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For THE CANADIAN ENGINEER.

PUMPS AND PUMPING MACHINERY.

BY WILLIAM PERRY, MONTREAL.

The date from which we commence the history of pumps is the year 200 B.C. Previous to that period there is no mention made of them. Nor has there been discovered any portion that can be judged appertaining to such a machine; the heathen Chinee cannot claim any priority in this special branch, which is peculiar, the more so when we consider their manner of irrigation. A pump is even now a rarity with them.

A pump is not a very intricate machine in itself, and its parts are comparatively few. But its action, or want of it, sometimes makes it seem most mysterious. To those readers who have not considered the question of water dispensation, the remark that pumping machinery stands prominent among the various branches of engineering, may seem to allow of discussion. A few instances will very soon give ample proof. How could our coal be obtained and our mines worked, if not for the pumping plant? Our water supply obtained, or our sewage and chemical works carried on? When man enters Nature's storehouse in search of wealth, he finds water ever ready to dispute his supremacy; it may be in a constant stream, varying only with the season; oftentimes vast quantities are stored in crevices of the rocks. Some idea of the quantity of water raised will be given when it is known that often its weight is double and treble that of other material raised, and is frequently 30 per cent. in coal mines.

Rude nations have not possessed the machine, simple as it is, but have always resorted to a more laborious method to obtain water. In the early ages it does not appear to have been known to the Greeks or Romans. Although the pump was invented 200 B.C., it was not until the beginning of the 17th century that its true principles were understood; although in 1636 fire engines were built in Holland, and from which, as far as general principles are concerned, no improvements have been made. In 1582, Peter Morris, a Dutchman, contrived a water engine to supply the residents of London from the Thames, and threw water over the steeple of St. Magnus church at the north end of London Bridge. The introduction of machinery for domestic use commences from May, 1582. The first patent record in England of a pump is patent No. 6, year 1618, by David Ramsay and Thomas Wildgoose. The air-pump was invented by Otto de Guericke in 1654. In 1660 Robert Boyle made many improvements in the air-pump.

Sir Samuel Morland, Master of Mechanics to King Charles II., in the year 1674 invented and patented the plunger pump, made of cast iron in 1675. He threw water 60 feet high at the rate of 60 barrels per hour, with 8 men, in 1681; the king presented him with a medallion portrait set in diamonds. 1695 is the first notice I have of ship pumps. In 1732 Mr. Demoun invented a pump like a V. In 1741 James Creed secured a patent, No. 579, for making three different machines for making lead pipe for pump use. The first oscillating pump was patented in the year 1750, patent No. 658, by W. Perkins.

The pumps commonly used for raising water from wells may be divided into two classes, lifting pumps and forcing pumps. The lifting pumps may be again sub-divided into two varieties, namely, those with a hollow piston and those with a solid or plunger piston.

1. Lifting pumps with a hollow piston, called also atmospheric pumps. This variety, in its simplest form, consists of the following parts:

A cylinder or tube, in which is fixed a valve opening upwards, and above which works a piston provided with a valve also opening upwards. The part of the cylinder in which the piston works is called the body of the pump, and is the only part which need be bored with any great accuracy. The top of the cylinder may be opened or closed, it matters not which, but somewhere above the level to which the piston ascends there must be an orifice for discharging the water.

The action of the common atmospheric pump is so simple, and is so well known to every school boy, that it will be unnecessary here to dwell upon it. The cylinder is made of various materials, as wood, iron, or copper, and frequently the lower part below the fixed valve is a mere iron pipe furnished with a strainer at its lower extremity. The fixed valve in this kind of

pump must be placed at such a level that the depth from it to the service of the water in the well must never exceed the height of a column of water, which will balance the atmospheric pressure or weight of the atmosphere. This weight is measured in the barometer by a column of mercury, which varies in different parts of the world, and at different altitudes, from 28 to 31 inches. Thus, an atmospheric pump at the level of the sea may have its fixed valve several feet higher than a similar pump working on the top of a high mountain. The height at which the mercury stands in a barometer at any given place affords, in fact, a tolerably practical measure of the height to which water will rise in a vacuum when pressed by the external atmosphere. Thus, in theory, where the mercury stands in the tube of a barometer at a height of 30 inches, the sucker or fixed valve of an atmospheric pump may be placed 30 feet above the surface of water in a well. In practice, however, owing to imperfection of materials, fluctuations of level in the water, and other causes, this difference of level is too great, and should not really exceed 25 feet. In shallow wells, therefore, which are not more than about 27 feet in depth, the part of the cylinder or pump above the fixed valve need never exceed the length of the slope or space through which the piston works. In deep wells the ascending part of the cylinder, above the body of the pump in which the piston works, may be, theoretically, of any height. There are difficulties, however, connected with the valves in the movable piston, which render it inconvenient to have the lift in this kind of pump much more than 100 feet. Whatever may be the height of the column of water above the movable piston, it is evident that the absolute weight of this whole column has to be lifted at each stroke of the piston, and for this reason atmospheric pumps, which are worked by hand, have scarcely any of the pump above the piston, as otherwise the weight of water to be lifted at each stroke would be too great for the power to be applied. This practically limits the height to which water can be raised from wells by common atmospheric pumps worked by hand, to about 25 feet.

In deep wells, however, when pumps are worked by horse or steam power, this objection does not apply, and if the power be sufficient to raise at each stroke the whole column of water above the piston, the length of the cylinder above this piston is only limited by the practical considerations before alluded to in connection with the valves. It should be observed that the common atmospheric pump is seldom or never used in waterworks for the purpose of raising water.

ON CALCULATING THE POWER OF PUMPING ENGINES.

The work performed by steam engines is commonly expressed in what is termed "horse power," that is, an engine is said to be equal to the work performed by a certain number of horses. The standard which has been fixed on to represent the work of one horse is equal to 33,000 pounds raised through a space of one foot high in a minute. This is equivalent to saying that a horse walking at his most effective speed of 2½ miles an hour, or 220 feet per minute, and attached to a weight of 150 pounds freely suspended over a pulley, will raise this weight at the same rate of 220 feet per minute. Using, then, this standard for computing the work of engines —a standard which has been agreed to by the mechanicians of all countries—we obtain a very ready method of determining the horse power required to raise any given quantity of water to any required height. The data required for this purpose are the quantity to be raised in any given unit of time, and the height to which it is to be raised. The quantity is simply to be reduced to the weight in pounds raised per minute; this weight is to be multiplied by the height in feet, and the product divided by 33,000, in order to find the horse power required to perform the work in question.

A gallon of distilled water, at a temperature of 60° Fahrenheit, weighs exactly 10 lbs. avoirdupois, so that by adding a cipher to any quantity expressed in gallons, we obtain its weight in pounds. Suppose, now, it be required to find the horse power capable of raising 350 gallons of water per minute to a height of 170 feet. Here we have $350 \times 10 = 3{,}500$ lbs. to be lifted per minute, and $3{,}500 \times 170 = 595{,}000$ lbs. lifted one foot high per minute, and $\frac{595{,}000}{33{,}000} = 18$ horse power.

When the quantity is expressed in gallons to be raised to a given height in 24 hours, it is necessary to divide this quantity by 1,440, in order to bring it into the quantity per minute, and as $33{,}000 \times 1{,}440 = 47{,}520{,}000$, if we divide the gallons per day of 24 hours by one-tenth of this, or 4,752,000, we obtain the horse power required to lift it.

The history of the steam pumping engine commences with the atmospheric engine, which is known as the Newcomen type. This is single-acting, the steam raising the piston, and the atmosphere forcing it down where a vacuum is formed by condensing the steam below the piston. This was improved by Watt, who substituted for it, first, his single acting engine without a crank, and afterwards his double acting engine, but its greatest development has occurred during the present century.

The oldest waterworks in the United States are supposed to be those at Bethlehem, Pa., which were built in 1754, by Hans Christopher Christiansen, a millwright, a native of Denmark, and being of historic interest, I will enter into the description of it somewhat in detail.

The water was taken from a spring issuing from magnesian limestone, near the banks of the Menogassi Creek, as it was then called. The water was conducted 350 feet through an underground conduit into a cistern, whence it was pumped by a lignum vitæ pump of 5 inches bore, through bored hemlock logs, to a height of 70 feet, into a wooden tank in the village square. Trouble was experienced from the bursting of the pipes, and one and one-quarter inch pipes of sheet lead soldered along the edges and buried in a cement of pitch and brick dust and laid in a gutter, were tried, without much success.

In 1762 Christiansen, aided by John Arbo an Marshall, constructed larger works. An eighteen feet undershot wheel drove three single acting force pumps of iron of 4 inches bore and 18 inches stroke. The force main was of gum wood, and the distributing pipes of pitch pine. The latter had to be renewed in 1769. In 1786 lead pipes were substituted for the gum wood force main and for most of the distributing pipes. The last pitch pine pipes were abandoned in 1791. The reservoir was a wooden tower in the "little square." This was removed in 1803, and a stone tower built on Market street about 15 feet high, in which was a tank at an elevation of one hundred and twelve feet above the spring. In 1832 a reservoir was constructed on higher ground, and the water tower abandoned. Also the triple pumps were replaced by one double-acting pump. In 1868 steam power was used for pumping.

In 1874 the wooden conduit from the spring to the pump-house was replaced by an 18 inch iron pipe.

Until the year 1800, there were in the United States, including Bethlehem, only eight waterworks, as follows, in the order of the year of their construction: Providence, R.I., 1772; Salem, Mass., 1796; Geneva, N.Y., and Portsmouth, N.H., 1797; Worcester, Mass., 1798; Morristown, N.J., and Peabody, Mass., 1799.

From 1800 to 1810 there were eleven waterworks built; from 1810 to 1820, seven; from 1820 to 1830, thirteen; from 1830 to 1840, eighteen; from 1840 to 1850, twenty-five; from 1850 to 1860, fifty-six; from 1860 to 1870, one hundred and three; from 1870 to 1880, three hundred and eighty-one; from 1880 to January 1st, at the beginning of 1894, there were over 2,100 waterworks in the United States, and over 120 in Canada. The proportion of waterworks in which water is pumped by steam is rapidly increasing, and the subject of pumping engines to do this work is becoming more important every day, but the conditions under which they operate are so varied that it is impossible to go into details in this letter, and I shall, therefore, treat the subject in a general way.

The first requirement of a pumping engine is that it must be able to pump water under the peculiar conditions which it has to work, and to do this continually, successfully and economically. Its ability to operate day after day, year after year, under the varied requirements of the service, with the least possible expense of repairs and delays, is the most essential fact to be taken into consideration, but, at the same time, it must be capable of easy management, and take care of itself to a great extent after being properly adjusted and started at its work.

The second requirement is economy of steam. Economic use of steam is, of course, important and desirable, but it must not be accomplished at too great expense of repairs and the necessity of continual attention and adjustment on the part of the attendant. The cost of a pumping engine is another important consideration, and is the "stumbling block" of waterworks companies and committees generally, when a few thousand dollars more of first cost has many times outweighed the above-mentioned qualities, and it has been demonstrated to their sorrow and cost that to own some pumping engines is sufficient to bring great loss and almost ruin, even if the engine had been taken as a gift, on account of the bills for repairs which are contracted, that things may be kept moving.

Pumping engines may be divided into two general classes—crank and fly-wheel or rotation, direct-acting or non-rotation, and are made of almost endless variety as to details, the particulars of which I do not care to enter into in this letter. Just where to draw the line that a crank and fly-wheel engine should be used and not a direct-acting engine, appears to be debatable ground, and where engineers, like doctors, disagree. It therefore behooves me to handle this part of my letter with great care, and endeavor not to tread on the toes of any pumping engine manufacturer.

The history of the pumping engine construction commences in this country, as in England, with the Cornish engine. This engine gave fine results in the department which it originated—mine pumping. The engine was inordinately large for the work, and made only a casual stroke now and then, as demanded by the flow of water into the mine, the water being delivered at the surface with no force main, and there being no demand for uniform flow.

A glance at the conditions under which it works will explain the otherwise unaccountable fact that a pumping engine without a rival in one place has a failing reputation in another. Its honors were never qualified until it was transplanted from the home of its usefulness to do duty in a service where water was to be discharged through a long main to a great height above the pump, and under the requisition of continuous and uniform delivery. This was the very requirement which, from its nature, the Cornish engine was unfitted to meet. The Cornish engine is in its nature precarious, requiring constant watchfulness on the part of the engineer, and cannot safely be trusted for a minute without this care and supervision. This uncertainty of its action, great first cost, and expensive repairs, has finally led to its abandonment for waterworks. The crank and fly-wheel engine was the first and most obvious alternative. While emulating the economy of the Cornish engine, it was positive in its motion and safer in its character. In the crank and fly-wheel engine, steam is cut off at a certain fraction of the stroke, while the remainder is finished by expansion, aided by the momentum of the fly-wheel, thus producing great economy in the use of steam at the expense of intricate machinery. These engines operate either vertically or horizontally. They require expensive and massive foundations to absorb the shocks and jars incident to their working, this being especially true of vertical engines, the momentum of the fly-wheel in its revolutions increasing to a large extent the accidents that would otherwise be trifling.

The use of duplex direct-acting steam-pumping engines in waterworks dates from about 1854, and it was brought in direct competition with the Cornish, and crank, and fly-wheel engines. The duplex engine is horizontal in action and usually allows the steam to follow the piston throughout its stroke, thus preserving great simplicity and compactness in working parts.

The foundations required are much lighter and less expensive than that for a crank or fly-wheel engine.

The duplex engine is essentially two direct-acting pumps placed side by side, their valve motions being so arranged that the motion of one pump acts to give steam to the other, after which it finishes its own stroke and waits for its valve to be acted upon before it can renew its motion. This pause allows all the water valves to seat quietly, and removes everything like harshness of motion, keeping up a uniform delivery, without pulsation or noise. The smoothness of motion and simplicity in steam valve mechanism reduces the liability of accident to a minimum. While it is not claimed that the compounding condensing duplex engine is capable of developing the highest duty, their yearly records are excellent, ranging from 50,000,000 to 65,000,000 duty, and trials have been reported as high as 120,000,000.

It is claimed for these engines that their moderate first cost—engine proper, foundation and building, as well as inexpensive repairs, and small expense of replacing any important part—makes them in a majority of cases the most economical to use.

In conclusion, I trust that I have brought out a few points which may be of interest to your readers on the subject of pumps and pumping machinery. I find in conversation with numbers I come in contact with that pumps and pumping machinery are very poorly

understood, even among some of our best mechanics. But they will find, as I do, there is always something to learn, and one man does not know everything about pumps and pumping machinery.

For THE CANADIAN ENGINEER.

TENNY CAPE MANGANESE MINES.

BY F. A. B.

The manganese deposits of Hants county, Nova Scotia, were first opened up in 1862, when John Brown began work at the now celebrated Tenny Cape mines. These mines have been worked almost steadily ever since. The Tenny Cape property passed after a few years into the hands of J. W. Stevens, who worked it until recently, when it was transferred to Messrs. Shaw, Churchill, and others.

In 1893 the Provincial Manganese Mining Co. was organized and purchased other worked and unworked deposits in the county, and did considerable prospecting and opening up. Early in the present year the Tenny Cape Manganese Mining Co. was organized and purchased the Tenny Cape property from Messrs. Shaw and others, and has since bought out the Provincial Co., so that all these valuable deposits are now under one management.

The new company has as president D. C. Fraser, M. P., J. T. Burgess being secretary and treasurer. The other directors are Geo. E. Boak and Lewis W. Desbarres of Halifax, Wm. A. French of Musquodoboit, Edwin Shaw of Walton, and W. F. Jennison, who is general manager. Mr. Jennison is a mining engineer of practical experience, and has a most intimate knowledge of the district and all its deposits. The most approved modern methods and machinery are being introduced in working the mines, and a greatly increased output will be the result. Hitherto the ore has been shipped from Nova Scotia in the raw state only, but the company intends shortly to erect the necessary machinery for grinding, sorting, and cleaning, so as to be able to place it on the market in the various states called for.

There are good facilities for shipping the ore, and the output this year is expected to be large; $15,000 worth was shipped last year, and the production can easily be doubled.

The Nova Scotia and New Brunswick ores of manganese occur in a marine limestone, sometimes solid, sometimes brecciated, belonging to the lower carboniferous series. The ore-bearing limestone of Hants county is probably several hundred feet in thickness, and is overlaid by the immense beds of gypsum that are such a remarkable feature of the district.

The ore at Tenny Cape is high grade pyrolusite, and is particularly valuable for glass work on account of its freedom from iron, and takes the highest place in the markets of the world. The analyses show from 85 to 95 per cent. of manganese peroxide. The ore occurs both in the breccia and in the large masses of solid rock in the form of flat nodules, seams and pockets, the last being either isolated or connected by thin leads of ore. The seams vary in thickness, sometimes thinning to less than an inch, and at others widening out to six inches or more. The pockets are from one inch to several feet in diameter. Some of them produced as much as three hundred tons of ore, and occasionally more.

