Water* and the *Engineering Record*, published in N.Y. We find more returns from our ad than any other paper we advertise in, coming more in contact with the engineers in Canada generally. Wishing you success in your valuable enterprise.

W. PERRY,

For R. H. Buchanan & Co.,
Machinery and Railway Supplies, Worthington Pumps, etc.

Cincinnati, May 7th, 1894.

SIR,—I have just received the May No. of THE CANADIAN ENGINEER for 1894, and am much pleased with its enlarged and improved appearance. Enclosed please find one dollar for this year's subscription.

J. EARNSHAW,
Of Earnshaw & Punshon,
Surveyors and Civil Engineers.

THE May number of THE CANADIAN ENGINEER has a full-page supplement and engraving showing a group of the delegates to the annual meeting of Civil Engineers held in Montreal. We are glad to find our new contemporary making such headway. It is now permanently enlarged, and is full of valuable technical information. Great credit is due the proprietor for the admirable manner in which he has catered to the wants of his engineering patrons.—*Trade Bulletin*.

THE CANADIAN ENGINEER is now one of the best conducted scientific journals published on this side of the Atlantic. It has been enlarged twice since it started, and the first number of the new volume (May) shows an addition of twelve pages, besides a portrait supplement.—*Miramichi Advance, Chatham, N.B.*

CANADIAN MARINE ENGINEERS' ASSOCIATION OF HALIFAX.

This association, formed recently at Halifax, has about thirty members, who meet once a week during the "close" season. The objects of the new association are to diffuse sound information on practical subjects, and generally to elevate and improve the condition of the marine engineer, as well as to enable vessel owners to obtain engineers of experience and ability.

The constitution declares that the officers shall be a president, two vice-presidents, a secretary, a treasurer, two auditors, and five members of council. There is also an inside guard. Engineers holding certificates from either the Canadian Board of Steamboat Inspectors, or British Board of Trade, are eligible for membership, and honorary members may be chosen from manufacturing engineers, steamboat inspectors or scientific men. The membership fee is \$2 and the annual subscription \$3. In electing a member the proposition shall be made a week before the ballot, and the residence and qualification of the proposed member shall be recorded in a book. When a new member is balloted for, the members shall state what they know of the candidate's character and qualifications, and a two-thirds majority is required to elect him. Any member in arrears for more than one year's subscription may be struck off the list. Nominations for officers shall be made each year in December, and the elections take place at the second meeting in January. Special meetings may be called on the request of seven members. An order of procedure is provided for the regular meetings. Every member shall hold himself in duty bound to recognize every other member in good standing as a brother, and shall not traduce or slander his character, or wilfully or maliciously injure him in any way, on penalty of being suspended or expelled. Any member about to leave his situation on water or land, shall report the fact to the association. In engaging assistants members are bound to prefer brother members, but may engage non members upon request of their employer, reporting the circumstance to the association. Branch associations may be formed on paying a per capita tax to the parent association. A reference library and a museum of models, etc., may be formed, such property to be held by the council in trust for the association. A registry shall be kept of unemployed members. The name of any engineer who is discharged for misconduct shall, if the case be proven, be erased from the books, as shall also be done in the case of anyone who has obtained membership by false representations.

CANADIAN SOCIETY OF CIVIL ENGINEERS.

A meeting of the Society was held in their rooms in Montreal on May 10th, when some correspondence was read from Mr. Alan Macdougall on Professional Ethics. It was resolved to refer the matter to the committee upon this subject. The secretary also read some correspondence from Messrs. Smith and Lordley, re Mr. Butler's paper upon the use of cement in freezing weather.

On the 25th ult. another meeting (the last of the session) took place, Mr. Garden in the chair.

A letter was read from Mr. Geo. A. Goodwin (who was recently elected president of the Society of Engineers, London, England) enclosing a copy of his presidential address, and offering his services to the Canadian Society, if at any time they should be needed.

The discussion on "Cement in Freezing Weather" was brought to an end.

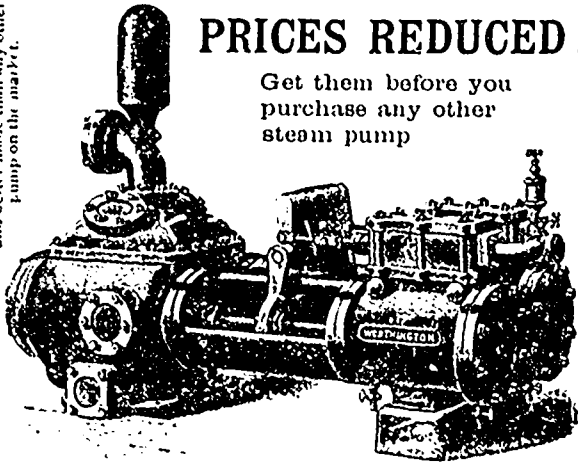
Mr. Macpherson wished to know the exact reason why salt was put in cement, he had often merely used hot water.

Mr. Cecil Smith said that cement did set in freezing weather without the use of salt, even in cases sometimes where the temperature was 6 below zero. At the same time experiments went to show that salt seemed to increase the strength, and it certainly did no harm.

Mr. Sinclair Smith read a paper by Prof. J. T. Nicolson on the "Theory of the Action of Pumps." It was decided to carry on the discussion of this paper by means of correspondence.

REPORTS to the daily press show that the destruction of life and property by the floods which swept the Fraser River valley of British Columbia during the last days of May is unprecedented. Bridges, sections of railway, houses, and other property have been destroyed, while thousands of animals have been drowned. How many lives have been lost is not yet known, but over 2,000 families have been rendered houseless, while property to the amount of \$3,000,000, it is calculated, has been destroyed. The river rose higher by two feet than was ever known in the history of the Province.

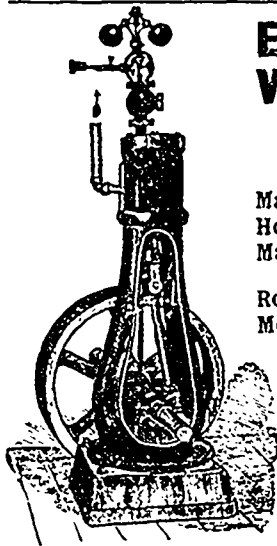
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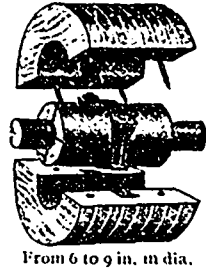
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HARVEY GRAHAM, Secretary

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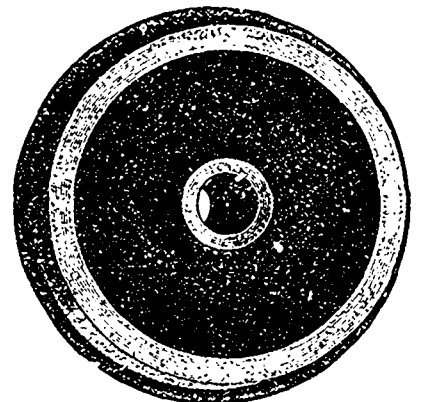
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Industrial Notes.

TRENTON, Ont., now has a basket factory.

THE Hamilton Bridge Co. has closed down owing to the dull state of business.

STRATFORD, Ont., City Council will purchase a new road-making machine.

THE Ontario Wool Boot Co., of Hanover, are taking steps to wind up their business.

PART of the bridge across the Bonnechere at Eganville appears to be in danger of falling.

ST HENRI, Que., ratepayers have authorized the expenditure of \$200,000 for permanent improvements.

THE Brunette Saw Mill Company, New Westminster, B.C., are increasing their capital stock to \$300,000.

THE Ontario Coal Company's wharf, plant and equipment in Toronto is to be sold by auction on the 19th inst.

ALLISTON MCKAY, Leamington, Ont., has the contract for drainage work at Point Pelee. The price is \$16,000.

PRINCE ALBERT, N.W.T., has voted a bonus of \$5,000 to Jos. Kidd for the erection of a new flour mill in that town.

CASSIDY, BONNER & Co., leather belting manufacturers, Montreal, have removed to larger premises at 128 Queen street.

THE contract for paving Dovercourt Road, from College to Bloor St., Toronto, was awarded to Shannon & Wellings for \$10,887.

THE Royal City Planing Mills at New Westminster, B.C., were destroyed by fire last month. Loss \$100,000. Insurance \$75,000.

G HEVENOR, machinist, St. John N.B., recently put in a 10-horse power engine made by Waring, White & Co., of that city.

RHODES, CURRY & Co., Amherst, have a contract to build 50 substantial cottages for the Dominion Coal Company at Glace Bay, C.B.

J A & W A CHESLEY, founders and ship owners, St. John, N.B., have assigned. Liabilities about \$10,000; assets about double.

JAS G. MILLER, who recently started a foundry and machine shop at Chatham, N.B., is doing very well, and is now employing 10 to 12 men.

JAMES MUSSELL, a millwright employed by the Montreal Elevating Co., was caught in the machinery of one of the elevators and badly lacerated.

