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For THE CANADIAN ENGINEER.

ROAD ENGINEERING.

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

(Concluded.)

The cost of road-making varies greatly in different localities, depending on the nature of the ground, on quality and accessibility of material, and on cost of labor and tools. For country gravel roads in Illinois the cost has been about nine hundred dollars per mile for a roadway 12 ft. wide with average depth of 10½ in. of gravel. The cost of gravel roads will vary from about 13 cents per square yard to as high as 50 cents and over. Broken stone roads will cost from about 30 cents per square yard (\$2,640 per mile of 16 ft. roadway) upwards, for roads constructed as described. Under favorable conditions the cost may be somewhat less than this. When stone has to be brought from a distance the cost is considerably increased.

Of earth roads and various other kinds of roads it is not the province of this paper to speak further, concerning itself, as it does, only with good roads as they are practicable in most localities. A properly made earth road may, however, be a very serviceable road for a large part of the year. It consists simply of a well-drained roadbed, as described, maintained as smooth as practicable. Frequent rolling will much benefit it. A plow should at no time be used on an earth roadway, as it breaks up the surface, which it will be difficult to get back to its former compactness.

In reconstruction of existing roads grades can often be eased, or eliminated, to great advantage. For improving them in general the same method is followed

as described for road construction. Drainage must be carefully rectified. An indifferent road, on being well drained, may serve as a good roadbed for a properly built one.

To get the best service out of any road, and the best returns for the money invested in its making, continuous maintenance is required. No road, however well built, or however carefully the materials for it have been selected, is proof against slight defects constantly developing. The economic course is to be at all times ready to promptly make good such defects, otherwise they soon become aggravated, and the road must be extensively repaired or rebuilt. Road maintenance consists of the removal of mud, excessive dust, and rubbish of any kind; the filling of ruts and depressions; the keeping clear of ditches, culverts, and the drainage system generally, so that drainage may be at all times uninterrupted; watering the surface in continued dry weather.

Mud is removed either with hoes or by means of road scrapers drawn by horses. All loose stones or gravel should be either raked into ruts or depressions or picked off the road and stored for use. No stone more than 2½ inches in greatest dimension should be allowed to remain on the road. The rake is one of the most useful tools in road making or maintenance. Ruts or depressions should be filled at once, and the regular transverse surface of the roadway should always be maintained. If the surface, where patching is required, is very hard, it should first be loosened with a pick, so that the new material will take hold. Gutters, ditches and culverts should be kept clear of weeds and rubbish at all seasons of the year. They should be especially gone over in the spring as soon as melting of the snow permits, and again before the fall rains. In long continued dry spells, watering is beneficial, not only as laying the dust, but as counteracting the extreme brittleness resulting from long drouth, and the consequent rapid wear of the roadway.

For all road maintenance material should be kept ready at hand. For gravel roads a few cubic yards of gravel, and for broken stone roads a like quantity of broken stone should be stored every eighth of a mile along a country highway. In towns such material should be kept as near by as is feasible, as it is required for filling ruts and depressions as fast as they appear. At least one laborer for every five miles is required for maintaining country roads. In towns there should be an organized maintenance force.

In repairing gravel roads it is best to apply the gravel in small quantities at a time, unless the surface has actually worn through. A layer of about two inches is generally best, in thicker layers the gravel is likely not to pack thoroughly, but to remain loose underneath, where it will then hold water. Six inches of gravel can be put on as cheaply in three layers as all in one, and a much better job will result.

The surfacing of broken stone roads will require to be renewed about once in four to six years. This should be done in as large sections as is convenient.

The stone is put on and compacted in the same manner as described for building the road. The tools used in road-making may be classed under tools for grading, draining tools, tools for excavating, tools for preparing material, and tools for laying and compacting the surface. For grading, besides picks and shovels, grading ploughs, scrapers, etc., there are used various kinds of mechanical graders, known as road machines. These have a rigid frame carried on four wheels and having, attached to it, a long curved blade, which is adjustable so that it can be raised or lowered, and set at any desired angle. Such a machine is very useful, both for bringing the road-bed surface to required shape, as also for scraping a road. Hammers used for breaking stone are generally of three sizes: Sledges, 5 lbs. and over; hand hammers, 3 to 5 lbs., and smaller ones $1\frac{1}{2}$ to 2 lbs. For measuring size of broken stone, ring gauges are used, of diameter equal to largest dimension of the stone wanted. There are many kinds of mechanical stone breakers or crushers, varying in capacity from 1 cub. yd. per hour to 20 and over. A good serviceable crusher, furnishing 5 to 8 cub. yds. of broken stone per hour, depending on quality of stone, requires about 15 H. P. to drive it, and costs \$750.00 to \$800.00. Such a crusher will do the work of about 35 men breaking stone by hand.

Rollers are also of many kinds. Steam rollers are the best, but a properly proportioned horse roller will do very good work. The Aveling & Porter, an English roller, is one of the best types of steam rollers. It has a wide roller, in two parts, for forward support, and two narrower ones, spaced outside of it, for the rear wheels, which are the drivers. This roller is made in 10, 15 and 20 ton sizes. The 15 ton gives about the best service for the amount of coal consumed. It has 48 in. diameter front roll, 72 in. drivers, is 87 in. wide and exerts a pressure of about 550 lbs. per running inch of width. A good steam roller will cost \$3,500 to \$4,000. Steam rollers will ascend grades of 17 per cent., and even steeper, on good surface.

Horse rollers have, preferably, the weight on one pair of rolls on one axle, and should have a small forward guide truck to which the horses are attached. The guide truck should be so arranged that it can be readily hooked on to, or be detached from, either end of the roller, so that this need not be turned around on the roadway. Horse rollers vary in weight from three tons to ten tons and over, and cost about \$100 per ton. Hand rammers are very useful tools for evening down small inequalities, &c. They are made either of iron, or of wood bound with iron, and vary in weight from twenty to fifty-five pounds, the latter being for use by two men. A framed straight edge, with adjustable cleats, spaced $1\frac{1}{2}$ to 2 feet apart, is required for shaping the transverse contour. The points of the cleats are set to the desired contour by setting them up or down on the straight edge. The required shape of the roadway is obtained when all the points touch the surface when the straight edge is held on it.

A NECESSARY DRAINAGE PROJECT FOR MANITOBA.

BY J. BAWDEN, KINGSTON.

Various schemes for utilizing the rapids of the Assiniboine River on the west end of Red River on the north of Winnipeg have been presented. Mr. Rutten, C.E., of Winnipeg, has devoted much attention to the project. A considerable fall in the Assiniboine, where it flows through the parish of St. James, is said to

afford a large water power. A fall in the Red River, in the parish of St. Andrews, a few miles north of Winnipeg, is occasionally discussed in connection with a scheme for building a lock to admit the passage of vessels from Lake Winnipeg to the city of that name. These projects become of perennial interest whenever the "crop prospects" of the Prairie Province raise the price of land, and a few cents addition to the price of wheat leads to large estimates of the future prosperity of our north-western plains. The value of a river basin at Winnipeg, with navigation from Lakes Manitoba and Winnipeg, has been lost sight of in the desire for increased railway facilities, and the accompanying chances for that silly gambling in land values in which so much of the enterprise of this country, like that of the United States, runs to pernicious seed.

The latter project has not been discussed, so far as the writer is aware, with a full comprehension of the facts. The most striking phenomenon confronts us at the outset of enquiry. The volume of water flowing in the Assiniboine River is at several points in its course very much larger than is discharged into the Red River at Winnipeg.

Prof. H. Y. Hind, in his Report of the Assiniboine and Saskatchewan Exploring Expedition, 1859, gives the following figures:—

VOLUME OF WATER IN THE ASSINIBOINE.		
	Cubic feet per hour.	Distance from Ft. Garry.
Lane's Post	5,702,400	22 miles.
Mouth of Little Souris	12,899,840	140 "
Opposite Mt. Ellice	9,979,200	280 "

The existence of one or more subterranean discharges into Lake Manitoba is alleged. An effort to drain a tract of savanne in the vicinity of Long Lake near Poplar Point Station, by cutting an outlet into the Assiniboine, has, in accordance with traditions of a contrary current there, proved abortive. Prof. Hind's report credits Rat River with carrying the freshets from the Assiniboine into Lake Manitoba. At page 71, he states that "down its valley the water of that river (the Assiniboine) during freshets, flows into Lake Manitoba, and by making a very shallow cut a permanent communication in time of high water could always be maintained.

Lake Manitoba is some 40 feet higher than Lake Winnipeg, in a distance of 40 miles measured across Shoal Lake. This lake and numerous ponds afford facilities for constructing a canal waterway between the larger lakes, the motion of which would, it is assumed, be of incalculable benefit to the Province.

Outside of the great savanne between these lakes there is comparatively little wet land west of the Red River. Settlement has not penetrated into this region, much of which is a morass, but one in which the canal mentioned would be an arterial drainage work. Can there be any doubt that over this vast "wet blanket" of country the great evaporation in progress in July and early August converts the region into a refrigerator whence icy currents move southward over the ripening wheat fields?

Arterial drainage offers the only means of checking the frost-generating influences of the extensive plain between Lakes Manitoba and Winnipeg. The erection of a dam for hydraulic purposes is not only unlikely to win any revenue from imagined mills; but is very likely to increase the damage from frost by the maintenance of subterranean backwater. At the same time, it will be unwise to divert any large part of the

waters of the Assiniboine into Lake Manitoba, without some check upon the discharge of the Red River, such as may be best effected at the rapids in the parish of St. Andrews. A dam and lock at this point will create the necessary river basin at Winnipeg.

The reclamation of some four thousand square miles of excellent land, now too wet for cultivation, well merits the immediate attention of Mr. Greenway's government. The future of silent leagues of prairie has been given over to the landgrabber, and the homeseeker is invited to move on from Manitoba to the cheaper land in the territories. It will be a fine stroke of enterprise to divert a part of the waters of the Assiniboine by canal into Lake Manitoba, and thence by a canal from this lake into Lake Winnipeg, to drain an immense area of fertile soil and mitigate the rigors of the climate. The enterprise will be all the more successful if the land reclaimed shall be thrown open to free settlement.

struction as to enable them to be reversed, thereby maintaining the alignment of the spindle. The tail-stock has means of adjustment for taper work, and is secured to the bed by two belts. The saddle has a bearing of 32 inches on the V's, and has suitable belt slots for securing work. The cross slide is of unusual length, and is fitted with a wedge jib with screw adjustment, and has a plain tool block and graduated half compound rest. The tool post admits a tool $\frac{3}{4} \times 1\frac{1}{2}$ in. While using the power cross feed the saddle is secured to the bed by a binder. The lead screw is of steel $1\frac{1}{8}$ inches diameter and $\frac{1}{2}$ -inch pitch, the nut being operated from the front side of saddle. All the apron gearing is of heavy pitch, the rack pinion being of steel; all the feeds are automatic. The feed rod and lead screw are each driven by independent gearing. A large face-plate, small driver, steady head, follow rest, and complete set of change gearing and wrenches are supplied.



Manitoba wants men rather than capital for the development of her vast agricultural wealth. Capital has sufficiently invited to sit down in the prairie province, with the result that it holds millions of unproductive acres, and waits to prey upon the vitals of the laborer who alone can make the possession productive.

ENGINE LATHE.

M. 54. SWINGS 24 INCHES.

This lathe can be supplied of any length up to 24 feet. The bed is of heavy construction throughout and is of ample width across shears. It swings 24 inches over shears, 14 inches over saddle, and with a 12 foot bed admits $7\frac{1}{2}$ feet between centres. The cone has four speeds for $3\frac{1}{2}$ -inch belt, the largest being 14 inches and the smallest $5\frac{1}{2}$ inches diameter, and with the back gear gives eight changes of speed. The spindle is of hammered steel, and runs in bronze bushes of such con-

The countershaft has one fast and two loose pulleys 15 inches diameter for $3\frac{1}{2}$ -inch belt, and should make 140 revolutions per minute. The weight of this lathe is 5,500 lbs. This lathe is manufactured by John Bertram & Sons, machine tool makers, Dundas, Ont.

For THE CANADIAN ENGINEER.

FROM IRON ORE TO STEEL.

A SKETCH OF IRON MINING, AND MANUFACTURING IN PICTOU COUNTY, NOVA SCOTIA.

BY JOSEPH DIX FRASER, FERRONA, N. S.

In presenting the following paper on Iron Ore, Pig Iron and Steel in Pictou County, it is my intention: First, to give a short historical sketch of the early iron smelting in that county. Secondly, to describe the conversion of iron ore into pig iron. Thirdly, the converting of pig iron into steel.

(1st.) From James Macdonald, of Bridgeville, who is 86 years old, I learned that in the year 1828, while

the late Rev. Dr. McGregor was making one of his usual visits to the people along the banks of the East River, he discovered what afterwards proved to be iron ore, and after consulting with Richard Smith, manager of the General Mining Association at Albion Mines, they started in search of the supposed mineral, which, when found, was sampled, and a barrel of it, taken principally from the Grant & Macdonald farms at Bridgeville, was sent over to the old country to be analyzed. It was not very long before a most favorable report was received, accompanied by a snuff box, razor and a pen-knife, made from the sample sent.

H. S. Poole, manager of the Acadia Coal Company, says that on receipt of the report the General Mining Association voted £1,000 for the erection of a blast furnace, which was erected at Albion mines, on the north side of the foundry, in front of an archway now bricked up. The furnace, according to Roderick MacKay, of Fox Brook, and who has seen 85 winters, was forty feet high and eight feet in diameter at the boshes. It was lined to the thickness of one foot with fire-brick, backed with a course of stretchers, between which there was a space of four inches filled with sand. The casing was some twenty inches thick, built with red brick and stone, and hooped with large iron bands. An inclined way with iron rails led to the top of the furnace for charging purposes. The ore used was mined at what is now known as Iron Ore Post Office, where, in some places, it is naturally exposed. This ore, known as red hematite, was mixed with some brown hematite taken from the Fraser "Saddler" farm at Bridgeville; it was then taken down to Albion Mines by way of McLellan's Brook. The foremen employed in mining the ores used were Robert Davidson, Alexander Purvis, John English and James McDonald, all of Bridgeville.

The limestone used was taken from the farm of the late Thomas MacKenzie, at Riverton, and the coal from the old bye pit, near the present Ford pit. The blast for the furnace was taken from the foundry engine. This engine was erected in 1828 and continued to be used until 1872, when new machine shops were built.

The fall of 1829 saw everything in readiness and a start was made, but great difficulty was experienced in getting the metal to flow, but after many failures success crowned their efforts. The furnaceman in charge, one Jerry Quinley, an Irishman by birth, was brought out from the Old Country, and so far as I can learn seems to have been an "old hand" at furnace work. He was a low set man, with scars and burns from head to foot, but he had that bad habit, so prevalent among men, the free use of bad language. Mr. Mackay says that he was the only man that would face the hot metal as it flowed from the furnace into the moulds or beds made of sand. Seven or eight tons a day was considered a good output, but the iron made did not come up to the expectations of the promoters, it being hard and very difficult to work. The trouble lay principally in the insufficient amount of silicon in the iron.

After having made some fifty tons, it is said that one night the men got drunk and left the furnace to take care of itself, which it did for all time to come, for they found on resuming work that the furnace was cold, and the metal in one solid mass, or as a furnaceman would say, "all frozen up." An attempt was made to re-heat her, but in vain, and thus ended the working of the first blast furnace in Pictou county.

In 1885 it was taken down and a large coal fire built around the mass of iron, and as it became heated water was thrown upon it, breaking it up into small cakes; in this manner the iron was removed. The discovery of gold in 1860 led to a demand for hard iron, and we are informed that some very superior stamp-heads were made from this old mass, and current report confirms Prof. How's statement that "stampers of a quartz mill at Waverley made of it, had been pronounced to be ten times more durable than Belgian iron." From a sample of this old iron I obtained the following analysis: Silicon, 0.409; manganese, 0.504; sulphur, 1.238; phosphorus, 0.788; graphite carbon, 0.668; combined, 1.295; metallic iron, 95.098 per cent.

In addition to the plant referred to, according to Mr. Poole, preparations were made for operating on a more extended scale. A blowing engine was imported, the air-cylinder of which remained lying on the bank of the river where it had been landed over half a century before, until 1884, when it was broken up; but the steam cylinder and beam were utilized in Gordon's pumping engine, at the bye pit of the second lift of workings, afterwards known as the "Crushed Mines;" and the blast pipes found service as a conduit for the first fill on the Albion Mine Railroad below New Glasgow, where, doubtless, they may still be found.

From the failure of the furnace in 1829 until 1875 no definite work was accomplished in developing the iron resources of the East River, but during these years the young men saw visions and the old men dreamed dreams of the time when blast furnaces would be erected along the banks of the river. In 1875 we find in the Dominion Statutes, vol. 3, chap. 91, "An Act to incorporate the Pictou Coal and Iron Company, for the purpose of mining coal and iron and for manufacturing iron in its various branches. Also to construct a railway or tramway either of wood or iron from its mines or deposits in the County of Pictou to some point or junction with the I.C. Railway, at or near Hopewell."

Extensive explorations were carried on under the supervision of Dr. (now Sir William) Dawson, and for several years later by Dr. Gilpin. Valuable discoveries were made of spathic, specular, red and brown hematite ores, varying from five to thirty feet in thickness, and from 45 to 60 per cent. in metallic iron; but notwithstanding the highly favored reports, both practical and analytical, the Pictou Coal and Iron Co could not raise sufficient capital; progress was stayed, and the once bright prospect faded away.

In 1882 Thomas Burrows, having on his mind the building of a furnace, in order to make steel direct from the ore, bought a plot of ground at St. Paul's, threw up trenches, set prospectors and miners to work mining and dragging ore. Speaking afterwards of his failure, he says: "New parties then entered the field, and, by changing the course of the river, cut off my supply of water, and blasted my hopes forever."

As we look back at the progress we are making, our hearts beat faster; we see capitalists growing more and more sanguine, for it was in 1885 that J. H. Bartlett became interested, and through his untiring efforts a company was formed to develop our mines. Analyses of our ores were laid before English and American capitalists, but, I regret to say, without success; they were afraid to invest their money in our country. But why? They must have known that within a radius of 15 miles coal, limestone, ore, a water supply, and everything required to make good and cheap iron could be obtained.

With such mineral wealth, and with men who devote both time and money for a good cause, success must eventually come, and come it did, for in 1888 the N. S. Midland Railway and Iron, and N. G. Iron, Coal and Railway Companies were formed. But without going into details, it is only necessary to say that, after working some six months, the Midland Railway and Iron Company stopped work, and up to date have never seen fit to resume it.

On the 16th day of April, 1888, an Act was passed in the Provincial Parliament to incorporate the New Glasgow Iron, Coal and Railway Co., Ltd., at Ferrona, N. S., and from that time the work was pushed forward. Mines were bought and leased at Springville, Bridgeville, Black Rock, and various places. In Pictou and Colchester counties prospectors were set to work, and miners dug ore as fast as possible. The actual work at Ferrona commenced in April, 1891, and was put in operation Aug. 25th, 1892. The works comprise the following departments: A complete railway system 12½ miles long, connecting the ore and limestone deposits with the furnace plant and I. C. Railway at Ferrona Junction; a complete coal washing plant; 55 retort coke ovens (Benard's system); a blast furnace of modern design, and storehouses, blacksmith and carpenter shops. Having traced the furnace operations from the earliest till the present time, I will in the second paper describe the conversion of iron ore into pig iron.

(Concluded in next issue.)

THE RELATION OF THE DRAWING OFFICE TO THE SHOP IN MANUFACTURE.

BY A. W. ROBINSON, SOUTH MILWAUKEE, WIS.

[A paper read before the Convention of the American Society of Mechanical Engineers at Montreal.]

The purpose of this paper is to describe the system employed by the writer in the drawing office of his company, in the hope that some of the points may be of use to members of the Society.

The drawing office is the origin of thought and action for the entire works, as far as design and construction of its product are concerned. It is responsible for the accuracy of its drawings and orders, and its authority should be unquestioned and above reproach in the shop. The shopmen should habitually trust and adhere to their drawings, and their faith should not prove to be misplaced. To maintain this there must be unceasing care and vigilance on the part of the office, and full adaptation to the shop needs and capabilities. It goes without saying that every drawing office, whether employing one draughtsman or a hundred, should have its system and methods adapted to the needs of the establishment with which it is connected. As these needs vary with each case, it is not to be supposed that the system about to be described will be of universal application. It will be well, then, to state in a general way the conditions which this system is intended to meet. We will assume, therefore, that the office employs from ten to fifteen skilled draughtsmen, and is in connection with a manufacturing establishment, doing a general engineering business in which there is comparatively little duplication of orders, and in which single orders frequently involve a large amount of detail, of which it is essential to keep exact records. It is also assumed that the drawing office is invested with the sole right and authority to issue orders to the shop for all new work, or all work in which there are changes and variations from previous similar work.

The practice of issuing verbal orders or directions for the conduct of work is productive of misunderstanding and confusion. When no evidence of authority exists no responsibility can be fixed. It is therefore advisable to have a system of written orders to all departments whereby the duty of those concerned is clearly defined, and the responsibility can be fixed for dereliction of duty.

SHOP ORDERS.—An order being once entered on the books of the company, the procedure is as follows: The business office issues a written order to both the drawing office and the shop upon a blank which merely states the general name of the machine, the time of delivery promised, and the number of specifications to be worked to, if any, and the number by which the order is to be known. It is the duty of the drawing office to prepare such specifications beforehand when necessary. On the receipt of these orders in the shop, if it be a repair or duplicate of something already made, so that the shop superintendent has the information by which to execute it, he does so. If, however, it is new, or in any sense special work, he cannot proceed until the orders come down from the drawing office.

The drawing office issues orders upon the pattern shop and foundry by means of blanks headed "foundry" or "pattern shop," as the case may be, arranged thus:

B. S. S. & D. CO. ENGINEERING DEPARTMENT.

FOUNDRY ORDER.