By far the largest consumption of manganese is in the manufacture of spiegeleisen and ferro-manganese for use in steel making. Some is also used in making alloys, such as manganese bronze, silver bronze, etc. It is largely used as a deoxidizer in the manufacture of chlorine, bromine and iodine, and as a dryer in paints and varnishes. In glass making it is used in small quantities as a decolorizer, and in larger as a color. It is also used in the manufacture of Leclanché battery cells and disinfectants, and as a coloring material in calico printing and pottery; also as a paint.

TO YE HOSTE OF ADVERTISERS.

We have been requested to reprint the circular issued a few days ago announcing the beginning of our new volume, and accordingly give it below with the compliments of our own antiquarian:—

GREETYNGE:

In ye merrie month of Maye ye CANADIAN ENGINEER beginneth hys seconde yeare, and full thankfulle are ye Publishers for ye Hoste of trustye Friends found in all Provinces of thys faire Dominion. "Tall Oakes from lyttle Acorns grow" is a sayinge both trite and trew. Ye CANADIAN ENGINEER began an Acorn of pages XXVIII., and now behold in ye Maye number soon to come forth an Oake of pages XL., besides ye bryghte cherry cover. Full many an Advertiser hath told us of riche Busynesse gotten from it; and lyttle marvaile they at thys, "Forbecause," they say, "we doe see it everywhere; in ye Office of ye Foundrie, in ye Shoppe of ye Mechanick, in ye Werkes whence comyth ye wonderfulle Electric Lyghte, likewyse in ye Shoppe of ye greate Merchaunt of Metalls, and eke ye grimy Stoker in ye Engyne-roome taketh ye CANADIAN ENGINEER."

"And well doe they that take it," quoth they all, "for eche tyme it goeth forthe with stores of artfull Knowledge, how many thynges may be contrived ryght usefull to know, of Discoveries wondrous strange, of Devices very curious that have gotten Patents at Ottawa, and of all that happeneth in ye Factories and Mills throughout thys Lande, from Uncle Sam hys borthers to ye North Countrie, and from ye Cape of Breton to ye Isle of Vancouver. In Pryntynge ye ENGINEER is most excellent, eke it hath Engravynges many and faire to see; whiles in number of coppies spred abroade it surpasseth them all—eche month ye Prynters doe certify that .MM. go forthe from theyre Presse.

Wherefore ye makers of Cunninge Machines and usefull Tules, if that ye would sell 'em abroade and find a goodlye Openynge for Busynesse, send hither and make Covenaunt to gett an Advertisement with goodlye Cuts, so it shall much avaunce your Weal.

Then write thy coppie and straightwaye mail it by Her Majestie's Post; eftsoons thy Name and Goods shall be famous through ye Lande.

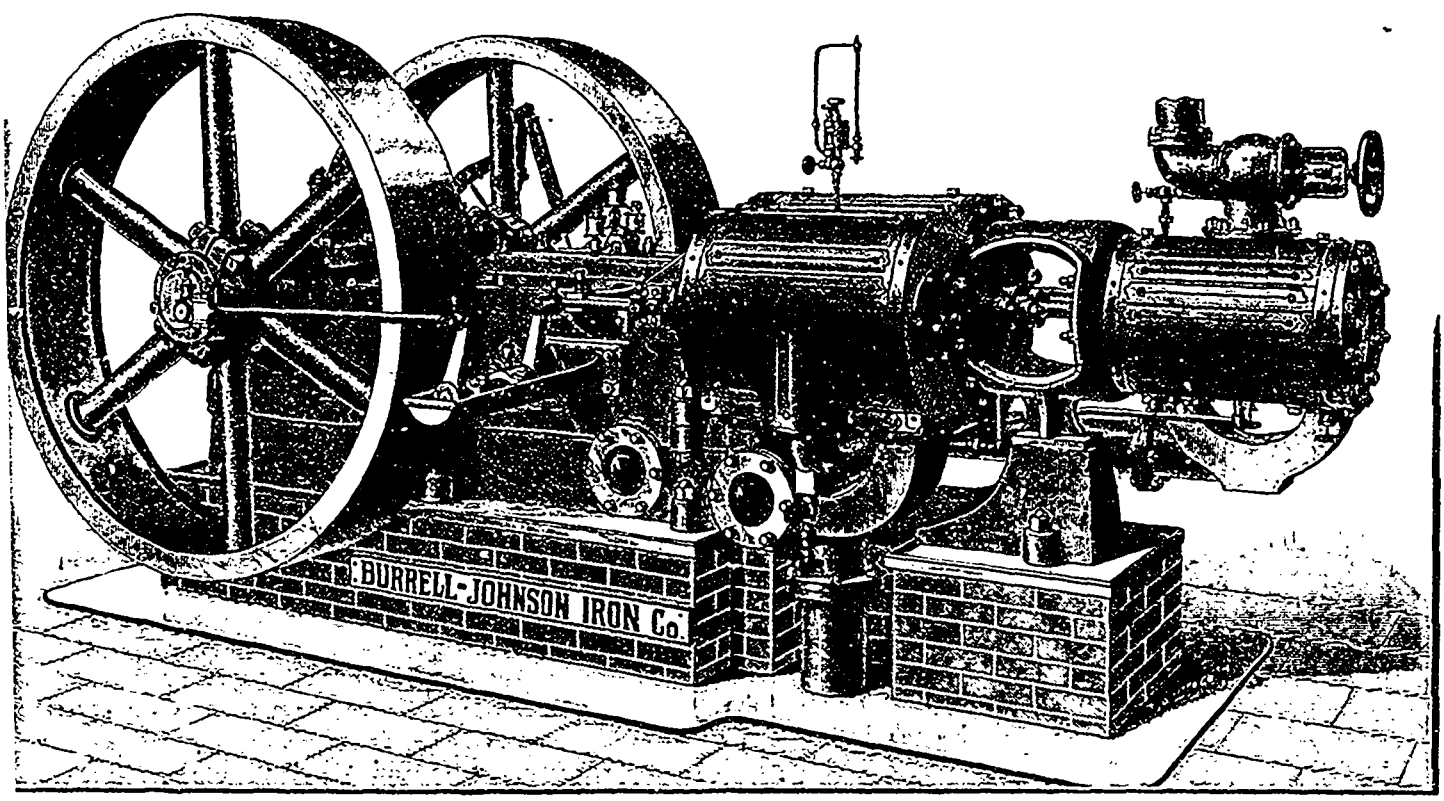
All Menne whose Eyes are open will find ye Price in ye Circuler incloased, and maye Felicitie and hye Prosperitie wait evermore on all who take space, so much as 1 finger-bredth.

Done at ye office in ye Fraser Buildynge, Montreal (ye Hedde of Navigation), eke at ye office, 62 Church St., Toronto, (yclept ye Queene Cittie of ye West), thys month of Aprile, .MDCCCXCIV.

IN a future number, William Perry, Montreal, proposes to give us some very interesting data with reference to friction in pipe, flow of water, etc., from practical experiments. The many readers of Mr. Perry's article on pumping machinery in this issue will be glad to hear from him again.

TANDEM COMPOUND HIGH-SPEED ENGINE.

The eminence which eastern Canadian firms are attaining in the way of engineering works, may be well illustrated by the accompanying engraving of a new tandem compound engine of the high-speed type, manufactured by the Burrell-Johnson Iron Co., Ltd., of Yarmouth, N.S. This particular engine is of the Fitchburg pattern, for which this firm have the rights in Canada, and has been installed in the power-house of the Yarmouth Street Railway Co. When a representative of THE CANADIAN ENGINEER visited Yarmouth recently, it had just been started, and J. S. Skinner, the engineer, was proud as a peacock of the new engine. Certainly he had good reason, for this engine is as fine a piece of workmanship as was ever turned out in Canada. Since then, Mr. Skinner has reported of it as follows: "It is giving perfect satisfaction. It is very neat in appearance, strong and durable. It runs perfectly cool and noiseless, and as for workmanship and close regulation there is no better. Our voltage stands the same, let it be light or heavy loads. As all know the sudden change of load to which a street railway generator is liable, I think the engine gives as near perfect regulation as can be had."



The engine is 145-horse-power, with high pressure cylinder, 12 inches; low pressure 18 inches; stroke 13 inches. It is to run 250 revolutions per minute. It has two fly wheels, 66 inches in diameter by 12½ inch face. The engine is non-condensing, and is fitted with a bed to form a jet condenser, to be used when the water supply is adequate. It is beautifully finished, with cast-iron lagging on the cylinders, is nickel-plated with nickel-plated eccentric rods. The crank is a solid steel forging, cut out, with cast-iron counter-balance keyed on, making a strong and durable crank, with very large bearings and wearing surfaces. The connecting and other rods are made of steel, with all chance for adjustment for wear. The oiling is done with signal oil cups, and all oil and water have trays and conducting pipes to carry off the surplus to a small box at the end, so that it is impossible for oil to be wasted or get on the floor or foundations. The valves are of the piston pattern, perfectly balanced, and are so constructed that they can be adjusted for wear. The whole machine is very compact and substantial looking, with every chance for overhauling and adjusting. The main bearings have a separate adjusting block at the back, which takes up all wear, keeping the main bearings running perfectly even without jar or rattle.

The Burrell-Johnson Co. make these engines both simple and compound, in various horse-powers, and guarantee their work.

PROFIT SHARING.

An association for promoting the principle of profit sharing has been formed in Boston with Carroll D. Wright, the well-known statistician, of Washington, as president, and the Rev. N. P. Gilman, 25 Beacon st., Boston, as secretary. The plan of giving employees in industrial establishments a share in the profits of the business has already been successfully adopted by several Canadian firms, and the principle is making sure headway in Europe and America alike. The new association, in anticipation of a revival of business in the States, has issued a circular to manufacturers calling their attention to the importance of introducing some form of profit sharing. The method of paying a dividend to the workmen out of profits as they are realized annually, has been approved by most of the economists of Europe and America as thoroughly practical, and advantageous to both the employer and the employed. Profit sharing can be adopted by an employer without risk of loss, inasmuch as he assumes under it no obligations except such as are to be discharged from profits actually made. His prerogatives as manager and his rights as proprietor are not curtailed. Profit sharing would establish a more friendly relationship of common interest between working people and the employer. This would be the surest pledge of industrial peace and the firmest support in times of commercial distress. The employee, responding to such an advance by the employer, can

increase the quantity and improve the quality of the product under a deeper feeling of personal interest. By his diligence, care and economy he can actually create an additional profit, which is to be used in supplementing regular wages. Profit sharing includes the payment of the best wages current, and promises a bonus beyond this, which experience shows the interested workman can invariably produce in good times. Profit sharing, as a principle, may be applied in a large variety of ways; and it can readily be adapted to the great majority of productive and distributive enterprises. Why not form such an association in Canada?

THE CANADIAN SOCIETY OF CIVIL ENGINEERS.

The first well-directed effort to found a society of civil engineers dates from 1880, when a circular was issued under the pseudonym X. Y. by E. W. Plunkett. The anonymous nature of the circular prevented its receiving proper recognition. In the next year a bill was introduced into the Ontario Legislature, no one seems to know by whom, which proposed to confer extraordinary privileges on a few engineers to the detriment of the profession. From a variety of reasons the bill never reached a committee. The next effort was made in January, 1886, by Alan Macdougall, who tested the profession by issuing a circular over his own signature, to which so many favorable answers were received that he held meetings in Toronto, Montreal and Ottawa in the next two months, at which the society was fairly launched. A provisional committee was appointed of which Mr. Macdougall was elected secretary. The success attending their labors was such that the first general meeting for the formation of the society was held in Montreal on 24th February, 1887, when 288 members of all classes stood on the roll. A charter of incorporation was obtained on the 23rd June, 1887. The progress of the society has been satisfactory and solid. The membership includes nearly every engineer in the Dominion, as well as several in the United States and Europe. As an illustration of the wanderings of engineers, many members have found their way to South America, Mexico, India, Burmah and Australia. The membership at present includes hon. members 7, members 283, associate members 133, associates 60, students 150. Total, 633.

The society pays special attention to its youngest members, the Students, and encourages them to hold meetings and read papers, which are published by the society. The society was extremely fortunate in enlisting the sympathies of Messrs. T. C. Keefer, the late S. Keefer, the late John Page, and Sir C. S. Gzowski, all of whom passed the presidential chair, and among the younger men, of Messrs. John Kennedy, E. P. Hannaford and P. Alex. Peterson, who is the present president. The society owes much to the generosity of Sir C. S. Gzowski, who, among other gifts, has presented a medal to be given annually for a paper. Prof. Bovey, the first secretary, was indefatigable in his exertions; he has an able successor in Prof. McLeod. Herbert Wallis, the first treasurer, resigned at the last annual meeting and was succeeded by Kenneth W. Blackwell.

The officers for this year are:—P. Alex. Peterson, president; Alan Macdougall, P. W. St. George and H. Wallis, vice-presidents; Prof. C. H. McLeod, secretary; K. W. Blackwell, treasurer; W. McNab, librarian; and H. Abbott, P. S. Archibald, J. D. Barnett, H. T. Bovey, O. Chanute, G. C. Cuningham, H. Donkin, G. H. Duggan, J. Galbraith, G. H. Garden, W. Haskins, H. A. F. MacLeod, H. Peters, H. N. Ruttan, L. A. Vallee. There are, besides, four past-presidents, Sir C. S. Gzowski, T. C. Keefer, J. Kennedy, E. P. Hannaford. We present with this issue a supplement containing portraits of all the officers but one.

For THE CANADIAN ENGINEER.

OLD-RAIL OVERHEAD BRIDGES ON I. C. R.

BY P. S. ARCHIBALD, CHIEF ENGINEER, I. C. R.

The overhead bridges of the Intercolonial Railway were originally built of wood, supported by trestle bents resting upon low stone walls on each side of the track. These walls, being near the side ditches, were subjected to the action of frost from the front and to the pressure from the sliding slopes at the back, the result being that the masonry required to be rebuilt by the time the wooden bridges required renewal. In fifteen years the slopes of one-and-a-half to one had flattened down to about two to one.

For the renewal of these bridges, the most stable and economical structure seemed to be a single iron span, resting on stone or concrete abutments, at the top, or beyond the top of the cutting; in which position the abutments would be simply ordinary retaining walls, and not surcharged walls, as they originally were at the toe of the slope. The stones from the old walls were hoisted to the top of the slope and built into the new abutments with cement mortar. Stone drains were laid down the slopes, and since 1879 none of these abutments have shown signs of failure.

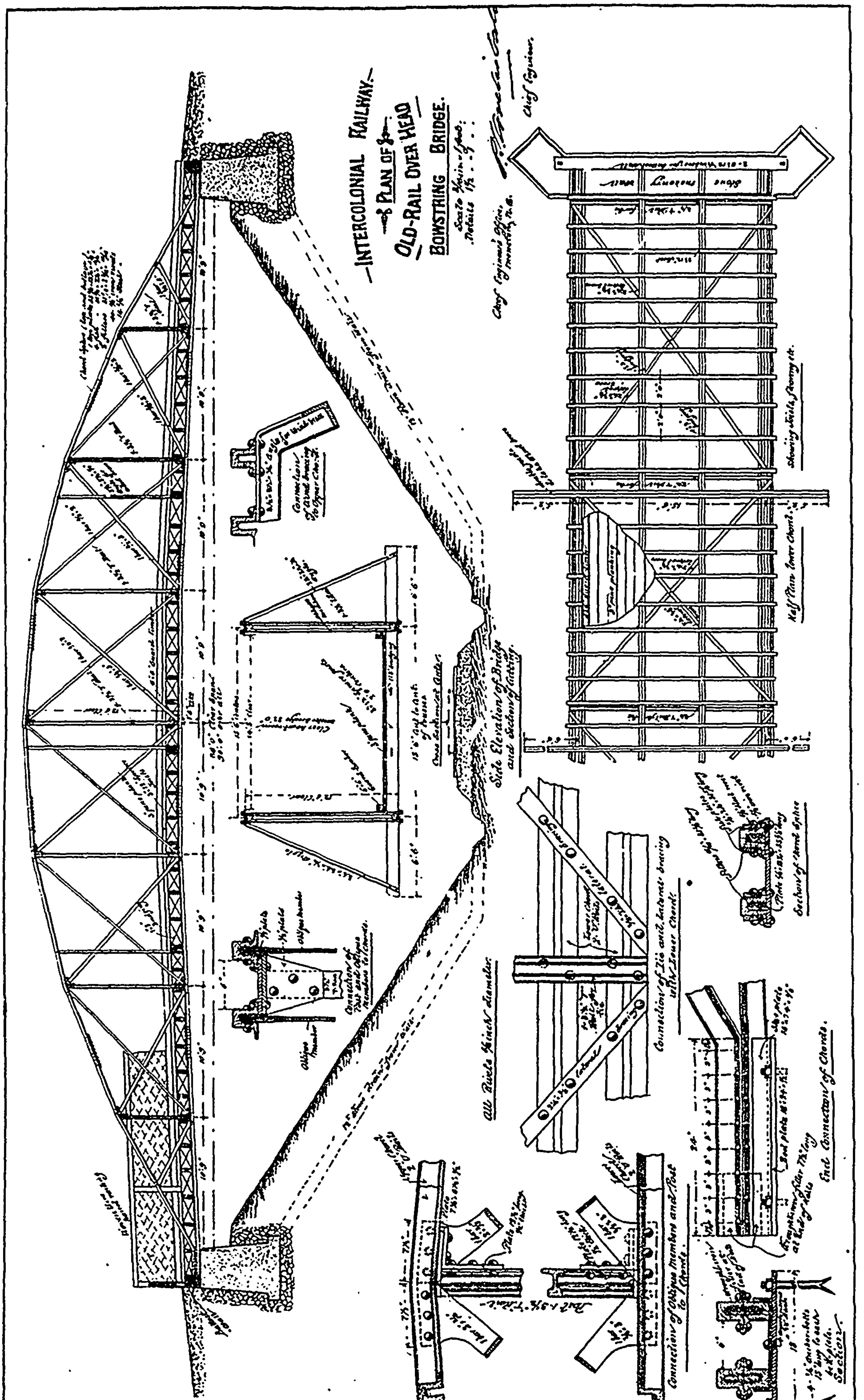
Fifteen years ago old U-iron scrap rails were worth one cent per pound when new iron was four cents per pound. These U rails were placed in the chords of the iron superstructure, the stresses in which were made practically uniform throughout by using the bow-string type of truss. In later bridges, where the head-room was limited, the lower chords were raised in the centre, making the grades on the bridges one in twenty both ways from the centre panel. This changed the truss to the crescent or sickle-shaped type, increasing slightly the stresses in the verticals and lower chords. The verticals are made of one tee-rail, to resist compression from a partial load. The diagonals are bars of flat iron, upset at the ends and fastened into the U of the chord rails with $\frac{3}{4}$ in. rivets. The wooden joists are doubled and extended outwards at every second panel-point, to take an angle-iron or light rail brace. The lateral bracing is of flat iron riveted to the chords.