C C. HARRIS will probably utilize the site of the old Parkdale pumping station, at Toronto, for the establishment of a tinfoil and bottle capsule factory.

THE tender of J W. Munroe, of Pembroke, Ont., for the masonry of the bridge over the Bonnechere River, at the price of \$3,900, has been accepted.

SAMUEL MAY, president of the Dodge Wood Split Pulley Co., Toronto, is in Europe attending to business connected with the company's rapidly growing export trade.

THE Crescent Watch Case Company, Montreal, are applying for incorporation. Capital stock, \$100,000. They will manufacture and deal in watch cases, jewellery and similar articles.

THE Rathbun company's mill, at Lindsay, Ont., has recently been enlarged. A new 100 horse power Wheelock engine, a shingle mill, and an automatic machine for feeding the furnaces with the refuse, have been added.

THE Symons foundry property, at Dartmouth, N.S., will probably be sold to a local and American syndicate, and used for a general foundry and forging business. It is probable that a wharf large enough for good-sized steamers will be built in connection.

THE company who will build the international bridge at Brockville have elected officers as follows—President, Mr. Pusey, vice-president, Mr. Cole, and L. H. Howland, secretary-treasurer. The company has now amalgamated with the St. Lawrence Railway Co. under the name of the Brockville and St. Lawrence Bridge Company.

THREE Ontario combines have collapsed during the past few weeks. The Ontario Linseed Oil and Turpentine Associations are two of these, with the result that turpentine has been reduced 5 cents per gallon, and linseed oil 1 cent. Another is the Mirror Plate Combination, which was dissolved owing to the action of one of its members in making several contracts at 25 per cent. reduction on the combine rates.

WORK is being pushed on the new waterworks at Campbellton, N. B.

S J HENDERSON, formerly of Berlin, Ont., will establish a machine and repair shop at Woodstock, Ont.

E F KEENE & Co., of Sherbrooke, Que., are going to build some large saw-mills at Spaulding, near Lake Megantic.

MR. HALL has been making pecuniary arrangements in England for the establishment of a meat-packing factory in Toronto.

THE Robb Engineering Company, Amherst, N.S., are building a number of Lancashire boilers for the Canada Coal and Railway Company.

MOORE & MACDOWALL'S saw-mills, about seventy miles north of Edmonton, were burned down last month. Loss \$9,000; no insurance.

J J. COLLINS, of Ottawa, will establish a foundry and machine shop at Arnprior, Ont. A free grant of land has been made to him for this purpose.

ORILLIA, Ont., Fire and Water Committee will purchase 600 feet of six inch pipe. They are also to provide firemen with rubber suits.

W R THOMPSON'S saw mill at Teeswater, Ont., has been burned down. Loss \$5,000, only partly insured. Cause of fire is supposed to have been lightning.

A BOILER in Cullis Bros' saw mill, at Auburn, Ont., exploded one day last month, while under heavy pressure. The damage was severe, though no loss of life resulted.

THE Hamilton Cotton Company, Hamilton, Ont., have purchased a Worthington fire pump. R H Buchanan & Co., Montreal, are the Canadian agents for these pumps.

TORONTO University Senate have decided to spend \$40,000 in equipping the proposed chemical laboratory, to furnish the biological museum, and to complete the gymnasium.

A PROPOSITION is before the Fort William Board of Trade, for establishing a flour-mill of the capacity of 50 barrels per day. A committee has been appointed to report on the matter.

THE new cold storage warehouse, at Morrisburg, Ont., which has a capacity of 120,000 boxes of cheese, was opened last month, the occasion being a great day for provision men interested.

THE promoters of the scheme for building a new theatre on Spadina Avenue, Toronto, are the New England Theatre Co., of Boston, Mass., who own and run a circuit of play-houses in several New England cities.

THE Welland Tribune understands that Mr. Yuile, the original purchaser of the Erie glass works at Port Colborne, has finally concluded his purchase, the vendors discounting some \$1,300 from the price bid for it.

IT is proposed to tear down St. Lawrence Market, Montreal, converting its site into a public square, and to build a new market further east. As the proposal stands, the new building is to contain 64 stalls, and is to cost \$75,000 or \$80,000.

LAST month Yarmouth, N.S., city council advertised for tenders for a proposed distributing reservoir. Those sent in, however, were not deemed satisfactory, and new ones are now invited. The engineer's estimate is a little over \$13,000.

THE Crown Pressed Brick Company of Ottawa are applying for incorporation, capital stock \$100,000. The provisional directors are G W McCullough, H. L. Corbell, J. J. B. Butterworth, all of Ottawa, and H. Mills, of Ormstown, Que.

THE Canada Machinery Agency, 345 and 347 St. James street, Montreal, have accepted the general agency of the Dodge Wood Split Pulley Co. for Montreal and vicinity, succeeding Miller Bros. & Toms. A complete stock of all sizes will constantly be kept on hand for prompt delivery, and every attention given to the Montreal patrons of Dodge Patent Pulley.

THE Fort William Journal has been interviewing leading citizens of that town on the question of establishing waterworks. The majority of those interviewed were in favor of the town owning its plant. Opinion was divided as to what source the government should be drawn from, and it is probable that an engineer or committee will report on the subject.

R. H. BUCHANAN & Co. are putting in fire protection for Wm. Mason & Sons saw mill, Ottawa, and placing a Worthington fire pump for the same. They have supplied a Worthington pump to the East end abattoir, Montreal, three to Messrs. Laing & Co., pork packers, Montreal, one Worthington pump to the Dominion Oil Cloth Company, and two to the Glycerine Works, St. Cune-gonde.

PLANS are asked for the proposed Masonic Temple, Montreal. WORK on the new \$20,000 opera house at St. Thomas, Ont., has commenced

SHERBROOKE, Que., will offer inducements for the Dominion Paper Co. to rebuild their mills there

A NEW dairy building is being erected at Maitland, N.S. It is 62 ft x 28, the engine room being 26 x 15 ft.

THE construction of an insane asylum at Bridgetown, N.S., three storeys high, is to be commenced soon

THE St. Thomas, Ont., Pipe and Foundry Co. will probably be set on a new basis and re-commence operations

THE iron bridge across the Nation River at Casselman, Ont., which was destroyed in a flood recently, will be rebuilt.

HUGH RYAN, of Perth, Ont., has given \$35,000 for the purpose of building a new wing to St. Nicholas Hospital at Toronto.

DOHERTY'S lumber, carding and grist mills at Campbellton, N.B., have been burned down. Loss \$12,000 not insured

THE iron for the new bridge at Shetland, Ont., has been delivered, and the work is expected to be completed in a short time.

AMES, HOLDEN & Co., boot and shoe mfrs., Montreal, are putting in a new boiler, manufactured by John McDougall & Co., engineers, Montreal.

THE boot and shoe factory at Pictou, N.S., which has been closed for a year, is to be re-opened by Gilbert Harrison, of Amherst

THE contract for the erection of an iron bridge at Nithvale, near Berlin, Ont., has been awarded to the Belleville Bridge Co. Price \$2,081

THE Robb Engineering Co. of Amherst, N.S., have installed a 100-horse power engine and boiler at Geo. Prescott's saw-mill at West River, N.B.

A COOPERAGE for the manufacture of barrels to hold gypsum fertilizer is to be established at Plaster Rock, N.B., by the Tobique Valley Railway Co.

THE Tanlem Car Brake Co., Toronto, will apply for incorporation. Capital \$90,000. John Gray and Geo. Hastings, both of Toronto, are interested

J. R. BOOTH has finished the re-building of the old Perley mill on the Chaudiere, Ottawa, and operations have begun. About two hundred men will be employed.

THE Weddell Bridge Co., of Trenton, Ont., have the contract to build a steel-lattice girder bridge over the Bonnechère at Kenfrew, Ont. The price is \$2,475

W. H. THORSE & Co.'s oil and hardware store at St. John, N.B., was damaged last month by fire and water to the extent of nearly \$50,000. Insured for \$30,000

H. BLACK will purchase from Mr. Iberville the Goyette & Melancon Pottery at St. Catharines, Ont., provided the town will consent to the continuance of the bonus

SARNIA township, Ont., council have decided in favor of the scheme for deepening the Perche drain at a cost of \$17,800. Mr. Pike, of Chatham, has the contract for dredging

CLENDINNEG & SONS hollow-ware manufacturers, Montreal, have nearly completed their works at St. Henri. The buildings will cover 550 ft. x 550 ft., and they have cost, up to the present, about \$100,000.

THE Dominion Coal Co. will erect a machine shop at Glace Bay, C.B. The correspondent of the *Stellarton Journal-News* says a good deal of building is going on in that place and that the village will soon be a city

GUELPH, Ont., council has given the contract for the laying of 155,000 square feet of composite stone sidewalk to the Ingersoll Silica-Barytic Company. The price is 15c per square foot for sidewalk, and 18½c for crossing

DESIGNS for the new Masonic Temple to be erected in Montreal, will be received by A. C. Hutchison up till the 14th inst. The price of the building is to be \$40,000, and it will cover 109 feet by 51 feet on Dorchester street.