ORDER NO.	DATE.	DRAFTSMAN.
	189	
Countersigned by		Examined by

These are manifolded in triplicate, and can be made out by any draughtsman to whom the job is delegated, but must be signed by the chief engineer, or in his absence, the chief draughtsman. The two copies are then sent down to the shop superintendent's office, who keeps one on file for his own reference and information, and immediately sends the other to the foreman of the department for which it is intended. In this way the shop superintendent retains control of his men in the different departments, and has knowledge of the orders that are issued. He alone is responsible for their proper execution, and undue interference of the draughtsman with the foremen or workmen is obviated.

It is also the duty of the drawing office to order all raw material for new and special work that is not regularly kept in stock. This is done by blank as follows:

B. S. S. & D. CO. ENGINEERING DEPARTMENT.

DATE.	Please order the following
189	for order No.
Ship	
Draftsman	Countersigned, Chief Engineer.

These are simply requisitions on the business office, and the copy goes to the storekeeper as a statement

that the articles noted have been this day ordered. He will therefore be expecting them, and on their receipt will at once know for what order they are intended. His copy of the manifold reads "The following material has this day been ordered for No. —."

Written orders are not issued from the drawing office to any other departments, except the pattern shop and foundry. Drawings and sketch sheets are issued to the other departments, as machine, smith, and erecting shops, etc. These pass through the hands of the shop superintendent, and in themselves constitute an order to make what they represent or call for, provided that they are covered by the original general order from the business office and bear the same order number.

By means of these written orders to each department, each foreman knows definitely what work he has on hand, and all responsibilities for errors or delinquencies are at once traceable to the culprit.

The shop superintendent is also empowered to issue written orders to his foremen in all departments, for all work which does not require information from or the authority of the drawing office. For these he uses his own blanks—those of the drawing office being labelled "Engineering Department."

It frequently happens that on large orders involving much detail, it is desirable to push the construction of parts as fast as they are determined upon before the completion of the general design. In these days of urgency and high pressure this is almost a necessary evil, but should be pursued with caution in the drawing office, lest difficulty be found in fitting the later part of the design to the earlier. Under this system of written orders the parts can be ordered in as fast as they are ready, even though the shop superintendent is as yet uninformed as to the balance of it, and does not know of what the complete order is to consist.

When the drawing office work on the order is completed an order list is made out and typewritten in duplicate. The order list enumerates in detail all the items making up the complete order, and is divided up into headings such as (1) castings, (2) forgings, (3) miscellaneous, (4) special material ordered outside, and so on. For each item is given a reference number of the drawing or sketch sheet on which it is shown, and it is or should be shown thereon so fully and definitely that no further questions need be asked. This order list is essential: 1st, to inform the shop definitely of what the work consists; 2nd, to refer the shop to a source of information concerning each and every item; 3rd, to form a shipping list so that in shipment nothing will be overlooked that should be sent; 4th, to form a permanent record by which repairs may be readily identified, and from which future machines may be compiled or adapted. These order lists are press copied in a book for the purpose.

DRAWINGS.—The primary function of a shop drawing is to answer the shopman's questions, and indeed it may be said that this is its only function. There are certain things connected with the material, form, dimensions, finishing, fitting and erecting of a machine and each part of it that each department needs to know. Sometimes in simple cases the various processes of pattern-making, finishing and erecting can be defined on one drawing, and in other cases separate drawings containing separate information for the different processes are demanded. It is important to have all the necessary information conveyed on a drawing in a

direct and legible manner, and that the views be so chosen as to represent the object in the simplest way. Let the draughtsman, on beginning to make a shop drawing, say to himself, "Now what does the fellow who is to make this want to know," and then let him put down just that information and no more, but be sure and get it all on. Refrain from all superfluous lines and marks, and make the drawings so plain that "he who runs may read" them.

The mere ability to make lines and circles and projections is really the least important and least valuable part of a draughtsman's skill. Neatness and accuracy of drawing is desirable, but if it is obtained with the expenditure of an undue amount of time, and does not carry with it a practical knowledge of shop needs and shop processes, it ceases to be a virtue.

The following set of rules for the drawing office have been found to be useful and to work well. They contain some points that a good draughtsman ought to know, but they are incorporated as reminders, and as being necessary to preserve uniformity of practice among changing draughtsmen.

DRAWING OFFICE RULES.

Shop Drawings.

1. All drawings shall be of the uniform size of 23 in. x 36 in.

2. All detail drawings for use in the shop shall consist of whole standard sheets, half standard sheets, and sketch sheets. Half sheets shall be 18 in. x 23 in., formed by ruling a line across the centre of standard size sheets as filed, the blue prints only to be cut, and mounted and varnished when necessary.

3. The sketch sheets shall be 8 in. x 11 in., and shall be used for all simple details, forgings, for bolt lists, and for all temporary work capable of being shown in this way. All standard machines shall be fully drawn out and blue printed. The sketch sheets shall be made with indelible pencil or copying ink and press copied in the book for the purpose. The information on the sketch sheets shall be as complete as that specified for drawings.

Character of Shop Drawings.

4. A shop drawing is to be considered as an order or instructions to the shop, and not merely as a statement or illustration. For this purpose it must convey clearly all the information needed to make and finish the article.

5. Every dimension necessary to the execution of the work is to be clearly stated by figures on the drawing, so that no measurement need be taken in the shop by scale. All measurements to be given with reference to the base or starting-point from which the work should be laid out. In comparatively simple constructions the several parts are to be shown together complete, although each part must be figured independently, and details supplied, if necessary, by sketch sheet. In more complicated forms each part should be detailed by itself and a general drawing made showing the thing complete. No details should be sent out without putting them together on a drawing, or taking them from a general drawing, so as to insure their fitness. Unnecessary duplication of views to be avoided, except in display or advertising drawings.

6. All figured dimensions on drawings to be plain, round vertical figures, not less than $\frac{1}{8}$ inch high, and formed by a line of uniform width and sufficiently heavy to insure printing well. No thin, sloping, or doubtful figures or diagonal-barred fractions will be tolerated.

All figured dimensions below 3 feet to be expressed in inches.

7. All centre lines to be alternate dot and dash in fine black line. All dimension lines to be in continuous red lines, with a central space for the figure, and of such strength as to show on blue print more faintly than lines of drawing. Lines of drawing to be bold and clearly defined in proportion to the scale, and to be shade-lined by making the right-hand and bottom lines heavier. No ornamental shading or other "frills" allowed on shop drawings.

Title.

8. Every drawing, whether whole or half-sheet, shall have the title, date and number of the sheet placed in the lower righthand corner. One man will be detailed for this duty, to secure uniformity.

9. The name of the drawing, as given in the title, is invariably to consist of two divisions in one line separated by a hyphen. The first division is to state the general name of the thing or machine, and the second division is to clearly designate the part or parts represented (or if a general view, should so state). The wording of the titles should be submitted to the chief engineer or head-draftsman for approval.

Drawing Symbols.

10. Detail shop drawings should state:—

(1) The pattern number of every casting in plain figures of larger size than the dimension figures.

(2) The number of each piece required for one set. This should be written in one word (not figures) and followed by symbol of material.

(3) The material of which the parts so ordered are made, using symbols as follows:—

C. I.—Cast Iron.	Bs.—Brass.
W. I.—Wrought Iron.	Bz.—Bronze.
C. S.—Cast Steel.	Bbt.—Babbitt.
M. S.—Machinery Steel.	V. F.—Vulcanized Fibre.
H. S.—Hammered Steel.	C. R. S.—Cold Rolled Steel.

Other materials write full name.

(4) The kind of finish on each of the different parts will be indicated by a letter preceding the figured dimensions, as follows:—

F.—Means "Finish," and indicates that the surfaces to which it applies are to be machined or dressed in suitable manner to size stated.

F. B.—Means "Finished Bright," or polished.

G. F.—Means "Grinding Finish," and indicates that the only finish to be allowed is that necessary for grinding.

When no letter precedes the figured dimension it is understood that the part is to be left black or rough. In cases where finish might be presumed, but not required, follow the figured dimension by the word "Cast" if a casting, and "Rough" if a forging.

(5) A reference list of sketch sheets that may be used for detail illustrations.

Sketch Books.

11. Each draftsman will be supplied with a sketch-book by the company, and in which he shall make all his notes, calculations and data referring to his work, and under no circumstances shall original work be done on loose sheets and transcribed into these books. No effort should be made at neatness or nicety in these books, but each entry should invariably be commenced with the name of the thing and the date, and full notes made of data on which the calculations were based, and the results obtained clearly stated. These books are to be the property of the company.

Index for Drawings.

12. An index book for drawings will be kept in the drawing office by the clerk. This book will be divided into as many divisions as there are drawers, with provision for indexing 100 drawings in each drawer. The names of the drawings will be added to the various divisions according to their classification. The system of numbering shall be as follows:

13. Each drawer shall be numbered consecutively, and shall contain drawings devoted to a certain class of work, which shall be indicated on the drawer label. The drawing number shall consist of two or more digits with a decimal point between them. The whole number shall indicate the number of the drawer, and the figures after the decimal point shall indicate the serial number of the drawing in that drawer. For example: Drawing No. 5.16 is the 16th sheet in drawer No. 5, and Drawing No. 75.96 is the 96th sheet in Drawer No. 75. Not more than ninety-nine drawings shall be put in one drawer, except in exceptional cases.

14. Sketch sheets will bear the number of the letter and page of the letter book, preceded by the letter S, to distinguish them from drawings, and will be indexed in their own impression book, but not in the drawing index book. They will be referred to on general drawing of which they are details, and will also bear the number of such drawing.

15. When making a new drawing the draftsman will apply to the clerk for a number, and will be allotted the first unappropriated number in the division to which the drawing will belong.

16. On completion of every drawing or sketch sheet it must be examined and initialed by the engineer before being issued, and the following entries made in books kept for the purpose:

(A) Record of blue prints and sketch sheets issued to shop, giving date, number, and title.

(B) Drawing index.—Record in daybook the number, title, and sub-title, draftsman and date.

(C) Pattern index.—Record in daybook the number, classification, and correct name of patterns, with remarks and date.

Each draftsman will see that these entries are properly made.

Patterns.

17. All patterns shall be numbered with the number of the drawing from which they are first made, followed by a letter indicating its serial on that drawing. For example, if four patterns are shown in detail on drawing No. 36.50, the patterns shall be numbered 36 50A, 36 50B, 36 50C, 36 50D. When existing patterns are utilized in a new design or machine, their original number is to be noted on the drawing on which they are shown in their new employment.

18. Upon receiving formal notice from the pattern shop that patterns are ready for inspection, the draftsman connected with the order shall examine same and issue foundry order for the casting. The date of inspection and name of inspector shall be entered upon the pattern maker's report at the time of making such inspection.

The sketch sheets referred to in these rules are 8 x 11 inches in size. They are of stiff cardboard, and the heading is printed in copying ink. The sketch is made with an aniline copying pencil, the "Eagle No. 2" in wood being used. They are press-copied in books for the purpose, and several books are used for different classifications of work. The books are of slightly

heavier tissue paper than is commonly used for correspondence, and have 500 leaves each, numbered consecutively throughout the series, so that the number of a sketch sheet is never duplicated. In this system there are six books for copying sketch sheets, representing as many classes of work, and these divisions will readily suggest themselves as required for any particular case.

The use of these sketch sheets is especially for work which does not require to be often duplicated, and for giving quick dispatch to emergency work. A free-hand sketch can be made, copied, and issued in this way in ten minutes, while the regular process of drawing, tracing, blue printing, and waiting for the latter to dry, or the sun to shine, may consume hours. They have the additional advantage of being more convenient to handle and file away in the shop than blue prints, and they save multiplication of tracings and consequent drawer space. The copies being in book form cannot be lost and are easily indexed and consulted. Sketch sheets are convenient for rapid detailing of forging and small parts, and such parts need, therefore, to be merely indicated on the general or erecting plan, and reference numbers given of the sketch sheets. The sketch sheets will also all appear as items in the order list.

In addition to the stiff card sketch sheet, it is convenient to have a "Drawing Office Memorandum" blank. This is a copying-ink heading printed on a sheet of letter paper, and is used for order lists and all sketch matter sent abroad from the drawing office.

After copying, the sketch sheet, if for permanent use, is sized with a mucilage, composed of gum tragacanth and water, and then varnished with white shellac and alcohol. The sizing is to keep the lines of the sketch from running while varnishing.

Two necessary articles of office furniture are the drawing table and the blue-print frame. So many excellent forms of these have been devised that it seems hardly necessary to refer to them in this connection, but sometime hereafter occasion will be taken to describe types which have the merit of cheapness and effectiveness.

It is our practice not to finish original drawings, but to trace from them on tracing cloth. These tracings are used only to print from and are filed away in a fire-proof vault. Two prints are made of each tracing as soon as finished, one for the shop (or more if necessary) and one to file away in the drawers of the office. These drawers are 24 inches x 38 inches x 2 inches, and are each calculated to hold a maximum of 100 prints. In this way the tracings are preserved from risk of fire and loss and from the wear of frequent handling.

As a rule each draughtsman makes his own tracings, and only skilled draughtsmen are employed. The writer does not advocate the employment of cheap draughtsmen to trace shop drawings from the originals of the designer. If this is done the designer must finish his original to entire completeness before turning it over to the tracer, thus consuming additional time and running more risk of errors and omissions than if he traced it himself. A skillful draughtsman will merely block out his entire work on the original and give his whole thought to the perfection of his design. In the tracing he can re-arrange his drawing if necessary, and the time occupied in tracing is usually much less than that employed in working out and perfecting the design, and a draughtsman, worth \$120 per month, will usually trace twice as fast as one worth \$60, and do it better.

The titles on drawings are mainly done by rubber stamps giving the name of the company, the number of the drawing, and having spaces for the insertion of name, date and scale.

Some experimenting was done to find a suitable ink for tracing cloth. Printers' ink was tried, but it rubs off and does not dry satisfactorily. A special lithographic ink is used, which is similar to printers' ink, but with the addition of a dryer. It is applied to the stamp by a composition roller in similar manner to printers' ink and gives a black impression which blue prints well. The number stamp has movable type.

As a rule it pays to employ only high-class labor in the drawing office. A draughtsman puts his own impress on his work, his individuality goes into it, even if closely supervised, and it is upon the perfection of detail that the success or failure of a new design mainly depends; it is important that the draughtsman entrusted with it shall have the necessary skill and ability.

We have appliances for testing the efficiency of almost every known mechanism, but who can measure the efficiency of a draughtsman. We can appreciate the economic value of good steam distribution and the like, but too often is the efficiency of the draughtsman neglected, and thousands of dollars spent in the construction of work which would have yielded much better results if a little more brains had been used in its design.

In conclusion, the writer would say: Do not have so much system that it is difficult to work to or burdensome to carry out. A few simple rules, faithfully adhered to, are better than the most elaborate system which is loosely or imperfectly carried out. The object of a system is to define the duties of each man and to fix the responsibility of dereliction of duty.

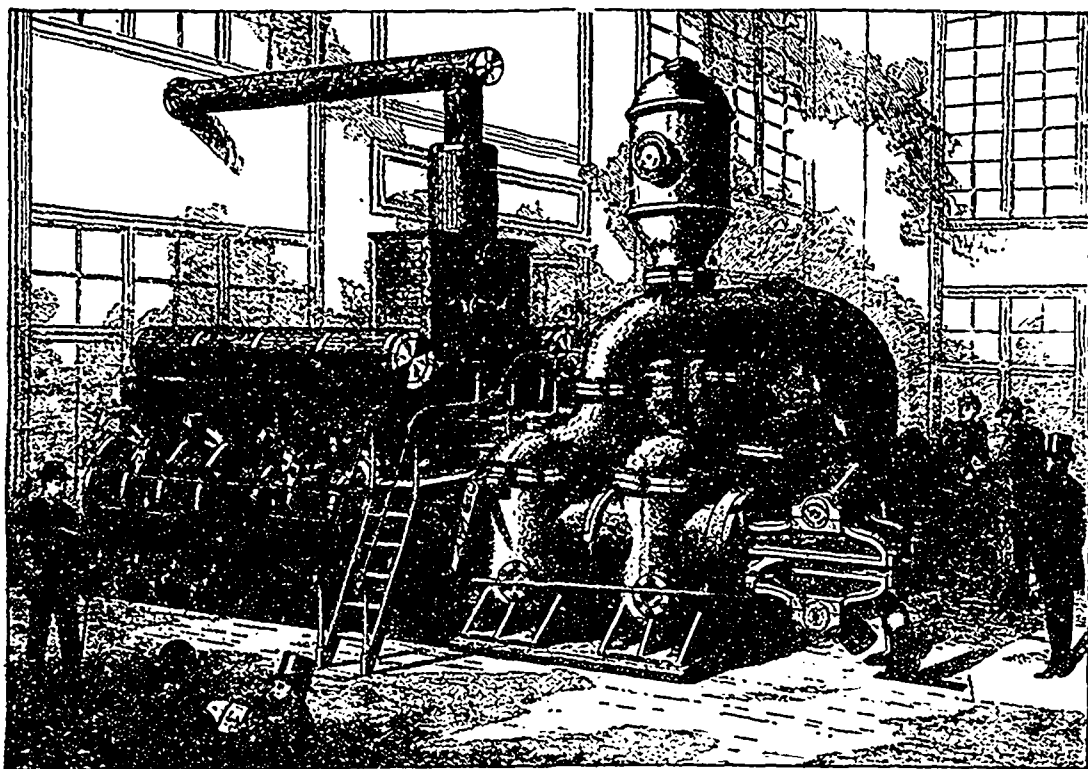
MONTREAL WATERWORKS IMPROVEMENTS.

The large new pumping engine and battery of boilers for the Montreal waterworks, referred to in recent numbers, have been installed, and the pumps were tested within the last few days by Prof. J. T. Nicolson, of McGill College, and J. E. Vanier, hydraulic engineer, of Montreal. The figures of the official test were not officially passed up to the time of going to press, but we are in a position to say that the tests were highly satisfactory. This addition to the equipment of the Montreal waterworks gives a steam-pumping capacity of 28,000,000 gallons and a water-pumping capacity of 9,000,000 gallons per twenty-four hours. With the present main pipes it would not be practicable to pump a total of 37,000,000 gallons, the full capacity of the engines, but the power is there in case of necessity or in case of accident to one of the engines. About the full capacity of the steam-pumping plant can be pumped if necessary under existing conditions, but it would not be safe to send more than 25,000,000 to 28,000,000 gallons per day through the present mains. Under the direction of A. Davis, superintendent of waterworks, a new section pipe has also been put in, so that pumping direct from the aqueduct may be done when the settling pond is closed off, thus providing an additional security against possible accident.

The new engine referred to is a Worthington High Duty Engine, and is illustrated herewith. It is installed at the low level pumping station. The test made by Prof. Nicolson and Mr. Vanier was conducted strictly in accordance with the rules laid down by the American

Society of Mechanical Engineers, and consisted of a preliminary run to determine the average temperatures of the feed water, etc., under regular working condition, and a longer run, during which the regular system was disarranged so as to allow the feed water to be weighed in tanks and supplied to the boilers cold. All the scales, gauges and thermometers were carefully tested at McGill College both before and after the trial, and every precaution was taken to secure accurate results. The official report of the test has not yet been completed, but we hope to be able to present it in our next issue. The engine under consideration was purchased by the city of Montreal while performing service with their other engines in the Worthington pumping station at the World's Fair at Chicago last summer, in supplying water for MacMonnie's electrical fountains in front of the Administration building, together with the other fountains located about the grounds, and was also held in reserve at all times for fire protection. It is an exact duplicate of one recently supplied by the Worthington company for

The new engine has two high pressure cylinders 25 in. diam., two low pressure cylinders 50 in. diam., and two double acting water plungers 27½ in. diam., all of 38 in. stroke. The working capacity is about 10,000,000 gals. per day. The horizontal air pumps are placed below the steam cylinders, and are worked by beams from the outside ends of the piston rods. The condenser is of the jet type and draws its supply of water directly from the pump well. The main delivery passes in common with that from the other engines at the station, and the waterpower pumps up to the low level reservoir, and the suction is drawn from the basin or headrace of the dam. The valve motive is somewhat similar to the Corliss type, having a cut-off system separate from the main valve motion. The main valve motion is worked from opposite sides of the engine, while the cut-off valves are worked from their own side. The links which drive both main and cut-off valves are connected to the piston-rod at a point beyond the water-plungers, so that if anything happens to the main engine which would cause the breaking of a piston-rod the engine



the waterworks of the city of Lowell, Mass., and is of the same general type as is to be found in most of the large cities of the United States. The most important feature of modern interest is the High Duty attachment, which was introduced by the Worthington company eight years ago, and enables the use of steam in a direct acting engine at as high a rate of expansion as in any form of fly-wheel engine. This principle is regarded by engineers as being one of the greatest advances in steam practice since the time of Watt, and attracted much attention at the Paris Exposition in 1889, as well as in Chicago. It has been widely introduced on this continent and in Europe for all kinds of pumping machinery, and has shown a saving of from 40 to 50 per cent. over the old type of direct acting engine, without departing from those features which insure reliability and safety. The engine just completed is the fourth Worthington to be placed in the Montreal waterworks, and the second to be supplied with the High Duty attachment, the old High Duty now having been in continuous operation for over seventeen years.

would immediately come to a standstill, since the valves would cease to move. The engine is neat and compact in appearance. The steam end is logged over all with highly polished black walnut, secured by brass bands, and on the whole the taxpayers of the city of Montreal should be congratulated upon having secured such a high class type of modern machinery, reflecting most favorably on the ability and far-sightedness of their public officials. R. H. Buchanan & Co., Montreal, are H. R. Worthington's representatives in Canada, and this department is ably represented by Wm. Perry, Messrs. Buchanan & Co.'s hydraulic engineer.

The steam for the new Worthington Pump at the Montreal waterworks is supplied by a battery of 3 Heine Safety Water Tube Boilers of 200 h.p. each, aggregating 600 h.p.—an exact duplicate of the battery supplied by the same maker, George Brush, proprietor of the Eagle Foundry, in 1838, for the old Worthington Engine, and which has been in use ever since without repair of any kind.