These bridges are figured for 80 pounds per square foot live load. The cost for spans of 70 to 90 feet, erected, is about $11.40 per lineal foot, exclusive of masonry. Girder bridges on trestle bents cost about $7.50 per lineal foot, erected, exclusive of masonry, old rails being figured at one cent per pound.

Twenty-one bridges of the type illustrated have been built, also two old tee-rail girder bridges on bents, besides many small tee-rail girders over open culverts, from 5 to 20 feet spans.

Tee-rails are also used for covers of box culverts, for protecting piers from running ice, and also in combination with concrete in foundations.

One or two rectangular trusses and plate-girders have been built of tee-rails, by making the chords or flanges of two rails with the broad flanges placed vertically and the web-plate riveted between. A plan of one of these bridges appears on the opposite page.


INTERCOLONIAL RAILWAY
PLAN OF
OLD-RAIL OVER HEAD
BOWSTRING BRIDGE.
Chief Engineer
Side Elevation of Bridge and Section of Cutting.
Half Plan lower Chords.
All Rivets 3/4 inch diameter.
Connection of Tie and Lateral bracing with Lower Chord.
Section of Arch Splice
End Connection of Chords.
Connection of Oblique members and Post to Chords.

GOOD ROADS.

The approaching speed test on bicycles from Sarnia to Montreal will bear ample evidence as to the condition and quality of our highways. Such a test should not be made for mere sporting purposes; the riders are all persons more or less directly interested in the advancement of highway construction, independently of their interest in roads as a means of fast locomotion for purposes of pleasure. The coaching days of the early years of this century had very direct influence on road construction; there were doubtless in those days many whips who tooled along their four-in-hands for purposes of pleasure; still the business part of the coaching traffic became so important, the condition of the road could not be neglected. In our day the bicycle is taking the place of the coach. It is suggested to the riders and other bicyclists taking an interest in the race, that notes should be made of good and bad bits of road, with such remarks on construction as come under the riders' notice. A short memorandum sent to the editor of THE CANADIAN ENGINEER will be gladly received, and if a sufficient number be sent in, a synopsis of opinions will be presented to our readers at an early date, with suggestions for improved construction.

Speaking of the financial value of road improvements, the editor of *Good Roads* concludes a pamphlet on the subject, reprinted by the Ontario Government, with the following observations:

"Of all the thousands of miles of good roads that have been made in this and other countries, the first mile has not yet been found that has not proved to be profitable. The increase in land values alone is always more than enough to pay for the improvement. Some benefits and advantages we cannot always compute in dollars and cents, and some things our common sense impel us to take for granted. No farmer in this country can tell the money value of an education, and yet each farmer concedes its value and sends his children to school, and watches carefully their advancement in knowledge. Good health is of infinite value, and the farmer seeks it and guards it, but he cannot tell its value in dollars and cents. The same is true of good habits, good morals and good clothes. Do not, therefore, waste any time in doubting the value of a good road. The people of other countries who have used bad roads, and now use good ones, are well satisfied that every dollar spent in this work is a good investment, and not one of them would tolerate the miserable dirt roads with which so many farmers seem to be content."

IN last issue we announced that the May number would be enlarged by four pages, but it has been found necessary to make it twelve, which increase we hope will be permanent. We have faithfully maintained the guarantee we started out with as to circulation, and we are thankful to find our friends standing loyally by us in their support of the paper.

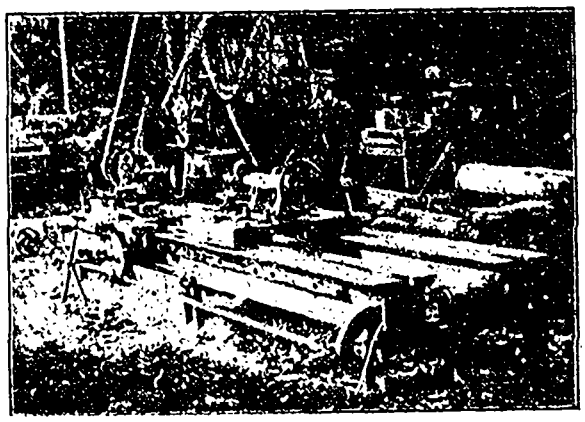
OUR CIRCULATION.

OFFICE OF MONETARY TIMES PRINTING CO.

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

MONETARY TIMES PRINTING CO.
OF CANADA (LIMITED).
Per A. W. LAW, Sec.-Treas.

Toronto, May 1, 1894.



A GRANITE LATHE.

The above engraving is from a photograph of a lathe for cutting granite and other stone. It is manufactured by the Allan Foundry and Machine Works of St. John, N. B., who make a specialty of stone-cutting and polishing machinery. A large quantity of this firm's machinery of this class is in use in the extensive granite works along the St. John river, and the users have given high testimonials to the makers.

WE have an answer to "A London Subscriber" regarding the piston of a steam engine, but owing to pressure of other matter it is held over till next issue.

ANY reader wishing an index of THE CANADIAN ENGINEER for the past year will receive one free on forwarding his address to this office. Subscribers wishing to have the back numbers bound at this office, and forwarding $1.25, together with their set of papers (post or express paid), shall receive back a bound volume prepaid to any part of Canada, Newfoundland or the United States. The volumes are bound with half-roan backs.

THE average death rate of the world's shipping, says an English exchange, is about 4 per cent., and the birth rate 5 per cent. The average life of a ship built in Great Britain is 26 years, of one built in the United States 18 years, of one built in France 20 years, of a Dutch ship 22 years, of a German 25 years, of a Norwegian ship 30 years, and of one built in Italy 27 years.

THOSE receiving a sample copy of THE CANADIAN ENGINEER, and intending to subscribe, should do so on the spot, as this is the first number of the new volume. It is much better to get each volume complete, and we do not care to keep many back numbers in stock. We hope to be able to maintain the present increase in the size of the paper—now twelve pages larger than hitherto—and readers may depend on getting a good dollar's worth of reading matter. Send in your order at once; you will never regret it.

AT the Nykroppa Iron Works, in Sweden, steel ingots are consolidated by pressure arising from centrifugal action. In the centre of the casting pit is an upright shaft carrying the arms, to each of which is jointed an ingot mould. The moulds are filled, and then the shaft is set in motion. As the speed increases the moulds gradually move from the vertical to the horizontal position, and a pressure is developed in the fluid metal equal to thirty times that due to the head in the first instance. This drives out the gases, and produces solid castings. The circumference of the circle described by the moulds is 67 feet, and the velocity nearly 10,000 feet per minute. The inventor of the process is L. Sebenius.

THE half century now closing is considered by many to be mechanically and intellectually the most progressive in the history of the world. Certainly the number of inventions and discoveries that contribute to the necessities, comfort and conveniences of man are unparalleled in such a short period. A few of these are enumerated by a contemporary as follows: Ocean steamships, street railways, telegraph lines, ocean cables, telephones, phonograph, photography and a score of new methods of picture making, aniline colors, kerosene oil, electric lights, steam fire engines, chemical fire extinguishers, and anæsthetics and painless surgery; gun cotton, nitro-glycerine, dynamite, giant powder; aluminum, magnesium, and other new metals; electro-plating, spectrum analysis and spectroscope; audiphone, pneumatic tubes, electric motor, electric railway, electric bells, typewriter, cheap postal system, steam heating, steam and hydraulic elevators, vestibule cars, cantilever bridges. All positive knowledge of the physical constitution of planetary and stellar worlds has been attained within this period.

GEORGE HAGUE of the Merchants' Bank, Montreal, in an essay the other day on the labor problem, made the assertion that the application of the principles of Christianity to the labor question would settle the strike difficulty and do away with every other industrial evil. There is no doubt on that point, and earnest thinkers, in and out of the pulpit, are forced to the same conclusion. Dr. Strong cites the widespread and deep discontent of the artisan class as sufficient evidence that our industrial system is not based on Christian principles, and declares that "we shall have no industrial peace until political economy becomes a department of applied Christianity, or, as some would prefer to say, till Christianity has been substituted for political economy." Till recently, indeed, "the Church has left the study of the science of society almost wholly to unbelievers, giving, of course, the common impression that religion is a thing apart from the ordinary life of man, and alienating from Christianity not only the great class of workers, dissatisfied because their condition has not improved proportionately with the general improvement of conditions, but also the growing class of men who cherish higher ideals respecting society than those which the Church seems, by its inaction, to endorse."

WHETHER it is owing to the friendly feeling which sprang up between the two peoples, owing to the spontaneous sympathy shown by Canadians when the great fire occurred two years ago in St. John's, Newfoundland, or whether it is the natural tendency towards an affiliation of interest among the colonies of the British Empire, we cannot say, but there certainly is a satisfactory development of trade between the Dominion and "Britain's oldest colony." The total exports of Canada to the island of Newfoundland in the fiscal year 1893, amounted to $2,594,633, of which all but $211,629 was the produce or manufacture of Canada. The total in 1892 was $1,750,714, the figures for 1893 being larger than any period since 1873, which was exceptional. The articles we sent to Newfoundland last year included coal, salt, oil, granite and building stone, wood and wood products, horses, cattle, sheep, live swine and pork, tinned meats, poultry, butter, cheese, eggs, grains and fruits; while among manufactures are agricultural implements, books, biscuit and bread, bricks, carriages, drugs and medicines, explosives, electrotypes, iron and steel manufactures, lime, soap, sugar, doors, sashes, household furniture and other wood manufactures, leather and leather goods. Cottons and woolens appear to be a line in which Canada is doing an increasing trade with the Island. It is worthy of note that of the amount of cottons we shipped to Newfoundland last year, all but $609 appear to have been the product of Canadian mills, according to the official figures. The following comparative statement of the principal items of our exports there in textiles in certain years is given by the *Canadian Journal of Fabrics.*

	1883.	1886.	1888.	1893.
Canvas	$ 711	$ 67	$	$ ....
Cordage	2,496	4,507	1,982	9,093
Rubber goods	5,993	2,179	....	2,448
Clothing, etc.	3,231	1,175	3,140	12,755
Woolens and cottons	45,825	22,054	14,761	38,627

CHARLES PERCY.

As briefly noted in last issue, Charles Percy has been promoted from the position of General Manager's assistant to that of treasurer of the Grand Trunk Railway Company The post has been made vacant by the retirement of Robert Wright, who, after a long service, returns to England, owing to ill health. The *Empire*, referring to the circumstances of the appointment, says: "The position vacated by Mr. Wright is so important a one in the eyes of the executive, the shareholders, and the public at large, that the greatest care seems to have been taken in the selection of a gentleman to fill his place; but, as usual, the Grand Trunk has been exceedingly fortunate in the choice." Mr. Percy was born in the County of Kent, England, in the year 1845. The first fifteen years of his business life at the Railway Clearing House, London, the latter four with the office of secretary to an association for the regulation of traffic between England and Scotland, led to his selection, in 1875, as treasurer of the Great Western Railway of Canada, whence the bondholders of the Midland Railway, whose affairs were very much involved, secured his services. He was therefore charged with the management of that property, but owing to its weak financial position it then escaped the control of the interests he represented. At that period, 1878, the Grand Trunk Company was acquiring its route to Chicago, and Mr. Percy was nominated as secretary and treasurer of the five railway companies soon after consolidated, and now known as the Chicago & Grand Trunk Railway. Consequent upon the fusion of the Great Western with the Grand Trunk, Mr. Percy was transferred, in 1885, to Montreal, continuing the secretaryship, to which office was soon after added the more arduous one he has up to this date filled. Like other Englishmen, he further identified himself with

his adopted country by marriage, and his alliance with Miss Meredith, daughter of the late Henry Howard Meredith of Port Hope, connected him with one of the best known families in Canada. Like Mr Lanigan, Mr. Percy has been in receipt of many congratulations from railway men and the press on his promotion. The *Shareholder* said "Mr Percy will, we are satisfied, do credit to the judgment which has led to his promotion." The *Trade Review* referred thus to Mr. Percy: "He has very worthily discharged most responsible duties, which have secured him the utmost confidence of the company, and the universal esteem of all its connections" Mr Percy continues in office for the Chicago and Grand Trunk and other western lines, and as secretary and treasurer or director attends to Grand Trunk interests in respect of the International Bridge, the St Clair Tunnel and other affiliations

ONTARIO RAILWAY EXTENSION

Among the lines of railway under construction in Ontario this year are the following. Grand Trunk, Georgian Bay and Lake Erie Railway, Owen Sound Extension. This line will extend from Parkhead on the Stratford and Huron Railway to Owen Sound, a distance of about 13½ miles. The survey was made in October, 1891 It is expected that the line will be opened for traffic as a portion of the Grand Trunk system about the 1st of September next. This branch will take in the natural cement works at Shallow Lake, and the company who have bought the works are already barrelling cement in anticipation of the opening of the road.

The construction of the Irondale, Bancroft and Ottawa Railway eastward from Irondale, which was commenced during 1892, has been continued, the line being completed for a distance of 10 miles, and opened for traffic to Gooderham in the township of Glamorgan, county of Haliburton, in November. It is expected that another 10 mile section will be completed in the early part of the summer.

The building of the Parry Sound Colonization Railway, which was stopped in 1892, was resumed in the early part of last year, and grading has been completed, and the rails laid for a distance of 10 miles, and 6 miles have been ballasted, the total distance from the commencement of the line at Scotia, to the end of track, being now 30 miles. The line will be opened for traffic to Edgington in the early part of this year, and it is expected that Parry Sound will be reached before the close of 1895.

The Ottawa, Arnprior and Parry Sound Railway is another road under construction, but the progress of this line has been closely noted from month to month in THE CANADIAN ENGINEER

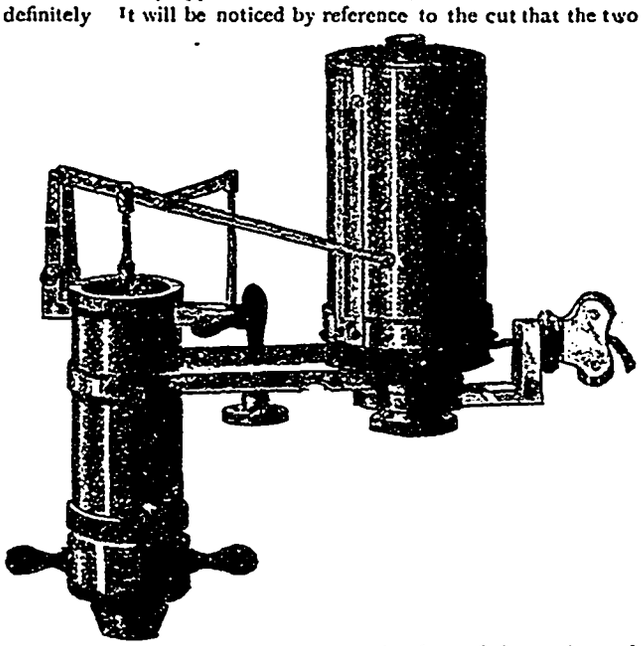
The Lake Temiscamingue Colonization Railway from North Bay to Lake Temiscamingue, is another road which will proceed this year. It will compete with the C. P. R. for the trade of this northern region now being opened up, and will be operated as an affiliation of the Grand Trunk system

A NEW MINING ASSOCIATION.