THE new iron bridge at Douglstown, N.B., is completed. It is 243 feet long including the abutments. The iron superstructure was made at the Record Foundry and Machine Works, Moncton, under the inspection of A. H. Hains.

THE St. John *Telegraph* states that Ald. George H. Waring, late of Waring, White & Co., is to leave shortly for the Island of St. Kitts, in the West Indies, whither he will take a small steamer laden with plant for a foundry which he proposes to start there.

WM. WHEELER, of St. John, proposes to start a nail factory at Moncton

C. C. HARRIS proposes to establish a factory in Toronto to manufacture tinfoil and capsules

A. McPHERSON & Co., founders, Oxford, N.S., have been succeeded by McNeil & Tangilla.

M. BEATTY & SONS, manufacturers of contractors' plant, Welland, have shipped a steam shovel to Cornwall.

A FIRE in the foundry of Neff Bros., Humberstone, Ont., has led to an agitation for a fire engine for the village

THE Robb Engineering Co., of Amherst, N.S., are making machines for two saw-mills in Newfoundland.

WILLIAM COOK, who owns a large carriage factory in Pontiac, Mich., purposes to establish works in Windsor, Ont.

MESSRS. DUNSMUIR have ordered a refrigerating plant, to be used in their cold storage warehouse at Victoria, B.C.

THE proprietors of the Coldbrook Rolling Mill at St. John have given notice to the employees of a reduction in wages.

DOBIE & STUART have manufactured a steam sand screen for a Stamford man. The screen is the invention of Mr. John Stuart. It will be tested at the gravel pits—*Welland Tribune*.

A DROP forge for the Ontario Silver Company's Works at Humberstone, Ont., has been purchased in Connecticut.

THE Ontario Pump Co., of Toronto, has gone into liquidation. It is said the estate will not pay a large percentage on the dollar. The capital stock was \$45,000

THE warehouse of Rhodes, Curry & Co., machinists, founders, etc., Amherst, N.S., has been burned down, together with its contents. Loss, \$5,000, insured for \$3,000.

THROUGH J. Douglas Hagen, M.P., an application has been made to the Minister of Marine, for leave to use the marine hospital at St. John as a technical school, which it is proposed to establish in that city.

THE Thomas McDonald Mfg. Co., against whom a workman named Lefebvre obtained a judgment of \$2,000 on account of injuries sustained while working with a defective machine in their Montreal factory, have assigned

THE contract for erecting a new power pump and turbine wheel for the Montreal pumping station, has been awarded to John McDougall & Co., engineers, Montreal, who will put in a Worthington pump and Lefel wheel at \$20,000.

THE C. P. R. have arranged to build creameries at intervals along their lines in the same way that they have erected elevators. These creameries will be rented to farmers at a rate not more than 5 per cent. of the amount invested in them.

THE hose made by the Fabric Fire Hose Co. of New York, for which W. A. Fleming, 57 St. Francois Xavier street, Montreal, is agent, stood one of the severest tests ever applied to fire hose. The testing was made at McGill College, and this hose withstood a pressure of 450 pounds per square inch

THE Wood Vulcanizing Company, Ltd., headquarters Montreal, capital stock \$75,000, are applying for incorporation. The object of the company is to manufacture articles made of wood which has been vulcanized or otherwise treated for the purpose of preservation, also to manufacture machinery for doing this. The applicants are H. L. Rutherford, Montreal; R. A. Rutherford, New York, and W. Bingham, W. J. White, and A. W. P. Buchanan, all of Montreal

THE Thomas Davidson Manufacturing Co., Ste. Cunegonde, Montreal, are applying for incorporation under the Joint Stock Companies Act. The capital stock is \$500,000, and the company will manufacture and deal in metal goods, and carry on the business of supplying water and electric power and electric lighting in the Province of Quebec. The applicants are Mary (widow of Thomas), James, Thos., Charles and Christina Davidson, and E. Goodwill, all of Montreal

A MEETING of military men was held in Montreal on May 19th to discuss the erection of a military school for Montreal. Complaint was made by those interested in militia matters that students who wished to get a military training can only do so by giving up civic occupations to attend the military school at St. Johns, Que. A special committee of the city council has met the leading volunteer officers of Montreal and will recommend an appropriation of \$25,000, provided the Federal Government will put up a building at a cost of \$75,000 to \$100,000. The proposed school would at present be used for the training of infantry, but would hereafter be extended to the cavalry and artillery branches of the service.

AN organ factory is likely to be established at Selkirk, Man., by Mayor Dagg.

ENGLISH capitalists are organizing a company to build a pulp mill in Newfoundland.

THE Rathbun Co., of Deseronto, are putting in a new engine in their cement works.

GODMANCHESTER Township, Que., council have purchased a road-making machine.

KINGSTON, Ont., school-board authorities ask for \$20,000 for the erection of a new school.

THE T. Eaton Co., of Toronto, are installing another engine in their dry goods establishment.

JOHN A. McDONALD will probably put in an additional plant at his creamery at St. Athelstan, Que.

DAVID KING, of Tilbury Centre, has the contract for building a bridge over Big Creek, Tilbury, for \$933.

GEO. L. DEHL & Co., wooden mantel manufacturers, of Toronto, have assigned. Liabilities \$25,000.

MONCTON, N. B., city council have made an offer of \$30,000 for the Gas Light and Water Co.'s property.

THE Brampton, Ont., gas works have been wrecked by fire. The cause of fire is unknown. No insurance.

THE wooden bridge over the river Speed, at Hespeler, Ont., will be replaced by an iron one and tenders are being advertised for.

THE work of building a new First Baptist Church at Yarmouth, N. S., will be commenced as soon as sufficient funds are in hand.

THE Dominion Bridge Company, whose works are at Lachine, Que., have the contract for building an iron bridge at Granby, Que.

SUDBURY, Ont., is voting on a by-law to introduce systems of waterworks, sewerage and electric lighting, at a total cost of \$35,000 or \$40,000.

THE binder twine factory at Kingston, Ont. Penitentiary is now running, about two tons per day being the output. Forty convicts are employed.

THE Robb Engineering Co., Amherst, N. S., have the order for a supply of machinery for a large new creamery and cheese factory at Middle Musquodoboit, N. S.

THE mechanical shops at the Vulcan Iron Works, Winnipeg, which have only been partially working during the winter, have now renewed full operations in all departments.

THE New Glasgow Iron, Coal and Railway Co.'s (Ferrona) 75-ton furnace produced one day last month 106 tons of iron in twenty-four hours. The average is 95 tons per day.

GEO. B. BURLAND, of Montreal, proposes to establish a paper factory in St. John's, Que., to employ from 50 to 100 hands. He asks for a bonus of \$15,000 and exemption from taxation for twenty years.

THE proprietors of the St. John's, Que., Stone Chinaware Co. ask to have the duty on white granite and chinaware restored to 35 per cent. It is reduced in the new tariff to 30 per cent, and the potters are afraid of Scotch and English competition.

A PETITION came last month before the Montreal city council asking that a bonus of \$40,000 per annum for twenty years be granted the Montreal Bridge Company, to provide for the building of a bridge from Longueuil to some point in St. Lawrence Ward.

CIVIL ENGINEER PAPINEAU is taking levels for St. John's, Que., drains to ascertain whether they can be conducted into one reservoir, and then discharged about a mile and a-half below the town and under the canal. At present the drainage is discharged into the canal.

JOHN RUSSELL's brick works in East Toronto were almost completely destroyed by fire a short time ago. Some valuable machinery was spoilt, and the whole damage amounted to about \$20,000. The loss would probably have been much less had the firemen had sufficient water facilities.

AFTER a recent examination made in Montreal by the water committee, it was stated that the cut wall of the new aqueduct was in a bad condition. About \$116,000 will be needed for the erection of a new engine, boiler house and engine house in connection with the low level reservoir.

JOHN CARNEGIE bought the Peterborough, Ont., Milling Company's property at public auction for \$57,000. He will probably leave it at once to a tenant who will put it into operation as soon as possible. The machinery, which is said to be of the most approved and modern form, cost the company between \$70,000 and \$80,000.

THE St. Croix mill of the Canada Colored Cotton Mill Co. has been closed for the summer, owing to a strike following on a recent reduction in wages.

ADAM WALKER, for several years with Sylvester Bros. of Lindsay, Ont., is moving to Moosomin, N. W. T., to start a machine shop there on his own account.

THE Burrell-Johnson Iron Co., Yarmouth, N. S., recently fitted up a 50 h.p. engine for the Buckler Brick Co., Annapolis, N. S., whose brick-making machinery they have also overhauled.

THE Canadian Engine and Locomotive Works at Kingston, Ont., have the contract for lock gates on the Sault Ste. Marie Canal. The price is stated as being somewhere between \$30,000 and \$50,000.

THE Oakville Cap and Tarpaulin Company's premises at Oakville, Ont., have been burned down. The fire is supposed to have originated spontaneously amongst some tarpaulins. Loss about \$4,000, mostly insured.