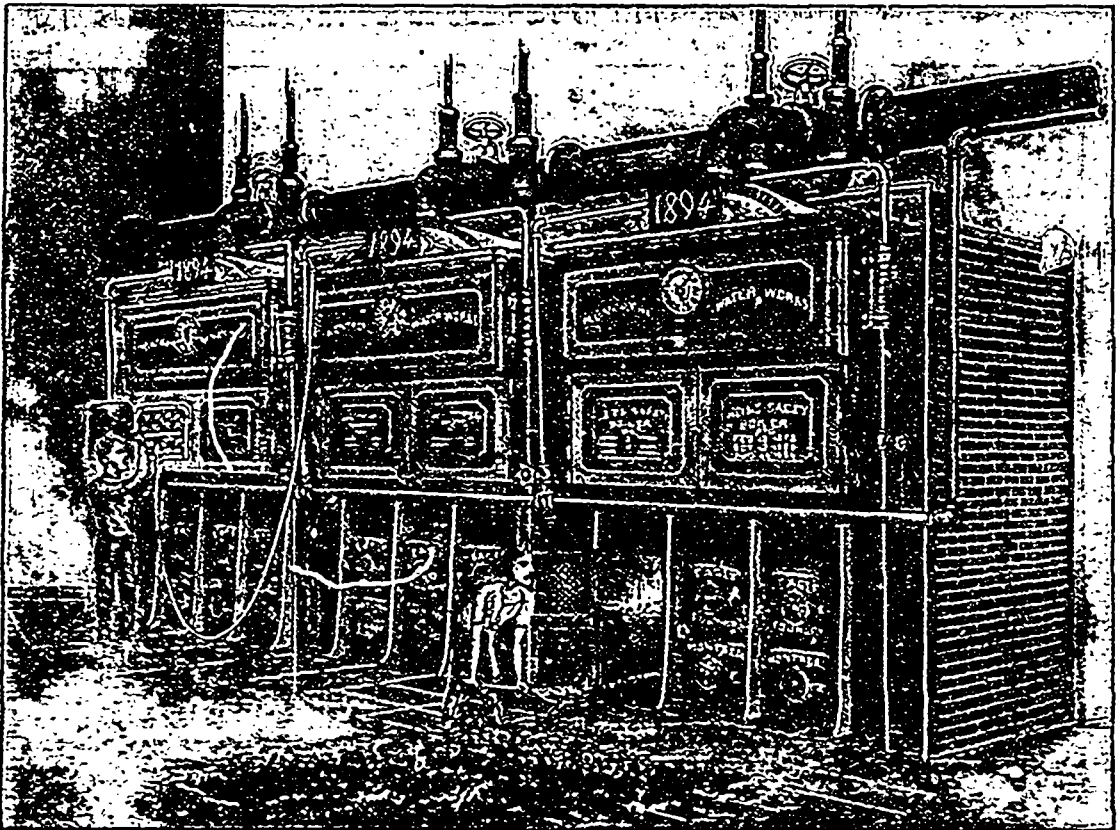
These boilers, of which an engraving is given

herewith, are of the standard size, E16, having each a drum 48 in. x 19 ft. 6 in. long, of steel plate double rivetted, with heads dished to a spherical form. The driver is rivetted to two water legs, one at either end, composed of a head plate and a tube sheet flanged all around of the best steel plate, and joined at bottom and sides by a steel butt strap. The legs measure 7 ft. 4 in. wide and 10 in. deep, affording an ample water space for circulation, with no obstruction whatever save the small amount of area taken up by the hollow stays. There are hydraulic tubes screwed and rivetted in the outside sheet and the tube sheet, and being plugged with wood and perfectly exposed at both ends of boiler, are availed of as a perfect mode of cleaning the tubes from soot by means of a nozzle and hose specially provided for the purpose.

The boilers thus constructed rest at their front end on a set of strong cast iron columns, bolted and braced together by the door frames, deck plates, &c., forming

The feed pipe enters it through a loose joint in front, and the blow-off pipe screwed tightly into the rear end, passes by a steam-tight joint through the rear head of the shell. The tubes are expanded into the tube sheets forming the inner side of the legs of the boiler with roller expander, and opposite each tube in the outer side of the leg is a hand hole, fitted with a plate cover and jacket, and yoke with bolt and nut. By removing any of these the tube can be easily and quickly examined or removed.

The brick setting of these boilers is provided with air spaces, through the side walls, and underneath the combustion chamber to the bridge wall. When the heated air mingles with the gases of combustion as they emerge from the furnaces, a suitable arrangement of fire brick, made especially for the purpose, and disposed in the lower and upper tier of tubes, so distributes the flame and guides it among the tubes that the entire tube-heating surface is made available



"NEW HEINE BOILER, MONTREAL WATER WORKS."

the fire front; and at the back end on plates and rollers laid on a solid brick wall, thus admitting of free expansion.

The boilers are placed on an incline descending to the rear at the rate of about 1 in 12, and thus a most active circulation is secured through the tubes from rear to front, and through the drum from front to rear. This circulation is so active as to prevent the deposit of scale in the tubes, and to keep them quite clean even if there were not means of purifying the feed water. A defective plate is provided so that the ebullition of steam and water from the front leg of boiler does not affect the dry box, over which the steam nozzle is placed, at the front of the shell or drum, and the entrainment or mixing of water with the steam is practically nil. The purification of the feed water is accomplished by means of a large mud drum placed within the shell of the boiler and well below the water line, when it is completely immersed in the hottest water of the boiler.

without any obstruction. Ample space makes leisurely progress for the flames, which meet in turn all the tubes, lap round them, and finally reach the second uptake at the forward end of the top tier of tiles at a temperature of less than 900° Fah., showing a loss of temperature between that point and the rear end of the lower tier of tubes of over 1800° Fah., which proves the utility and efficiency and perfect arrangement of the tube surface.

These boilers have been tested to 200 lbs. hydrostatic pressure per square inch, and are capable of sustaining a much greater pressure without risk or danger. Their capacity for steam production is only limited by the grate area and the ability to consume coal, as the design of the boilers, the number and disposition of the tubes, and the freedom of circulation, enable these boilers to be forced so as to yield in some cases, by actual test, more than 70 per cent. above their actual rating.

The mountings and fittings of the boilers are in keeping with such a high class plant and leave nothing to be desired either in appearance or in completeness and convenience.

THE question of the enlargement of the canals of the St. Lawrence route, so as to admit of the larger sea-going vessels coming up to the great lakes, has been discussed at various times for the last thirty years, but until now the subject has never been taken hold of by any large body of Canadians acting in unison. Now, however, this great question will be discussed by a large gathering of Canadians from various provinces, and will include also delegates from American centres interested in the lake and ocean navigation. Prominent merchants, steamship owners and delegates from Boards of Trade will be represented in large force at this convention, which meets at Toronto on September 17th, and the various phases of the enterprise will receive a more thorough turning over than has ever yet been the case. That the day will come when ocean-going steamers may reach the great upper lakes without transshipping of cargo seems a certainty. Whether the enormous expense can yet be undertaken by this Dominion alone is one question, and another question is whether Canada would be justified in shouldering the whole of this outlay for a scheme which would benefit some of the American lake ports far more than it would the Canadian. If the American Government would contribute a fair share of the expense without claiming any national right in the canal works or the route itself, the way would be tolerably clear, but the great majority of Canadians would certainly object to any alienation of their territorial rights.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS.

Continued from Last Month.

Mr T. R. Almond said that the molecular condition of metals was not as closely considered as it should be. After putting a metal under a great strain, time ought to be allowed for it to get back into its normal condition. Until it did get back to its normal condition, it would be constantly trying to get back. He had once found that a lot of coiling wire which he had thought useless and which he had put through a bath, had thereupon resumed its normal condition. He did not agree with Mr. Cary when he thought that for a bath to put the tension into good condition again, great heat was required. He himself had done it with a change of temperature not exceeding 150 degrees. He did not think any metal could be made to undergo any electric process without any alteration in it being manifested. The molecules were sure to want to return to their original and proper condition.

Mr Henning stated that different tubes for different pressures were sometimes used with advantage. In an ordinary case the tube never returned to its original condition. With regard to the Bristol tube, this did so, however, and there was no mechanism to retard it. The question he asked was whether the expansion of the tube would not alter the reading? He then made some remarks upon the different forms of recording sheets used, and said with the flat sheet used by Mr. Bristol, one could go on for a long period with the same paper. Mr. Henning said the inscribing liquid's friction between the pen and paper was there, though this friction might be very slight. The liquid consisted of a combination of glycerine and aniline colors.

J. McBride agreed with Mr. Henning's remark about the creation of friction.

Mr. Cary said the matter had been discussed considerably in the courts whether steel was affected under a temperature of 300 degrees, and it had been decided that no appreciable effect was produced under such a condition. The best temperature was between 400 and 600.

F. Richards' paper on "Compressed Air" was then read.

Prof. Jacobus stated that the plan adopted on certain cars run on the compressed air system was to pass the air through hot water, it being partially evaporated. The problem was how to get a motor

combining the full advantages of compressed air and of the hot-water process

The next paper was one by A. W. Robinson on "The Relation of the Drawing Office to the Shop in Manufacturing."

L. S. Randolph wrote on a few points raised in Mr. Robinson's paper, mentioning that a very good plan was to have all orders written. This would ensure full responsibility on each employee, and would have a very good moral effect

In the afternoon a special train was courteously placed by the G. T. R. Company at the disposal of the delegates for the trip to Lachine. At Lachine wharf they changed into a steamer, furnished by the harbor commissioners, and were conveyed down the rapids and past the city of Montreal as far as Long Point, viewing the dredging operations and harbor works on the way. After partaking of refreshments on board, the Engineers and their companions disembarked at Montreal after a very pleasant outing on the St. Lawrence.

Wednesday evening was taken up with a reception to the members and their ladies by Sir Donald Smith at his house on Dorchester street. The reception proved to be one of the most brilliant social re-unions which has ever taken place in Montreal. The list of distinguished Montrealers who were present to meet the American visitors is too long to repeat, but amongst them were Lady and Miss A. VanHorne, Sir Joseph Hickson, Mr. Claude and Miss Hickson, Chief Justice Sir Alexander and Lady Lacoste, Dr. Craik (Dean of McGill College), Dean and Mrs. Johnson, George Brush, Dean Bovey, Prof. Cox, Granville Cunningham, I. C. Keefer, W. Laurie, Frank R. Redpath, P. W. St. George, F. L. Wanklyn, Prof. J. T. Nicolson, G. H. Duggan, G. H. Garden, Mr. and Mrs. Cantlie, Dr. and Miss Adami, Mr. Justice and Mrs. Wurtele, Judge and Mrs. Archibald, etc., etc.

THURSDAY, 7TH JUNE.

The morning session was devoted to professional papers, the first on the list being R. H. Thurston's, on the "Theory of the Steam Jacket: Current Practice."

Mr. Hague remarked that it was sometimes forgotten that a jacket's real and most important use was to lessen condensation. This he thought had not been brought out sufficiently in the paper under discussion.

Albert F. Hall said that while the use of jackets did not very materially affect the working of some engines, yet, at the same time, for some they were absolutely essential. The Pawtucket, for example, could not be run without them.

G. J. Rockwood animadverted on the habit of many scientific and technical men to dogmatize. There were many authorities on the steam engine, and they were all equally sure of their facts, and yet nearly all of them differed the one from the other in a remarkable manner. He went on to say that at the present day there existed data sufficient to upset the whole basis of this paper. The proper thing to do would be for them to rest on their oars for say ten years: it was of no use laying down the law in the present state of things.

Prof. D. S. Jacobus then read his paper giving the "Results of Experiments with a 50 h. p. Single Non-Condensing Ball and Wood Engine, to determine the influence of Compression on Water Consumption."

The Professor showed that for either equal amounts of work produced, or for equal points of cut-off, the cushion steam in an engine should not, in general, be compressed as high as the initial pressure in order to obtain the best economy; but to some lower pressure governed by the amount of drop at the end of expansion, thus verifying conclusions arrived at by theory in the past.

Prof. J. H. Barr gave results of some experiments showing that a variation of pressure generally tended to an alteration in the consumption of water.

F. H. Ball presumed that the difference in results between Prof. Jacobus, and those of Prof. Barr, was due to differences between the engines experimented on. He stated that Prof. Barr would shortly be carrying on some more experiments, and no doubt the results would be shown more accurately then.

Prof. Jacobus briefly enunciated one or two theories to account for the dissimilarities between Prof. Barr's results and his own.

The secretary read Frank H. Ball's paper on "Cylinder Proportions for Compound Engines, determined by their Free Expansion Losses."

Prof. Jacobus said there was need for more experiments before it could be stated exactly how much the use of a compound engine reduced cylinder condensation. He was of opinion that they should make each engine do its very best in each range of pressure, and stated that he would carry on some experiments himself in

order to show what the actual condensation ought to be in this form of engine.

Mr. Rockwood thought that Mr. Ball had, by his paper, added considerably to our knowledge of the steam engine. There were many queries which it gave rise to, and these, when settled, would lead the way to still more knowledge.

Mr. Ball said that he did not place very much importance on the figures that had been assumed. The point was, however, that by his method work could be done systematically and with accuracy, and if they had to guess at the condensation, yet they would arrive at a better idea than from the ordinary methods. Prof. Barr, he stated, had just completed a triple expansion engine for the express purpose of experimenting in detail on this subject, the cylinders being so arranged as to render it possible to make any combination wished for.

F. M. Rites' paper was then read, on "A New Method of Compound Steam Distribution."

Mr. Rockwood propounded the query, why the effect of varying the compression should be to keep the temperature uniform?

Mr. Rites said that the relation of the compression curve to the receiver ought to be taken into account. Drop represented loss, and as the clearance volume increased in size, the loss increased.

Mr. Rockwood said that in one cylinder there would be a loss, say of 20 per cent. If there were two cylinders, it would be about the same, or perhaps a little more. What was done ordinarily was to make the condensation of one cylinder serve as a scapegoat for that of the other. Preserving the continuity of the pressure in each cylinder was an object worked for, and it seemed to him, gained on Mr. Rites' plan.

The secretary read a paper by Jesse M. Smith on 'Tests for a Small Electric Railway,' on which there was no discussion.

The next professional paper on the programme was one by W. S. Aldrich on "Power Losses in the Transmission Machinery of Central Stations." Very little discussion.

Prof. J. B. Webb continued the previous day's discussion on "Springs," referring to Mr. Almond's statement that he had put coil wire previously useless into good condition again by the use of a hot water bath. He said, on the authority of an old engineering author, that this had been done years before, with the bath at a temperature of about 430°.

Mr. Holloway had not gained the same impression from what Mr. Almond had said, as Prof. Webb apparently had done.

Mr. Almond said he had found the bath cause the wire to soften, whereupon it could be drawn out and would be found in good condition. He explained that he referred to No. 11 tempered steel wire. This was exactly the wire required by him for a certain purpose, but unfortunately it was a difficult matter to get it of the right degree of hardness and elasticity. It had to be hard in order to give a good spring, and yet not so hard that it would break. He had known a whole coil of such wire, which he had treated in a bath, to be passed through the machine by a boy of 16 years, when before such treatment it had been condemned as of no use at all for the purpose. It was necessary for the molecules of a substance to be in their normal condition, like those, for instance, of rock-salt after it had lain so many centuries underground in complete repose. This normal condition (as it may be called) was very different, however, from the state of the molecules of a metal which had recently been heated, hammered, rolled, beaten out, or had undergone any of the other hundred and one processes to which it was usual to subject metals.

Prof. Webb remarked that Mr. Almond was not very clear in his details. *Was the wire drawn while still very hot, or was time allowed for it to become cool again?*

Mr. Balson mentioned the case of the metal used for making files, which was heated red-hot and then gradually cooled in water to a fair temperature.

Mr. Stetson related some experiments in which he himself had been engaged. By immersing the iron while very hot, it was made liable to crack. Some blacksmiths produced a higher grade of tempered hardness by warming the water in which the metal was to be plunged. The best way when a really fine and hard spring was wanted, was to dip it in oil, at a temperature about or nearly equal to the flashing point.

Mr. Cary wanted to know how long it was before Mr. Almond had wound the wire after putting it into the bath.

Mr. Almond then related his experiences with regard to various wires. He had been told by the manufacturers that the exact kind of wire wanted was beyond their capacity to produce. At last, after a long search, he obtained a sample of wire which suited him, but unfortunately after the first order there was no regularity. A

large amount which he had purchased he now found to be useless. He was bound either to lose it altogether or turn it by some means or other into what he wanted, and at length, after a good deal of thought, hit upon the method of passing it through a bath of boiling water placed about twelve inches away from the machine in which it was to be drawn into the form of a spring. He believed in the great power possessed by an increase of temperature to do away with the molecular disturbance brought about by the processes to which they had previously been subjected.

Mr. Cary said that the peculiar seasoning that went on in metals was a thing not readily understood. The differences between steel of different sorts, or even between different samples of the same steel, were wonderfully marked, even when they were proved practically similar in composition by chemical analysis. He then described an apparatus he had invented, consisting of a series of baths for the tempering of metals uniformly. After tempering steel once, it was found that second tempering could not be got to quite such a high state as before.

Mr. Wright brought up anew the discussion on the "Relation between the Drawing Office and the Shop." He said that it was well to keep the pattern shop and the drawing room as close together as possible, so that the draughtsman should be able to go into the former pretty often for reference.

Mr. E. C. Shaw told of the arrangements which had been made in his works. The various patterns were separated into between twenty and thirty classes, to which reference could easily be made without any undue waste of time and energy. By going to the pattern list the draughtsman could find what pattern he was looking for immediately without trouble. This saved time in the duplication of patterns.

The session adjourned in time for the members to reach the Electric Street Railway Company's fine new power-house by one o'clock. Here they were entertained to an enjoyable lunch by L. J. Forget, president, and G. C. Cunningham, C.E., managing director of the company.

After inspecting and duly admiring this powerful plant, which, when finished, will be perhaps the most complete on the continent, the visitors proceeded to a garden party which had been arranged in their honor by Dean and Mrs. Bovey and Mrs. Redpath. About a hundred of the visiting engineers, together with the ladies of their party, availed themselves of this invitation and enjoyed a very pleasant afternoon. Amongst the representative Montrealers present were Sir William and Lady Dawson, Sir Joseph and Lady Hickson, Lady Van Horne, Miss and Miss A. Van Horne, Mr. and Mrs. J. H. R. Molson, Mrs. Geo. A. Drummond, Miss Drummond, Mrs. and Miss Gillespie, Mrs. Sam. Greenshields, Miss Greenshields, Mrs. Archibald, Mrs. Peterson, Prof. and Mrs. Penhallow, Mrs. W. A. Molson, Mr. and Mrs. Granville Cunningham, Mrs. Wurtele, Prof. Nicolson, Prof. and Mrs. Cox, and many other well-known ladies and gentlemen.

The first paper read at the evening session was by M. P. Wood on "Rustless Coatings for Iron Steel."

Mr. Holloway remarked that he had observed round about Montreal a remarkable number of unprotected tin roofs. Could anyone explain why it was that the metal did not become corroded as in other localities.

Mr. Henning said the explanation consisted in the fact that a good price was paid for the tin, and the result was that real tin was obtained, not a mixture with lead or anything else.

Mr. C. W. Nason said he had observed the same thing in a few other cities, especially in the West.

Mr. Henning said the explanation of corrosion was the old story of *prevention being better than cure*. Put on a proper coating of paint at the beginning, and it would be long before any doctoring was needed, and it was the cheapest plan in the end. A good protection for iron or other metals, especially when near the seashore, was to connect with them plates of zinc and copper placed in salt. Near the copper the iron became corroded, but near the zinc it was perfectly protected and kept clean. The corrosion was evidently due to the fact that electrical action was set up near the copper, causing oxidation.

Jas. McBride then read his paper on the "Corrosion of Steam Drums."

J. T. Hawkins said that water heated and moving with great velocity would naturally act with great force on a metal and would gradually wear it away, as even cold water falling from a height would gradually wear a square boulder into a round pebble. He would suggest to Mr. McBride that he should attach both inlet and outlet nozzles to his drum and always leave a certain amount of water there.

J. S. Randolph said that all cases of erosion were due either

to chemical action in the water or to mechanical action knocking off the particles of chemical matter already formed. Water without sediment, so far as he could discover, could not do this; the erosive process was due to the presence of sand.

Mr. Davis observed that it would appear that even the purest water would erode when aided by heat. Erosion was due to the entrainment of water in the drum, aided by the presence of sand. The remedy, either in drums or in coils, was to establish perfect drainage.

Mr. Fladder wished to know whether after all there was not some impurity in the water; water chemically pure might still contain mechanical matter.

Mr. Holloway said that in the case of a plate (which was shown to the members) the erosive action had honeycombed it, not acted in a smooth or uniform way.

Mr. Nason did not think it was necessary to look for anything beyond erosive action.

Mr. McBride said the boilers (in the case mentioned) were insufficient for the work they were used for, and it was reasonable therefore to look for a considerable amount of *debris*. There being no return pipe, this was of course deposited as a covering over the pipe, and the steam coming in with great velocity gathered it up and deposited it on the opposite side.

The next paper read was C. W. Hunt's on "A New Mechanical Fluid."

Mr. Rockwood wished to know how this method could be used—could it be applied to large bearings?

Mr. Hunt did not know; it was a new thing. It had worked well in that it was very fluid. In a machine which he had modelled, the action could be seen admirably, and it was curious to watch, upon a change of adjustment, the strange way the balls moved, something like the eddies in a strong current of water.

W. S. Rogers observed that a good many firms used such balls for packing pumps, etc., and, as far as he had heard, they had proved a very satisfactory packing.

Mr. Brashear supposed the action of the balls, like that of a liquid, was not affected by the height of the columns.

Mr. Hunt said the peculiar action of the balls was no doubt due to their friction, one against the other, and against their envelope.

Prof. F. R. Hutton then read his paper on the "First Stationary Steam Engines in America," but owing to the lateness of the hour, discussion was left to be carried on by means of correspondence.

There was also a paper by J. R. Freeman on "A New Form of Canal Waste-Weir."

FRIDAY, 8TH JUNE.