A meeting of Ontario mining men took place at the Rossin House, Toronto, on April 10th, for the purpose of forming an organization, having for its aim the protection and promotion of the interests of miners. It was decided that the association should be called the "Ontario Mining Institute," and its members will consist of persons engaged in the ownership, working or direction of mines or quarries in the Province of Ontario, mine and mill owners, mining engineers, metallurgists, prospectors etc A resolution was passed favoring an Act to place beyond doubt the power of joint stock companies to issue shares at a discount, there being at present considerable uncertainty on this point, which was detrimental to mining interests. It was also decided to send a deputation to the Ontario Government asking for the passage of a mining joint stock companies' Act to provide that the only penalty attachable to the non-payment of calls upon mining stock be the forfeiture of the amounts already paid upon the stock. Such legislation, it was thought, would help considerably in doing away with the risks attending mining speculation A motion was introduced to the effect that the Government should encourage the development of refractory gold ores, give a prize of $10,000 for the best and most economical process of doing this. After a good deal of discussion, however, the motion was lost, chiefly on the grounds that the hunting for bonuses would put the Institute in a bad light before the public, and that the man who could invent such a process would inevitably become a rich man without the assistance of any Government grant Another resolution, that the Government ought to substantially assist in the development of the mineral resources of the provinces, particularly in the case of steel and pig iron, carried with little difficulty. The following were elected officers of the Ontario Mining Institute: President, James Conmee, M.P P for Algoma; vice presidents, Judge Kingsmill, Archibald Blue, and W. Hamilton Merritt, all of Toronto, and Prof. Goodwin, of Kingston, secretary, B. T. A. Bell, Ottawa, and treasurer, Thos. W. Gibson, Toronto. Council: Prof. Nicholls, Kingston; Prof. Coleman, T. D. Ledyard, J. M. Clark, and Prof. Eames, all of Toronto; Wm. Young, Rat Portage; J. Cameron, Sudbury; A. W Carscallen, Marmora; and P. McKellar, Fort William.

THE ROBERTSON-THOMPSON INDICATOR.

This instrument is standard size, with piston ½ inch in area, of the best material and workmanship, and guaranteed by the makers to be equal in accuracy to anything on the market. The parallel motion is of unquestioned accuracy, and is secured by a controlling lever attached to the pencil arm, governing it direct, and the pivots are free from any appreciable lost motion, and will remain so indefinitely It will be noticed by reference to the cut that the two



links are parallel with each other at all points of the stroke, and that the lower pivots of these links are always in a straight line with the pencil point, and by substituting the controlling lever for the imaginary link, it forms an exact pantograph, without depending on the piston-rod for a guide, the disadvantage of which we have already mentioned. It will be seen that the movement of the pencil coincides with that of the piston at all points of the stroke, a point of great importance, which every intending purchaser should carefully consider.

The piston rod is made of steel, hollow, and threaded inside to receive a swivel rod, which permits of the adjustment of the pencil to any height of the drum.

The drum is 1.75 inches in diameter, is as light as is consistent with ordinary use, is turned on centres, and provided with a bearing one and one half inches long at the bottom and one-half inch long at the top, and is further provided with cone bearings at the top and bottom to take up end play on the shaft. The spring can be adjusted for any speed, high or low, by quarter revolutions.

The guide pulley admits of the cord being led in every possible direction with the use of carrying pulleys. The instrument can be readily changed from right to left hand, and is perfectly adapted, on account of its light moving parts, to engines of any speed met with in practice. The springs are made of the finest quality of steel wire, carefully tempered and accurately adjusted. Circulars and all information can be had of Hine & Robertson Co., the manufacturers, Cortlandt street, New York.

It is understood that the proposal of Gates and Syre to start a new carpet factory at St. Catharines, will be encouraged by the city council, and Mr Gates' factory at Woodstock is now being removed to the city of the saints

THE CANADIAN ENGINEER for April is an exceptionally bright number. The Canadian Iron Industry is an able article from the pen of Geo. E. Drummond, which is continued from last month. No less than eighteen columns are devoted to the Electrical, Industrial, Mining, Railway, Marine and Personal Departments. Every mechanic should subscribe for THE CANADIAN ENGINEER.—*Comber Herald.*

MR SCHOLFIELD, formerly manager of the Penman Mnfg. Co.'s mill at Paris, Ont., is thinking of erecting a knitting mill at Merritton, Ont

ROBIN & SADLER, leather belting manufacturers, Montreal and Toronto, have put in two 50-inch belts for the Montreal Electric Power Co., and have shipped a 48-inch belt to Thos. McAvity & Sons, St. John.

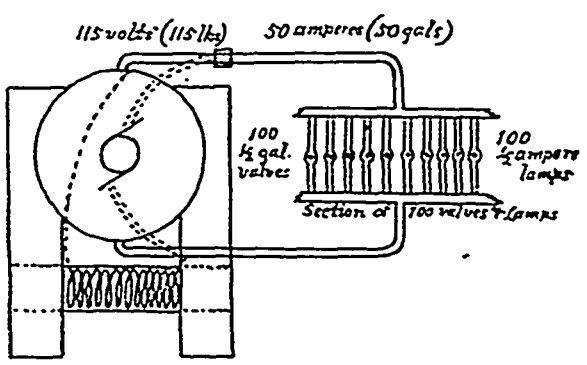
THE *Engineering and Mining Journal* describes an apparatus for utilising the heat from furnace slags. The boiler consists of a steel shell in the form of a strong, egg-ended receiver, having flattened faces on the top and bottom. Through these flat portions a number of Galloway tubes, arranged in two rows, tapered from 5 in. at the top to 10 in. at the bottom, are passed and secured to the shell by flanges. The lower or larger end of each tube is closed by means of a cast iron door, which is manipulated by means of a convenient lever. The upper end of each tube is provided with a funnel for convenience in pouring slag into the tubes, and a pair of iron rails pass across the upper face of the boiler and over all the funnels, and thus serve as a track for the slag pots. At each end of the boiler a bin is provided, into which is dumped the skin of the slag, which always sets on the cast-iron pots from which it is poured, and this red-hot material lying against the ends of the boiler plates serves to conserve the heat at the same time and impart additional heat to the water. Beneath the lower end of the tubes a railway track also passes, on which runs a track for removing the slag after the heat has been extracted from it. In connection with the machine now working, a handy form of hydraulic lift is utilized for the purpose of raising the slag to the upper portion of the boiler. In actual practical work, however, it is contemplated sinking the boilers to the level of the slag dump, and removing the slag after treatment by means of a truck, running to the edge of the dump, along a line laid in a specially prepared cutting The boiler being filled with water to the required level, the slag is poured into the tubes one at a time just as it comes from the furnaces. As soon as all the tubes, which are 24 in number in the machine now at work, are full, the tube first filled is emptied by merely releasing the lever which controls the door, and a conical cast of cool slag drops into the truck below which is provided for its reception. The operation is continued with the various tubes, and as soon as the truck is loaded it is conveyed to the edge of the dump by means of horse or some other convenient power and tipped over. As the tubes are emptied they are filled with molten slag, and in this manner the work is conducted continuously. This operation in itself is considerably less laborious than the method now adopted of wheeling the pots of hot slag by hand-power for a great distance before tipping them over, a work that is particularly arduous during the warm summer months.

Electrical Department.

AN ILLUSTRATION FOR ELECTRICAL STUDENTS.

At a meeting of No. 1 branch of the Canadian Association of Stationary Engineers in Toronto last month, J. C. McLachlan, manager of the Toronto Electric Motor Co., gave a familiar talk on the care of electric motors. To make his remarks clear to steam engineers, Mr. McLachlan made use of a form of illustration which we do not remember to have seen adopted by instructors in electricity, and his method is so clear and simple that we make no apology for reproducing it. He draws an ingenious analogy between the steam engine and the motor, and supposing the boiler to have a double steam pipe, converts the flow and pressure of steam into their equivalents in electricity. The following is the report of Mr. McLachlan's "blackboard talk":

He first illustrated the boiler with pipes leading from the top of the boiler into headers with small pipes between, and valves placed half way between headers, then back to the bottom of the boiler as shown. These valves, 100 in number, will allow, say, one-half gallon to pass through them per hour, at a boiler pressure of, say, 115 lbs. This would require 50 gallons to pass through the main pipes in the same time. To keep up an even pressure on each valve, and to give an even distribution, we place the main pipes in the centre of the headers. Now, by keeping up a steady fire you will get a continuous flow from top to bottom of the boiler through these valves. He did not give these figures as correct, but simply for convenience of illustration. Proceeding with his sketch, Mr. McLachlan said:—



"Now we will change this boiler arrangement into an electric-light plant of one hundred 16-candle power incandescent lamps, and to do this you will see that it is very simple. We use the boiler for the armature, the brick work for the poles, the fire-place for the field, the main pipes for main wires, the headers for feed wires, and the half-gallon valves for lamps. Now we have a complete 100-light plant installed, and using the same figures, the 115 lbs. become 115 volts, the 50 gallons become 50 amperes, and the half-gallon valves become half-ampere lamps. Now by keeping up a steady speed on the armature we get a steady pressure, but by increasing the speed the voltage will increase, and increase the force of the current at the lamps, which is very bad for the lamps, as they will not last as they would do if kept at their proper voltage. Many times the makers of the lamps are condemned for not making a good serviceable lamp, when the fault is in the engine or in lack of knowledge, or carelessness in not attending to the rehostat so as to keep up an even pressure. Now, going back to the boiler, we find if we increase the pressure we increase the quantity circulating in a given time, and we have identically the same if we increase the voltage of the dynamos. In such case the damage to the filament of the lamp would be greater (as it is very tender) than any to the valves already referred to. You will notice the square on the main pipe at the top. This would be a safety valve for the boiler, and we use it for the electric plant for the same purpose, but call it a "cut-out." If we get a short circuit it will melt this and save the armature of the dynamo. I have seen parties put in copper wire in place of fuse wire of proper size. You might as well tie down the safety valve on your boiler; the result would be destruction in either case. If a fuse blow is caused by a short circuit, you will find the trouble between that and the end of that circuit. The cause may be water in a lamp or in a socket, or a nail may have been driven through between lamp cords. If there is no water, and no pipes or rods which the wire passes over, then we must look for the cause elsewhere. Now we come to taking care of the dynamo. First, keep it clean. Clean your commutator and keep it true and smooth, and the results will be in your favor. If you see myriads of small red sparks around the commutator you will find it dirty; if there is a clear electric spark about ⅜ of an inch long, look for a broken wire or bad connection; if a flash, look for a "ground." If you are unfortunate enough to have a burnt section, cut off the wires of that section and connect the commutator section on each side, and you will be able to get along if your dynamo has not been overloaded before. Sometimes you will see that the commutator shows a mark as if struck with a sharp hammer. This may be caused by a closed circuit."

THE electricians of the Sherbrooke, Que., Light and Power Company have recently introduced for their own convenience a device which we do not remember to have seen elsewhere or read of. They have a telephone in their power house, but of course such is the noise of the water-wheels that the telephone bell could never be heard nor the instrument made use of in the power room. The instrument is therefore enclosed in a cabinet and with it is connected a wire leading to a large gong in the middle of the room. To this gong is attached a battery similar to the call-bell battery of the telephone, only much stronger, and when anyone rings up the power house the drop falls and the gong rings loudly enough to be heard all over the room. Such a device will be found very useful in all offices or factories where the noise of machinery prevents one from hearing a call or hearing the manager when at the telephone. The same company have improved the construction of their arc light pole-attachments by having a chain instead of a rope to lift the lamps by. The movement of the lamps in high winds cuts the rope and open circuits are not infrequent. No difficulty is experienced with chain lifters.

Electric Flashes.

THE Seaforth, Ont., electric light plant has been offered for sale.

THE Nanaimo, B.C., Electric Light Company are to introduce a new system.

THE introduction of electric lighting at Mile End, Montreal, is being talked of.

STEWARD & MILLS, electrical agents, Vancouver, B. C., have dissolved partnership

COTE ST. ANTOINE ratepayers refuse to sanction the mountain railway scheme

ERNEST CHARTERS, a small boy, was run over by a Montreal electric car and instantly killed

MR. SCHOLFIELD proposes to put in an electric plant at Guelph, Ont., to supply both light and power.

THE Comber *Herald* says the Tilbury Centre council have decided to purchase the electric light plant

THE contract for constructing Galt and Preston Street Railway has been given to John Hartnett, Toronto.

THE Packard Lamp Company, Montreal, have applied for incorporation The capital stock is $300,000.

THE G T R. will light their shops at Point St. Charles and the Bonaventure depot, Montreal, with electricity.

THE Montreal Street Railway Co have given an order to J Brooks Young, Montreal, for a number of car fenders.

MITCHELL, Ont., has just awarded a contract for a 500-light incandescent system to the Royal Electric Co., Montreal

AN iron pulley in the Chatham, Ont., Electric Light Works burst the other day. The engineer had a narrow escape.

JEAN BAPTISE BRAZEAU, a gardener, was last month killed by a Park and Island electric car on the Back River route, Montreal.

THE electric street cars in Kingston, Ont., have been lately running on Sundays, though they have met with some opposition.

F. B. THOMPSON, formerly chief electrician to the Royal Electric Co., Montreal, has brought an action against that company for $2,000 damages on the ground of wrongful dismissal.

TORONTO city engineer is figuring on the cost of establishing an electric light plant under civic control. Last year the cost of lighting the city was $139,067, including $30,125 for gas.

SIEMENS BROS. & Co have manufactured 1,600 out of the 2,200 miles of the Commercial Company's cable. Most of this will be laid from Canso to near the Newfoundland bank, where it will be buoyed

ARRANGEMENTS are being made for the extension of the southern line of the Peterboro', Ont., Electric Street Railway. Monaghan council have given them the right of way as far as the locks bridge.

D W. KINGHORN, master plumber, was another Toronto victim of the trolley car last month He was sitting on the tailboard when the car rounded a curve, and he was thrown off in front of the trailer. Death was instantaneous.

THE St John, N B., Electric Railway has been purchased by a Montreal syndicate, which includes W. C. Van Horne, T. G Shaugnessy, R B. Angus, James Ryan, with H. P Timmerman, St. John The road will be extended around the city, and altogether about $300,000 is to be spent on equipping it.

THE foundations of the two large Siemens-Halske generators, as well as the foundations for the smoke stack at the new power house at Toronto, are now completed. The Bertram Engine Works Co., Toronto, have the contract for a compound condensing horizontal Corliss steam engine.

THE preamble of the measure giving power to the Hamilton Electric Railway to alter its name to the Hamilton Radial Electric Railway, and to operate tracks by any power except steam, through Guelph, Berlin, Niagara Falls, Oakville, Brantford, Mimico, etc., was carried in the Ontario House committee by the casting vote of the chairman.

THE Colonial Telegraph and Telephone Co. (Ltd), capital stock $25,000, headquarters Niagara Falls, Ont., have been incorporated The applicants are Jacob Dilcher, Buffalo; Jas & Jno. Jos. Bamfield, Niagara Falls, J. F. Cleary, Troy, N.Y., and H. Steinert and John Harrington, New York.

THE Nova Scotia Telephone Co. have commenced work on the new line between Truro and Halifax.

WALTER MACHELL is proceeding rapidly with the installation of an electric light plant at Aurora, Ont.

MOOSE JAW, N. W. T., electric light plant has been purchased by H N Rorison, who will put in several improvements.

THE Gurney-Tilden Co. of Hamilton has purchased the Canadian rights for the new arc light invented by W. E Irish

G. R. ROBERTSON has resigned from the directorship of the Royal Electric Co., and A Brunt, Montreal, has been elected in his place.

THE Preston & Berlin Street Railway Company have elected T. M. Burt president, and Fred Clare vice-president and secretary-treasurer.

THE Bell Telephone Co. are preparing to build a new central office in St Roch's, Que. This will give the benefit of a reduced tariff to the St Sauveur district.

MONTREAL and Toronto Street Railway Companies are suing the Dominion Government for the return of $50,000, being the amount of duty paid under protest on steel rails.

THE Bell Telephone Co. have discontinued the extension of their underground cables in Toronto. The current from the street railway tracks was found to affect the transmission of sound in the wires.

THE Toronto Electric Motor Co. last month put one of their motors into an establishment in Brantford, and the result of its operation was so good that it has led to the sale of four other motors since.