F. LLOYD, of Chemainus, B. C., is starting a new saw mill at Hall's Crossing with a capacity of about 20,000 feet per day. Two high pressure boilers have been put in, together with a good deal of high-class modern machinery.

WORK is progressing favorably on the new Montreal incinerator. "Hard pan" has been reached only a few feet from the surface of the ground, which renders the task of erecting the chimney easier than was expected.

A COMPANY is being incorporated at Pictou, N. S., under the name of the Cairo Polish Co., to manufacture all kinds of polishes, pastes, &c., for domestic, toilet, or culinary purposes. They will also manufacture bricks, tiles, pipes, paints, etc. Capital \$10,000.

AMHERST, N. S., shoe factory has added four new machines, viz., a gang punch machine, a four-last beating out machine, a globe buffer and a new process rivetter. These additions will add greatly to the capacity of the factory. A large new rubber warehouse will be built shortly.

EFFORTS are being made to persuade the Dominion Paper Company, whose mills at Kingsey Falls, Que., were burned down recently, to rebuild at that place. The *Richmond Times*, however, seems to have grave doubts as to whether they will do this. Two hundred and fifty men were thrown out of employment.

MOISE JOANNISSE, a mill-wright in Gilmour & Hughson's mill at Chelsea, Que., met with a fatal accident last month. He was working in a turbine when a fellow employer, not knowing he was there, let the water in from above, causing the wheel to revolve immediately. Joannisse was terribly crushed and died in a few minutes.

THE Dominion Bridge Company's representative in Digby, N. S., Mr. W. E. Brown, is superintending the building of a new bridge 700 feet long at Pugwash for the Nova Scotia Government. Mr. Brown is also putting up 25 steel spans for the Dominion Coal Co., at Louisburg, C. B., besides three others for the Nova Scotia Government, and two for the Western Counties Railway Co.

THE Robb Engineering Co., Amherst, N. S., have a relief society among their employes. Ordinary members pay 25c per month, and those earning \$5 or less per week pay 13c per month, while the firm contributes 10 per cent of the total assessments. The fund is used to assist members who are disabled by sickness or accident, and is found to work very satisfactorily. G. W. Cole is secretary.

THE examiners and inspectors of steam boilers under the new regulations framed by the Quebec Government are O. E. Granberg, of the Boiler Inspection and Insurance Co., Montreal, E. O. Champagne, the city boiler inspector, Montreal, Francois Gendry, of Sorel, William Laurie, of Louiseville, and Joseph Samson and Edward Manny, of Levis.

FOR the Grand Trunk Railway John Bertram & Sons, of Dundas, are getting ready a switch and frog planer of heavy style, 48 by 36, and two Craven 36 in. drills. To the Three Rivers Iron Works they will ship one 20 ft. by 42 in. gap lathe, one 24 in. shaper, one 52 in. by 48 in. by 12 ft. iron planer, one 72 in. radial drill, one 84 in. face lathe, a bolt-cutter and a slotting machine. To the Canada Machinery Agency, Montreal, one 36 in. by 10 ft. gap lathe. To B. R. Mowry & Sons, of Gravenhurst, one 72 in. radial drill, and to Benoni Hardy, at St. Casimir, Que., one 42 in. gap lathe, with 22 ft. bed. The Baldwin Iron Works, Ottawa, Ont., will be supplied with one 10 ft. engine lathe 18 in. swing, and one 50 in. gap lathe 15 ft. bed. And they are preparing for C. A. Farrar, of Meaford, Ont., one 16 ft. by 24 in. engine lathe, one 25-in. drill, one 8 ft. by 30 in. by 30 in. planer, one 16 in. shaper, and one No. 3 punch.

THE Fraser Valley Canning Co. (Ltd), Chilliwack, B. C., are reported to be going out of business.

AN addition is being made to the Merriton, Ont., Paper Mill in order to accommodate screening machinery.

W. J. GAGE, Toronto, offers to give \$25,000 towards the erection of a home or hospital for consumptives in the city.

THOMAS DUMAS has purchased Acton's Sash and Door Factory, at Eganville, Ont., and will extend the business.

PRICE BROS & Co's steam saw mill at St Thomas' Station, Que., has been burned down. Loss, about \$70,000.

ST. PIERRE & GAMACHE'S foundry and mills at Bic, Que., have been destroyed by fire. Loss heavy, with no insurance.

THE St. John, N.B., *Sun* reports that the spinners in the Courtenay Bay cotton mill in that city have returned to work at the reduced scale of wages, and it is expected that the employes of the New Brunswick mill will also return to work on the same basis.

THE erection of a flour mill is talked of at Fort Vermillion on the Peace River, which is about 1,000 miles north of Toronto and 350 miles north of Edmonton. How about the "narrow strip of land bordering the United States" now, in the face of this practical illustration of the vastness of Canada's useful and inhabitable territory?

STIRLING & BROWNLEY, manufacturers of the now celebrated Brownley Injector, described in this journal, have issued a new price list. Engineers and manufacturers in want of a boiler feeder may be interested in knowing that this firm are prepared to send one of their injectors on a 30 days' trial, so that it costs nothing to test this injector.

KERR & MORGAN'S machine shop in White's Lane, Montreal, was gutted in the fire which destroyed the Montreal Silk Mills Works the other day. The Dominion Rolled Plate Company and Montreal Watch Case Company's premises in the same building were damaged. Kerr & Morgan have lost considerable. The loss on the silk mills is estimated at about \$4,000.

OWING to the terrific downpour in Toronto district towards the end of last month in which nearly 7 inches of rain fell, much damage was caused. Taylor Bros. Don Paper Mills, as well as many other buildings, were inundated, resulting in heavy losses in machinery and other property. Winchester street bridge gave way at both ends and the bridge at York Mills was also destroyed.

THE Canadian Colored Cotton Mills Company held their annual meeting in Montreal a few days ago, when the old board of directors was re-elected. The total value of the output was reported as \$2,050,000, or one third less than the previous year. A dividend of three per cent. had been declared. There was complaint at the meeting that the cost of selling goods had been too high.

Railway and Marine News.

THE C. P. R.'s new wharf at Calumet, Que., is now complete.

THE C. P. R. will establish works for the manufacture of car-wheels at Fort William, Ont.

THE Ulster Steamship Company is starting this month a direct service between Dublin and Montreal.

IT is proposed to build a marine railway at Harvey, N. B., in connection with C. C. Dow's shipyard.

THE tender of Chas. Reinsborough to construct the Bay du Vin, N. B., wharf for \$2,150, has been accepted.

J. C. O'NEIL of Kempville has a sub-contract for the construction of ten miles of the O. A. & P. S. Railway.

THE portion of the Pontiac Railway lying between Coulonge and Black River is being put into working order.

ABOUT \$40,000 will be spent this year on the Moncton-Buctouche Railway and in repairing the Buctouche bridge.

THE G. T. R. have extended the switch to the oil mill at Baden, greatly facilitating the loading and unloading of freight.

MAJOR WAISH has secured the charter of the Winnipeg & Lake Dauphin Railway, and is forming a company to construct the line.

THE Lake Erie and Detroit River Railway bridge at Wheatley, Ont., was washed away during a storm last month. Loss \$10,000.

THE *News* speaks favorably of a scheme to improve transit facilities between Kingston and Cape Vincent by the completion of the Wolfe Island Canal.

A new steamer, to be called the "St. John City," is being built in England for Furness, Withy & Co's line between London, Halifax and St. John.

SOME sheds and freight cars belonging to the C. P. R., at St. Stephen, N. B. were burned down last month. Their wharf also was damaged by the fire.

THE Toronto Ferry Co. have built another large steamer for the Island service, the "Shamrock." Engines are being put in by the Doty Engineering Works Co.

THE Lake Manitoba Railway and Canal Co. are applying for an extension of time for commencement and completion of their line and to extend it to Swan Lake.

THE Montreal and Cornwall Navigation Company are applying for incorporation. The chief applicants are W. C. White and Wm. Currier. Capital stock \$50,000.

THE Government have decided to build a new lighthouse at the west end of the Burlington canal. A dredge is now being used to deepen the channel leading to the harbor.

THE Plant Steamship Co. have bought out the North Atlantic Steamship Line of Halifax. The "Florida" will take the place of the "Halifax" between Boston and Halifax.

THE M. C. R. will build a new station at Petrolia, Ont., to cost \$12,000, perhaps one also at Windsor. The company are laying new 50 pound rails between Atercliffe and St. Thomas.

MONCTON, N. B., has decided to give \$5,000 towards a new dock, if the Dominion Government will also subsidize it. The scheme was described in a recent number of this journal.

LA COMPAGNIE GENERALE TRANSATLANTIQUE will make representations to the Canadian Government for a subsidy for a line to ply weekly between Montreal, Halifax and some French port.

A DEPUTATION from Trenton waited upon the Dominion Government recently to petition them to have the ship canal between Trenton and the Murray Canal dredged and widened to 150 feet.

THE following are the present officers for the Philipsburg Junction Quebec Railway and Quarry Co.: E. L. Bond, president; F. B. Wells, vice-president and general manager, and Henry Timmis, secretary and treasurer.