On Friday morning there was another session devoted to professional papers, the first one read being De Courcy May's "Cost of an Indicated Horse-Power."

Mr. Cary remarked that the question of horse-power was one of very great importance. He then told how he himself had once put together the cost of the various items in detail, which had to be considered, in order that he might arrive at the exact cost. The result showed that what cost about \$37 per horse-power was sold on the average for about \$55, though in New York city perhaps the cost was somewhat higher still.

Mr. Holloway said the element of cost for horse-power or steam-power necessarily varied very much in different localities, depending on the cost of fuel, the sort of coal (whether there was much or little slate in the latter), and on many other things distinguishing the particular place in question. It was necessary to know also the type of engines and the cost of water also.

F. L. Hart related his experiences when endeavoring to arrive at some conclusions with regard to this question. In his works they had, in connection with their feed-water system, a method of getting at the exact amount of water used, and they utilized this for testing the different quantities required under different conditions.

Mr. Cary said that he had made all his calculations on the standard recommended by the American Society of Mechanical Engineers (32½ lbs. of water), and he then went on to explain how he had managed with a series of reservoirs, by means of which he was enabled to avoid the necessity for any meter, with considerable advantage.

The next paper read was the "Effect of Varying the Weight of the Regenerator in a Hot-air Engine," by Prof. G. W. Bissell.

There was no discussion on this paper.

W. R. Roney's paper on "Mechanical Draft for Boilers" was the next on the programme.

Mr. Cary said he had described before the society, on a previous occasion, an almost similar appliance which he had himself

invented. A large firm with whom he had dealings at the time said his idea was impracticable, and refused to put themselves to the trouble of making a special fan for the apparatus. He believed that now, however, the same firm made many such fans. His apparatus, he said, was quite successful, and worked very uniformly and economically.

Pres. Coxe remarked that the waste and cost of running a chimney were something enormous. The most expensive way of getting a draft was to build a chimney, even though the chimney were given you. The thing to do was to control absolutely and perhaps automatically the flow of gases through.

Mr. Rockwood said the question of a mechanical draft and the question of getting rid of noxious fumes and economizing were totally different matters. He doubted even if the author's calculation of the saving of fuel effected were a fair average, whether the appliance described would be altogether worth putting in. If they got all the saving that they could by using a compound engine, what was the absolute saving effected by the use of an economizer? An economizer was an expensive article, and took up a large amount of valuable space.

Mr. Roney said the whole question hinges upon the coal. Had a large or a small amount to be paid for coal?

R. C. Carpenter's paper was then read on "The Saturation Curve as a Reference Line for Indicator Diagrams."

No discussion.

At this point the secretary read the society's addresses of thanks to the entertainers, who had done so much towards making their visit to Montreal a happy experience, and one to be remembered for a long time. These were addressed to the mayor and city of Montreal, to McGill University, to Sir Donald Smith, its chancellor, to Prof. and Mrs. Bovey, and Mrs. Redpath, to Herbert Wallis and the local committee of reception, to Prof. J. T. Nicolson, its secretary, to the Montreal Street Railway Co., to the G.T.R. Company, and the Harbor Commissioners.

These addresses having been adopted in the usual way, the secretary asked the members of the society to render thanks for the favors on the programme which they had yet to enjoy.

Prof. Jacobus then read a paper by himself, in conjunction with Professors Denton and Rice, on the "Results of Measurement of the Water Consumption of an Unjacketed 1,600 h.-p. Compound Harris-Corliss Engine."

Mr. Ball remarked that the paper was a valuable contribution to the transactions of the society. He regretted, however, that the author had not seen fit to think out some theory to account for the extraordinary economy of the engine under experiment.

Mr. Rockwood said there were meters and meters, but in this case no doubt it was of the accurate kind.

Prof. Jacobus said the meter was all right. The fact that one meter went wrong should not make people think that all were bad. If put in correctly there was little chance for a meter to go wrong. He then related some other tests which went to check and prove the thorough accuracy of the one under discussion. The reason that meters showed wrong sometimes was that they were allowed to get air in them.

The last paper on the programme was by F. B. King, consisting of "Notes on the Corrosion of a Cast Steel Propeller Blade."

Mr. H. B. Roelker stated that he had experienced results similar to those described.

Mr. Henning thought the corrosion was due to the air which rushed into the vacuum near the blade, passing behind the propeller and thus corroding it. The reason that the earlier blades corroded more easily than modern ones was that they were made of a higher quality steel, which was more easily affected. The higher the carbon, the less the corrosion.

Mr. Grundy stated that the British admiralty recognized magnetic action and put zinc near the boiler plates.

On Friday afternoon different parties of the Engineers visited the C. P. R. works and the Canadian Rubber Company's factory, after which there was an enjoyable garden party at Piedmont Hall, Mrs. J. H. R. Molson's residence.

SATURDAY, 9TH JUNE.

The final day of the convention was devoted to an excursion to Ottawa, the C. P. R. Company having kindly proffered a special train for the occasion.

On reaching Ottawa at 11 a.m. the visitors were met by a reception committee, composed as follows:—J. W. McRae, H. B. Spencer, T. Alcorn, George H. Millen, W. Y. Soper, M. Donaldson, George P. Brophy, P. D. Ross, R. Surtees, Thos. C. Keefer, J. R. Booth, J. Fred Booth, F. W. Avery, Wm. Scott, Hon. E. H. Bronson, W. L. Marler, A. R. C. Selwyn, E. B. Eddy, Sir James Grant, M.P., H. Robillard, M.P., Sandford Fleming, Louis Coste,

H. A. Bate, C. Schreiber, Robt. Blackburn, Senator Clemow, E. E. Perrault, F. A. Hibbard, Mrs. T. C. Keefer, Mrs. Chas. Keefer, Mrs. W. Soper, Hon. Mrs. Herbert, Mrs. Workman, Mrs. Rainsford and Miss McKinnon.

They were then conveyed by rapid special cars, which had been placed at their disposal by the Ottawa Electric Railway Co., to J. R. Booth's great saw-mills and the Chaudiere Falls, and then to the power-house. Their next move was to the Parliament buildings, and after the visitors had inspected the library, House of Commons, etc., they listened to addresses of welcome by the Premier, Sir John Thompson, and Hon. J. A. Ouimet, Minister of Public Works. Prof. Hutton, the secretary of the society, briefly replied in the absence of the president. The party then took the cars again to Rockliffe Park, where at 1 o'clock, in a marquee erected in the grounds of T. C. Keefer, C.E., they partook of lunch, given by the citizens of Ottawa.

After the refreshments Prof. Hutton made a short speech, thanking Mr. Keefer and the reception committee for their hospitality, and Mr. Soper, of the Electric Railway Company, for his courtesy and attention during the day. Mr. Soper, Mr. Keefer, Senator Clemow and Sir James Grant responded.

A glimpse having been obtained of the beautiful peeps of scenery round about the park, the visitors again took the cars and drove to Rideau Hall, whence they had been specially invited to a garden party by his Excellency Lord Aberdeen. They remained in the grounds of Government House about an hour and a half, and then the greater portion of the party left, taking the special C. P. R. train to Montreal. The remainder came on by the Canada Atlantic train at 6.30 p.m.

Thus ended what was, owing to the good choice of entertainments and the thoroughness with which they were carried out, a week of thorough enjoyment to the American visitors. From the beginning of the convention to the end there was no hitch in the arrangements. Everything went smoothly and satisfactorily. Altogether the things done and the sights seen made quite a formidable list, but they alternated with one another so well that there was none of that fatigue which so often weighs down the inveterate sightseer. Take the Ottawa excursion as an example. The delegates, after enjoying one entertainment, merely had to stroll down towards the track, board a swiftly moving car, and in a few moments, presto, they found themselves at another entertainment. With all this there was happily no disposition on the part of the visitors to find fault with the arrangements, and it was the wish of everybody that the convention would come to Canada again.

CANADIAN ASSOCIATION OF STATIONARY ENGINEERS.

The second annual Souvenir, to be published at the convention of stationary engineers in Toronto, September 4th, 5th, 6th and 7th, is now nearly ready for the press. The last issue was very creditable, and the boys are doing their best to make this one equally so. It will form a good advertising medium, and those who wish to be represented in it should send their advertisements at once to Toronto or Montreal. The proper addresses will be found in the "Directory" on last page, or in the association's card elsewhere.

The following officers have been elected for Montreal No. 1, Canadian Association of Stationary Engineers: President, John J. York; 1st vice-president, Thomas Nadin; 2nd vice-president, W. Brown; secretary, O. E. Granberg; trustees and auditors, George Hunt, Edmund Hay and John Murphy.

At the adjourned meeting of London Branch, No. 5, Canadian Association Stationary Engineers, on the 13th July, the following officers were elected for the present term: President, R. A. Lyons; vice-president Wm. MacLane; financial secretary, Wm. Meaden; recording secretary, P. Tean; treasurer, F. G. Mitchell; conductor, G. Powell; guard, T. Harding; trustees, MacNeil, Needham and Tean. At the close of the meeting the brothers were invited to partake of refreshments on the invitation of the popular Past-President, Bro. F. G. Mitchell. The meeting was very satisfactory.

Bros. Wm. Hill and Frank Merrill have been appointed delegates from the Ottawa Branch to the Convention of Stationary Engineers in Toronto in September.

At the last meeting of Montreal, No. 1, a talk took place on boilers. Bro. John J. York, the president, giving some account of his observations during a recent visit to New York.

The newly elected officers for Berlin Branch, No. 9, C.A.S.E., are: President, W. J. Rhodes; Berlin; vice-president, J. R. Uttley, Waterloo; secretary, Geo. Steinmetz, Berlin; treasurer, Hy. K. Snyder, Waterloo. The branch meets on the second and fourth Saturday evenings in Engineers' Hall, over Bank of Hamilton,

corner King and Queen sts., Berlin. Bro. Rhodes writes: "We are running very smoothly. No hot bearings."

"The installation of officers of Brantford Branch, No. 4, took place at regular meeting last month, and the following officers were installed by Past-President Bro. A. Ames: President, C. Walker, vice-president, J. B. Forsyth; secretary, Jos. Ogle; treasurer, L. Fordham; conductor, T. Pilgrim; door-keeper, A. McKinnon; trustees, Bros. Ogle, Ames and Pilgrim. I may say that No. 4 is getting along in very good shape. The meetings are well attended and all the boys at present are working pretty steady. Almost every one has passed the examination and received his certificate of competency. We are looking forward for a visit from Toronto No. 1, and expect an interesting open meeting, when some papers on steam-heating will be read, of which I will report.

"Jos. OGLE, Sec."

The election of officers of St. Laurent Branch, No. 2, Montreal, C.A.S.E., took place last month as follows: R. Drouin, president, P. Marchand, 1st vice-president, Joseph R. Guillemette, 2nd vice-president; F. Latour, recording secretary; Francois Denis, financial secretary; W. Gendron, treasurer; J. J. Joly, conductor. This branch has, we understand, added about twenty new members during the past year, and is in a thriving condition. They now meet every Monday evening in their hall, which is at 43 Bonsecours street.

"The officers for the Hamilton Branch, No. 2, C.A.S.E.—the election of which was reported last month—have been duly installed. This branch is in very good condition, although we have not made many members of late. As the times are so very dull, we can hardly expect anything else. Not a great deal of discussion has taken place of late on our profession, but the very hot weather may account for that. You can look for something very soon, I think, as the "boys" are wanting to get to work again. We are glad to report that as far as the C.A.S.E. in Hamilton is concerned, "it is all right." It is very encouraging to notice the interest which manufacturers show towards the order. We expect to have quite a number of manufacturers of this city subscribe towards the Souvenir for this year's Convention.

"Wm. NORRIS, Cor. Sec."

"Toronto No. 1 held two successful meetings during July, there being two proposals for membership and four candidates for initiation. Interesting discussions have taken place on 'The Safety Valve' and indicator diagrams. At the fourth annual convention, to be held in Toronto September 4th to 7th inclusive, a large attendance is expected.

"W. G. BLACKGROVE, Cor. Sec."

THE CONVENTION.—The following is a general outline of the programme of the fourth annual convention of the Canadian Association of Stationary Engineers, to be held in Toronto:—

Tuesday, 4th Sept.—Convention opens at 10 a.m., and a session will also be held in the afternoon. In the evening an open meeting will be held, to which all engineers are invited.

Wednesday, 5th Sept.—Morning session opens 10 o'clock. In the afternoon there will be a drive round the city and a visit to the Industrial Exhibition. The evening will be taken up with the annual banquet.

Thursday, 6th Sept.—Trip to Niagara Falls, and a visit to the power house and hydraulic canal of the Cataract Company.

Friday, 7th Sept.—There will be both morning and afternoon sessions on this day; and besides the election of officers, interesting papers will be read, with discussions at the conclusion of each paper. The place of meeting has not yet been decided upon.

A GREAT LABOR SAVER.

Among our advertisements this month is one of John Clendinning's Rust Proof Compound and Bronzing Lacquer. The former is invaluable to engineers, foundrymen and all classes of machinists and those having the care of machinery.

Foundrymen know the amount of labor entailed in preserving iron patterns from rust, and those in charge of burnished machinery also know the quantity of emery cloth, time and energy it takes to keep their plant in proper condition. Applied to patterns this compound is much cheaper than wax. The pattern does not require heating or any preparation other than to be simply dusted. On application a hard, smooth surface is produced, to which the sand will not stick, and the article is made absolutely rust proof. When used in machinery, a finish similar to varnishing is the result, and it lasts for months, preventing all suspicions of rust. Engineers who take a pride in the appearance of their machinery will find this compound a great labor saver. In the machinist shop the uses of the compound may be put to use innumerable, and a

special feature in its favor is its cheapness. A gallon will last six months to a year in an ordinary-sized shop, and only costs a couple of dollars. Exposure to the weather, or dampness, has no effect on it. The manufacturer has many testimonials speaking highly of the compound. Amongst others who recommend it are: Moses Parker, John Findlay, Canada Machinery Agency, Wm Rodden & Co., W. Clendinneng & Son, of Montreal, Record Foundry & Machine Co., of Moncton, N.B., and The Robb Engineering Co., of Amherst, N.S.

The Bronzing Lacquer is more in the line of steamfitters, for use on coils, radiators, screens and general iron work. Will not burn or scale off. It is transparent and liquid as water, and will cover as much surface. It will not discolor the bronze, is easy to apply, and gives a smooth, hard surface to the work.

BEATTY & SONS' "MILLER" CABLEWAY.

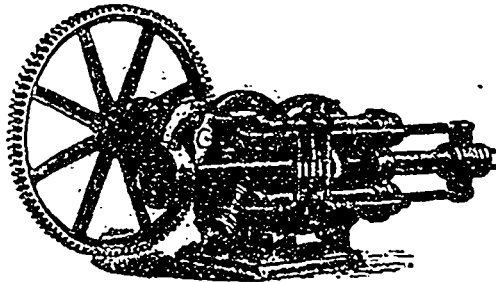
M Beatty & Sons, manufacturers of contractors' plant, Welland, last April erected in E. Terrill's sand pit, near Niagara Falls, Ont., a double cable way of the "Miller" type, the cables being 2 in. dia., 800 ft. span, and 1½ in. dia., 270 ft. span, standing at right angles with each other. There is a one-yard self-dumping scraper used on the larger cableway, for loading building sand from a pit 700 ft. away from the track into the cars, and a one-half yard

scraper of same kind on the shorter cableway for loading gravel into cars on the same track. Both cableways are operated by an engine with two 9x12 in. cylinders, with a drum and spool 40 in. dia. for the larger cableway, and a drum and spool 24 in. dia. for the short cableway, all on one iron frame. The engine has a link motion so it can run in either way to make the scrapers travel in either direction. These are the first of these cableways erected in Canada that we know of. They are being used largely in the United States for stove quarries, mining and contractors' work, and will be used in Canada as soon as they become known, for they expedite and lessen the cost of handling materials very much in any place where they can be used, and in fact they are about the only machinery that can be used in some places. In May they shipped to Wm. Davis & Sons, Cornwall, one of their No. 1 Victor Excavators, or steam shovels, to be used by them in making the dams from the island to shore to form a portion of the canal, according to the new plans adopted by the Department of Railways and Canals.

The Canadian-Australian liner, "Miovera," which has been undergoing alterations at North Shields, Eng., was a short time ago made the subject of several trials in order to test the auxiliary power recently added to her engines. The engines were found to work smoothly and practically without the slightest vibration.

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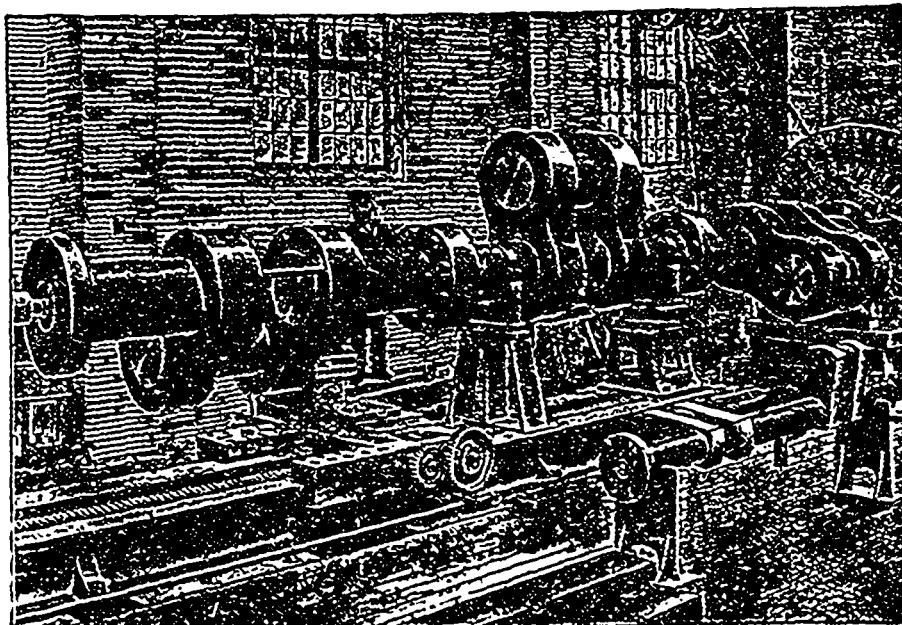
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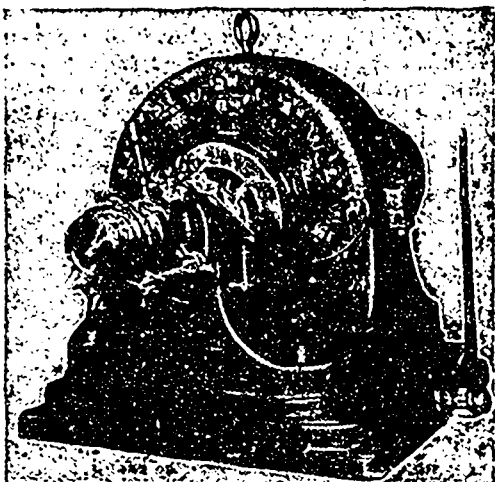
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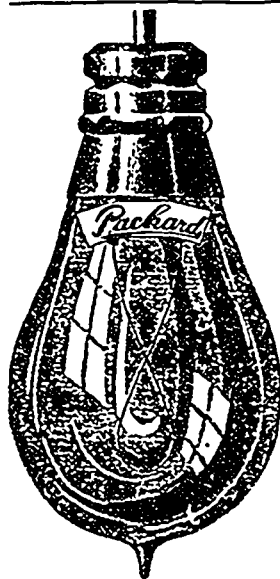
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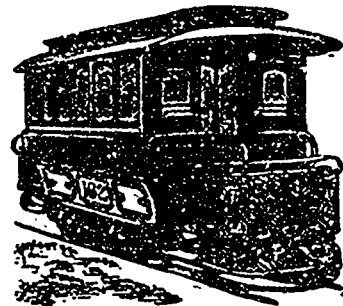
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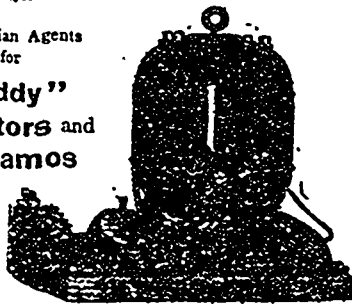
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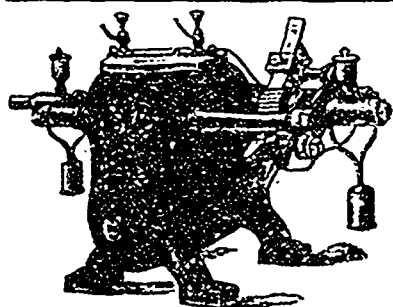
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Electrical Department.

CANADIAN ELECTRICAL ASSOCIATION CONVENTION.

The forthcoming convention of the Canadian Electrical Association, which is to be held in Montreal, promises to be the most successful yet held. The programme of the convention has not yet been finally settled, but the Entertainment Committee have drawn up the following, which will no doubt be accepted by the Executive.

Wednesday, 19th Sept.—Convention opens with an afternoon session, followed by a trip to Lachine and down the rapids.

Thursday, 20th Sept.—Visit to the Technical Department of McGill University, 9.30 a.m., and the morning session opens at 11 a.m. At the conclusion of the afternoon session an excursion will be held over the Montreal Park and Island Railway Co.'s line to Back River. While at Back River a dinner will be held at Peloquin's Hotel.

Friday, 21st Sept.—Morning and afternoon sessions. The sessions this day will be followed by a trip up Mount Royal and a visit to the new power house of the Montreal Street Railway.

The Entertainment Committee is composed of L. B. MacFarlane, of the Bell Telephone Co., W. B. Shaw; John Carrol, of the Eugene Phillips Electrical Co.; J. Kammerer, of the Royal Electric Co., and D. A. Starr, Board of Trade Building. The sessions will be held in the Long Room, Mechanics' Institute.

ABOUT ELECTRIC MEASURERS.