THE St. Hyacinthe Gas and Electric Light Company are putting in a new alternating dynamo for 500 lights. It will be a Westinghouse machine, and will be installed next month. They are also putting in a new steel boiler from E. Leonard & Son, London, Ont.

THE ratepayers of Etobicoke will soon vote on a by-law for a bonus in aid of the extension of the electric railway from Mimico to Long Branch. One of the Toronto papers says it is the intention of the company to extend the line through to Hamilton within the next four years

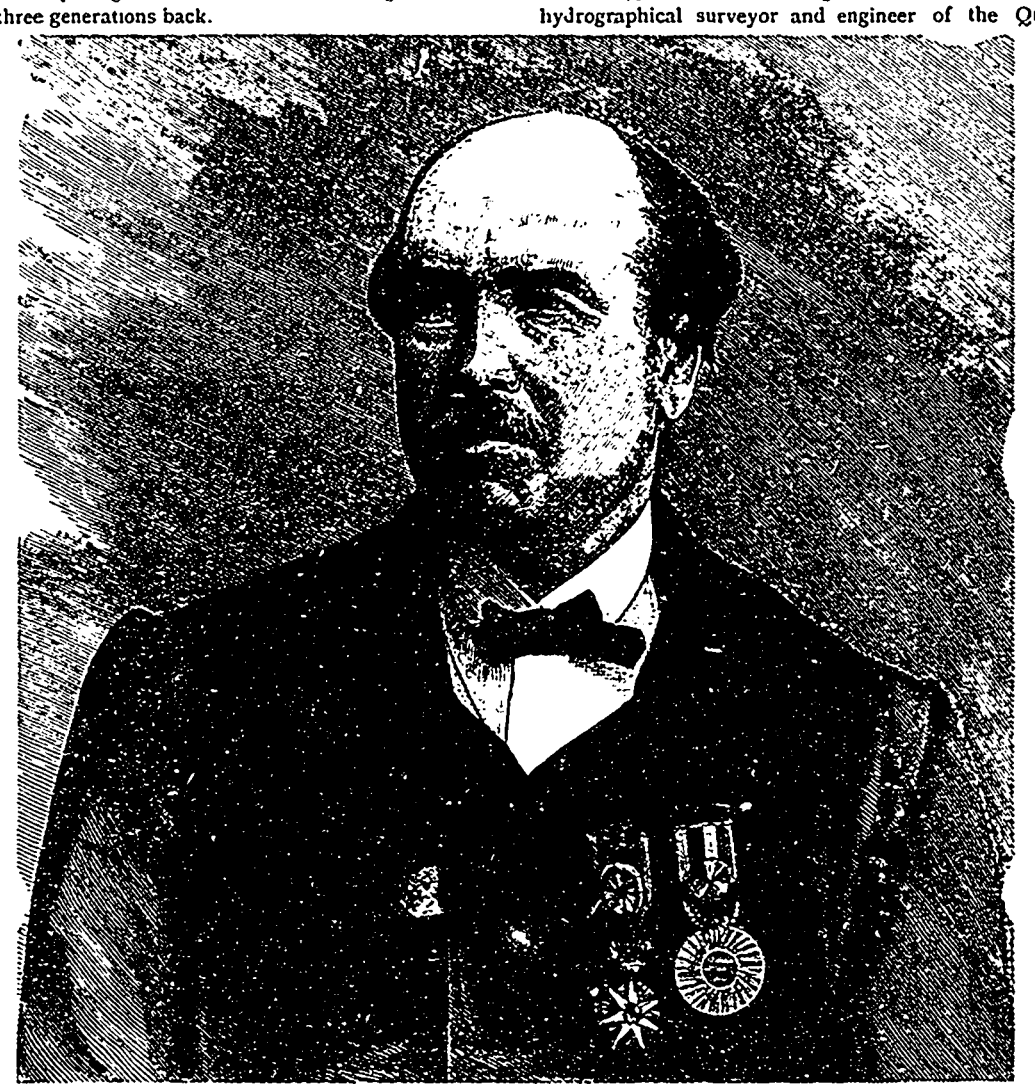
W. R. HITCHCOCK is organizing a company in the United States for the construction of an electric street railway at Cornwall, Ont. There will be spur lines to the cotton and paper mills, a distance of four miles. The power from Sheik's Island dam will be utilized, and the system employed will be the Westinghouse. The plant will be exempted from taxation for the term of ten years.

THE New Glasgow, N S., Electric Co. are having plans prepared by Fred A Bowman, C E., for an electric railway to be built this spring or summer connecting New Glasgow with Trenton on the one side, and Stellarton and Westville on the other. The line to Trenton would be two miles long, to Stellarton about two and a quarter miles, and to Westville about four and a quarter miles.

A BILL has been passed by the Ontario Parliament to make it compulsory for companies to provide proper shelters for motormen and other employees operating electric and other cars. It is difficult to understand why electric street railway companies do not adopt the vestibule system always, if only on the ground of self interest. However, the public safety demands that some system of the sort must be adopted permanently throughout the country, and not merely left to the whim of each individual manager.

CHARLES BAILLAIRGE, C.P.E., M.A., F.R.S.C., ETC.

Two admirable characteristics of the French-Canadian race are their industry and perseverance. It is almost as hard to find a lazy French-Canadian as it is a white-skinned negro. While these are common characteristics, there are not infrequent cases where energy, united to their natural quickness of intellect, has developed lives of extraordinary usefulness and merit. Take the work of Abbe Tanguay, who undertook to compile a genealogy of the French-Canadian people Laboring for years in obscurity, he has produced seven large volumes, giving dates and facts concerning hundreds of thousands of French-Canadian families, not only of the Dominion, but of those residing in the United States and there is probably not a branch of any French-Canadian family of which he has not some facts. It contains nearly 1,250,000 entries of births, marriages and deaths. The enormous labor involved in such a compilation can only be imagined by those who may attempt to get accurate dates concerning their own family for say three generations back.



Another man of remarkable ability, whose work has come under the notice of the writer, is Charles Baillairgé, the city engineer of Quebec, now widely known not alone as an able official, but a writer and original thinker of no ordinary powers. To give the slenderest outline of the literary and engineering work of Mr. Baillairgé would require far more space than the writer is limited to in this notice. He was born at Quebec, Sept. 27th, 1826. His father was for 36 years "road surveyor" of Quebec, and his mother was a daughter of Lieut. Horsley of the British navy. His grand uncle, Frs. Baillairge, of "l'Academie Royale de Peinture et de Sculpture," France, who carved several of the statues of the Basilica, Quebec, had his studio in the quaint old building in St. Lewis street, now occupied by Campbell's livery stables, and was almost daily visited by the Duke of Kent, father of Queen Victoria, during his stay in Quebec. He was educated at Quebec Seminary, and at an early period of his studies showed a special aptitude for mathematics and logic. At the age of 17 he and another school mate designed and built a double-cylindered carriage for common roads, and often made excursions with it through the country. Beginning his apprenticeship in engineering, architecture and surveying, he received a diploma as land surveyor in 1847. In the following year he married Miss Duval, step-daughter of Chief Justice Duval of the Court of Appeals. By her he had eleven children, and she dying, he married Anna, daughter of Capt. B. Wilson of the Royal Navy, by whom he has had six children, so that Mr. Baillairgé is not only the engineer and author of a great many architectural, engineering and literary works, but is esteemed as the author and architect of a goodly family.

He has been city engineer of Quebec since 1866, but previous to that he carried out a great many works. He designed and superintended the construction of the Laval University buildings, the asylums and churches of the Sisters of Charity and Good Shepherd, the music hall, the new jail, and very many private residences. He designed and built the Church of Ste. Marie Beauce. Many other parish churches, presbyteries, school houses, cottages, villas and other structures were erected after his designs. In 1860 he erected on the St Foy Road, the cast iron bronzed monument to the braves who fell there under General Levis, and to which Prince Gerome Napoleon contributed at a cost of over $5,000, the crowning statue of Bellona. Having been hydrographical surveyor and engineer of the Quebec Harbor Commission, he has been frequently consulted by both Dominion and Provincial Governments on questions of technology and engineering, and often his services have been called in as arbitrator. He planned and built Dufferin Terrace, which is 1,500 feet long, and crowning a cliff 182 feet high, forms the most picturesque promenade possessed by any city in the world. The foundation stone of this terrace, it will be remembered, was laid by Lord Dufferin in 1878, and the structure was inaugurated by the Marquis of Lorne and Princess Louise in 1879. In the long years of his service he planned and built wharves, ferry landings, pontoons, ferry boats, police and fire stations, halls and similar works too numerous to mention, and old Quebec is marked everywhere by his beaver-like industry Fortification walls have been cut through, steep hills have been graded down, new streets have been built to open a way to inaccessible quarters of that hilly city, and eyesores have been converted into spots of beauty.

In the midst of all this practical work Mr. Baillairgé has yet found time to do literary work, which of itself would do credit to the industry of a professional *litteratur*. Not to speak of annual reports, he has produced over a dozen books and pamphlets, one of which is a volume of 900 pages numerously illustrated, besides essays and articles on scientific subjects. In addition to this he

has delivered numerous lectures on the steam engine, mechanics, optics, astronomy, and kindred subjects. His work on "Plane and Spherical Geometry and Trigonometry," published in 1866, upset some so-called solutions of problems in previous works. This book contains the solution of some 200 pertinent problems, among others an easy solution of Stickel's hydrographic problem of the four points, not before solved by a simple geometrical construction. It also gives a novel solution of the difficult problem of laying out city lots between non-parallel commercial streets where every inch of frontage is precious, in a way to contain given or proportional areas, with proportional frontages on each of the streets. In 1874 Mr. Baillairgé published in both languages his "Key to the Stereometrical Tableau," "Cle du Tableau Stereometrique," giving applications thereof to numerous solid forms. This system was ordered to be taught in all the elementary schools of Russia, and afterwards was found to work so well that it was applied to all the polytechnic schools of the Russian empire.

In that year he was called to France, when in the "Grand Conservatoire des Arts et Metiers" he received the gold medal of the "Societe de Vulgarisation de l'Ensignement en France," also the medal called "Philippe de Girard," given by M. de la Boronne de Pages for the most useful invention or discovery of the year. He has since received 13 medals of honor and 17 diplomas from France, Italy, Russia, England, Brazil, Japan, Belgium, Canada and the United States of America. As a supplement to this he published his "Stereometricon," applying the prismoidal formula to some 200 elementary geometrical forms, giving in each case the nomenclature of the solid and of the class to which it belongs, the nature and mode of arriving at the areas of the opposite bases and middle or other sections, the form or shape and area of the developed lateral and other surfaces thereof, the object of which the model is representative or suggestion, and of the many other uses to which the figures may be applied By this an easy method is provided for finding the contents of a cylinder of varying diameter, such, for instance, as a barrel or cask. Another well-known work is his English and French "Homonyms." One of his most recent works is a valuable pamphlet on the navigation of Hudson Bay and the development of its trade. In a paper before the Association of Architects of Quebec, Mr. Baillairgé gave to the world some valuable ideas on the construction of public buildings, so as to provide means of fire escape, and the theatre at Antwerp, after its destruction by fire, was rebuilt on his plan. This was a tier of outer iron galleries to each of the five tier of boxes, and 25 doors to each gallery, 125 issues, in addition to those from the orchestral level and stage, and of the body; there being iron stairs from the uppermost to the lowest gallery, that leading from the first gallery to the roadway level being suspended to prevent ingress and detachable at will by the mere pressure of the foot upon a spring.

Another short essay worthy of study was the "Free Ventilation of Sewers," a paper read in 1892 before the Royal Society of Canada, of which, by the way, he was one of the charter members. Before the Canadian Society of Architects, in 1893, he presented a "Plea for a Canadian School of Architecture," which was published in the *Canadian Architect and Builder*. It will interest the reader to know that Mr. Baillairgé is something of a dramatist too, he having written a play called "Le Diable Devenu Cuisinier," which abounds in humorous hits, and which has been acted more than once in Quebec. When in Paris last, one of the leading scientific publishing houses did him the honor of publishing a sketch of his life, and a large portrait, from which the accompanying vignette is a reproduction.

CLEANING A WATER MAIN.

The Halifax city engineer's report for 1893, referred to elsewhere, contains the following with reference to the cleaning of water mains:—

The water mains should be cleaned at least once in every year. The inside of old pipes become covered with a heavy incrustation of oxide of iron, which reduces the internal diameter of the pipes, and consequently the capacity. Many who are aware that the first mile of pipe laid from Spruce Hill Lake is 20 inches in diameter, suppose that it would deliver more water than the 15-inch main with which it connects. Such is not the case, however, for the first mile is level and the pipe has very little fall, while the 15-inch pipe falls rapidly The smaller pipe, in consequence of the heavier grade, is capable of delivering as much water as the larger, and it is necessary to clean both pipes in order to increase the discharging power of the mains. The 15-inch pipe has been cleaned every year since 1881 with a self-propelling mechanical scraper, but only once since that date, viz., in 1885, has the oxidation been removed from the 20-inch pipe. After the incrustation has been once removed, the succeeding formations become tougher and the resistance to the scraper greater. It was expected that there would be some difficulty in forcing the scraper through after a rest of seven years, and the first attempt was made through the pipe from the gate house to the hatch box at the old screen chamber, a distance of about 100 yards. The work was begun on Thursday, November 3rd, at 9.30 a.m. A coil of stout rope had been provided, and was floated through the pipe so that the scraper could be pulled out at the hatch box, if it should stop. This precaution was unnecessary, however, as it went through without any difficulty. It was again inserted and started for the run of one mile and a quarter to the junction with the 15-inch pipe. It had only gone about one hundred yards when it stopped short, but in a few minutes made another short run and stuck solid. No 1 steam fire engine was sent out from the city and succeeded, with the aid of water rams from the gate house, in forcing the scraper to the foot of the grade, 2,200 feet from the dam, and about one hundred yards up the grade to the edge of the bog, but at this point so much water had gathered ahead of it on the up grade that the pressure behind could not overcome the resistance, and it stopped again and could not be dislodged. The pipe falls for nearly half a mile after leaving the dam and then rises for half a mile to Scotch Hill, where it is only twelve feet below the level of the water in Spruce Hill Lake on November 3rd. It was about daylight on Friday, the 4th, when the scraper stopped altogether, and the men were at once put at work to uncover the joints, in order to discover, if possible, the exact location of the machine. Its progress had been so slow that it could not be followed by the usual rumbling noise. The joints were opened along a quarter of a mile of pipe and the pressure tested, but it was not until daylight on Saturday morning that the supposed location was discovered. The pipe was immediately cut, but the hammering worked the scraper ahead, as the water had not been turned off, although when the pipe was separated it showed no signs of cleaning. This naturally led to the conclusion that it had not passed, and a long line of half-inch pipe was run back into the main, but meeting with no obstruction it was withdrawn, and a bag of hay which filled the pipe was inserted at the gate-house and the water turned on. When the water had subsided, after being turned off, the bag of hay was found intact at the spot where the pipe had been cut, and one of the men crawling into the pipe beyond the opening with a lantern discovered the truant. As the scraper could not be withdrawn and the pipe connected until after midnight, it was decided, after consultation with the chairman, who was on the spot, to clean the 15-inch pipe. It was with some anxiety that the scraper was started at 3.30 a.m., but it travelled more rapidly than ever before, making the run of 29,500 feet to St. Andrew's Cross in about one hour and three quarters; and before the householders on the high service required it Sunday morning, water was again running freely from the taps.

During the three days of water famine the low service was turned on in such districts as it would supply, and those who could not be reached by the low service were supplied by watering carts ordered out by the chairman.

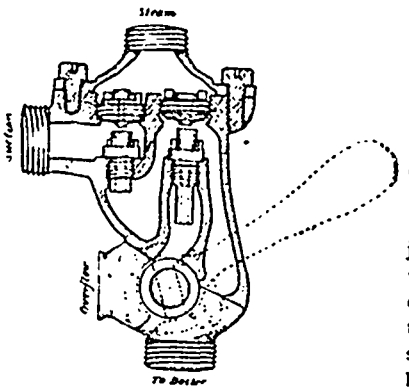
Profiting by experience, precautions are being taken to prevent a repetition of the trouble in future, and Mr. Doane urges the necessity of a storage reservoir in the city.

A COPPER AGE ESTABLISHED.

At a recent meeting of the Académie des Sciences, Paris, M. Berthollet read an interesting paper on the archæological question whether there was an age of copper prior to the age of bronze. Pieces of copper have been unearthed by M. de Sarzec in Mesopotamia, which are apparently older than any found in Babylon, and more ancient than the celebrated vulture steel of Chaldea. Copper is easily reduced from its ores by carbon, but bronze requires the addition of tin, a comparatively rare metal as it is chiefly found in Malacca and Cornwall Its use, therefore, implied the power of making long voyages and a considerable advance in civilization. M. Berthellot has analyzed the Mesopotamian specimens, and finds them to contain no tin or zinc, and only traces of lead or arsenic. Air and water have oxidized the specimens to a mixture of protoxide and metallic copper. M. Berthellot is also analyzing a portion of a sceptre of one of the Pharaohs of Egypt, who reigned about 3,500 years before Christ, and so far he has discovered no tin Of course a large number of specimens will require to be analyzed before the question of a pure copper age is really settled, but his researches are in favor of the supposition. We may add that Prof. Flinders Petrie has adduced much evidence from Egypt in favor of a copper age.