ANDREW ONDERDONK, of Chicago, who built the British Columbia section of the C. P. R., has been interviewing the Government with reference to a claim he has against them for \$74,000 in connection with that work.

AN Act will be applied for to incorporate a company to construct and operate a railway from a point near Black River to some point near Ferguson's Point, county of Pontiac, thence across the Ottawa River, to a point in Petewawa, county of Renfrew.

THE Ontario Government has refused to grant the South-Eastern Railway Co. a bonus of \$12,000 per mile to build a line from Winnipeg to Rainy Lake district, on the ground that the route proposed would pass through a comparatively valueless territory.

CONNOR and LAWLOR, of St. John, N. B., have obtained a renewal of the charter for the Woodstock and Centreville, N. B., Railway. The *Carlton Sentinel* says they are now looking after gypsum mines in the Tobique Valley in which they are interested.

THE Government steamer "Druid" which had a hole punched in her bottom last month by an ice jam, has been on Davis' slip at Levis for repairs. She is to be ready for sea early this month, and will, we understand, be placed at the Grosse Isle Quarantine Station.

SOME Montreal aldermen now propose to give the G. T. R. a million dollars in order to raise the level of the line from St. Henri to Bonaventure depot. This sum also would include the cost of bridging Mountain and Guy streets, a proposition made a month or two ago.

AS the Government appear dilatory in the matter, it is proposed by the mayor of Peterboro' to send a large deputation to Ottawa to press the Government either to complete the Trent Valley Canal or to give it over to some private party who will. It would shorten the journey between Chicago and the West by about 500 miles.

THE Collingwood, Ont., Dry Dock Co. have been remarkably busy during past season, and it has been found difficult to obtain a sufficient number of hands to carry on operations. At the present time several new vessels are on the stocks, besides a few undergoing repairs. The length of the dry dock is 336 ft. over all, width 50 ft., depth 13 ft. The entrance gate is 50 ft. wide. A new steamer for the Buffalo Fish Co. was launched a week or two ago, and a tug is being built for the same owners. Three large tugs are also being built for service on Georgian Bay and Lake Huron.

A LIGHTHOUSE and range lights will be erected on the east of Toronto Island.

SURVEYS have been made for the extension of the Miramichi Railway to Black Brook.

THE Quebec Central Railway now has 1,000 men at work on its Tring and Megantic branch.

E. LANTALUM & Co., ship-owners, St. John, N.B., have assigned liabilities, about \$20,000.

THE C.P.R. will build as far as Caletonia Springs on the Montreal and Ottawa line this summer.

THE bill reviving the charter of the Brandon & Southwestern Railway Co. has passed the Dominion House.

THE C.P.R. bridge across the Columbia River, at Revelstoke, B.C., was washed away in a flood a few days ago.

THE New Glasgow *Chronicle* calls for an extension of the I.C.R. from Port Mulgrove to Guysboro, and thence to Canso.

THE time allowed by Parliament for the completion of the Montreal & Ottawa Railway has been extended to five years.

THE engines of the steamer "Garden City," Toronto, have been repaired, and there is considerable improvement in her speed.

BOTH the C.P.R. and G.T.R. have been going in extensively for reductions of their staff in all departments, owing chiefly to the drop in receipts.

THE Verdun Navigation Co. propose to run a large boat from Montreal to Lachine Rapids. Picnic grounds will be laid out near the latter place.

THE Government is being asked to grant a subsidy of \$20,000 a year, for ten years, for a line of steamers to Hayti, San Domingo and Porto Rico.

DURING the coal famine the Hamilton Steamboat Company is obtaining a supply of Nova Scotia coal and mixing it with hard coal for use on the "Macassa" and "Modjeska."

TENDERS are invited for the proposed breakwater or pier at Phillipsburg Junction, Que. It is to be 1,200 feet in length, and plans have been prepared by the chief engineer, Ottawa.

AT the annual meeting of the Phillipsburg Junction Railway & Quarry Co. it was reported that 7½ miles of road were in running order, connecting Phillipsburg with Stanbridge, Que.

THE Nicola Valley Railway Co. will shortly commence the construction of their line from the C.P.R. near Spence's Bridge to the coal lands, about forty miles away, and thence to Nicola Lake.

THE Great Northern Railway Co. have decided to equip and operate the Kaslo-Slocan Railway and to build wharves at Kaslo and Bonner's Ferry, from which the cars will be run on to the steamers.

THE engines and boilers of the tug "Springhill" were built by James Fleming, engineer and machinist, St. John. When sent out with a tow of barges for the Cumberland Railway and Coal Co., she developed 500 horse power.

IN the Dominion Parliament the question of deepening the canals to a uniform depth of 20 feet so as to permit of ocean vessels coming up to Toronto, has again been discussed. An expenditure of \$150,000,000 would be required.

JOS. BOUCHER, A. Beggs and Jas. Wilson, of Almonte, have the contract for all the stonework required for 25 miles of the O.A. & P.S. Railway, west of Eganville. The cost will be \$40,000, the work to be completed by the end of this year.

AT the annual meeting of the Quebec & Lewis Ferry Co. the following board were elected: President, Edwin Jones, directors D.C. Thomson, G.R. Renfrew, L.J. Shaw, F. Samson, W. Simons and Phillippe Huot, and James Patton, general manager.

RAILROAD spikes from the United States will hold down the steel rails used on the Newfoundland railway. A schooner load is about to be despatched from Philadelphia to Exploits. The British makers could not compete with the Pennsylvania prices.—*St. John Sun*.

THE Desert Lake Mining and Railway Co. have elected the following officers:—President, Wm. Chisholm, Cleveland, vice-president Geo. Rankin, London, treasurer, E. A. Page, Cleveland, and secretary, F. A. Hilton, Toronto. Construction work will begin at once.

SOME additions are to be made to the Campbellton, N.B., ferry landing this summer under the direction of J. B. Hegan, the Government engineer at St. John. A wharf is also to be built at Gardner's Creek, 20 miles east of St. John, to enable vessels to ship wood, lumber, and produce from that point.

THE salaries of several officials of the Richelieu and Ontario Navigation Company have been reduced, and several employees dismissed. The gross earnings of the company from the opening of navigation till May 6th were \$33,000, nearly double those for the corresponding period of last year.

THE Allan Foundry and Machine Works of St. John, N.B., have recently shipped their power capstans to vessels on the upper lakes and their work has given high satisfaction. They lately cast a keel weighing over 2½ tons for a yacht now being built on the Kennebecasis River for the Rev. Lindsay Parker, of Brooklyn, N.Y.

THE second steamer ordered by Furness, Withy & Co., for their line between London, Halifax and St. John, to be named "St. John City," is building at Stephen's yard, Linthouse, and will be on the berth in September. She will be on very similar lines to the "Halifax City," but larger, and with more passenger accommodation.

THE Melbourne Steamship Co. (Ltd.) is the name of a new company seeking incorporation, with headquarters at Toronto. They will operate steamboats and barges between Montreal, Duluth, and intermediate ports. The applicants are C. A. & J. B. Cantin, G. E. & C. A. Jacques, all of Montreal, and F. Elliott, Denver, Col. Capital stock \$45,000.

THE steamer "Ocean," belonging to G. E. Jacques & Co., met with a bad accident in Lock No. 7 of the Beauharnois Canal, striking her bow against some obstruction. The ship was whisked out of her course in an instant and charged through the lock gates, with the result that she was seriously bruised and otherwise damaged, and a flood ensued over the neighboring meadows.

OWING to the disastrous coal strike in the States, many Canadian railways were much inconvenienced for lack of "black diamonds." The G.T.R. had to seriously curtail their freight services, and to cancel several passenger trains. There was some talk of so altering their engines as to allow of the consumption of oil instead of coal. The G.T.R. bolt works and foundry, at Hamilton, closed down indefinitely for the same reason.

STEPS are being taken to resuscitate the Midland Railway Company. This company was organized a few years ago, began operations on the East River, and graded some miles of the road projected by them. The most important feature of the scheme, at present, is the extension of the line eastward to some harbor on the Atlantic coast. It would be of immense advantage to important interests in the neighborhood, says the *New Glasgow Chronicle*.

THE Nova Scotia Southern Railway are proceeding with construction work. Geoffrey Stead, of St. John, is in charge of construction at Shelburne, and Alex. Mitchell, the chief engineer, is with a locating party twenty-five or thirty miles from Shelburne working towards New Germany. A.R. Duman & Co., Montreal, have the contract for twelve miles of clearing beyond Jordan River, but are at present working on a spur leading into Shelburne along the water front to the company's proposed wharf.

MONTREAL steamship lines are not sanguine as to the success of the proposed new fast line. They say that the chief British buying centre for such goods as would form the greater haul of the cargo of such a line varies from week to week. It has been found that speed for freight purposes does not pay. They also say that the chief steamship lines at present in existence could easily work in unison and give a much more useful service at a quarter of the proposed subsidy.