F. Bain, discussing the subject of electric appliances in *Electrical Industries*, has this to say of meters:

Don't get ammeters or voltmeters for your plant until you are sure you know just what you want. There are instruments now on the market that are not any more reliable than the method used by an old farmer for weighing his pigs—which was to balance a pig on a rail on one side and a stone on the other, and guess at the weight of the stone. I will describe the construction and peculiarities of the instruments you are familiar with, and then give you my idea of what you require.

In a plant where a number of instruments are to be used, it is not necessary to pay extravagant prices for instruments of great delicacy and theoretical precision; there are cheaper instruments which will answer every purpose. These instruments will indicate within one per cent., which is quite close enough provided they may be depended on, and for this reason one fine, standard instrument—one voltmeter and one ammeter—should be kept for the purpose of checking and recalibrating those in regular use.

Do without an instrument rather than buy one which is unreliable and which does not possess the features described. There are a number of instruments in the market which depend upon the power of a coil to lift a heavy piece of iron and pointer against the varying force of gravity. These instruments are sluggish of action, so that small changes in the strength of the current or potential difference that is being measured is not instantly indicated. The needle and other moving portions being large and heavy, the

moment of inertia is great, and this moving in a weak magnetic field, upon any change taking place in the current strength, the needle would simply oscillate over the scale. Many changes might take place in the current strength, the current or potential even remaining constant at each of its various values for a very decided time, before the needle had come to rest and allow any measurement to be taken. An instrument with the needle dancing around over the scale is not of much practical use. These solenoid instruments also indicate differently for the same values, depending upon whether the readings are taken on the rise or fall of potential or current.

Instruments employing permanent magnets are not reliable; the effect of each measurement varies the condition of the permanent magnet. A temper fracture, which is liable to exist undetected, causes the strength to be constantly changing and consequently give variable readings for the same value of current. A spring is the most unreliable and inconstant of all mechanical devices. Temperature affects its value, it is easily misplaced, and its molecular structure is changed with every strain to which it is subjected.

Multiplying devices of all kinds should be abjured; they have no place in a properly constructed voltmeter or ammeter. Select an instrument in which electro-magnets, or the action due to the currents flowing in diamagnetic conductors, are employed. The moving portion should be the very lightest weight possible, and there should be no complicated multiplying devices. The instrument should be tested to see that it is absolutely dead-beat. This is an important feature. A voltmeter should be wound with a wire having a very small heat coefficient, and it should be wound with a resistance having at least fifty times as many ohms as the highest number of volts on the scale. For instance, a 600-volt instrument should have a resistance of at least 30,000 ohms. An ammeter, on the contrary, should have as little resistance as possible.

For THE CANADIAN ENGINEER.

AN ENGLISH LIGHTING AND POWER PLANT.

BY JAMES H. KILLEY, HAMILTON.

Thinking that it might interest the mechanical and electrical readers of your paper, I now place before them in condensed form a description of what I believe is the most advanced electrical installation in existence for the production of arc and incandescent lights and power from one dynamo. This system is now in successful operation in Portsmouth, England.

The writer, in connection with the Edison Company, inaugurated the first incandescent electric light system on a large scale in Canada, the dynamo having been built in my works in Hamilton. Since that time I have taken a deep interest in the advance of electrical science, and have endeavored to post myself as far as a non-professional could be expected to do. This explanation I hope will be a sufficient reason for my trespassing on your space to so large an extent.

The Portsmouth installation is run in the day time and early in the evening, when under light loads of light and power, by direct driver to dynamo, Parsons' turbo-steam engine running at 3,000 revolutions per minute, one of these machines in the Newcastle, England, plants, runs 5,000 revolutions per minute. It runs on the same principle as a water turbine, the steam taking the place of water as a driving power, acting on a large number of buckets on the periphery of the wheel, and from wheel to wheel as in the

multiple cylinder engines, until the strength of the steam current is exhausted, after which it is passed into a condenser, bringing the atmospheric pressure into action as a further source of power. These machines, as constructed by Parsons Bros., of Newcastle, very nearly come up in economy of fuel to high-class engines. Their lasting properties under constant loads have, I think, yet to be demonstrated. The heavy work in connection with the Portsmouth plant is performed by direct driven Terranti dynamos, these dynamos, etc., possess three essential points of novelty:

1st. The dynamos being mounted on the fly-wheels of the engine, and running at the slow speed of 90 revolutions per minute.

2nd. The arc lighting being done by a continuous or direct current, transformed or rectified, feeds from the alternate current.

3rd. The method of distributing the current by automatic change-over converters, which allows a very high efficiency to be obtained.

The Portsmouth installation is the first on this system, as a whole, in any part of the world, and has been proved to have great advantages not hitherto brought into operation. The saving by the system in capital outlay and working expenses is very great; while the lights, both arc and incandescent, are pronounced to be the steadiest and purest known.

The wheel dynamos are not a novelty, as they have been previously adopted. The difference in the Portsmouth is in the remarkable simplicity of their electric parts; in fact, so mechanical is this machinery that it is difficult to those not initiated to find out where the electrical part begins, for a practical machine for everyday work is to make it as simple mechanically and electrically as is consistent with efficiency. The arrangement of the Terranti dynamo is such that there is no part carrying the high pressure current in any way exposed. It is impossible for any person, even if so disposed, to receive a shock from any part of the machinery whilst running, the working parts being entirely enclosed by metal work. They and the insulation surrounding them are fully protected from damage or deterioration, so complete is this protection that no harm would take place should water or oil be dashed over it. These are sources of danger to the ordinary dynamo as now built.

Each dynamo consists of a number of magnets bolted around the fly wheel of the engine; these are wound with solid copper strips formed into coils by means of special forms, and left bare. Unlike the ordinary copper winding in other dynamos, the exciting current is passed through these coils, and is of so low a pressure that it is absolutely harmless. The magnets surrounding the fly-wheel act upon the armature of the dynamos, which is carried by a large circular casting surrounding the magnets. The armature consists of a quantity of thin plates of wrought iron formed into segmental blocks, the electric conductors pass back and forward through holes in the blocks, and are connected to the ends on stout gun metal boxes, and are run on solid by an insulated point, the electrical part being thoroughly insulated. The electricity is generated in this armature up to 2,800 volts, to be increased or diminished by step down or step up transformers as may be desired. Each machine is capable of lighting 6,000 16-candle power incandescent lamps and 100 arc lamps of double the capacity of ordinary street lamps. The dynamos are driven by means of compound Corliss engines, now coming into general use in England and the European continent for this purpose. There can be no question as to the fact that for general factory and electrical purposes that the Corliss engine is the best in existence when carefully designed and well built. Such is the opinion of most European engineering circles, when not interested in some other design. This has been fully realized in the three compound Corliss engines running in the Plymouth power-house so far as tested.

The second point with the Portsmouth plan different to others is that the arc lamps are run with a continuous current obtained from the main alternating circuit and rectified into a continuous current. Up to the present time, as nearly all electricians know, the plan adopted has been to place a number of lamps, varying from two or three to fifty, upon a single circuit coupled in series, the same quantity of current passing through every lamp one after another, this current being obtained from what is called an arc dynamo. This system has hitherto given the best results, and has been generally applied. The difficulty attending it is that each machine will only, at the most, light fifty arc lamps. Therefore, for an installation of large size, a large number of machines are required. In order to make a proper duplicate of the plant it has been convenient to run each machine with a separate engine, in fact many electricians and engine builders have claimed that this is the only correct system to run arc lights from. Further, the speed of these dynamos is too high to run them direct, necessitating pulleys,

shafts, ropes or belts, with the attendant losses from friction, oil and attendance. In order to obviate these difficulties some have endeavored to run these arc lamps from the alternating current, but this has in every instance proved so unsatisfactory that arc machines on continuous current had to be substituted for the Alternate or Portsmouth Arc Incandescent and Motor Power Arc taken from the main alternate current cable.

In Portsmouth they combine the advantages of both these systems without the disadvantages. The lights have all the steadiness of the continuous current in the arc lamp and the alternate in the incandescents.

The system adopted is to take the alternating current from the main supply at the station, and by means of constant current transformers and rectifiers to change the alternate into a continuous system of the right amperes and voltage for feeding a circuit of arc lamps. Four of these sets of apparatus are now in position in Plymouth, capable of supplying 47 arc lamps each; there is therefore supplied a pure continuous flow from alternating current without the erection of extra dynamos, driving belts, ropes, shafts, bearings, etc., steam exhaust and other pipes. The great saving in this plant is that the current is obtained cheaper from the big compound Corliss engines and dynamos than it can be from smaller engines and dynamos that the large amount of ordinary attention necessitated by small engines, small dynamos, shafts and belts is done away with, and the valuable space in city stations retained for further use. The cost of repairs and maintenance is very materially reduced, as the wear and tear of small engines and dynamos running at high speed is very great as compared with Corliss engines and fly-wheel dynamos. The arc and incandescent lights in Portsmouth, it is claimed, are vastly superior to those in general use in England; as high as 50 per cent of advantage, photometrically, is insisted on for the arc lights.

The third point of novelty in the Portsmouth plant claimed for the system is the transformer, or the change over converters, as they are called. They change-over the high tension alternate current into the low pressure continuous, which feeds the mains supplying the various consumers of incandescent lights and the motor powers of the city; the two great systems at work up to now have been the high tension or alternating current, and the low tension continuous current, each having great advantages and corresponding disadvantages, which it has for a long time been the endeavor of electricians to overcome. The continuous low pressure system is very economical and generally satisfactory where a very small area has to be lighted, and when the demand is so great as to put up several central generating stations; its advantage is that it is possible to consume a much larger portion of electricity generated than by any other means, because there is less loss between the current generated and that supplied to the consumers. The great disadvantage is the very small distance that it is possible to distribute light and power through the mains, on account of the very low pressure at which the electricity is generated and distributed. This necessitates the generating stations being small. We are all well aware of the fact that it is more expensive to run several small stations than one large one to do the same amount of business. Again, the amount of copper required in the system for a low tension system is very great, requiring a heavy expenditure and a large amount of regulating to ensure constant pressure and an even current to the lamps. The alternating system is the reverse of this. One generating system is capable of supplying an area of almost any probable size, and consequently greater economical results; the current can be conveyed to a great distance by small mains. The alternating current dynamos are more mechanical in construction and substantial, and the general workableness of the system, all that could be desired; it suffered, however, in the loss in working the transformers as hitherto constructed. They are all right when under a full load and entirely turned off during the day, or when only a small amount of light is desired. As this is not practical, some people requiring a single burner for the 24 hours, they have in this way remained a source of serious loss. The system at Portsmouth is quite different from anything that has hitherto been done commercially, and consists in transferring the high pressure current into a domestic supply current by means of transformers placed under the side walks. These transformers are specially designed: they are so wound that they adapt themselves automatically to an electric supply of the highest possible efficiency under all conditions. That is to say, that they are not only efficient when supplying a large amount of light, which only occurs a short time, but they are equally efficient and economical under a small number of lights, and when a small amount of current is being taken. So good is the economy of this type of transformer that it almost entirely corresponds with the continuous current system. This is, there-

fore, a system that corresponds with all the advantages of the direct system and the alternate incandescent one. The transformers are really a modern development of the old induction shocking coil. In the old induction coil a very low continuous current was obtained from a battery and transformed into a high pressure current capable of giving a very strong shock. The modern transformer is the reverse of this, and takes the very high pressure current obtained from the powerful dynamo, which is specially suitable to transference through mains to a long distance, and transforms it into a low pressure and a perfectly harmless current suitable for applying direct to incandescent lamps. These transformers consist of a double ring of sheet iron, around which are wound a large number of turns of cotton covered copper wire, and are arranged with several separate windings whose action is automatically varied to suit the amount of lighting that is taken from the transformers at any particular time; the changing of the action of these windings is the means by which the high economy of the transformer is always maintained. The whole of the electrical parts are enclosed in a cast-iron case filled with resin oil, serving to keep out damp, which otherwise might get in and injure the apparatus, and greatly improves the insulation. An experiment was tried on a cable under a pressure of 15,000 volts. Mr. Koller, the engineer, with a steel chisel in hand, cut it in two without receiving the least shock, this was done in the presence of many experts, without any other effect but putting out the lights.

Twenty-five miles of cables have been laid in Portsmouth under the sidewalk in specially designed conduits, the transformers are also in boxes under ground. Although these long lengths of conduits and cables are buried under the ground in some places to three feet, every one of the cables can be easily reached, either for making repairs or for house connections, or to the street lamps more easily than if they were suspended on poles. There is room in these conduits for drawing in more cables when required; the conduits are so constructed that no water gets in them, not one wire in the whole system is to be seen, either to the street lamps or into the houses.

The dynamo room at the central station is 102 feet by 66 feet. There are three Corliss compound engines in it, and five boilers Lancashire pattern, 30 feet by 7 feet 6 inches, with room for double the number of engines and boilers. The whole instalment, engines, boilers and electric plant, have been a success from the start, notwithstanding its many entirely new features; it is also a commercial success, the cost of the lights being very materially less than that of any other known system, considering their very great efficiency.

The whole installation, including buildings, machinery and electric plant, together with the conduits, wires and street lamps, is the property of and operated by the municipal council of Portsmouth, in the interests of the citizens. The total cost of everything appertaining to the system was under \$250,000, with means for a further extension when desired. So much has the Portsmouth system been appreciated in England, that London, Dublin, Edinburgh, Liverpool, Cardiff, and other cities are making the necessary arrangements to adopt this system as soon as it can be done. It has been visited by electrical experts from all points. Surely some of our Canadian city authorities will investigate this matter, and if as good as claimed, adopt it.

THE NEW ELECTRIC RAILWAY TO COTE DES NEIGES.

The Montreal Park and Island Railway Company are working in earnest to give the whole Island of Montreal a thorough electric service. A short time ago their new line to Back River was opened, and on Wednesday, the 1st, another spur, a portion of the line projected to run from the city to Notre Dame de Grace, was formally opened as far as Cote des Neiges. The grading of this track only began ten weeks before that date, yet the roadbed is now a wonderfully smooth and solid one. The opening of the line for traffic was inaugurated in very pleasant fashion. Two special cars, bedecked with bunting, left Cote street station about 2 o'clock, and conveyed full loads of those interested to Mayor Swail's grounds at Cote des Neiges, which is as far as the track at present goes. Here the party partook of refreshments, listened to congratulatory speeches, and had (as at other places along the route) their photographs taken by Mr. Heckman, whose fine pictures have appeared in our pages on other occasions. Amongst those present were Hon. J. A. Chapleau, Lieut.-Governor of Quebec, Hon. G. A. Nantel, Minister of Public Works; Hon. Louis Beaubien, Minister of Agriculture and Colonization; J. Israel Tarte, M.P.; Judge Mathieu, Mayor Villeneuve (of Montreal), Mayor Swail (of Cote des Neiges), Mayor Dunlop (of Outremont),

Mayor Decarie (of Notre Dame de Grace); E. L'huier, of the Montreal Street Railway Co., Mr. A. J. Corriveau, the contractor, Mr. Joseph R. Roy, chief engineer, Mr. L. E. Marple, chief electrician, besides the councillors of the various municipalities through which the line passes. Further reference to this line will be made in next number.

Electric Glashes.

W. E. SMITH, of Fredericton, is making arrangements to open a new telephone exchange in St. Stephen, N.B.

THE Bell Telephone Co. will before next spring put in a complete new fire-alarm system in Cote St. Antoine, Montreal, at a cost of \$1,675.

GEO. SIEMENS, the well-known cable electrician, is on a visit to Ottawa, on business, it is believed, connected with the proposed Pacific cable.

THE Hamilton Electric Light Co.'s contract with that city expires at the end of August, and the question of a renewal is being considered.

ST. JOHN'S, Que., town council have received a proposition for an electric light service as follows. \$70 per arc lamp of 2,000 c.p., or five incandescent lamps of 37 c.p. for the same price. The town at present pays for 34 lamps.

THE employes of the Hamilton Electric Light and Power Co. held their annual pic-nic at Dyers' one Saturday afternoon last month. The attendance was large and an excellent programme of games and dancing was gone through.

J. G. HAMPTON, superintendent of the North American Telegraph and Telephone Co., was in town the other day, and under his direction a telephone cable was successfully laid to Tremont Park, and communication between the town and island established. It will prove a great convenience to islanders. — *Gananoque Reporter*.

LAST month arrangements were being made by the Supreme Court for the final distribution of purchase money, amounting to \$92,000, obtained by the sale of the Consolidated Electric Company's property, among the bondholders of the Eastern Electric Co., the New Brunswick Electric Co. and the St. John City Railway Co.

It was expected from a report of Engineer Jennings that it would be necessary to re-tie the Hamilton and Dundas Railway in converting it into an electric road, but Mr. Miles, of the Hamilton, Grimsby and Beamsville Electric Railway, who has leased the Dundas road, says the present roadway will stand. The work of conversion will not be proceeded with immediately.

THE Fire and Light Committee of Toronto city council have decided to ask for tenders for from 1,300 to 1,500 electric lamps, for a term of five years, the price paid under the present contract being considered too high. Should the tenders be thought too high, a by-law will be submitted to the ratepayers for the purpose of issuing debentures to provide funds for the purchase of the plant necessary to provide the city with its own electric lighting.

A NEW electric fire alarm system is being introduced in Montreal, buildings equipped with which are allowed by fire underwriters a 5 to 10 per cent. rebate off the ordinary premiums. It is called the Watkins Automatic Fire Alarm, and is a system of thermostats, which are adjusted to the normal temperature of the place in which they are located. The instruments are quite small and operate upon the principle of the expansion of metal by heat, being so adjusted as to close an electric bell current upon an increase of temperature amounting to 30 degrees above the normal.

SECRETARY-TREASURER William B. Rankins, of the Cataract Construction Company, Niagara Falls, has given for publication the manner of transmission of electricity to Buffalo and Rochester. The induction and transmission will be the overhead system and similar to that adopted in the Tivoli-Rome circuit in Italy, a distance of over twenty miles. Steel poles will be sunk in beds of concrete to the depth of six feet. Copper cables 3-10 of an inch in diameter will be strung overhead a distance of 25 feet from the ground, and by an automatic arrangement, should a cable be cut, it will become dead before it reaches the ground. The loss of electricity in transmission will be much less than any published statement made thus far. The contract for the line to Buffalo has been let. The line to Rochester will not be built before late this fall.

THE track of the new electric railway from Danville to Asbestos and the slate quarry has now been laid

THE by-law to raise \$13,000 for the establishment of an incandescent plant at Orillia, Ont., was carried by a small majority.

ADAM BRIZ, a tailor of Hamilton, was riding a bicycle when he came into collision with an electric car and was fatally injured.

THE second annual picnic and games of the employees of the Bell Telephone Co. will be held at Otterburn Park on Saturday, the 11th inst.

THOMAS SCOTT, the trackman of the Montreal Street Railway Co. has left for St John N.B. to take charge of construction work on the new street railway there.

THE Railway Committee, Ottawa, last month passed the bill incorporating the Boynton Bicycle Electric Railway Co., proposed to run from Winnipeg to Nova Scotia.

JOHN DINEEN, superintendent in the warehouse of Dineen Bros., Toronto, was knocked down last month by an electric car, receiving such injuries that he died within a few hours.

THE completion of the third Atlantic cable for the Commercial Cable Co. by Siemens Bros. & Co. makes a new record, the actual time taken by the "Faraday" in laying it being only twenty days.

THE Montreal Street Railway Company have taken a move in the right direction in introducing special smoking cars on their lines. The only two cars we have yet noticed were crowded with lovers of the "weed."

THE trailer of a Montreal electric car ran off the rails at Hochelaga, and while in this position came into collision with another car and was smashed to pieces. A young child who was in one of the cars was injured.

WM. A. SWEET has been appointed chief engineer of the Hamilton, Grimsby and Beamsville Electric Railway. Mr. Sweet is past-president of the Hamilton No. 2 branch, Canadian Association of Stationary Engineers.

P. A. PRINCE has a 5 years' contract with the Calgary, N.W.T., town council for electric street lighting. There will be twenty-five 1,200 c.p. lamps at \$7 per month each, with a discount of 15 per cent. for payment within a stated period.

THOS. MARSHAL, of the Second Yorkshire Regiment of Infantry, committed suicide two or three weeks ago by throwing himself in front of an electric car in Montreal. Death was instantaneous. The act was supposed to have been the result of a week's drinking bout.

LAZIER & SONS, Belleville, Ont., have the franchise to construct and operate an electric street railway, and to supply power, heat and light in the city. Construction work on the railway will begin at once, and the road will probably be completed by the end of the year.

JOHN MARQUETTE, a Montreal barber, was killed last month by an electric street car. He hailed a car, and, as it did not stop, ran after it and succeeded in grasping the rail. He then, however, lost his footing and fell under the wheels, where both his legs were cut off above the knees.

IN order to avoid all risks of infection, telephones have been introduced in Germany in which the speaking part is made upon the principle of a blotting pad, so that each person, as he finishes talking, can tear off a sheet of paper, thus leaving a fresh mouth-piece for the next comer.

AT a meeting of the Knights of Labor recently in Montreal, the Street Railway Co. were denounced for the numerous accidents which had lately occurred on their tracks. They decided that one of the chief causes of these accidents was the excessive number of hours' work of their motormen.

D. G. STEPHENSON, of Toronto, Warden of the County of York, a Justice of the Peace, and President of the Toronto and Scarborough Electric Railway Light & Power Co., a few days ago made an assignment of his property to James Baird, of Toronto, his liabilities exceeding \$50,000. He shortly afterwards disappeared, and has not been seen since. A large number of ladies had placed funds in his hands for investment.

THE Toronto Electric Motor Company are carrying the war into Africa, having shipped to W. J. Goddard, Detroit, a 15 h. p. motor. This motor Mr. Goddard ordered after examining motors in Sarnia and Windsor made by this firm, and his preference is sufficiently strong to justify him in paying the American duty. Two or three months ago the Toronto Electric Motor Co. sent their first machine to Montreal, now they have six in operation in that city.

VICTORIA, B.C., city bonds to the amount of \$55,000, for the purpose of establishing an electric light plant, have been sold to a Chicago firm at 100⁰/₁₁.

ORILLIA, Ont., incandescent electric light system is expected to be completed by October 1st. The Canada General Electric Co. have commenced the work of putting it in.