THE BROWNLEY INJECTOR.

In recent issues we have referred to the new Brownley Injector brought out by the firm of Stirling & Brownley, brass founders, St John, N B Both members of this new firm are Canadians, Mr. Brownley being a native of Halifax, though for several years living in St. John Mr. Stirling was, we understand, a graduate of the firm of Thos McAvity & Sons. For several years Mr. Brownley has been making a study of the subject of boiler feeders, and the new firm have at last succeeded in producing an injector which for simplicity and effectiveness is said by all users to surpass anything hitherto put on the market. That this claim is not an empty vaunt may be believed when it is known that a New York firm, after months of close investigation of the performances of the Brownley Injector, have decided to pay $30,000 for the rights for the United States. The injector, some parts of which—as in the case of many other inventions — were the result of almost accidental hits, while others were the outcome of long study and experiment, was only perfected after eighteen machines had been made. A study of the cut will be almost a sufficient explanation of its principle, so simple is its construction, and as the makers say, a child can learn to work it in five minutes. The feed may be started at 120 lbs of steam and left alone, and the injector will continue to feed at a lessening pressure till the steam works down to six pounds. It is equally adapted to a stationary or locomotive boiler, the jarring of a locomotive engine in no way affecting it It will feed when as hot as steam can make it, and it seems to work under almost any condition. One engineer who thought the plug would wear down in consequence of dirty water, when it would not feed, filed the plug down so that half the feed escaped at overflow through the apertures filed, but still it did its work and did not break. The firm have one in their own works lifting water 22 ft. at 40 lbs. pressure, and it has been lifting 25 ft In this injector there is not a single valve or any loose part to get out of order, and consequently it need not be sent to the factory for repairs, which is a great drawback in other injectors It can be attached to the dome of the boiler or the steam-pipe driving the engine Water can be fed from a hot well with an intermediate cooling pipe A leaky check-valve on the boiler feed pipe does not affect its work, and it may be attached vertically or horizontally. While most other injectors work only with full feed, this, as before shown, can be regulated to any quantity of water.



The New York firm who have bought the rights have converted their business into a joint stock company, called the Brownley Injector Co. The company had a No 35 injector placed in the works of the De La Vergne Refrigerating Machine Co, who reported the following tests. "We give you the average performance under two lifts, viz. When lifting two feet and discharging against a boiler pressure of 120 lbs, the injector stopped working when temperature of the water had reached 145 degrees, the temperature of the water discharged into the boiler was at that time 260 degrees. When lifting 18 feet against the same boiler pressure, it broke with temperature of suction at 114 degrees, while the temperature of the water fed into the boiler was again 260 degrees This performance is eminently satisfactory and assuredly must be gratifying to you We will be only too pleased to show the working of the injector to any one whom you may send, as we have it in use, it taking the place of one which we always thought was an excellent one Besides doing remarkably good work, the injector is substantially built and is very simple in operation."

Stirling & Brownley guarantee their machines under a 30 days' trial. They report to us that their sales are rapidly increasing in the Upper Provinces. Though only starting the manufacture last September, they have already placed 447 in this market, and from none of the users have they had complaints.

A SHODDY mill, employing 10 hands, has been started at London, Ont., by T. W. Birks & Co

S. V CLUTTON'S new woolen mill at Vienna will be larger than his old one The machinery is now being installed.

KNOWLTON, Que., council is advertising for some manufacturing company to locate there The town would assist with a bonus.

THE PEERLESS DRILL.

This drill, which is manufactured by the Mac Machine Co. of Belleville, is described by them as follows It is run by steam or compressed air as required. It is so constructed that it can be shifted from one style of mounting to another. A perfect valve is the essential point in a rock drill The "Peerless" has a single spool valve, which admits the steam or compressed air into the cylinder to move the piston The valve being light, is moved easily backward and forward by steam or air This valve permits a variable stroke of from one to seven inches, at will. The square guide shell and guides are made of malleable iron, and consequently are much lighter and stronger than grey iron castings The cylinder slides have extra wide wearing surfaces. The back cylinder heads are protected by our elastic cushion on the outside of the cylinder, and does not therefore come in contact with steam or oil The cushion receives the blow of the piston, when the bit suddenly cuts into an open seam or hole and allows the piston to make the full stroke with safety. The feed screw is held in place by two steel stay-rods and a malleable iron cross-head, which makes a direct strain on the screw when the drill is working, and prevents it from breaking at the neck and crank-handle. The steel piston-rings are made in two pieces with an elliptical spring underneath, to keep them tight to the bore of the cylinder. The front head is made in two pieces with scraped joints, securely bolted together; the thread is cut on the outside to secure the gland or stuffing box. The gland is so arranged that any wear on the thread can be easily adjusted or taken up. The rifle bar is extra strong, made from the best of steel, hardened and ground to gauge. The rotating device is worked by three friction rollers or pawls on the head of the rifle bar; being all in one solid piece, there is no ratchet or nut to come loose. All drills of the same size are duplicates of each other, and the parts are interchangeable.

In most drills termed "Tappet Drills," the valve is moved by a blow from a steel or tappet, which is struck by the piston twice every stroke It is evident that so many small pieces of metal striking together, from three to six hundred times a minute, must wear and break very rapidly Our valve permits a variable stroke of from one to seven inches Tappet drills require full stroke in order to trip the valve, unless aided by auxiliary valves or other delicate and complicated arrangements.

The Peerless universal joint tripod is strongly constructed and simple in adjustment. The legs are adjustable to any angle, allowing the tripod to be used to great advantage on sewer work or in narrow cuttings, each movement being independent of the other. Common bolts and nuts are used, so that the blacksmiths may readily repair and replace them.

CANADIAN SOCIETY OF CIVIL ENGINEERS.

An ordinary meeting of the society took place at their rooms, in Montreal, on Thursday evening, April 12th. President Peterson in the chair

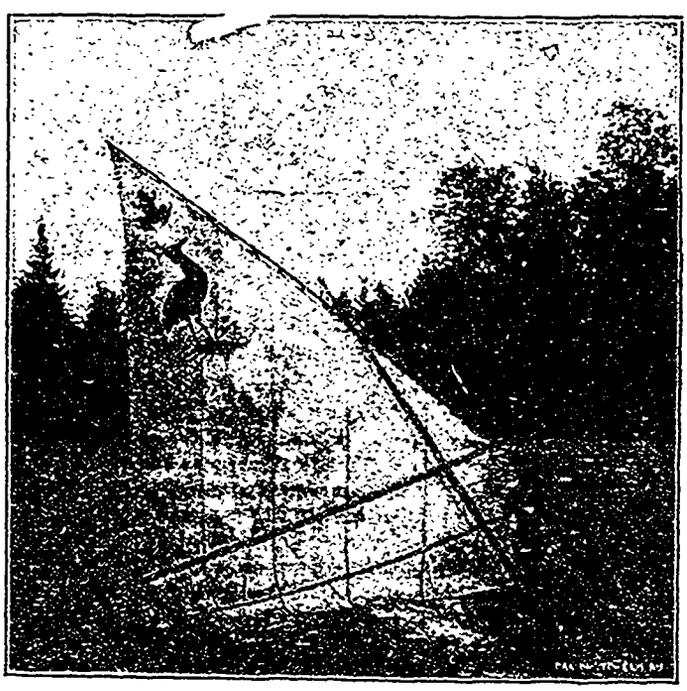
A paper by M J. Butler, upon "Cement Mortars in Freezing Weather," was read, in which the author endeavored to show that though extra precautions ought to be taken, yet it was quite possible to carry on masonry work in frosty weather. In the fall of 1892 he had to construct some 600 yards of masonry, and thought it best to add to the specifications the following: "No masonry will be allowed to be laid in freezing weather unless so ordered by the engineer, in which case the following precautions shall be taken.—The stones shall be warmed to remove any ice from the surface, and the mortar mixed with brine made as follows:—Dissolve one pound of salt in 18 gallons of water when the temperature is 32° F., and add one ounce of salt for every degree the temperature is below 30° F., or enough salt, whatever the temperature, to prevent freezing. The sand shall be heated sufficiently to thaw any frozen particles." Cement and salt were furnished by the Railway Co A careful chemical analysis of the cement supplied showed the following composition:—Lime, 60.15, silica, 24.30; alumin and iron oxid, 10 78; magnesia, 1.18; alka-

lies, 1.60. Seven per cent. residue was left on a standard sieve of 10,000 meshes to the square inch, 6 per cent of which passed through a sieve of 22,000 meshes to the square inch. Samples prepared with 25 per cent. of water, and pressed with the fingers into the moulds, when allowed one day in air and six days in water, broke with an average tensile strain of 350 lbs to the square inch. All the cement used was carefully submitted to the boiling test in thin pots on glass. None of the samples showed any cracks, and but one or two left the glass. The sand used was clean, rather coarse, sharp river sand, very nearly all silica. Knowing from the success of the hot test that there was no danger to be feared from "blowing," all the brine was made with very hot water. The sand was kept as hot as possible. The stones were not heated, but care was taken to see that no ice was on them. During the construction of the work the temperature varied between 39° above to 10° below zero F. The whole work was carried forward to successful completion, and was and is satisfactory in every respect. The author mentioned one or two other cases in which the cement had been made to set properly in freezing weather, when a proper amount of salt had been added.

Another meeting of the society was held on Thursday, April 26th, President Peterson in the chair. A paper entitled "Some Applications of Electric Motors," by Fred A. Bowman, of New Glasgow, N.S., was read. The paper will be referred to in next issue.

ABOUT CANOES.

There is no more fascinating or healthful pastime than boating and canoeing, and it is a grand thing for Canadians that, with the advantage of a system of beautiful lakes and rivers unparalleled in the world, they are able to perpetuate the maritime instincts of the Anglo-Saxon race. In the cultivation of these maritime instincts lies our hope of future supremacy on this continent, and what better school for the sea have we than is to be found on the broad lakes and beautiful rivers of this country. These thoughts occur to us on looking at the new and revised catalogue of the Canadian Canoe Co., Ltd., of Peterboro', Ont. The sight of the accompanying sail-



ing canoe, scudding through an Ontario lake, makes one sniff the odor of fresh waters in imagination and breast the blue waves through the summer gale. Their new catalogue, which is neatly printed, shows that the Canadian Canoe Co make all sorts and sizes of canoes, sailing skiffs, dinghies and steam launches. Among their specialties in canoes are the "Nassau," the "Chemong," the "Otonabee," the "Klattawa," and "war" canoes, built of various materials and in many different styles. The catalogue, besides, gives a good deal of general information about canoes and boats and is worth having for its own sake. The company inform us that they are having the best season they have ever experienced. Their hands are kept busy as bees trying to keep up with orders, and the office staff are fully employed answering correspondence and mailing catalogues. At the present time, besides their large canoe trade, they have nine steam launches approaching completion. These range in length from 20 ft. to 40 feet, and in price from $175 to $1,200. This company, our readers may remember, last month gave this journal the credit for being the best advertising medium in Canada, and in a note received since they further remark that "every week adds largely to the number of enquiries mentioning that our advt was seen in THE CANADIAN ENGINEER." It is a pleasure on our part to think that all who have ordered canoes and boats from the company are satisfied with their investments.

SIZES OF CHIMNEYS.

The following is a table showing the sizes of chimney required for boilers of different specified horse-power, which we have taken and abbreviated from a booklet recently published by the W. J. Johnston Co., entitled, "Reference Book of Tables and Formulas for Electric Street Railway Engineers."

Diameter in inches.	Height of Chimney. Commercial Horse Power. 50	60	80	100	125	150	200	Effective area, square feet.	Actual area sq. feet.	Side of sq. of approximate area, inches.
18..	23	25	....	....	....	....	....	0 97	1.77	16
21..	35	38	....	....	....	....	....	1.47	2.41	19
24..	49	54	62	....	....	....	....	2.08	3.14	22
30..	84	92	107	....	....	....	....	3.58	4.91	27
36..	..	141	163	182	....	....	....	5.47	7.07	32
42..	..	....	231	258	....	....	....	7.76	9.62	37
54..	..	....	363	449	503	551	....	13 51	15.90	48
60..	..	....	505	565	632	692	....	16.98	19.64	53
72..	..	....	....	835	934	1023	1181	25.08	28.27	64
84..	..	....	....	1163	1294	1418	1637	34.76	38.48	75
90..	..	....	....	1344	1496	1639	1893	40.19	44.18	80

CANADIAN ASSOCIATION OF STATIONARY ENGINEERS.

A meeting of Montreal No. 1 was held on the 19th ult., President J. Robertson in the chair. There were also present Dist Dep' A E Edkins of Toronto, and Bro. Wm. Mead of Hamilton Secretary York having stated at a recent meeting that it would be to the advantage of the association to have a corresponding secretary, nominations were asked for, after which the ballot was taken, and Bro. H. Thompson, chief engineer of the *Gazette* Printing Company, was declared elected to that office, the general opinion being that he will fill it with credit to himself and to the association, as past experience has shown when he held the office of recording secretary. One new member was initiated during the evening.

WINNIPEG BRANCH NO. 1.

In spite of the weather, sixteen members attended the meeting of the Canadian Association of Stationary Engineers on the 26th April. The resignation of President H. E. Robertson was accepted, and James Whyte, engineer of the Ogilvie Milling Co., was elected president for the unexpired term. James Sutherland was initiated as a member of the order. The question of incorporation of the order was fully discussed and a deputation appointed to wait on the Government for that purpose. Three trustees were appointed by the order. A question box will be placed at the outside of the door of the meeting room every meeting night. Engineers and power users are invited to put in questions which will be discussed in the meeting. The secretary, L. Brandon, was appointed to prepare a paper to be read at the next meeting. Subject. "Heat as Pertaining to Boilers." This will be continued every meeting night by different members, each member choosing his own subject.

TORONTO BRANCH NO. 1.

Toronto No 1, Canadian Association Stationary Engineers, held its regular meeting on April 14th, President W. Phillips in the chair. After the routine of business, Bro. J McLachlan gave an interesting chalk talk on "The Relations of the Steam Boiler to the Dynamo," which was thoroughly appreciated by all present The talk brought out a very large attendance of members. The proposed amendments to the by-laws were read and laid over till next meeting night. One candidate initiated.

The association held another successful meeting April 27th. Two propositions were received for membership The amendments to the by-laws were adopted clause by clause, with slight alterations, and the utmost harmony prevailed.

W. G. BLACKGROVE,
Corresponding Secretary.

PHOTO BY J. W. HECKMAN, C.E.

GROUP OF MEMBERS OF CANADIAN SOCIETY OF CIVIL ENGINEERS

[TAKEN AT ANNUAL MEETING, 1894.]

1. *Unidentified*
2. *Unidentified*
3. M. V. E. Deniel
4. C. de B. Leprohon
5. F. X. T. Berlinguet
6. G. H. Duggan
7. H. D. Lumsden
8. J. M. McCarthy
9. G. H. Garden
10. *Unidentified*
11. H. T. Bovey
12. J. M. Shanly
13. T. W. Lesage
14. E. P. Hannaford
15. L. G. Papineau
16. J. G. G. Kerry
17. W. Shanly
18. N. E. Brooks
19. F. Crossley
20. John Kennedy
21. H. Wallis
22. R. M. Hannaford
23. W. McL. Walbank
24. M. J. Butler
25. E. A. Stone
26. J. Ewing
27. R. W. Leonard
28. R. W. King
29. Alan Macdougall
30. H. A. Gray
31. *Unidentified*
32. A. Rhodes
33. J. L. N. Coste
34. G. C. Cunningham
35. Thos. Monro
36. J. E. Schwitzer
37. *Unidentified*
38. D. Macpherson
39. E. H. Parent
40. W. E. Gower
41. C. H. Macleod
42. C. E. Goad
43. W. P. Anderson
44. G. A. Mountain
45. J. T. Nicolson
46. W. McNab.
47. R. E. Hunter
48. Stuart Howard
49. H. Irwin

CANADIAN SOCIETY OF CIVIL ENGINEERS.

BIOGRAPHICAL NOTICES OF OFFICERS FOR 1894

WILLIAM MCNAB was born in 1857 in Ayrshire, Scotland. He came to Canada with his parents when about ten years of age, and was educated in Montreal. He entered the service of the G.T.R. in the civil engineering department at an early age. He has frequently read papers before various societies. He has been a member of the C. E. Society since its inception, and at present is librarian.