DURING the last few weeks the Government steamer "La Canadienne" has been undergoing a thorough overhauling under the hands of Carrier, Lainé & Co. This having been completed, the steamer made recently a trial trip, which seems to have been a success in every way. The chief changes which the vessel has undergone consists chiefly in her compound engine having been converted into a triple expansion engine. A new boiler, giving an increased pressure of 100 lbs. to the square inch, and a new screw and steel shafting have also been put in. The machinery during the trial gave every satisfaction.

A convict named Lanctot, from the St. Vincent de Paul, Que., penitentiary, was brought out on the Queen's Birthday to act as fireman on the Warden's steam launch. While engineer Champagne, brother of the Montreal city boiler inspector, was taking him out on the St. Lawrence in a row boat, he pulled out a revolver and compelled Champagne to row to the opposite shore. Watching his chance, however, Champagne seized the revolver and threw it overboard. In the struggle which followed the boat was capsized and both nearly drowned, but the convict was secured with the help of some *habitans*. People are now wondering where and how the convict got his revolver.

C. J. BOOTH has been re-elected president, and G. H. Perley vice-president of the Canada Atlantic Railway Co.

NEXT year's convention of the Grand International Brotherhood of Locomotive Engineers will be held at Ottawa.

STARTING on the 15th June the Richelieu and Ontario Navigation Co. will put on daily steamers between Montreal and Toronto.

CONSTRUCTION work on the Nova Scotia Southern Railway commenced last month at Shelburne. Duman & Co., of Montreal, have the contract for twelve miles.

THE Canadian Canoe Company have manufactured a 20 foot portable steam launch for D. Breeze, Dominion Fishery Inspector. Its first trip, which was made the other day, proved a success.

UNDER the direction of St. George Boswell, harbor works engineer of Quebec, the new face for the Commissioners' wharf is now being about completed. It is 900 feet long and will enable vessels drawing 30 feet to lie alongside.

THE father of George Brush, proprietor of the Eagle Foundry, Montreal, built the first tug, the "Hercules," that was ever used in bringing vessels up the St. Mary's current. Before that vessel entering Montreal harbor had to be towed up the current by oxen.

THE C. P. R. has nearly completed its new branch from Revelstoke, B. C., to the deep water on Upper Arrow Lake. This, according to the *Canadian Colliery Guardian*, will effect a reduction in freight of about \$30 per car load for ore shipped from the Slovan mines to American smelters.

THE Upper Ottawa Improvement Company's steamer "Dauntless" has been destroyed by fire, which is supposed to have arisen owing to some fragments of oakum and pitch coming into contact with the heated machinery. Loss about \$25,000, insured for \$15,000. The crew had a narrow escape. The company will build another boat.

THE long pending and oft postponed sale of the Montreal and Sorel Railway has at last "come off." It was sold for the small sum of \$1,000 to the Hon. Mr. Tourville, who was the only bidder. Mr. Tourville, who is president of the company now operating the road, bought it in their name. The other members of the company are Joel Leduc, J. M. Fortier, and H. Beauchemin.

IN the Soo passage early last month there was a collision between the steamer "S. S. Curry" and the whaleback "A. D. Thomson." The former's bow was crushed in and her forward compartment filled with water. Her loss is estimated at \$30,000, covered by insurance. The latter vessel was still more seriously damaged, her nose being completely smashed in. Not insured.

JOHN KENNEDY, Harbor Engineer of Montreal, has prepared plans of the inland basin at Hochelaga, the construction of which is being agitated. The area of the land required for the dock and entrance, and for freight houses and railway tracks alongside, but not including the streets already laid out on the site, nor those surrounding the dock, will be about 2,000,000 square feet. Mr. Kennedy estimates that the cost of the works will vary from \$1,740,000 to \$3,173,000, according to which several plans may be adopted. The lowest estimate is for a low level dock with cribwork walls, and the highest is for walls built by concrete and high enough to keep the freight houses above flood level.

THE Quebec and Lake St. John Railway have just sent up from Quebec an engine and machinery for a new steamer to be launched in a few days on Lake St. John. In some parts, the shores of this lake are very shallow, the depth of water sometimes being only about two feet at a distance of two or three miles from shore. This is especially the case at the mouths of some of the rivers where there are extensive sand bars. Though of large carrying capacity, the new steamer, which is a flat-bottomed side-wheeler, will only draw 18 inches of water. She will ply between Roberval and St. Prime, St. Felicien, the mouth of the Mistassini, and 20 miles up that river, also to the mouth of the Assumpouchouan. She will carry goods and produce to and from the new Trappist settlements, whether about a hundred families are moving this season.

C. F. GILDERSLEEVE, the new manager of the Richelieu and Ontario Navigation Co. is already making his judgment felt in the affairs of that company. Mr. Gildersleeve is not revolutionary in his methods, but is beginning to stop the leaks which formerly were a drain upon the company, and no doubt next spring will see more visible improvements in the management of the steamers. Mr. Gildersleeve's record in this respect has been excellent. An instance of this is to be seen in the changes made in the steamer "Norseman," now called the "North King," which runs from Rochester to Port Hope. This boat, which was formerly 159 ft long, was lengthened to 175 ft, and her wheel, which was formerly

26 ft in diameter, was reduced to 19 ft, which, driven by a new engine of a 10 ft stroke, gave 30 to 34 revolutions per minute, as against 18 to 20 formerly. The result of this change is that even in a heavy gale she can now cross the lake in six hours where it formerly took eight or more, while in an ordinary wind her time of crossing has been reduced from five hours to an average of less than four. On making these changes the shaft was brought down to the main deck without changing the elevation of the engines, and while they have given more power, there has been an economy of fuel, comparatively speaking.

Mining Matters.

AN eight-inch vein of tin has been found in the Rainy Lake district.

A STEAM hoist has been put in at the Nickel Plate gold mine, Trail Creek district.

A TORONTO syndicate have purchased the Sol Holden mine in the Big Bend district.

THE Styne Creek Gold Mining Co. (Ltd.), Vancouver, is applying for incorporation. Capital \$200,000.

W. ROBERTSON and J. H. KASHDALL are working on their property, the Glengorden and Montreux mines, Revelstoke.

WORK on the Anaconda, May, Washington, and other quartz mines in the Boundary, B. C., district is making good headway.

THE Riverside, B. C., claim is said to be opening up better at every foot of the drift, and is now in 80 feet, with the quartz looking well.

THE Bear Lake Consolidated Mining Co. (Ltd.) has just completed formation. Headquarters, Victoria, B. C.; capital stock, \$500,000.

A NEW vein has been discovered at the Ledyard gold mines, Belmont, Ont., averaging from 10 to 14 feet in width. The ore is rich in sulphates, containing \$102 per ton in gold.

TWO or three deals will shortly be consummated connected with gold properties in the Cedar Creek, B. C., mining camp. Several parties are about to begin placer work at points on the Pend d'Oreille River.

A MONTREAL man proposes to purchase the gold and silver mine near Bathurst, N. B., which is at present owned by Messrs. Ellis, Payne & Jack, C. E. He thinks he has a good and paying process for separating the gold.

A WING dam has been built at the Rip Van Winkle mine, Kootenay, in order to turn the stream into a new channel. The bed of the creek will be utilised for the mouth of a new tunnel, which is to be 250 ft. long.

THE United States Government contemplate the erection of extensive nickel smelting works just within the International Boundary near the Sudbury district. Great things are expected for the Canadian nickel industry if their intention is carried out. An American expert has been studying in Germany for some months with a view to the discovery of the best means of producing the metal, and considers that to gain the best results it is necessary to extract the nickel directly from the ore without any intermediate process.

Personal.

JOSEPH HUDSON has been installed as manager of the colliery at Glace Bay, C. B.

A. A. BREWER has resigned his position of chief engineer of the New Brunswick Division of the C. P. R. The position has not yet been re-filled.

J. H. BARBER, who formerly held the position of assistant engineer of the C. P. R., at Toronto, has been appointed chief engineer of the Atlantic Division.

GRAHAM FRASER, manager of the Nova Scotia Steel & Forge Co., has not quite recovered from his recent illness, and has gone on a trip to the West Indies.

PROF. H. T. BOVEY, of McGill University, has been elected vice president of physical, chemical and mathematical section of the Royal Society, Ottawa. B. J. Harrington is president, and G. Deville, secretary.

CAPT. RODRICK CAMERON, of the steamer "Northumberland," of the Charlottetown Navigation Co., died at his home on May 28th. Years ago he was in the East India trade and he had spent the greater part of his life on the sea.

A. E. EDKINS, inspector for the Boiler Inspection Insurance Co. of Toronto, has been in Montreal for the last two months taking the place of O. E. Granberg, who has been on a tour through the province. Mr. Edkins will return to Toronto this month.

THE Hamilton Times records the death in that city, last month, of Wm. Turnbull, formerly in business there for 20 years as an iron founder under the style of Turnbull & Co. He had previously been bookkeeper for Gurney & Carpenter, stove founders, but was latterly a city assessor.