THE Bell Telephone Company have commenced the construction of their underground system at Ottawa. 18,000 feet of underground cable and 19,000 feet of aerial cable will be used.

FRANK RATCLIFFE, a six year old boy, was, two or three weeks ago, riding on the back of a cart, when he jumped off, and was almost immediately knocked down by a Toronto electric car going in another direction. He was fatally injured.

THE Valley Telephone Co. have decided to extend their line to Digby, N.S. The line now passes from Annapolis to Hantsport, with several branches, and makes connection at the latter place with the Nova Scotia Telephone Co.'s line, which connects Halifax with most of the principal towns in the central and eastern portions of the province.

ONE of the three big generators which are being built by an Ontario company for the Montreal Electric Railway, was tested last month with very satisfactory results. It is a duplex machine, capable of supplying a current of 1,200 h. p., and has an arrangement of clutch wheels, by means of which either of the two generators can be used separately if required.

MARCEL GAGNON, a Montreal grocer, was driving his wagon homeward when it collided with an electric car. Gagnon fell out with the shock, and his clothing caught in the cross-bar pin of the car, his head coming several times in violent collision with the ground before the car could be brought to a standstill. He expired shortly afterwards. The motorman was not to blame.

THE Toronto Electric Street Railway Company has signed an agreement to purchase the Metropolitan Railway Company's property and charter. The sum specified is \$76,000. The stockholders in the Metropolitan Company are Nicholas Garland, Robert Jenkins, Charles D. Warren, and John Anderson. The consummation of the sale is being delayed by an injunction granted some time ago to Mr. Anderson, which prevents the disposal of any of the company's property until his claim as a stockholder is settled. His shares amount to \$20,000.

THE official opening of the Galt and Preston Electric Railway took place under auspicious circumstances on the 26th ult. This line forms a connecting link between Preston and the C.P.R., and as it is set standard railway gauge an interchange of rolling stock can be effected if convenient. The rolling stock and electrical equipment have been furnished by Ahearn & Soper, of Ottawa, and form one of the most complete electrical ensembles in Canada. W. A. Lee, formerly of Toronto, has been appointed manager, while in the power-house Christian Gladly has been appointed engineer, his assistant being Richard McWilliams, formerly of Toronto.

THE Hamilton, Grimsby & Beamsville Electric Railway Co. is progressing with construction work. The car sheds at Grimsby are being put up, the contract for the iron work having been let to J. E. Riddell, manufacturer of roofing materials, Hamilton. The power house at Stoney Creek has been built and the engines put in. They consist of two 150 h. p. Corliss engines built by Inglis & Sons, Toronto. At present 14 miles of track are laid, and the bridges and culverts all done, and poles and arms up. The total mileage to Beamsville is 22 miles, not including the spurs to Winona Station and to Grimsby Park. A station 140 x 80 feet is to be built in Hamilton, the roller rink property having been bought for that purpose. Eight passenger cars and three express cars have been built. As already noted, the Hamilton & Dundas "dummy engine" railway will be taken over, and converted into an electric road.

THE Chaudiere Electric Light and Power Company, the Standard Electric Company, and the Ottawa Electric Light Company, which had done business in Ottawa for many years, have been amalgamated into one company, under the name of the "Ottawa Electric Company," which will carry on all the business of the former three. The authorized capital stock of the Ottawa Electric Company is \$1,000,000, and the paid up stock is \$645,000. The board of directors of the new company are Thomas Ahearn, Hon. E. H. Bronson, M.P.P., G. P. Brophy, G. B. Pattee, C. B. Powell, J. W. McRae, Robert Blackburn, Hon. Francis Clemow and Wm. Scott. Mr. Ahearn is president, and Hon. Mr. Bronson is vice-president. Mr. O. A. Dion, of the old Canadian company, is general superintendent; Mr. G. F. Macfarlane, of the old Standard Company, secretary-treasurer, and Mr. Douglas Street, of the old Chaudiere Company, accountant.

McCORMACK and McEvoy are making good progress with incandescent electric light contracts, and nearly every business man and a large number of private residents will place the lights in their stores and residences. It is expected the dynamo will be started by September 1st, with nearly 500 lights in the different places, and from the cheap light furnished many more will probably order it put in.—*Amherstburg Leader*.

The assignment of T. W. Ness & Co., manufacturers and dealers in electrical appliances, Montreal, was one of the events of last month in the electrical line. The immediate cause of the assignment was the failure of the Reliance Electric Co., of Waterford, Ont., for whom they acted as agents, but it was known that for some time past the firm had been extending its operations over too wide a sphere, and the assignment was not altogether a surprise. The creditors number fully two hundred, and the amounts aggregate between \$30,000 and \$40,000. The firm had been intending to move to Carleton Place, where a bonus was offered, but the present shot between wind and water prevents the accomplishment of that design. The works are being carried on meantime, and it is expected that the estate will yield a fair dividend. John McD. Hains has been appointed curator.

LITERARY NOTES.

The Indian Engineers' Diary and Reference Book for 1894 is a useful and well-bound book published by the *Indian Engineer* of Government Place, Calcutta, India, and 28 Victoria street, London, S. W., England. The diary is furnished free to yearly subscribers to that journal. It contains a quantity of curious information respecting various Oriental calendars, holidays, etc., in addition to a vast number of facts relating to postal and telegraphic charges from India to other countries, the Indian stamp and customs duties, the value of foreign weights and measures, and many other items worth remembering. It also contains short articles on engineering, building, electrical and many other subjects. Altogether the diary is well worth having, as it is full of information not easily obtained from any other source.

Electricity One Hundred Years Ago and To-day. With copious notes and extracts. By Edwin J. Houston, Ph.D. (Princeton) New York: The W. J. Johnston Company, Ltd., 253 Broadway 199 pages, illustrated. Price, \$1. In tracing the history of electrical science from practically its birth to the present day, the author of this work has, wherever possible, consulted original sources of information, and he was fortunate to have at his disposal for this purpose the excellent library of the Franklin Institute, which contains, perhaps, the most complete collection of scientific publications of the last century to be found in this country. As a result of these researches, several revisions as to the date of discovery of some important principles in electrical science are made necessary. For example, it is found that Sir Humphrey Davy was anticipated in the discovery of the electric arc by many others, and in fact, did not claim to have been the first to discover the brilliant effects of the arc. Proper credit is given to Gilbert for his inductive methods, and in an appendix several writers are quoted to show that Bacon has been honored above his merit in this respect. While, as the author states, the compass of the book does not permit of any other than a general treatment of the subject, yet numerous references are given in foot notes, which also in many cases quote the words in which a discovery was first announced to the world, or give more specific information in regard to the subjects mentioned in the main portion of the book. This feature will be found of interest and value, for often a clearer idea may be obtained from the words of a discoverer of a phenomena or principle than is possible through other sources. Much information as to electrical phenomena may also be obtained from the book, as the author is not satisfied to merely give the history of a discovery, but also adds a concise and clear explanation of it.

The publishers of the *Water and Gas Review*, 35 Warren street, New York, have issued a valuable supplement, giving statistics concerning the waterworks of 194 cities and towns in the United States and Canada. These figures include the cost of the waterworks, number of taps, amount of pressure, cost of coal, consumption of water per head, number of meters in use, and other useful information conveniently arranged in tabular form.

The Hamilton, Ont., Facing Mill Company, Ltd., have lately issued a new illustrated catalogue, specifying all the appliances, facings, and tools required in the foundry trades. The Hamilton Facing Mill Company are the largest manufacturers of foundry facings in Canada, and their mill is one of the best equipped on the continent.

We have received a copy of the annual report of the South Australian School of Mines and Industries and Technical Museum. We were not prepared to see such evidence of progress in technical education as is contained in this report. It consists of 179 pages, and is illustrated by seven photo engravings and numerous diagrams. These engravings illustrate the various departments of the institution, which is situated in Adelaide, and they show it to be admirably fitted with machinery and scientific appliances. The institution has a metallurgical laboratory and assaying furnace, engineering, electrical and blacksmithing departments and rooms in which masonry, carpentry, lithographing, plumbing and gas-fitting and other trades are taught, including a tailor's cutting school and wool-sorting department, the latter of which is well calculated to aid in the wool growing industry, which is one of the specialties of the colony. One of the most striking features of this institution is a school of naval architecture, a department which might well furnish a model for adoption in Canada. A country such as Canada, whose mercantile marine ranks fourth or fifth amongst the great nations of the world, might well have such a school when our enterprising neighbor here has set the example. It is highly creditable to the intelligence of the South Australians that there are 660 pupils connected with this institute.

THE FIRE ENGINEERS' CONVENTION.

The convention of the National Association of Fire Engineers, which is to be held in Montreal, from August 14th to 17th inclusive, promises to be one of the most successful on record. We have already given the main items of the programme, to which the following supplementary items have been added in the way of papers for discussion:—

Simon Brentano, New York City.

Subject: The Modern Fire Department.

Wm. Paul Gerhard, C.E., New York City.

Subject: Theatre Fire Catastrophes.

Prof. J. T. Nicolson, Faculty of Applied Science,

McGill University, Montreal, Canada.

Subject: Some Points in the Design of Fire Engines.

Charles A. Rolph, Chicago, Ill.

Subject: The Progress of Electricity in Municipalities.

George Dickson, Principal Upper Canada College,

Toronto, Canada,

Subject: Fire Extinguishment in High Buildings.

William Brophy, Boston, Mass.

Subject: Some Points in the Transmission of Electric Energy.

William McDevitt, Inspector of Fire Patrol, Philadelphia, Penn.

Subject: Slow Burning Mill Construction.

Brown Flanders, Supt. Fire Alarm Telegraph, Boston, Mass.

Subject: Dynamo Currents as applied to Fire Alarms.

The headquarters of the convention will be in the Windsor Hall, adjoining the Windsor Hotel, but the exhibition of their appliances will be held in the Victoria Skating Rink. Col. Stevenson, whose interest in matters pertaining to fire engineering is well known, is doing all in his power to awaken local enthusiasm in the convention, and it is understood that the visitors will be entertained with various sights in and around Montreal, including a drive round the mountain, a trip down the Lachine Rapids and through the harbor, etc.

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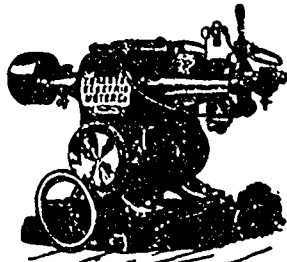
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WINNIPEG—Forrest Block, Main St.

Toronto Electric Motor Co.



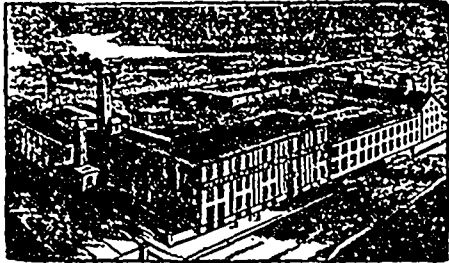
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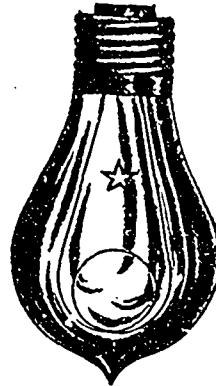
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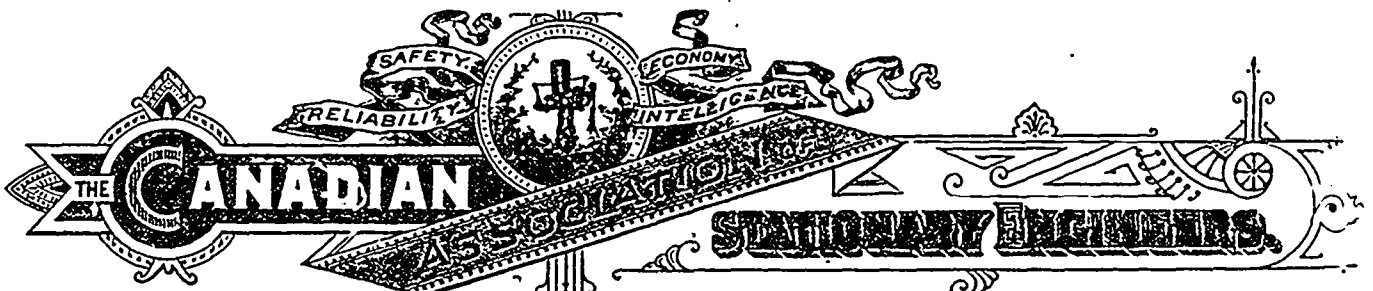
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We therefore trust that the manufacturers will enter liberally into our scheme, seeing that we are devoting our time and money to the more economic operating of their several plants.

GEO. HUNT, Executive Pres.,
JOHN J. YORK, Executive Sec'y,
 15 Tara Hall Ave., Montreal.
 625 Dorchester St., Montreal.

WOOD, VALLANCE & CO.'S WAREHOUSES.

In a former issue reference was made to the erection of new warehouses by Wood, Vallance & Co., wholesale hardware merchants, Hamilton. The firm are now in full occupation of their new premises, which are not excelled, if they are equalled, by any wholesale hardware house in the Dominion. The accompanying engraving is from a photograph taken on completion of the building. The main block contains four stories, besides the basement, and the buildings altogether contain 74,942 square feet of floor space. The premises are provided with hydraulic elevators, heating apparatus and all the appliances of modern warehouses, and the architecture, while not ornate, is imposing. There is a frontage of 178 feet on King William street and 137 feet on Hughson street, while a portion of the establishment runs through to King st.



The basement is devoted chiefly to plate and sheet glass, while the ground floor is taken up with steel, wire, bar iron and building paper. On the ground floor are the private offices of the heads of the firm, with typewriters' and stenographers' offices convenient to hand, and spacious sample rooms are on the same flat. These offices are finished in natural woods and are excellently lighted. The general offices are on the same floor, but in another part of the building, and the rest of this flat is taken up with a very elaborate show of cutlery in cases and on shelves. The third floor is devoted to shelf hardware, of which there is a very diversified stock. The top flat is occupied by granite ware, saws, nails, etc., while a cosy corner is used as a sanctum for the travellers of the firm, one of whom has placarded the door with the suggestive sign, "Missionary Headquarters."

Between the main building and the extension on King William street, is a drive-way where trucks and drays may load and unload, and the large packing and shipping-rooms are ranged convenient to this. On either side of this drive-way are the stocks of heavy bar iron, wrought iron pipes, fittings, etc., disposed in such a way as to be handled with the least difficulty. Other portions of the premises are taken up with stocks of ropes, pulleys, bellows, woodenware, and the miscellaneous items that go to make up the varied stock of a Canadian wholesale hardware establishment. The firm of Wood, Vallance & Co. has now reached the 45th year of its existence, and their patrons throughout the Dominion will congratulate them on this latest monument to their enterprise.

A MINING MOVE IN B.C.

(From a Correspondent of The Canadian Engineer.)

News has been received of a move that will be of great interest to all who have mining investments in the Kootenay country. Several leading business men of British Columbia have joined forces with Eastern Americans in the promotion of one of the most extensive schemes known to the history of this rich mineral region. For a long time it has been known that one of the chief reasons for the comparative standstill in this section is the excessive tariff that all ores coming out of its mines have been made to suffer. Owing to a combination of inadequate transportation in the immediate vicinity of the mines, the long hauls necessary to convey the products to the smelters on the American side, and the tax at the line, only high grade ores could be handled to any advantage or profit. This necessarily left a large number of valuable medium and low grade properties idle on the hands of the owners. But American enterprise was not long to be baffled by such difficulties, and the solution of the problem appears to have been reached. As the result of the efforts of Andrew B. Hendryx, of New Haven, Conn., and Mr. Joshua Davis, of Victoria, B.C., a company has been formed to be known as the Kootenay Mining and Smelting Company, with a paid-up capital of \$2,250,000, which has been subscribed in New Haven, Minneapolis, and Victoria, B.C. E. W. Herrick, a Minneapolis capitalist, is the president of the new com-

pany. R. P. Rithet, of Victoria, B.C., is the vice-president, and Josi Davies, E. Crow Baker, W. H. Ellis, W. P. Sayward, W. J. Macaulay, James Hutcheson, and Headly Chapman, all of whom rank high in the business circles of British Columbia, are associated with them in the enterprise. Pilot Bay is the geographical centre of the Kootenay country, commanding on the one hand the rich Slocan with its high grade silver-lead ores, and on the other the copper, silver, and lead of Ainsworth and Nelson, with all their intermediate points. At Pilot Bay, and owned by the company, is the Blue Bell mine, one of the largest and most valuable deposits of fluxing ores in America. Such is the favorable location which the company has selected as the base of their operations. The plant as designed will accommodate four stacks each of 100 tons capacity. Seven large buildings have already been completed for the works and three others are under way. Over 200 tons of the most modern machinery has been received and is now being put into place, while several carloads more are on the way from the East. The plant will be the most modern and complete that money can buy. Extensive wharves are being erected along the water front, and apparatus will be placed for the handling of ores in large quantities.

The works will be in operation before the first of October next, with one 100-ton stack in full blast for the reduction of silver-lead ores. The three other stacks will be added as fast as the district develops, and it is designed to give the treatment of copper ores the same attention as lead ores. In fact, all ores that can be handled to profit and advantage will be purchased and treated by the company.

In addition to the smelter proper, the works will include a 300-ton sampling plant, a 200-ton concentrator, a refinery capable of treating all the bullion produced, and the finest laboratory and assay office in the west.

The new works will create a demand for the now unused volume of medium grade ores of Kootenay, thus greatly increasing the extent and profit of all operations in the vicinity. The company does not propose to stop with the production of bullion, and its separation into base and precious metals. Works will be established for the manufacture of pig lead into white lead, sheet lead, lead pipe, etc., and an attempt will be made to supply Canada and the Orient with lead and lead products.

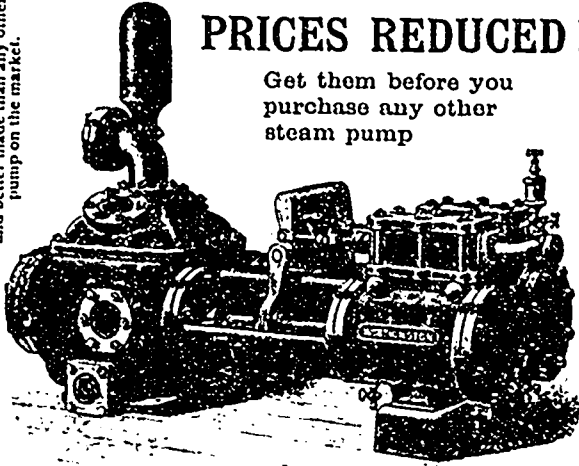
There can be no doubt but that the scheme will go ahead all right. Messrs. Hendryx and Herrick are pioneers of the British Columbia mining regions contained within the Kootenay country. Mr. Hendryx is the founder of the Andrew B. Hendryx Company, of New Haven, Conn., whose goods are well known on both sides of the Atlantic. He is a practical and successful mechanic and business man, and under his management the works will be skilfully handled. R. P. Rithet, the vice-president, is British Columbia's leading business man. He is at the head of the firm of R. P. Rithet & Co., Victoria, and Welch & Co., of San Francisco, is largely interested in the sugar trade of the Sandwich Islands and China, has extensive steamboat interests, owns the Enderby flour mills, and large wharves at Victoria, is interested in lumbering enterprises, and has an interest in the Albion Iron Works and other business concerns. He has been mayor of Victoria and president of the British Columbia Board of Trade, and holds to-day a foremost position as a progressive commercial man. Mr. Joshua Davies, who has the handling of the business in Victoria, is well known as a man of sound business integrity and ability, and there is not a name on the list but belongs to a man who is known to make a success of whatever he undertakes.

REVIEW OF THE METAL TRADES.

MONTREAL, AUGUST 3RD, 1894.

There are no new features to record in the metal trade, and the position is just about the same as has characterized this business for months past. There is nothing particularly cheerful in the outlook, and the dawn of brighter days seems as far away as ever. Turn where we will, and every avenue seems blocked by some obstruction. Occasionally reports come in that indicate an improvement, but it does not appear to gain much headway, and we shall have to wait patiently till strikes are settled and things get down to a sounder basis, which we think will be the ultimate result. Values are lower than ever. For all classes of mild steel Germany is the cheapest market and can easily compete with our own production. The coal strike in Scotland, while it has not enhanced values, has nevertheless interfered with the manufacture of pig iron and puddled bars, and a good many furnaces have been damped down pending the outcome. The United States seem to capture their share of what few orders are going.

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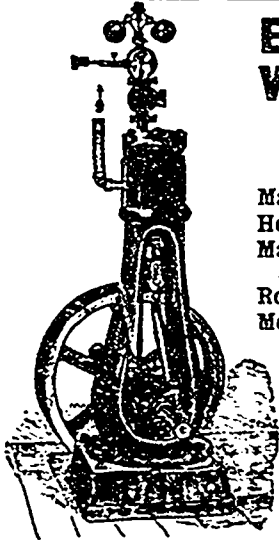
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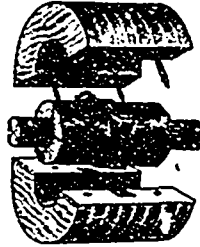
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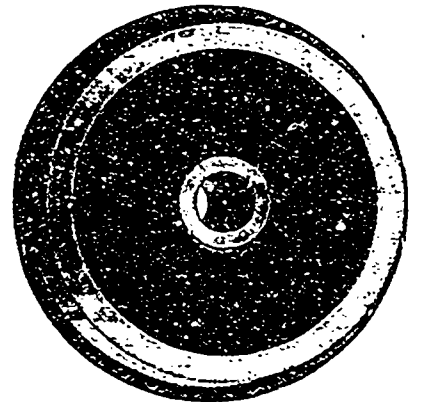


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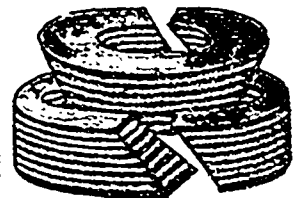
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Industrial Notes.

THE bridge over the Big Shikjehawk stream near Bristol, N.B., is now completed.