KENNETH W. BLACKWELL was born in Devizes, Wilts, England, in 1851. He was educated in England and then came to this country and entered the service of the G.T.R., where he remained for some years. He was then made mechanical supt. of the C. & G. T. R., and from there went to the C.P.R. in the same position. On leaving this company he entered into his present business, manufacturing car springs, switches, frogs, steel castings and general railway work.

P. S. ARCHIBALD was born in Truro, N. S., in 1848. He joined Sanford Fleming's I.C.R. survey staff in 1867, and was assistant and resident engineer while the road was under construction. In 1874 he was appointed assistant engineer of maintenance of way, and in 1879 became chief engineer on the I.C.R., which position he holds at the present time. Besides being a member of council of the Canadian Society, Mr. Archibald has been a member of the American Society of Civil Engineers for the past ten years.

H. N. RUTTAN, city engineer of Winnipeg, was educated at the Cornwall and Cobourg grammar schools. He served his time on the engineering staff of the Grand Trunk Railway, and on the commencement of the Intercolonial Railway was transferred to its engineering staff, and had charge of a division during construction near the Bay of Chaleur. On completion of the work, he obtained employment under the Government on the Canadian Pacific Railway in surveys along Lake Superior, he also took a locating party through the Yellow Head Pass of the Rocky Mountains. As contractor, he built the first 50 miles of the Manitoba Southern Railway. In 1885 he was appointed city engineer of Winnipeg. Among numerous works he was engaged upon notice must be made of his exhaustive report on the Assiniboine River at Winnipeg. He has also been consulted about sewerage and waterworks at Calgary, Brandon, Regina, Rat Portage and other places.

G. HERRICK DUGGAN, son of the late Joh. Duggan, Q.C., was born in Toronto, 1862, educated at Upper Canada College and School of Practical Science, graduating from the latter in 1883. He was temporarily employed on several surveys while at college, and acted as instructor for one term after graduating. He was employed on the engineer's staff of the C.P.R. (Mountain Division) as section engineer, and afterwards in designing the heavy wooden bridges through the Selkirks. When construction of that road was finished in 1866, he joined the Dominion Bridge Co., Ltd., where he has successively filled the positions of chief draughtsman, designing engineer, and since 1891 chief engineer.

HERBERT WALLIS was born at Derby, Eng., in 1844. He was educated at the Commercial College near Halifax, Eng., where he was specially trained in mechanical engineering. After being in the service of the Midland Railway Co. at Derby and at Bradford, he left the old country in 1871 and sailed for Montreal, where he had an appointment as assistant mechanical superintendent on the Grand Trunk. Less than two years later he was appointed chief mechanical superintendent, an office which he still holds. Mr. Wallis is one of the council of the Canadian Society of Civil Engineers, and is a member also of the Institution of Civil Engineers, and of the Institution of Mechanical Engineers in England.

WILLIAM HASKINS, city engineer of Hamilton, came to this country about forty years ago as a mere lad. He received his early training under Geo. Lowe Reid, chief engineer of the Great Western Railway, being employed on both location and construction, on the completion of the works, he applied for and obtained the position of city engineer of Hamilton. He enjoys the unique position of having been the city engineer for over a quarter of a century;

as he himself puts it, "When asked, I don't like to tell how many years I have been city engineer, so I always say *over* 25 years"! In his position as city engineer, he has been connected with the construction of the waterworks, sewerage and other improvements in the city.

PROFESSOR CLEMENT H McLEOD is a native of Nova Scotia, and graduated from McGill University in 1873. After this he was engaged for some time in railroad construction and public works At the present time Mr McLeod is a professor of geodesy and superintendent of the observatory at McGill College, Montreal, and he has been connected with all the important determinations of longitude in Canada Indeed, he has only just completed a re-determination of the longitude of Montreal by direct communication with Greenwich through the Atlantic cables He is now secretary to the Canadian Society of Civil Engineers, to which office he succeeded on the resignation of Prof. Bovey three years ago. He is a fellow of the Royal Society of Canada.

HARRY ABBOTT is a brother of the late Hon. J. C. Abbott In 1875 he was in partnership with Duncan McDonald and had the contract for the construction of the Northern Colonization Railway between Montreal and Ottawa until such time as the road was taken over by the Quebec Government. Shortly after this he was engaged for a time building Nova Scotia railways, also on construction work for the Canada Central Railway He afterwards became general manager of the latter road, and in that capacity resided at Brockville. Mr. Abbott was subsequently appointed manager of construction of a considerable portion of the C.P.R., and for a time resided at Biscotasing. About 1884 he was for a short time superintending engineer of the C P.R., and since 1885 has been general superintendent of the Pacific Division.

School of Practical Science in affiliation with the University of Toronto, he was offered the Chair of Engineering, a position he has filled with marked ability. Commencing with about thirteen students, he has now over 150 in his classes. The school has now a splendid equipment for technical education, where electricity, hydraulics, thermo-dynamics, strength of material, and other subjects can be thoroughly taught.

G H GARDEN first began engineering on the Woodstock, N B., Branch Railway as rodman in 1868 He was engaged on the construction of the Intercolonial for five years as assistant engineer. His next work was on the Q. M. O. & O., now the C P R between Quebec and Montreal, in the same capacity, and then on the Algoma branch and main line of the C P.R Eastern Division Mr. Garden located the greater part of the Q & L St John Ry., and was chief engineer of the Montreal and Western from St Jerome to Labelle, lately completed. He has just returned from a reconnoissance of the country between La Chute aux Iroquois or Labelle to Lake Temiscamingue, a distance of about 325 miles

J D BARNETT's engineering experience commenced under J Armstrong, of the Great Western Railway, of England, at Wolverhampton, London and Swindon. Coming out to Canada in 1866, he entered the service of the Grand Trunk Railway, graduating through the workshops and drawing office, Montreal, to the position of assistant mechanical superintendent. He was mechanical superintendent of the Midland of Canada in 1883. He takes an active interest in mechanical engineering and modern physical science, is a M. I. M E. and A M. I. C. E., and was president of the American Master Mechanics' Association for two years. He is a charter member of the C. S. C E., and has been a member of its council for the last six years. Mr Barnett is an energetic

READING ROOM, CANADIAN SOCIETY OF CIVIL ENGINEERS

PERCIVAL WALTER ST. GEORGE was born at Forres, Scotland, in 1849. He is a son of Lt.-Col. J D. N. St George, who had charge for many years of the British army clothing establishment. Mr. St. George came to Canada in 1866, and for the two following years was the pupil of Alex. McNab, chief engineer for the Province of Nova Scotia. From 1868 to 1872, he was assistant engineer on I.C.R. survey and construction work; in 1872-3, engineer on the survey of the North Shore Railway of Canada; in 1873-4, engineer maintenance of way on the I.C.R., and in 1874-5, engineer on survey of the Northern Colonization Railway from Ottawa to the Mattawa. In 1875-6 he was assistant engineer of Montreal; from 1876 to 1883 he was deputy city surveyor for Montreal, and during the latter part of 1883 he had charge of 300 miles of line on the Norfolk and Western Railway, Virginia. In 1883 he was appointed city surveyor for Montreal, which position he holds at the present day.

PROFESSOR JOHN GALBRAITH, M.A., distinguished himself at the University of Toronto, graduating with highest honors, and obtaining the mathematical medal. He commenced his work as a civil engineer under George A. Stewart, chief engineer of the Midland Ry. Co. at Port Hope, under whom he also served his articles, and was admitted to practice as a provinical land surveyor for the Province of Ontario. He was afterwards employed on the construction of the Intercolonial Railway and the extension of the Midland Railway to Georgian Bay. On the formation of the

student, and a recently published account of the larger private libraries credits him with the possession of 17,000 volumes.

HURD PETERS, city engineer of Saint John, New Brunswick, was born at Fredericton, N.B., his father being Hon. Charles Jeffery Peters, Attorney-General of that province. After passing through the collegiate school (silver medal), Mr. Peters took his degree of A.B and A. M. at King's College, now the University of N B. (gold medal) He also took his diploma at the special course in engineering at that time instituted under Mr. Cregan, C.E. After having been employed on the European and North American R.R between St John and Vanceboro, and what is now the Intercolonial, between St. John and Moncton, as leveller, he spent some time working in the United States After being in partnership with the late J Edward Boyd, he was appointed city engineer of St. John in 1863—that office being then for the first time established—and still holds that position. He was one of the first Council of the Canadian Society of Civil Engineers.

PROFESSOR HENRY TAYLOR BOVEY was born in Devonshire, and is a graduate of several English schools and universities In 1878 he was appointed Professor of Civil Engineering, at McGill University, Montreal. In the following year, this department was converted into a separate faculty under the name of the McGill Faculty of Applied Science, and Prof. Bovey was made Dean, a distinguished position which he holds at the present time. Prof. Bovey has a predilection for, and is intimately acquainted with, the

science of electricity, and one section of his department is devoted to this subject. He is a wonderfully painstaking observer, and is at the present time doing important work in making the tensile and crushing tests of iron, wood and other materials. His name is well known throughout the continent in connection with the scientific work done on the fine testing machines at McGill University. He is a member of a large number of engineering societies. Last year he was granted the title of LL D , of the University of Cambridge, U. S. A., and in the previous year he became a D.C L., of Lennoxville, and was elected honorary member of the Electric Light Association of the United States He is also a Doctor of Law at Queen's and McGill. Prof. Bovey has added to his reputation in other fields, being the author of the ' Theory of Structures and Strength of Materials," which probably is the most concise, and at the same time, most clearly written book ever issued upon that subject He also wrote a book upon "Applied Mechanics," besides a considerable number of valuable pamphlets on scientific subjects.

HENRY A. F. MACLEOD was born at Drynoch, Isle of Skye, Scotland, in 1832, and was educated at Upper Canada College, Toronto, and by private tutors He served his apprenticeship with John C. Innes an English engineer, at Kingston, and in 1851 assisted in making the first surveys for the Montreal and Kingston (now G. T.) Railway. He was assistant engineer of the Brockville and Pembroke, and Montreal and Bytown Railways, in 1853-4. Practised his profession in London, Ont., and was assistant engineer on the construction of the Grand Trunk Railway between Detroit and Port Huron, Mich Practise: his profession in Belleville, 1860-67 He was resident engineer on the Intercolonial Railway, in Nova Scotia and New Brunswick, from 1867 to 1874. He was resident and district engineer on explorations, surveys, construction and maintenance on many portions of the Canada Pacific Railway between Lake Huron and the Pacific coast. In 1875, having completed 1,100 miles of instrumental surveys with two parties, in one season, across the plains and up to the summit of the Rocky Mountains, he completed the first actual measurement from sea to sea in Canadian territory. In 1879 he made an exploration from the mouth of the Skeena River, in British Columbia, through the Peace River valley to Winnipeg, for the Canadian Pacific Railway He was resident engineer of one of the difficult sections in the mountains of British Columbia during construction until 1886. He made an examination of the Straits of Northumberland, and projected railways, in connection with the winter crossing to Prince Edward Island, in 1878. Latterly he has been engaged upon important arbitrations, and was recently chairman of the Lachine Canal Commission. He is now employed as a consulting engineer in Ottawa. He was elected a member of the Institution of Civil Engineers, London, in 1878, and of the Canadian Society of Civil Engineers, at its formation in 1887.

ALAN MACDOUGALL was educated in Edinburgh, Scotland, and served his pupilage under Mr. Charles Jopp, consulting engineer of the North British Railway Company, under whom he had charge of several important works, especially on the Dalkeith branch of the N. B. Railway. He came to Canada 25 years ago, and was employed on preliminary surveys and construction of the first sixty miles of the narrow gauge railways, as chief assistant under Mr. Wragge, consulting engineer, leaving the road before completion. He had charge of construction of the North Grey branch of the Northern Railway He was for four years in the Department of Public Works, in charge of harbor and river improvements on the upper lakes and lower St. Lawrence, in the crisis of 1877 the staff was disbanded Returning to Scotland, he obtained employment in his old company, the North British Railway, as chief indoor assistant to the chief engineer; had charge of all the survey and draughting department. Returning to Canada in 1882, he was a divisional engineer on construction of Canadian Pacific Railway for one season, after which he devoted himself to sanitary science, and commenced practice in Toronto, where he has worked up an extended practice in every branch of sanitary engineering and science. His opinions have been sought by municipalities in every part of the Dominion on waterworks, drainage, and other health questions, and also in Newfoundland, where he was offered the city engineership of St. John's, which he was unable to accept. Before leaving he received the thanks of the St. John's Board of Health for his services rendered during an outbreak of diphtheria. Among the numerous places he has advised on sewage and water supply may be mentioned Stratford, St. Catharines, Port Arthur, Belleville, Peterboro, Goderich, in Ontario, and Brandon, Calgary, and Vancouver, in the North-West.

O. CHANUTE was born in France, but having come to this country in 1838, when about six years old, he is by education and training an American. He began the practice of his profession as civil engineer on the Hudson River Railroad in 1849, and thence went to Illinois in 1853, where he was engaged in the construction and operation of various railroads, notably the Toledo, Peoria & Warsaw, and the Chicago & Alton, on both of which he became the chief engineer. In 1867 Mr. Chanute went to Kansas City and built there the pioneer bridge across the Missouri River, which attracted considerable attention in consequence of the apprehended difficulties. He also constructed, as chief engineer, three or four different railroads in Kansas, and became superintendent of one of them. In 1873 he returned to the East as chief engineer of the Erie Railway, to take charge of the extensive improvements planned by the management which wrested this property from Gould and Fisk. In subsequent years he was engaged in several other large railway works in the Mississippi valley and the West. He now resides in Chicago, where, among other work, he is developing a process for preserving railway ties. Mr. Chanute was president of the American Society of Civil Engineers in 1891, and in 1893 he was the president of the temporary association of the fifteen engineering societies of the United States and Canada, which maintained headquarters and promoted the International Engineering Congress during the Columbian Exposition. He became a director of the Canadian Society of Civil Engineers in 1894. Mr. Chanute has contributed a considerable number of professional papers to the transactions of the several societies of which he is a member and to the press, the latest thing being a series of articles upon the very unusual subject of "Progress in Flying Machines," which have just been republished in book form.

PETER ALEXANDER PETERSON, who is the present president of the society, was born in 1839 at Niagara Falls, Ont., and is the eldest son of Wm. Lounsberry Peterson and Susan Macmicking, who were both descended from United Empire Loyalist families. Mr. Peterson was educated partly at a school in Stamford and partly by private tuition, and he went through the engineering course at Toronto University. In 1859 he was articled to Thomas C. Keefer, C. M.G., with whom he remained as a student and assistant till May, 1867. During this time he was engaged on the Hamilton & Port Dover Railway, the Hamilton Water Works, a survey for the Georgian Bay Canal, and the construction of some large dams upon the Grand River at Paris and Brantford, besides doing a general consulting engineer's business in the Queen City. In 1867 he accepted a position on the Great Western Railway of Canada, and in the same year became resident engineer on the New York, Oswego & Midland Railway. After being engaged for three or four years on I. C R. survey and construction work, he was appointed chief engineer for the Toronto waterworks, where he carried out the scheme recommended by T. C. Keefer and E. S. Chesborough. In 1875 he accepted the position of chief engineer on the railways being constructed by the De Boucherville Government from Quebec to Montreal and from Montreal to Ottawa. It was in this year also that Mr. Peterson removed to Montreal, though he retained charge of the Toronto waterworks for two years more. He resigned his appointment under the Quebec Government in 1881, though he had enjoyed the fullest confidence of three administrations, and he was requested to withdraw his resignation, though his line of conduct throughout was appreciated by the Government, however, apparently such was not the case with the contractor, who assailed him with much vigor On the completion of the railway between Quebec and Montreal in 1877, the contractor refused to hand it over to the Government, but continued to run it for his own benefit Attempts to get possession of the line failed, until Mr. Peterson undertook the task. His efforts were crowned with success, and the Government was so satisfied with the able manner in which he had performed a difficult task that he was appointed general manager. In the meantime, he built the Chaudiere Bridge over the Ottawa River, just above the Chaudiere Rapids. The building of the St. Lawrence Bridge was accomplished under Mr. Peterson's direction in 1886, and besides this he built the St. Anne's and Vaudreuil bridges over the Ottawa, on the Ontario and Quebec section of the C.P.R., and he directed the Sault Ste. Marie Bridge. He is now chief engineer of the Canadian Pacific Railway, and besides being president of the Canadian Society of Civil Engineers, is a member of the Institution of Civil Engineers. In 1892-93 he was a director of the American Society of Civil Engineers.