GEORGE TAYLOR, SR., of Don Mills, Ont., died a few days ago at the age of 81. He was born in England and came to this country at an early age. Mr. Taylor and his two brothers were the pioneers of the paper industry in Canada, having established their first mill in 1845.

WE regret to hear of the death of Gilbert Murdoch, C.E., chief engineer of the waterworks, St. John, N.B. He was born in Paisley, Scotland, in 1820, and came to St. John when 22 years of age. Soon after, he was appointed to a clerkship in the water department, and had been the chief engineer there since 1855. The work of bringing the water in from Loch Lomond was accomplished under the direction of deceased, while the entire sewerage system of the city was built under his management. Mr. Murdoch died after a short attack of pneumonia.

ST. JOHN, N.B., May 25th, 1894

Enclosed please find cheque in settlement of account enclosed. We are pleased so far with results from our ad. Have just received several enquiries from up West mentioning your paper.

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CANADIAN ASSOCIATION OF STATIONARY ENGINEERS.

Bro A. M. Wickens reports to the Executive Secretary that on May 17th he went to Warton, Ont., and instituted the thirteenth branch of the association in Canada. By a curious coincidence the number of members present was thirteen. If these engineers are not members of the Thirteen Club, it is to be hoped that they will at least be as free from superstition as the members of that courageous society. Some of the members of this new branch run stationary engines, but most of them are steamboat men or tug men who are on the lakes during the summer, and some of them fill in the winter months by running stationary engines. Several who intend to join the association are now on the lakes, and intend to join when they return to town. Bro. Wickens feels safe in saying that they have the material for a prosperous lodge. They have provided themselves with a very neat little room adjoining the Mechanics' Institute, and it is understood they will meet on the second and fourth Tuesdays of each month. The installation was over by ten o'clock, when the following officers and members were installed:

President, Wm Craddock, Vice-President, Chas. Shaw, Recording Secretary, Ed Dunham, Financial Secretary, Robert L. Graham; Treasurer, J. Dunham, Conductor, Archie Sheldon, Doorkeeper, R. Murray; Trustees, Wm. Smith, A. McLaren, and G. L. Kitchen. The other members were Wm. McKenzie, Robt. Burrows, E. Drinkwater, and D. McDonald.

This makes the fourth new branch formed since last convention.

A committee of the Canadian Association of Stationary Engineers was appointed to see what steps could be taken in welcoming the convention of American Mechanical Engineers. This

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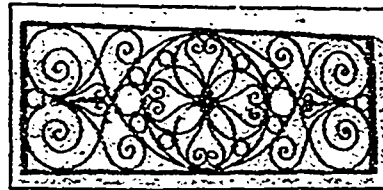
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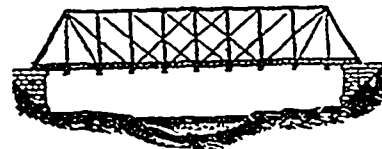
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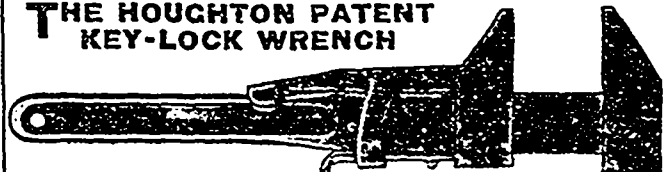
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committee, consisting of George Hunt, Harry Nuttall and J. J. York (secretary), decided to present an address to the convention as their tribute of honor to the visitors.

A new branch of the Canadian Association of Stationary Engineers will be organized at Peterboro' this month with the following charter members: W. M. Foster, Engineer Bridge Works; John Morency, Peterboro' Porcelain & Carbon Co.; Wm Taylor, Can. Gen. Electric Co.; Ed Morency, Peterboro' Lock Works; Thos. Duncan, Can. Gen. Electric Co.; Wm Taylor, C.P.R. pumping station; Sylvester Potter, Chief Eng. Can. Gen. Electric Co.; Robt Bell, Peterboro' Porcelain & Carbon Co.; John Foden, Can. Gen. Electric Co. This branch would have been organized before but for the unexpected detention of Mr. Eddins in Montreal.

The annual meeting of the Ontario Association of Stationary Engineers was held in London on the 28th ult. The usual annual reports were adopted and all the officers of last year were re-elected to serve for another year, F. Robert being added to the board for the city of Ottawa.

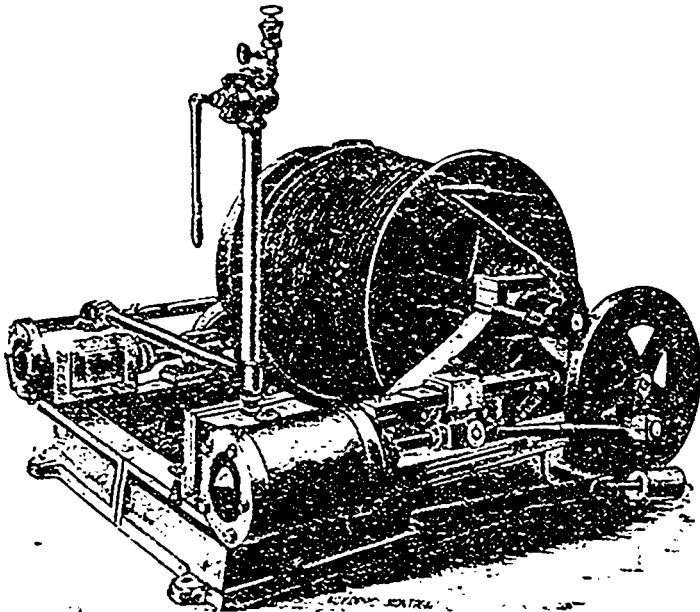
KINGSTON SCHOOL OF MINING.

From the report of the Kingston School of Mining it appears that the progress for the past year has been highly satisfactory. The number of mining students availing themselves of its opportunities was not large, but the school is a new one, and has hardly had time yet in which to become very well known. The prospects for the near future, however, are very encouraging. The total number of students attending the classes was 149, and the fees paid

amounted to about \$1,740. The "special classes" were a great success. Among these was a practical class for those who did not desire so much to undergo the course leading to the degree of Mining Engineer, as to get some knowledge in addition to that gained in the ordinary course of their experience as foremen, assayers, prospectors, etc. Another course of special lectures, illustrated by experiments and diagrams, was given at night for the benefit of those who could not attend during day. Another interesting feature was the holding of classes at other places, in order that persons residing some distance from Kingston should still be able to have the advantage of the school. The class at Marmora under this head proved a great success, and efforts are being made at Sudbury to have another held there.

Preparations are now being made to erect a mining laboratory at the school, to be equipped with a stamp mill, amalgamators and other apparatus. It is expected to be completed by the beginning of the session, October 1st. The school has acquired the Dominion exhibit of fossils shown at the World's Fair, Chicago, and also a part of the Ontario mineral exhibit.

THE CANADIAN ENGINEER, published at Toronto and Montreal, has been received. It is devoted to the interests of mining, locomotive, marine, sanitary and electrical engineering. It covers the field thoroughly, and is full of interesting articles gathered from all parts of the Dominion. As a representative of mechanical science, THE ENGINEER has commenced at home, and its neat make up shows that its mechanics are well skilled in the "art preservative of all arts." - *St. Louis (B. C.) Prospector.*



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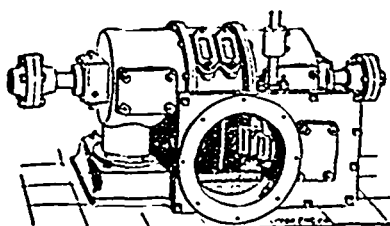
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L. A. VALLEE, C.E.

The following notice was received too late for insertion in the sketches of officers of the Canadian Society of Civil Engineers in last issue:—

Louis André Vallée was born in 1851, in the parish of Beauport, county Quebec, and was educated partly at Laval Normal School, Quebec, and by private tuition. From 1870 to 1872, he served on the Levis and Kennebec Railway, and the Sherbrooke, Eastern Townships & Kennebec Railway, and from 1872 to 1877 successfully filled the position of roadman, leveller and transit man, respectively, on the late North Shore Railway. He served as assistant and resident engineer in charge of works on the Q M O. A O Railway from 1877 to 1882, and from the latter date to 1885 as engineer in the Railway Department of the Province of Quebec. On 1st July, 1885, date of his permanent appointment as Government Railway Inspecting Engineer, to the present time, he has fulfilled the onerous and difficult duties devolving upon him to the utmost satisfaction of all concerned. Mr Vallée is a member of the council of the Canadian Society of Civil Engineers

SCHOOL OF PRACTICAL SCIENCE, TORONTO.

The following is the result of the recent annual examinations at the School of Practical Science, Toronto

First Year Civil Engineering Honors—W. F. Laing, J. A. Stewart, B.A. Pass—T. Martin, W. G. Parker, H. R. Crews, H. S. Carpenter, H. W. Proudfoot.

Mining Engineering Honors—J. W. Bain Pass—J. A. DeCew, C. B. Mollins, L. T. Burwash.