THE bridge across the Bonnechere at Golden Lake collapsed last month during a high wind.

A FINAL test of the new waterworks system at Pembroke, Ont. was made recently with satisfactory results.

GANANOQUE, Ont., factories are closing down for six weeks whilst a new dam is being built at the Falls.

THE Surprise Soap Works, at St. Stephen, N.B., have just put in a new soap boiler of 50,000 lbs. capacity.

THE Mineralogical Society, of Boston, made a tour through the mining regions of Nova Scotia last month.

J. C. SEPES, of Galt, writes to the *Hamilton Times* saying he has discovered a great subterranean lake of petroleum.

THE work of rebuilding Humphrey & Trites' sawmill at Petitcodiac, N.B., is nearly completed, and the machinery will be put in shortly.

CITIZENS of Sudbury, Ont., will, on the 15th inst., vote on a by-law for the expenditure of \$30,000 for constructing waterworks in that town.

THE corner stones of the chimney of the Thackeray Incinerator, now in course of erection at Montreal, were placed in position late last month.

A. F. GAULT, president of the Montreal Cotton Co., has just placed a contract for the erection of a \$20,000 Protestant school building at Valleyfield, Que.

THE Robb Engineering Co., of Amherst, N.S., have shipped to Hill & Corbett, Londonderry, two steam driers for drying the mud in the lakes at Westchester.

WHILE working at the bridge over the Tantramar, at Sackville, N.B., last month, Coleman Bowser fell out of his boat and was carried away by the current and drowned.

J. C. GRANT's grist mill at Windsor, Ont., has been destroyed by fire, which is supposed to have been caused by overheated bearings. Loss, \$6,600; insurance, \$4,000.

SUTHERLAND, TRENES & Co.'s saw mills at Renwick, Ont., have been consumed by fire. Loss \$15,000 and \$20,000. Nearly a hundred men are thrown out of employment.

S. INGERSOLL, the inventor of the rock drill bearing his name, died last month at his home in Glenbrook, Conn., aged 82 years. Like many other inventors, Mr. Ingersoll died a poor man.

EUGENE SAVARD, proprietor of a foundry at Ste. Marie de la Beauce, Que., was instantly killed a short time ago, owing to the bursting of a grindstone, a fragment of which struck him on the breast.

MAGOG town council has decided to purchase a steam fire engine to cost \$2,600. They are now calling for tenders for the construction of eight cisterns to serve as the basis for a water system.

JOHN LEAHY, of the Colonial Brewery, and John Bennett, City Brewery, Victoria, B.C., have amalgamated under the style of Leahy & Bennett. The works will now be at the Johnson street brewery.

THE Lincoln Paper Mills at Merritton, Ont., were last month struck by lightning and damage to the extent of \$47,000 done. The stock room, baggage and printing departments were destroyed, and a good deal of valuable machinery injured.

LAST month all the stonemasons employed on the new Government Buildings, at Victoria, B.C., struck work owing to the non-acceptance of a piece of work done by one of them. The contractors we hear, employed new men from the east to take the strikers' places.

L. Z. MANNETTE has brought a suit, in the Supreme Court, against A. Charlebois, to recover a one-third share of the contract price for the construction of the Quebec Court House, alleging that Mr. Charlebois had sublet a portion of the work to him at a price amounting to \$133,333.

THE sewerage committee of Peterborough city council recommend the construction of an outfall sewer from Townsend street, by way of George, Lake and Lock streets, to the river, the portion from Lake street to the river to be made of brick 3 ft. by 2 ft., and that from Lake to Townsend street to be an 18 inch pipe. The cost is estimated at \$21,000.

A NEW fire engine station is being erected at Chatham, N.B., the cost to be \$5,000.

J. CORNBURY and J. J. Hughes are opening a large plumbing establishment at Woodstock, N.B.

THE Canadian Bridge Co., Montreal, have the contract for two bridges over the aqueduct at Verdun, Montreal.

J. F. LILLCRAP & Co. have purchased the Lakefield, Ont., planing mills hitherto operated by G. M. Bellasis.

HALE & MURCHIE's sawmill at Fredericton, N.B., is closing down for a time, owing to dullness in the lumber industry.

IT has been decided to build a new house of industry at Athens, near Brockville, the buildings to cost about \$12,000.

TORONTO City Commissioners have issued a permit to the Comet Cycle Co. for the erection of a factory to cost \$25,000.

C. F. MOTT, of the Justice Soap Factory, Halifax, has assigned. Liabilities about \$21,000. The factory was mortgaged for \$7,000.

THE corner stone of a new hospital being built by the Carmelite Fathers, at Niagara Falls, Ont., at a cost of \$80,000, was laid on the 16th ult.

A PAPER mill for Winnipeg is one of the latest enterprises being started by local capitalists. Water power from the Assiniboine river will be utilized.

THE Golden Era Mining Co., Lt'd, Vancouver, has been incorporated, with a capital stock of \$8,000. G. L. Allan, H. Rhodes and Robert Hamilton are trustees.

D. L. VAN VLACK has been awarded the contract for the cedar paving of Bloor Street, Toronto, between Dufferin street and Lansdowne avenue. The price is \$11,669.

WORK is rapidly progressing on the new Roman Catholic school, corner of Champlain street, Montreal. The building is to be four storeys high, and is to cost \$80,000.

SILLS Bros.' flour mills at Meyersburg, Ont., have been consumed by the flames. Loss, \$15,000 to \$20,000. Insurance, \$10,000. About 3,000 bushels of wheat were destroyed.

THE new iron and brass foundry at Moosomin, Assa., which we referred to in the June number as about to be started, has now begun operations under the management of McCurdy & Walker.

THE Burrell-Johnson Iron Co., Yarmouth, N.S., have appointed John Trimble foreman in their works. He was formerly in James Heming's foundry, St. John, and is a thoroughly competent machinist.

N. T. GAGNON, who is to have in hand the erection of a hospital for the aged in St. Jean Baptiste, Montreal, says that the floors will be made of terra cotta laid on steel tension rods, in order to render the building fireproof.

W. E. WELDING's pottery works at Brantford, Ont., have been purchased by Dr. Lowrey. The price paid, including real estate, buildings and plant, was \$14,500.

A BUILDING permit has been issued for the erection of Fern Avenue Public School, Toronto, to cost \$17,400; also one for an addition to Bolton Avenue Public School, to cost \$10,500; and one to Giveas Street School, cost \$13,500.

ENGINEER KEATING recommends that the contractors for paving certain streets in Toronto be relieved from the obligation to put in scoria toothing, as the latter has been found to be hardly worth the inconvenience caused by its putting in.

WORK will be commenced shortly on a new parochial church at St. Jerome, Que., at a cost of between \$75,000 and \$100,000. It will be 150 ft. x 250, with a steeple 140 ft. high, and will be lighted by electricity and heated by steam.

VICTOR BELLEDOR, an employé in Gillies Bros.' saw-mill at Braeside, Ont., was attempting to adjust a friction wheel with a piece of scantling, when the stick was caught in the wheel and flew up, striking him in the mouth, breaking his jaw and shattering his face.

THE waterworks which are to be constructed at Campbellton, N.B., are to be controlled by a mutual company, of whom the following are the officers. S. Bousquet, president and treasurer; Chas. Coursol, vice-president, and J. H. Lefebvre, secretary. The other directors are Hon. J. R. Thibaudeau and Alfred Thibaudeau.

THE city authorities of Kingston are preparing to put in a second pumping engine in the near future. The engine is to be a duplicate of the one put in four years ago, by J. H. Killey, of Hamilton. That engine was of the same design as the one at the Hamilton Water Works, both having given the highest satisfaction.

WINNIPEG waterworks have just had a new battery of boilers put in.

WAWANESSA, Man., offers a bonus in aid of the construction of a 150-barrel flour mill.

BELLEVILLE city council has decided to spend \$15,000 in the rebuilding of Gordon's Bridge.

AN aerial bridge is to be built connecting Rat Portage, Ont., with Coney Island, at a cost of \$5,000.

A. E. HODGINS is superintending the construction of a new bridge across Three Forks Canon, B.C.

THE Dominion Paper Co. works, recently burned down at Kingsley Falls, Que., will be rebuilt at Sherbrooke

LAHHE & Co.'s furniture factory, Montreal, has been completely destroyed by fire. Loss, \$70,000; insured for \$52,000.

ARMSTRONG BROS' cheese-box and basket factory at Markdale, Ont., has been destroyed by fire. Loss, about \$10,000; insurance, \$2,500

D. W. HOEGG & Co will shortly commence the rebuilding of their canning factory at Fredericton, N.B., which was burned down recently.

THE iron bridge over the Mira Gut, which J. Stewart, of New Glasgow, has been constructing for the Government, is now ready for traffic.

WORK on the large steel bridge at Woodstock, N.B., is progressing slowly, but surely. The frame work of the first span is now in position

JOSEPH KIDD, of Tilbury, Ont., is having a roller flour mill of 100 barrels capacity built for him at Prince Albert, N.W.T. The town is aiding with a bonus.

ROBT A. KELLOND, a patent solicitor of Montreal, has been missing since May, and a number of creditors regret his absence. It is supposed he is in the United States.

THE plan of the Longfellow Sanitarium Co. for building an establishment in Berwick, N.S., was approved of by a meeting of the citizens, and stock is being subscribed for.

THE Cooperage Association of Essex, Kent, and Lambton counties have decided to close their stave mills for a month. Twelve hundred men are thrown out of employment.

W. B. McALLISTER & SON'S stone flour mill at Pembroke has been burned. Loss \$20,000, partly insured. The fire is supposed to have originated in the overheating of some machinery.

MR. BLACK has been granted by Iberville, Que., council a bonus of \$600 per year for ten years in consideration of his building in that place a pottery for the manufacture of porcelain baths, sinks, etc.

R. H. BUCHANAN & Co. have sold the Dominion Wire Mfg Co., Lachine, one 1,000-gallon underwriter fire pump, and one to the Point aux Trembles Water-works Co.; also three pumping plants to the Montreal Quarry Co.

THE Fox Tie Plate Company, Hamilton, are applying for incorporation. Capital stock, \$10,000. The applicants are: A. Zimmerman, John Bradley, M. A. Hunting and S. S. Ryckman, of Hamilton, and W. H. Muir, of Detroit.

E. BROAD, SONS & Co., axe manufacturers, St. Stephen, N.B., have dismissed their employes, and intend to remove their plant to Montreal, unless they can dispose of it advantageously in the locality, when they would establish an entirely new plant in Montreal.

A COMPANY has been formed at Wallaceburg, Ont., for the purpose of establishing a glassware factory in that town. They have a capital stock of \$50,000, and will apply for incorporation under the name of the Sydenham Glass Co. The secretary is A. G. Laird, Wallaceburg.

A MEETING of the creditors of the Dominion Blanket & Fibre Co., whose works are at Beauharnois, Que., was held a few days ago at the company's office in Montreal. The capital of the company is about \$180,000, which has been swallowed up in putting in plant, purchasing land and erecting buildings. The majority of the creditors present agreed to an extension of a year to give the concern a chance to get in shape to make money.

VICTORIA LODGE, No. 111, of the International Association of Machinists, Montreal, have appointed the following officers: Master machinist, H. McGue, foreman, T. A. Donovan; recording secretary, T. W. Swinton, financial secretary, A. Bucklow; conductor, A. C. West, inside guard, E. Blais; outside guard, E. Price, treasurer, W. B. Davie, trustee, Alex. Cunningham, and statistician, W. Wakefield. The lodge will hold a picnic at St. Rose on the 10th inst

JACOB MILLER'S machine shop, at Clinton, Ont., has been burned down. Loss \$2,500; partly insured.

MR. McLAREN, of Alliston, Ont., has a contract to build a new town-hall at Beeton, Ont., at a cost of \$3,575.

RICHARD ARMSTRONG'S planing mill, at Fairville, N.B., has been burned. Loss, \$3,000; no insurance.

THE Berlin, Ont., School Supply Co. are moving into the works formerly occupied by G. V. Oberholtzer's shoe factory.

THE Williams, Greene & Rome Co., manufacturers of shirts and collars at Berlin, Ont., have failed with large liabilities.

W. H. THORNE & Co., St. John, N.B., have a contract to supply the city with 1,000 feet of new fire hose at 90 cents per foot.

WATERLOO county council has signed a contract with a Montreal company for the erection of a bridge at Nithvale for \$2,081.

A ROMAN Catholic chapel is being built at the Joggins' Mines, N.S., at a cost of \$6,000. It will be 100 by 42 feet in dimensions.

REGINA, N.W.T., town council will appropriate \$10,000 for the erection of the buildings for the Territorial exhibition in 1895.

TWENTY-FIVE thousand dollars stock have been subscribed in Gananoque, Ont., for a new carriage factory to be built in that town.

THE construction of the new sewers in Waterloo, Ont., has been commenced, J. R. Pedder and H. J. Bowman being engineers in charge.

BRYAN & Co.'s Stave and Hoop Mill, in Raleigh Township, Ont., was destroyed by fire last month, including a large stock. Loss, \$10,000.

PLANS have been made, by John Galt, C.E., Toronto, for the masonry dam and a small steel bridge at Mount Pleasant cemetery to replace the one recently carried away.

VICTORIA city council invites tenders for debentures for \$25,000 under the exhibition loan by law, also for debentures to the amount of \$100,000 for sewerage purposes.

THE corporation of Brockville are laying a water main to the new asylum now being built there. The extension being made will probably necessitate a larger pumping engine and boilers next year.

JOSEPH McAFEE has built a new foundry on Paradise Row, St. John, next to Lordly's foundry, and calls it the "Valley Foundry." He is fitting it up with appliances to make stoves, plumbers' goods, etc., and castings.

THE following are the officers of the New Westminster and Vancouver Tramway Company for the ensuing year: President, David Oppenheimer, vice president, B. Douglas, directors, J. A. Webster, Isaac Oppenheimer and E. A. Wyld, secretary-treasurer, P. N. Smith.

JOHN GALT, C.E., Toronto, reported last month to the Port Hope town council regarding the waterworks of the town. The water supplied at present is only for fire purposes; but Mr. Galt estimates that \$30,000 would put in a reservoir and house service for the town.

THE Hovey Bros. Packing Co. of Sherbrooke, Que., is asking incorporation. The capital is to be \$25,000, and the first directors will be A. F. Hovey, Fred K. Hovey, W. B. LeBarron, J. B. LeBarron and C. E. Jenkins. The Hovey Bros. did a pork-packing business at North Hatley.

THE Northey Manufacturing Co. have shipped, among other orders, a large compound duplex plunger pump to the Intercolonial Coal-Co.'s works, to raise water up a slope of 3,000 feet with a straight lift of over 600 feet. They have also put in a large pump for the Toronto street railway.

JAMES F. DAVIS opened up in Hamilton an electro-plating establishment last February, and reports a very favorable beginning to what promises to be a successful industry. One of his specialties is the manufacture of the "Universal" gas sad-iron. His works are at 258 Catharine street north.

THE council of the united counties of Leeds and Grenville contemplate granting \$400 towards the erection of a bridge over Irish Creek, between Easton's Corners and Kilmarnock; also \$300 towards erecting a bridge across the south branch of the Rideau in the township of Augusta. The latter bridge would cost about \$1,000.

THE Owen Sound, Ont., Portland Cement Co.'s Works, at Shallow Lake, were another of last month's preys to the flames. Some extensive plant, which had just been imported from England, was destroyed, together with a large stock in hand. Origin of the fire, unknown. Loss about \$50,000, partly insured. The works will be rebuilt.

GALT town council is asking for tenders for debentures to the amount of \$11,000 for public school purposes.

WEST FLAMBORO, Ont., council will call for tenders for the construction of a wooden bridge across the creek at Little's mill.

THE Ottawa Government Agricultural Department has refused to accede to the request for a grant in aid of the Dominion Exhibition, which it is proposed to hold next year in Toronto.

JAS. BOWERS' sash and door factory at Orangeville, Ont., has been destroyed by fire. Loss \$8,000, insured for \$2,000. An electric light plant in connection was damaged by water.

CHARENTE AND DESORMEAU, of Montreal, have the contract from St. Henri (Montreal) council to pave Notre Dame street west at a cost of \$3.64½ per yard. The total cost will be \$25,000.

THE *North Star*, Parry Sound, says W. R. Beatty, M.P.P., has been engaged as mill manager for Wm. Peter, and that the old Midland (North Shore) mill has been fitted up for sawing lumber.

THE council of St. Cunegonde, Montreal, have spent some time lately, discussing the Vibartis system of incineration with S. G. Smith, of New York, its inventor. The cost of erecting such an incinerator would be about \$20,000.

MISFORTUNES have an unpleasant knack of never coming single! J. R. Booth, of Ottawa, who only a short time ago lost his fine new saw-mill at Ottawa, has now met with another considerable loss, nearly 280,000 feet more of lumber being destroyed by fire. Loss estimated at about \$4,000.

At the recent convention of American Flint Glass Workers, at Montreal, the following officers were elected: President, W. J. Smith; vice-president, W. J. Doolin, Millerville, N.Y.; general secretary, J. Kunzler, Pittsburgh, Pa.; assistant secretary, W. J. Close, Pittsburgh, Pa.; and executive officer for Canada, J. Higgins, Montreal.

JOHN A. FRY, Yonge street, Toronto, has taken proceedings for \$10,000 damages against the Computing Scale Co., of Dayton, O. Mr. Fry was appointed agent of the company in Toronto, and had an agreement to act as the Dominion representative. Lately Mills & Co., of Chicago, secured the Canadian agency, and Mr Fry was crowded out, hence the suit.

O. M. HARTT, of Hartt, King & Co., shoe manufacturers, Tarrytown, N.Y., is enthusiastic over the notion of establishing a shoe factory in Fredericton, N.B., to employ 200 hands and have a capacity of 1,000 pairs per day. He guarantees to get subscriptions amounting to one half the required amount of capital stock, provided Fredericton citizens will provide the remainder.

S. C. STEVENSON, manager of the Montreal Exhibition Co., has made a proposition to the Dominion Government to the effect that, with a view to the establishment of closer relations between the various colonies of the British Empire, a series of intercolonial exhibitions might be arranged, to be held either alternately or simultaneously in Canada, Africa, and Australia.

Work is proceeding on the new Roman Catholic hospital, at Valleyfield, Que. The building is 110 x 50 ft., four storeys high, and will cost from \$30,000 to \$40,000. The work is being built under the direction of Father Emard. Plans are also being prepared for a large Catholic college building for Valleyfield. The cost of this building will be about two or three times that of the hospital.

THE E. B. Eddy Co., Hull, convey power to their new buildings by means of the Dodge system of rope drive, 150 horse-power being transmitted from a water wheel 180 feet distant. The pulleys used in connection are made of cast iron, grooved according to the "Dodge" method, the tension carriage and tightener having a run of about 30 feet. This system, including several ingenious devices for the saving of power, etc., is controlled by the Dodge Wood Split Pulley Co., of Toronto, whose methods have been in use at the Eddy mills with complete satisfaction for several years.

THE Kramer-Irwin Rock Asphalt and Cement Paving Co., of Hamilton, have been the successful tenderers for the large contract for street asphalt in Hamilton which was advertised last month. The Construction and Paving Co., of Toronto, the Warren Scharf Co., of Toronto, and Connolly & Co., were the other competitors. A very favorable report had been made from the United States to the council on the Pitch-Lake asphalt as against the Trinidad asphalt, and it was decided to take the former at \$2.59 per sq. yd. The price of stone curbing is to be 89 cts. per foot and recutting and setting of old curbing 60 cts.; new curbing without concrete 70 cts., and old curbing re-dressed, with concrete, 50 cts. The work will probably be finished this year, and will cost about \$10,000 less than the city engineer's estimates.

THE building for John Ballantyne's wood working machinery establishment at Preston, Ont., is nearly finished.

THE St. John *Sun* confirms the rumor that Mr. Leckie, of Londonderry, N.S., is to erect smelting works in that city. He expects to ship quantities of iron to the Scotch market.

DOTY Bros. & Co., engine and boiler makers, Toronto, who called a meeting of their creditors last month, have now assigned, with liabilities of \$20,000 and assets of \$15,000. The business, after the extinction of the old firm, the Doty Engine Co. was re-organized and carried on in the name of Mrs. Doty. The building in which the works have been carried on for several months past is being torn down to make room for the new bridge at the Union Station.

THE Montreal Gas Company last month tried to get an injunction against the city enjoining the authorities to hinder the Consumers' Gas Co. from distributing gas by means of pipes within the city limits. The application was refused on the ground that though the plaintiffs had obtained exclusive rights, yet the Consumers' Gas Co. had obtained power to do what they were doing from a higher authority, namely the legislature. Another legal fight is now in progress between the two companies.

IN radial drills John Bertram & Sons, Dundas, have made an unparalleled record during the past year. Since the 1st January, 1893, they have made and shipped 13 of these machines. The catalogue recently issued by this firm has been quite a success. Requests for copies of it have come from the most distant parts of the earth. Among other places to which it has been sent are: Tokio, Japan; Vienna, Moscow (the Imperial Russian Institute), Bologna, Paris, and various places in Germany and Holland.

As briefly noted last month, Hamilton has a new industry in the shape of a factory for the manufacture of pipe and boiler covering, the Clappison Pipe and Boiler Covering Co. having started such a factory at 56 Alanson st. The new factory is operated by steam power and is well equipped with the latest machinery for producing such goods. The asbestos-magnesia sectional covering which they are making has hitherto all been imported, but the new company will not only afford to Canadian steam users the advantage of getting it on the spot, but in filling contracts they are in a position to send their own men to apply the covering. It is the only company in Canada making special fittings for elbows and T's. This covering is an excellent non-conductor and is neat in appearance.

THE Toronto Industrial Exhibition, which is to be held from the 3rd to the 15th of September, will no doubt be the greatest fair of the present year, and from present indications it promises to excel all others, both in point of exhibits and in attendance of visitors. The grounds have been vastly improved since last year, and already most of the space in all the buildings has been applied for. All entries close on the 11th of August. A good programme of special attractions, both novel and interesting, will be provided as usual. Cheap excursions will as usual be run on all railways at rates in keeping with the times. The great fair attracts visitors, not only from all parts of the Dominion, but from the United States as well, and those who have never been there will be surprised at its magnitude.

SUPPLEMENTARY RAILWAY AND CANAL ESTIMATES.

The Supplementary Estimates for 1894-95 of the Dominion Government contain the following items: Intercolonial Railway, construction Cape Breton and Oxford and New Glasgow sections, and increase of accommodation at Halifax, \$146,875; Annapolis and Digby Railway construction, \$5,000; Rapide Plat, Lachine, and Trent Valley Canals, enlargement and construction work, \$456,875; Rideau Canal, completion and rebuilding of bridges, &c., \$26,500; Cornwall Canal, repairs, and extension of sewer, \$21,000; Welland Canal, repairs, &c., \$19,500; Beauharnois Canal, repairs, etc., \$14,500; Trent Valley Canal, building bridges, etc., \$12,100; Carillon and Grenville Canal, rebuilding a portion, \$4,700. Besides these items, \$27,552 was voted for repairs and extensions to harbor and river work in Nova Scotia, such as wharfs, piers, etc.; \$5,000 in Prince Edward Island; \$6,720 in New Brunswick; \$69,600 in Quebec Province; \$91,500 in Ontario; \$2,500 in Manitoba, and \$15,500 in British Columbia. The Allan Steamship Co. are to receive \$126,533 for the transportation of mails to Great Britain, and \$10,000 was voted for the purpose of maintaining a new steamer for Government service, now in course of construction in England.

Railway and Marine News.

Work has begun on the G.T.R. bridge on John street, Toronto. The ground is now being surveyed for a new railway line between Waverly, N.S., and Windsor Junction.

The new branch line of the G.T.R. running from Owen Sound to Park Head, Ont., was opened for traffic last month.

The work of laying the railway track between Houlton and Monticello will be commenced about the middle of next month.

A HUNDRED and fifty men struck work on the Soulanges Canal at Coteau du Lac last month, owing to the delay in the payment of wages.

The Northern Pacific section house at Greenway station, Man., was set fire to last month by an incendiary, and burned to the ground.

The Dominion Parliament voted the required subsidy for the proposed new fast Atlantic line. The Government does not fix the terminal points.

SEVEN hundred men are now at work on the C.P.R.'s Temiscamingue branch, north of Mattawa. Eleven miles of track have already been laid.

The construction of the new workshops for the O.A. & P.S. and Canada Atlantic Railways will probably be commenced shortly at Ottawa.

The Allan line steamship "Scandinavian," on June 30th, struck an iceberg in mid-ocean, a large hole being knocked in her side about four feet above the water line.

At a meeting of the bondholders of the Manitoba & North western Railway they decided to foreclose the mortgage, but they afterwards discovered this could not be done.

The Northern Pacific Railway Co.'s workshops at Winnipeg will not be reopened until September. The places of the men who struck work recently will be filled by new hands.

The boiler of the steamer "Queen" exploded early last month in North Thompson River, near Kamloops, B.C., and the boat was blown to pieces. Two men were killed instantly and several more injured.

JOHN E. STEWART, the originator of the Tobique Valley Railway enterprise, who acted as its first president, has taken suit against the company for \$15,000, claiming this amount as salary for services rendered.

The following have entered into partnership under the title of the Quebec Shipsmiths' Association: Oliver Kennedy, John R. Webb, Richard Swindell, Thomas Lyons, Wilbrod Jalbert, John Byrne and David Swinton.

A TERRIFIC wind storm swept over Arrow Lake on Sunday, July 29th. The steamer "Illicillewaet," lying in Nakusp harbor, was broken in two. The steamer "Lytton," unloading railroad iron, was driven ashore and damaged to the extent of \$2,000.

The Dominion Line have secured the passenger steamer, the "Mariposa," for their weekly service between Montreal and Liverpool. They have also transferred their SS. "Toronto," under Captain Davis, to the Bristol trade, to replace the "Texas."

The International Steamship Company, St. John, N.B., will next month begin the construction of a new steamer, to be ready for service next year. Specifications for the new boat, which will be of large capacity, and one of the fastest on the coast, are now in the hands of the contractors.

The promoters of the proposed Manitoba and South Eastern Railway offer to the Provincial Government to transfer their land grant to the Government in consideration of a bonus of \$1,500 per mile and a guarantee of interest at 4½ per cent. for twenty-five years on \$5,500 per mile of second mortgage bonds.

The widening of the St. Lawrence ship channel at Varennes, where there used to be a curve much complained of by pilots, has been completed and the government dredge which has been working on the improvement, has been moved to Contracocur, and has begun operations on the widening and completion of the curve at that point.

The steamer "Rideau Belle," plying between Kingston and Ottawa, was entering a lock on her way to Perth, when something went wrong with her machinery and she struck the front of the lock, smashing the gate and knocking a large hole in her stern. She sank in a few minutes, with the water above her decks. She was raised after suffering damage only to the amount of \$100.

The rails on the O.A. & P.S. are now laid as far as Killaloe. Over a thousand men are working in the vicinity.

The bridges on the London & Port Stanley Railway across Kettle Creek are said to need great repairs or rebuilding.

JOHN PERKINS, of the Toronto Engine Works, has secured the contract for the construction of a base for the Red Rock lighthouse, Parry Sound.

The North-West Navigation Co.'s steamer "Colville," plying on Lake Winnipeg, was burned to the water's edge last month. Nothing was saved.

The Toronto Police Magistrate imposed a fine the other day of \$100 on the owners of the steamer "Garden City," for carrying over 1,300 passengers, when the vessel was only licensed to carry 700.

The Dominion Government granted a bonus of \$4,500 per mile to the Port Arthur, Duluth and Western Railroad for a distance of 150 miles. This will carry the line to the eastern end of Rainy Lake.

The "Amarynthia," which was grounded off Ile Ronde, Montreal, last June, was got free after a good deal of delay. She was taken to Hochelaga and afterwards to Quebec, where it was found that she had been badly damaged.

In the case of Gilbert vs. the Queen, in which the plaintiff claimed \$300,000 for balance of contract for deepening the Galops Rapids in the St. Lawrence, Justice Burbidge gave judgment for Gilbert Bros., Montreal, for \$205,000. Leave of appeal was given.

A SERIOUS accident took place a short time ago on the Salisbury & Harvey Railway, a bridge giving way and precipitating a train into the river. Fortunately there was only a depth of four feet of water, and the train's passengers and crew escaped with nothing worse than a severe shaking.

TENDERS have been accepted, and contracts entered into for clearing the right of way for the narrow gauge line from Yarmouth, N.S., to Tusket. Active preparations in all branches of construction work are now under way, including the abutments and piers for the Salmon and Tusket river bridges.

The steamer "Richelieu," of the Northern Adirondack line, running between Cornwall, Stanley Island and Summerstown, was running down the Salmon river when her bow violently struck on a sunken log. She began to take in water so rapidly that Captain Anderson decided to run her on to the sandy shore, where pumps were used. She was afterwards taken to Cornwall.

A SYNDICATE has been formed to handle Major Hughes' invention for ventilating railway cars, steamships, &c., and will apply for incorporation under the name of the Hughes Car Ventilating Co. (Ltd.), Toronto. Capital stock \$500,000. The applicants are Wm. McKenzie, president of the Toronto Street Railway Co.; Jas. Ross, Montreal; H. A. Everett, Cleveland, O.; Sam. L. Hughes, M.P.; and J. C. Grace, Toronto.

ABOUT eight tons of machinery have been shipped from Owen Sound for use on the new Sault Canal. It consists of two 45-inch horizontal new American turbine water wheels on iron frames, which will develop 200-horse power each under the head of water available at the Soo. Besides this there is also the heavy shafting, gearing, friction pulleys, iron floor stands and iron bridge trees for shafting, gearing, etc., for driving the pumps and the electrical generators and dynamos in connection with the works. The water wheels will be controlled by electric governors.

PILOT BRUNET, who had charge of the steamship "Amarynthia," which went aground off Montreal a few weeks ago, has been suspended for two months. The Harbor Commissioners, who investigated the case, came to the decision that the accident was due to the pilot's fault, in that he failed to exercise the proper and necessary care in the way the ship was turned, and further that the requisite skill was not shown in throwing off the stern tug by the order "Full steam ahead," which was an order to throw off given by him before the ship was in a good position.

A CAPE BRETON paper states that the bridge at South West Brook, on the railway line between there serve mines and Sydney, was destroyed by fire one day last month. A locomotive and train of cars passed over the bridge when it was burning, the engineer not knowing until it was too late to stop the train that it was on fire. How the engine and cars managed to pass over the bridge is most miraculous, as part of the structure collapsed only a few minutes afterwards. The fire is supposed to have started from ashes falling from one of the locomotives while passing over the bridge.

A. R. DICKEY, the member for Cumberland, N.S., has been visiting Ottawa in company with B. Baker and A. D. Provand, two gentlemen representing English capitalists.

A MANCHESTER man has invented a self-acting coupler, which he claims will couple any number of cars in as many seconds. The uncoupling can be done as fast as a man can walk from one end of the train to another. The present system of chains remains unaltered, and there is said to be no danger of accidental uncoupling.

THE receipts of the Richelieu & Ontario Navigation Company to the end of July this year showed an increase of over \$31,000 over the figures of last year. The revenue from the Saguenay route alone has been nearly double that of last year. Things have seemed to take an upward turn with this company from the moment the management was assumed by Mr. Gildersleeve.

FOLGER BROS., Kingston, Ont., have purchased for the Thousand Island Steamboat Co., the interest held by Cornwall Bros., of Alexandria Bay, in the Alexandria Bay Steamboat Co. The purchase includes the steamers "Wanderer," "C. M. Depew," and "Island," and will give the Thousand Island Steamboat Co. a monopoly of the excursion business in that district.

A DISASTROUS railway accident took place early last month on the Eastern Division of the C. P. R. near Moosehead Station, Maine. While going at full speed, the express crashed through a trestle spanning a portion of the lake. Five persons were killed, and several injured. Little doubt seems to exist but that the immediate cause of the disaster was the malicious placing of sleepers across the track near one end of the trestle.

A PARAGRAPH went the rounds of the newspapers last month to the effect that the construction work on the Canadian "Soo" Canal had been done so carelessly that a portion would have to be rebuilt. Hugh Ryan, one of the contractors, subsequently wrote as follows, however: "The injury was of a most trifling nature. It was caused by the action of the frost in the new material placed behind the curbing. The damage has been about made good, and will not cause the slightest delay in the opening of the canal for traffic." The canal will be formally opened in September.

THE handsome new steam yacht "Athena," of Hamilton, was built by Johnson & Fearside, of that city. She is of California cedar and is 58 feet over all, 9 feet beam, 5 feet 5 inches draught, and was designed by Kerby of Detroit. The compound engine and Fitzgibbon boiler were designed and built by the Killey-Beckett Engine Company, Hamilton. She is owned by Messrs. McDonald and Clendening, of the same city. She is fitted out in all respects in the most luxurious manner, and is believed to be the fastest yacht of the size on Canadian waters, as she can easily make 16 miles per hour with 120 to 130 pounds steam pressure in boiler. She made a run from Hamilton to the Niagara River in less than 3½ hours under easy steam. The machinery was built and placed in the boat under the inspection of Robert Mackie, of the Stationary Engineers' Association.

GEORGE CHAPMAN was on the Dartmouth railway survey with the engineers. All the old routes were traversed and one new survey made. It crosses Wright's still-water, near Hardwood Grove, and then leads into a gulch that extends right through to West Waverley. Only one or two cuts of any depth occur, and no trestling to speak of. This line is 8½ miles long. It is east of Anderson's Lake, and does not go near the Enchanted Lakes or Lake Charles. This gulch suits admirably for railway construction, it is so level, and there are gravel beds right along for ballasting and grading. The survey terminates at Windsor Junction. At this end there is a choice to be made. The aim was to connect with the old branch at the bridge. But the idea is now to bring the line in on the highlands, and fall down slowly to some point nearer Dartmouth than the Narrows. The object of that is to enable mills and factories that are going to be built in the north end to have a siding that will bring raw material in as well as take products out. The old line was inconvenient in that respect. It was on the shore, and the land rises so abruptly from the harbor that it was folly to think of building sidings to factories above.—*Halifax Herald*.

SENATOR POIRIER and C. J. Weldon, of Shediac, have been examining the manganese mines at Markhamville, N.B., with a view, it is supposed, of purchasing them.

THE idea expressed by many old timers that on the recession of the water after the recent high floods, the crevicing on the Pend d'Oreille would yield good results, is being verified day after day. One man brought down to Waneta \$80 worth after four weeks' work; another had three ounces of dust, and a third a nugget worth \$6.—*Nelson Miner*.

Mining Matters.

JOHN SULLIVAN, of Lyndoch, Ontario, has discovered what he takes to be a valuable silver mine in that township.

A RICH deposit of gold and silver has been discovered by J. B. Waddell, of Green Oak, at South Maitland, N.S.

MR. NASH has discovered near the Cowan mine, Kempt., N.S., a 3-foot gold lead, with an extraordinarily good yield.

THINGS are rushing on Canon Creek in the Southern Cariboo district, B.C., gold discoveries having been reported in many places.

A TALC mine at Sharbot Lake has been opened by the School Supply Co., Berlin, Ont., for the purpose of supplying them with dustless crayons.

S. E. DRENNAN, of Camden township, Ont., believes he has discovered near there a bed of coal 18 by 11 miles in dimensions and 13 ft. deep.

COPPER mining operations on Little Bay, Nfld., have been suspended owing to the low price of copper. These mines were the means of support of hundreds of people, who will now be at a loss for a living.

MINING operations are now going on at the Crocker mine, the Whiteburn Company's mine, and the Rossignol mine, Whiteburn, and the ore is said to look encouraging.

THE Block House Coal Mine, at Cow Bay, N.S., was sold by the sheriff last month to Adam Burns, who represented the mortgagees, for \$86,000. The mortgage amounted to \$100,000.

THE Stevenson Gold and Platinum Hydraulic Mining Co. (Ltd.) has been incorporated. Capital \$1,000,000. They will develop a placer claim situate near the first fork of Granite Creek, Yale District, B.C.

THE "Black Prince" Mine, Lardeau district, is said to be looking very well just now. Ten men are working on it. The pay-streak is 22 inches wide, very rich in ore, with a lode varying in width from 4½ to 5 feet.

JOHN CLINTON, who has had considerable experience in Alaska, Australia, and South Africa, is now undertaking a foreman's duties at the Nelson Hydraulic Company's claim at Forty-Nine Creek, succeeding George Atcheson.

MINERS in the Mountain Chief, Kootenay, struck a vein of peacock ore and gray copper, last week, on that property. The vein gives promise of being continuous. Specimens shown here have caused favorable comment.—*Ledge*.

ALEXANDER DICK, C.E., M.E., of the *Canadian Colliery Guardian*, has been appointed lecturer on mining for the Province of Nova Scotia. We hear that Mr. Dick is to deliver a series of lectures on mine surveying in the coal districts, for the benefit of those intending to try for mining managers' certificates.

THE Ramsay Lead Mining and Smelting Company has been incorporated. Capital, \$200,000. Its immediate purpose is to work lead mines in the County of Lanark, not far from Carleton Place. The following are directors: Theodore Hart (president), Henry Chapman, Thomas Kay, E. H. Parsons, and Hugh L. Fletcher (secretary).

ACCORDING to the *Kootenay Star*, there is considerable danger of everybody at Nakusp going mad with the gold fever, gold having been discovered on Cariboo Creek, about twenty miles below that town. About five miles of ground have already been staked off by enthusiastic fortune-seekers.

SOME workmen were engaged in removing some pipes which had been used in a lighting display of natural gas at Walkerville, Ont., when there was a terrific explosion. Several of the men were blown over fifty feet away, and injured severely. The pipes were supposed to be capable of standing a pressure of 500 pounds, though at the time of the accident the pressure was 325 pounds only.

A NEW mining company has been formed in Nova Scotia, to be known as the Caribou Gold Mining Co., with headquarters at Halifax. Amongst those interested are J. W. Longley, of Halifax; J. L. Jennison, New Glasgow; Premier Blair and W. Pugsley, of St. John. The capital stock is \$500,000. Seven good properties, covering in all about 1,000 acres, have already been secured, and four of them have quartz mills at present in operation. The following officers have been appointed: President, D. McLellan, St. John; vice-pres., N. Curry, Amherst; secretary, M. Cunningham, Amherst.

THE New Brunswick antimony mines at Lake George, near Fredericton, were, a short time ago, sold by public auction under a mortgage given by the mining company. The trustees bought them in for \$6,000, though they have no intention of working the mines.

A COMPANY is in process of organization which is to be known as the Nova Scotia Gold Mining & Smelting Co., for the purpose of treating some tailings at the head of the northwest arm of St. Mary's Bay. Capital stock, \$50,000, and the promoters state that the probable profits will be \$36,000 per year.

THE Summer School in connection with the School of Mining, Kingston, has been attended by an enthusiastic class of students, most of whom are teachers in high schools and collegiate institutes. E. C. Storey, M.A., (of Hawaii), and F. J. Pope, M.A., are engaged in original investigations. Others are studying mineralogy, assaying chemical, analysis, and crystallography.

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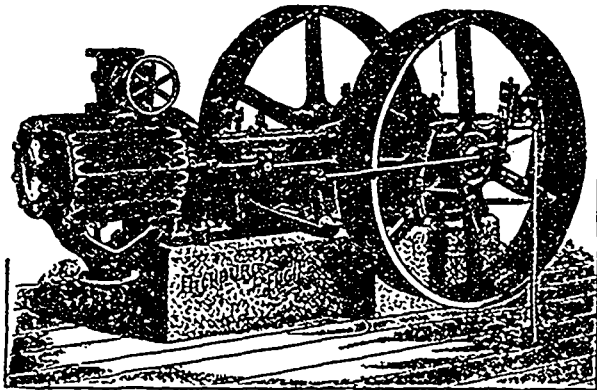
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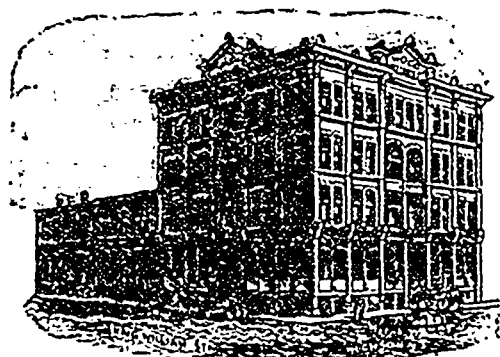
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LEANDER SHAW, of Hantsport, N.S., and E. W. McVicar, of Tennycupe, have purchased a mine near Kootenay Lake, in which the vein shows 14 to 18 inches wide of solid ore and about 2½ feet of poorer ore. Assays show 75 per cent lead, 40 oz. silver, and 5 to 7 dwts. gold to the ton, amounting in total value to about \$80.

THERE is every evidence to show that Carpenter creek is going to follow the lead of Four-mile creek. The near approach of the railway is causing a general revival of mining all over the country. Five additional men have been put to work on the Alamo, bringing the total at work on that property to seventeen. The Slocan Star is about to double its force. Byron White expects to have a hundred men at work during the coming winter. A force of men has been put on at the Blue Bird, under the direction of Mr. Taylor, who has a large interest in the property. The Idaho and the Dardanelles will both start up again within the week. Excavation for the foundation of the Alamo concentrator will be begun in a day or two.—Victoria Colonist

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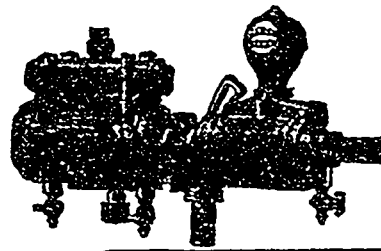
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Personal.

WM MURDOCK, C.E., has prepared a new map of St. John, which has been published by C. D. McAlpine, of that city.

PROF COLEMAN, of the School of Practical Science, has been appointed geologist and mineralogist to the Ontario Bureau of Mines

H A MASSEY, head of the Massey-Harris Co., is gradually recovering from his illness, and is now in Muskoka for the benefit of his health.

GEO A SPOTSWOOD, M.E., Kingston, has gone to Labrador and Newfoundland, to examine some oil regions, and copper and asbestos mines

WM. PERRY, hydraulic engineer, Montreal, has been appointed an expert for the valuation of the Louisville, Que., water works by the corporation of that town.

F. H. MASON, F.C.S., etc., Truro, N.S., who recently returned from a business trip to England, has added considerable to his laboratory plant, and is now in a position to undertake all classes of assaying, mineral analysis, analysis of water for boiler purposes, etc

The following Canadians have received the degree of "Mechanical Engineer" at Cornell University: W F McLaren, Hamilton; W G Krantz Berlin, Ont.; and J H. Meikle, Morrisburg, Ont. The degree of Master of Mechanical Engineering has been conferred on Thos. Hall, Washington, Ont.

EUGENE ORESLYCK, late foreman in the Chanteloup foundry, Montreal, was found at his home on July 23rd suffocated from gas. He had lost his place a couple of weeks before and seemed discouraged. The gas was found turned on in his room, but whether it was intentionally or inadvertently done is not known.

We regret to hear of the death of Mrs. Perry, the wife of Wm. Perry, the well known hydraulic engineer, of Montreal, which occurred suddenly at Outremont last month. She was born in St.

John's, Que., and was, at the time of her death, aged 55. Mrs. Perry was much respected in the neighborhood, and her husband has the sympathy of his many friends in his sad bereavement.

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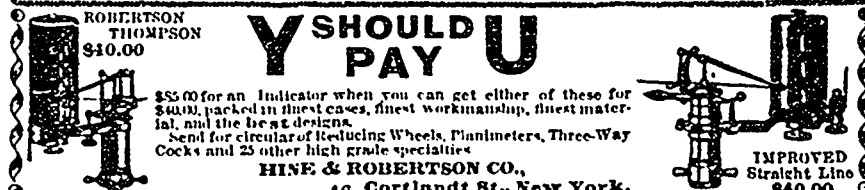
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