Mechanical and Electrical Engineering Honors—G. M. Campbell, H. V. Haight, G. Hartman, R. R. Shipe Pass—C. Macbeth, H. K. Wade, C. P. Fowler, C. K. Blackwood, H. C. Pense, E. F. Shupe, E. J. Sifton, W. C. Gurney, R. R. Lawrie, W. G. MacMillan, O. E. Harman, J. A. McMurchy, F. R. Wickson, J. W. Watson.

Architecture Prizeman—E. A. Forward Honors—E. A. Forward. Pass—F. G. McKay, C. G. McMaster, H. C. Baker.

Second Year—Civil Engineering Honors—W. W. Meadows.

Pass—F. W. Guernsey, J. Armstrong, J. S. Dobie, F. J. Robinson, E. J. Boswell, H. B. Sims

Mining Engineering Pass—C. W. McPherson.

Mechanical and Electrical Engineering Honors—A. E. Blackwood, G. Brebner, A. W. Connor, B.A.; J. McGowan, B.A.; I. E. Moore, B.A. Pass—H. L. McKinnon, W. M. Brodie, L. L. Brown, F. T. Stocking, W. N. McKay, H. S. Hull, R. C. C. Tremaine, G. E. Patterson, R. L. Gray, W. S. Hudspeth, R. G. Black.

Architecture Honors—A. H. Harkness Pass—R. J. Campbell

Third Year—Civil Engineering Honors—A. L. McTaggart. Pass—S. M. Johnson, A. E. Bergey, J. D. Shields, J. E. Jones, Angus Smith, H. Rolph

Mechanical and Electrical Engineering Honors—R. W. Angus, W. Minty Pass—A. K. Spotton, H. E. Job, C. J. Nicholson, A. T. Beauregard, W. A. Bucke, D. G. Boyd, N. M. Lash, W. J. Herald, A. C. Johnston

Architecture: Honors—J. A. Ewart Supplementals. Pass—A. C. Johnston, S. M. Johnson, A. Smith, Jones Herald, Boyd, Beauregard, Sims Dynamics—Campbell, Dobie, Hull, Gray, McKay.

A. A. Allan is allowed to complete his examination in September.

FIRE ENGINEERS' CONVENTION.

The following is the programme for the Convention of the National Association of Fire Engineers, to be held in the Windsor Hotel, Montreal, on August 14th to 17th. The topics to be discussed are:

The best plan to extinguish a fire in a cellar stored with oil when the only entrance to same is on the inside of the building. Chiefs J. A. Crawford, Benton Harbor, Mich.; C. F. Wall, Toledo, O.; Henry Heinmiller, Columbus, O.

The best plan for extinguishing a fire in the attic of a frame building. Should streams be thrown from both ends or holes through roof, or both? Chiefs E. W. Fiske, Mt. Vernon, N.Y.; J. R. Hopkins, Somerville, Mass.; J. O. Crawford, Benton Harbor, Mich.

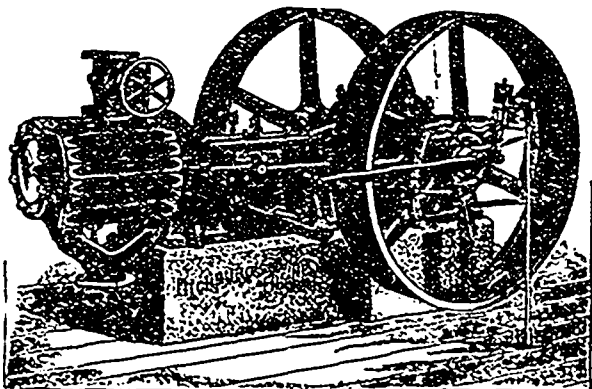
Should not a uniform coupling be adopted in cities within a

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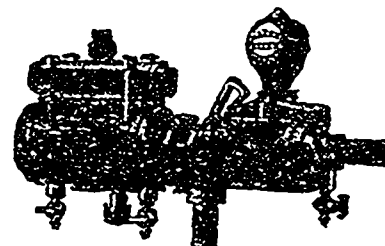
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radius of fifty miles, and where they are not of the same size and style, should not interchangeable couplings be provided? Chief W. C. Davoe, jr., Fall River, Mass.; John Stagg, Paterson, N.J.; W. G. Fuller, Richmond, Va.

Is it not the duty of cities and towns, provided with a system of waterworks, to place in the fire stations water gauges, that the fire department may at all times become familiar with the state of the water pressure? Chiefs T. T. Clewes, Jamestown, N.Y.; Geo. Kofflack, Mansfield, O., ex Chief F. E. Perkins, Burlington, Vt.; D. J. Swenie, Chicago; A. C. Leshure, Springfield, and J. R. Canterbury, Minneapolis

The proper location of gas-meters: Chief J. W. Dickenson, Cleveland, O.; Supt. Samuel Abbott, jr., Boston, Mass.; Chief F. P. Kroty, Lafayette, Ind.

The service and economy of fire patrols and salvage corps: Chief John C. Spencer, Jonesville, Wis.

Should not the size of hoses, nozzles, hydrants, and engines be increased to meet modern demand? Chief Jerry, Carleton, Sioux Falls, S.W.; J. A. Archibald, Cincinnati, O.; Robert Kiersted, Newark, N.J.

How best to handle brush and prairie fires threatening suburbs or residences beyond the reach of water: Chiefs A. H. Cameron, Butte, Montana, Robt. Willow, Lieut.-Col. Neb, Frank Zweirt, Yorktown, S.D.

How should buildings be constructed with a view to the least expansion by excessive heat? Chief Geo. C. Hale, Kansas City, Mo.

What tests should be required from a water company for renewal of contracts? Chief C. E. Bundel, Sharon, Pa.

At the request of Ald. Stevenson and Chief Benoit, of Montreal, Prof. J. T. Nicholson, on behalf of McGill University, will read a paper on "The best mode of setting steam fire engines.

Other "Outsiders" have consented to read papers on the following topics: "The modern fire department", "Theatre fire catastrophe", "The progress of electricity in municipalities", "Fire extinguishment in high buildings", "Continuation of danger of electric wires", "Slow burning mill construction," and "Dynamo currents as applied to fire alarms."

The Patent Review.

- 45,004 Thomas D. Jones, Algernon, Ill., nut lock.
 45,005 Gustavus G. Weigand, Des Moines, Iowa, ribbon needle.
 45,007 Ansel W. Fisher, Charlotte, Maine, thill coupler.
 45,008 Nicolas Wagener, Baltimore, Maryland, propeller wheel.
 45,010 Morgan Williams, Aspen, Colorado, wrench.
 45,012 John Tyler Hicks, Boston, Mass., cash register and account check.
 45,013 Anson K. Cross, Boston, Mass., method of correcting drawings.
 45,017 Frank F. Gobey, Winooski, Vermont, sharpener for calks.
 45,018 Carl Spiel, Cannstatt, Wurtemberg, Germany, hydrocarbon engine.
 45,019 Birney C. Batcheller, Philadelphia, Penn., process of and apparatus for drying brewers' grain.
 45,021 Theodore Guillaume, Mulheim-on-the-Rhine, Germany, electric cable.
 45,023 James D. Craig, Chicago, Ill., combination lock.
 45,025 Miles L. Clinton, Ithaca, N.Y., steam boiler.
 45,030 Charles R. Schmidt, Baltimore, Maryland, valve.
 45,031 Oliver H. Hicks, Chicago, Ill., electric device for operating doors.
 45,032 Pierre A. Moreau, Meung-sur-Loire, Loiret, France, method of making marble.
 45,033 Wm. A. Rife, Waynesboro, Virginia, hydraulic ram.

- 45,036 Albert Richard Whittal, Montreal, Quebec, Can.
 45,037 Samuel W. Rowell, Beaver Dam, Wis., grain drill.
 45,038 Lawrence George McKam, Toronto, Ont., method of refining oil.

GERMAN PATENTS.

Compiled at the patent and technical office of Brockhues & Co., Cologne, for THE CANADIAN ENGINEER. Information referring to these lists given free of cost to our subscribers.

Apparatus for cleaning steam-water outlet-pipes; G. Kessler and Jacob Rein, Hochel on the Maine.

Apparatus for preventing trains going at a very high speed from leaving the rails; F. Engel-Gros, Bâle.

Connection of rail-joints for portable field railways; Arthur Koppel, Berlin.

Electricity meter; Fred. Bentler, Cologne.

Automatic laterally detachable coupling for railway vehicles; Mihail Alexandrescu, Berlin

Multiple switch for telephones; Georg Ritter, Stuttgart.

Means for rendering impervious the joints in masonry allowing water to penetrate; Karl Rummle, Weldshuh.

Fire-tube bent at top for steam boilers; Gustav Streitz, Berlin.

Process for ornamenting metal objects with a polished and wear-resisting coating of aluminum; G. Menrer, Dresden.

Manufacture of carbons for arc lights; Dr. Rickmann and Rappe, Kalk, near Cologne.

PATENTS procured for Canada, United States, Great Britain, etc.
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