GRANVILLE C. CUNNINGHAM, M.I.C.E., learnt the profession of a civil engineer in Edinburgh, Scotland. After having been engaged in various railway works and other engineering enterprises in the old country, he left his native land in 1870 and went to Honduras in Central America, where he had charge of part of the survey of a

trans-continental railway that was then projected. The outbreak of war between Honduras and San Salvador brought this enterprise to an untimely end, and in 1871 Mr. Cunningham came to Canada. Since then his work has connected him with many of the chief railway schemes of this country. In the early railway building in Western Ontario he had charge of construction on the Wellington, Grey & Bruce lines, now merged in the G. T R. system. In 1874 he had charge of a party on the preliminary surveys for the Canadian Pacific west of Winnipeg (then Fort Garry), and his party was one of the first, if not the first, to continue work on the prairie during the winter and to brave the hardships of the Nor'-West during that trying season. He was afterwards, for four years, engineer in charge of the maintenance and operation of the Prince Edward Island Railway and of the harbor works there. Subsequently he turned his attention to railway law, with the purpose of giving up the engineering profession, and for two years lived at St Thomas, Ont., as the resident solicitor of the Canada Southern Railway In 1882, however, he was appointed chief engineer of that line, which position he held until its amalgamation with the Michigan Central. He then took up contracting, and built the double track branch of the Michigan Central, from Welland to Niagara Falls, in connection with the great cantilever bridge across the Niagara gorge, which work was finished in the end of 1883. In 1884 and 1885, two years were spent on the Rocky Mountain division of the C. P. R. as assistant of the manager of construction, concluding with a winter spent at the summit of the Selkirks, for the purpose of observing the snow slides and designing snow sheds—an occupation of no small danger. After this he was again a contractor, and in 1887 and 1889 carried out contracts for the construction of part of the Temiscouata line near Riviere du Loup, and of the C. P. R. short line near Sherbrooke. In 1889 Mr. Cunningham was appointed assistant city engineer, and afterwards city engineer of Toronto. Here his attention was turned to electric street railway matters, and it was on the report made by him to the City Council of Toronto, that the system now in operation there was adopted. In 1892 he was appointed chief engineer of the Montreal Street Railway, and the work of converting this from a horse to an electrical system has been carried out under his direction. In 1893 he was appointed manager and chief engineer of the Montreal Street Railway. In 1878 Mr. Cunningham was elected a member of the Institution of Civil Engineers of London, and has contributed papers to the transactions of that society, notably one describing the construction work on the C P. R in the Rocky Mountains, which was separately published by the Society with cognate papers in pamphlet form. He was also among the first members of the Canadian Society of Civil Engineers, and was recently elected a Fellow of the Royal Colonial Society of England.

FIXING STEAM PIPES.

When putting up a steam pipe between boiler and engine, it should be made to slope slightly toward the engine, so that all the water and condensed steam will be carried forward, as it cannot be made to run back against the flow of steam; for water once in the pipe must move forward, and if no outlet is provided it must travel through the cylinder of the engine. The water can be kept from the engine by putting a separator or water catcher in the horizontal pipe near the last end before it reaches the engine. A small pipe will lead from this back to the boiler, trapping the water before it reaches the cylinder By the use of this simple arrangement, says the *Stationary Engineer*, the steam supplied to the cylinder will be much dryer and give better results in doing the work; it will also remove the injury to the engine on account of entrained water. The pipe leading back to the boiler need not be larger than ¾ or 1 inch for engines of 100 horse-power or less If a water glass forms a portion of the return pipe, it will show that a surprising amount of water is returned from the steam pipe to the boiler. The water would otherwise have gone through the cylinder, requiring a greater amount of lubrication, assisting or causing leaks and presenting a possibility of great danger to the engine. In boiler tests, the steam which is condensed in the pipe and the water carried off by priming, is often credited to the coal, when a large portion of it is due to priming effects. The condensation of steam in the steam pipe is much greater than is generally supposed, and is always so much that greater economy in fuel would be obtained if the pipes were covered with some good non-conducting substance. The different forms of separators employed in steam pipes serve an excellent purpose in providing dry steam only to the engine, but if steam pipes were well covered the work required of the separator would be vastly reduced.

GREAT TRANSCONTINENTAL SHIP AND GOLD DUST CANAL.

The following clever burlesque of the joint stock company promoters' literature is from the Toronto *World*:

This canal will start with the moderate capital of $5,000,000,000, divided into 5,000 shares of $1,000,000 each. It will be constructed through Canadian territories as a mean gradient between the Atlantic and Pacific oceans, piercing the Rocky Mountains with a tunnel 300 feet square, which will be lighted by electricity produced partly by the canal, but chiefly by the perpendicular currents flowing down through crevices from the mountains above.

It will have a water depth of 84 feet 3½ inches, and will thus accommodate ships built in the next century. It will carry the hot current from the Pacific to the Atlantic, similar in speed and effect to the Gulf Stream, and will raise the temperature of the North-West above the freezing point the entire winter. In addition, the hot chinook wind rushing through and blowing from the mouth of the tunnel will give two crops of wheat a year within a radius of 500 miles.

It is expected the shareholders will not be called on to pay up more than 17¼ mills on the dollar, when the enterprise will pay not only its own way, but will pay up the shareholders' stock in full, leaving a large surplus for a reserve fund. The Rocky Mountain portion of the tunnel, penetrating the richest gold and silver deposits in the world, will furnish unlimited capital in these metals as the work goes on, and the larger the tunnel the greater will be the profits. The gold dust, which will be washed off from the completed tunnel by the current, will be caught in traps at fixed points. It is estimated the concern will pay 20 per cent. annually on capital stock without collecting a cent of toll; in fact, the friction of passing vessels will increase the yield of gold dust.

Canals of this kind are known to be in operation on the planet Mars, and we have engaged the services of the eminent astronomer, Swiggins, who is now taking measurements, and will soon furnish specifications and details of the same. The work will be facilitated by use of our Patent Lightning Scoop Shovel, warranted to excavate clay or rock with equal facility. Investors who study our enlarged prospectus will see that it is mostly as a matter of favor that we offer any stock to the public. The following well known financial men being officers of the company is a guarantee of good faith: Hon. S. W. Indle, president; C. Heat, vice-president; D. Faulter, Esq., treasurer; S. Teal, secretary; Will. Bur. Stup, managing director.

PHENOMENON OF ELECTRO-MAGNETIC ROTATION.

In a recent issue of the *Elektrotechnische Zeitschrift*, Mr. M. Jullig refers to a phenomenon of this character. He states that if a hollow copper ball be suspended by a thread in the field of an electro-magnet, the coils of which are traversed by an alternating current, a turning movement is generally produced in the ball, causing it to rotate. This rotation, however, does not take place (1) if the centre of the ball lies in the plane at right angles to the plane of the magnet and to the line joining its poles; (2) if the centre of the ball lies in the plane of the magnet. In every other position the ball rotates without being artificially started; but it is necessary to work with large forces, as the rotation is due to a small difference of impulses. A diagram of the poles and ball in plan will show that each pole makes an induced current in the sphere, and the resultant current is more strongly acted on by one pole than by the other. The phenomenon might possibly be used in the construction of an ampere-hour meter for use with alternating currents.

AVERAGE WEIGHTS PER FOOT OF WROUGHT IRON PIPE.

Sizes, Inside Diameter.	Weight Per Foot.	Inside Diameter.	Weight Per Foot.
⅛ inch.....	.24 pounds	3 inches.....	7.54 pounds
¼ inch.....	.42 pounds	3½ inches.....	9.05 pounds
⅜ inch.....	.56 pounds	4 inches.....	10.72 pounds
½ inch.....	.85 pounds	4½ inches.....	12.49 pounds
¾ inch.....	1 12 pounds	5 inches.....	14.56 pounds
1 inch.....	1.67 pounds	6 inches.....	18.77 pounds
1¼ inches.....	2.25 pounds	7 inches.....	23.41 pounds
1½ inches.....	2.69 pounds	8 inches.....	28.35 pounds
2 inches.....	3.66 pounds	9 inches.....	34.07 pounds
2½ inches.....	5.77 pounds	10 inches.....	40.64 pounds

Industrial Notes.

THE Mimico, Ont., Sewer Pipe Co. is in liquidation.

THE manufacture of needles and pins has been started in Montreal by the Canadian Needle Co.

KASTNER'S tannery, Sebringville, Ont., has been destroyed by fire.

CARLETON PLACE and Eganville, Ont., have decided to build town halls.

THE Mainland Pottery at New Westminster, B.C., has started operations.

AN elevator will be built by Atchison & Co., High Bluff, Man., this summer.

MR. FRASER is establishing a machine and woodworking shop at Grenfell, Assa.

THE Stratford, Ont., Bridge and Iron Works are preparing to enlarge their works

W. H. HEPBURN talks of removing his boot and shoe factory from Preston to Guelph.

TENDERS will shortly be called for the building of a new iron bridge at Norwich, Ont.

PILGRIM BROS., of Hamilton, are reported to be starting a ginger ale factory at Brockville.

MOFFATT & KINCH, Peterboro', Ont, have taken over the foundry formerly run by John King & Sons.

THE liquidators of the Reed and Currie Iron Works Co. of Victoria have restarted the business.

THE Ottawa Car Co. are building an addition to their factory. It will be 100 x 40 and three stories high.

THE British Columbia Iron Works Co. (Ltd.), of Vancouver, have declared a dividend of 10 per cent.

ARRANGEMENTS have been made to re-start the Napanee paper mills under the management of John R. Scott.

LABELLE, GREAVES & CIE have opened a factory in Montreal for the manufacture of travelling bags, valises, etc.

WINNIPEG Committee of Works are asking for tenders for constructing block pavements in that city to cost $27,000.

THE Winnipeg Board of Works call for tenders for the iron superstructure of the Boundary street bridge, cost $22,000

THE old pipe factory at Three Rivers, Que., is being repaired and enlarged, and $12,000 worth of new machinery added.

MR. MCDOUGALL, engineer of Peel Co., Ont., is preparing plans for a steel bridge over Mimico Creek, near Summerville.

JOSEPH DUNDERDALE had his arm broken in three places while fixing a pulley on a shaft in Steinhoff & Gordon's mill at Wallaceburg.

THE new improved kiln, which Isaac Bechtel & Son are building at Waterloo, Ont., will have a capacity of 300,000 bricks per month.

JOHN M. FRENCH & Co., dealers and manufacturers of paints and oils, Toronto, have assigned. Liabilities and assets about $15,000.

THE contract for the steel bridge between St. Stephen, N.B., and Calais, Me., will be awarded soon, the engineer's plans being deemed satisfactory.

THE Merchants' Manufacturing Co., Montreal, Que., have installed a 1,000-gallon fire-pump in their mill, made by the Northey Manufacturing Co., Toronto.

THE F. S. Henderson Manufacturing Co will establish a factory at Brantford, Ont., for the manufacture of pneumatic sulky wheels, horse clippers, etc.

THE Lake of the Woods Milling Co.'s flour mill, at Portage la Prairie, Man., will have its capacity increased to 800 barrels a day by the addition of new machinery.

CAPT NOLAN of the Montreal fire brigade has left for St. Johns, Nfld., where he is to reorganize the brigade there at the request of the Newfoundland Government.

THE contract for the Provincial Home for Aged Persons, at Kamloops, B.C., has been awarded to Murdock McLeod, of Vancouver, for $25,000. Work will start at once.

A PROVINCIAL Exhibition will be held at Quebec from September 10th to 15th, and the Government has decided to give a grant of at least $12,000 towards its expenses.

ALBERNI, B.C., paper mill will soon be in readiness for operations.

COMPTON'S new grist mill at Little York, Ont., has begun operations.

THE Vernon, B.C., Pump and Irrigating Co. have dissolved partnership.

IT has been decided to build four bridges across the marsh near Pelee Island, Ont.

A $5,000 bonus has been granted to the owners of the Richmond, Que., dam.

THE opera house and the new bridge at Strathroy, Ont., are now nearly completed.

A NEW paper mill is to be established in Campbellford, Ont., at a cost of $350,000.

ST. ANDREW'S congregation at Winnipeg will erect a new church, to cost $40,000.

E. P. ELLIS & Co., of Milwaukee, are fitting up a roller process flour mill at Sarnia, Ont.

THE Etna Mills, Tavistock, Ont., which were recently burned down, will be rebuilt at once.

AN annex, with a capacity of 70 beds, is being constructed at St. Michael's Hospital, Toronto.

H. J HALL has purchased the planing mill at Berlin, Ont., for $1,[illegible]00, and will put in a new boiler.

THE Lamont Glass Factory at Trenton, N.S., has been undergoing repairs, but is now hard at work again.

J. HAVEY of Arnprior offers a free site to any manufacturer who will establish an industry in that town.

MR. C. E. MOYER, of Berlin, Ont., has started a factory for the manufacture of ivorine collars and cuffs.

JOHN LAURIE & BRO., engine builders, of Montreal, are turning their business into a joint stock company.

WORK is going on apace at the E. B. Eddy Co.'s new factory at Hull, Que., for the manufacture of pails, etc.

THE Ontario Car Works at London, Ont., were last month scorched by fire, the damage being about $5,000.

INGLIS & SONS' engine and boiler factory, at Toronto, has been damaged by fire. Loss over $5,000. Fully insured.

ARRANGEMENTS are being made for the erection of the new Canada Life Insurance Company's buildings in Montreal.

AN explosion took place in the Acadia Powder Mills, at Waverly, N. S., last month. Fortunately no life was lost.

TENDERS are asked for the building of a bridge over Big Shiktehawk stream near Lockhart's Mill, N.B.—*St. John Telegraph.*

JESSE COOK'S saw-mill, planing mill and sash factory at Zephyr, Ont., have been burnt. Loss about $10,000; no insurance.

GOLDIE & MCCULLOCH, of Galt, have bought the flour mill at Highgate, Ont., at public auction, for $11,000. The mill will be remodelled.

THE St. Albert Grist Mill, Edmonton, Alta., has been burned down. Loss about $8,000. No insurance. The cause of fire is not known.

HOVEY BROS.' pork packing factory at North Hatley, Que., has been entirely consumed by fire. Loss about $11,000; insured for $4,000.

FIRE last month did damage to the amount of $20,000 or more at the Singer Sewing Machine Co 's premises in Montreal. Covered by insurance.

THE elevator at Belwood, Ont., has been destroyed by fire, including 2,000 bushels of wheat. Insurance, $4 000. Cause of fire unknown.

THE new lazaretto at Tracadie, N.S., will cost $50,000. It will be built of local sandstone. The cost will be about $2,000 for each inmate.

THE bill which came before the Ontario Legislature, having for its object the compulsory examination of stationary engineers, was defeated by 24 to 12.

THE Hardware and Metal Association at a meeting in Montreal recently, came to the conclusion that the new tariff needed simplification in several details.

THE furniture firm of D. Hibner & Co., Berlin, Ont., have dissolved partnership. Mr. Hibner will carry on the business, while his partner, S. T. Doolittle, has started in business in Ingersoll.

Work has begun at the Quebec Paper Bag Co.'s factory at St. Sauveur.

The estimated cost of the proposed high-level bridge from Lacroix to Berri street, Montreal, is $100,000.

The C. P. R. shops at Toronto Junction have closed down indefinitely, throwing a number of men out of work.

J. F. Teed, of Dorchester, N.B., has the contract to build the new art building at Sackville. The price is $25,000.

W. P. McNeil & Co., New Glasgow, N S., are busy making farming implements, while their new machine shop is being rebuilt.

The syndicate who purchased the St John, N B., electric street railway are talking of erecting a first-class $250,000 hotel there.

No. 2 bridge at Woodbridge, Ont, is now being completed. There was a good deal of delay in construction, owing to quicksands being met with.

The Consumers' Gas Company, of Toronto, are conferring with the city council as to the establishment of gas works on the island.

The Mechanics' Supply Co., Quebec, have issued a neat card announcing their special agencies in plumbers' and engineers' fittings.

J. Humphrie & Sons' flour and oatmeal mill at Keene, Ont., with a quantity of grain and oatmeal, have been burned down. Loss, $3,000; partly insured.

Mrs Dufour, the widow of the fireman who was killed at the Monklands Convent fire at Montreal last year, has brought an action against the city for $10,000.

Wm. Parks & Son, Ltd., the well-known cotton manufacturers of St. John, N.B., have just put in at their mills some new boilers made by Jas. Fleming, St John.

A. E Peters, president of the Record Foundry and Machine Company of Moncton, N.B, visited Montreal last month on business connected with the firm's city branch.

Peter and Hector McRae, and F W. Powell and F Aikel, C.E, all of Ottawa, have been incorporated as a company to manufacture imitation walnut. Capital, $100,000.

It has been decided to hold an exhibition in Montreal this year, the prospects for success being good The directors hope to make it a more extensive affair on several lines.

A workman named Bauchene, employed in Robert Scott's sawmill at Black River, near Three Rivers, was caught in an endless band, and after suffering terrible injuries was killed.

Montreal water works committee are calling for tenders for a double horizontal turbine wheel of 300 horse power; also for tenders for bricking the new boilers at the low level pumping station.

Chas Fawcett, the burning of whose foundry at Sackville, N.B, was mentioned in a late number, has begun the erection of his new foundry and machine shop, which he says will be larger than before.

The first tenders for new turbines at Montreal were put off and others called for. Among the new terms is one that the contractor must begin work within twenty days and complete it within four months.

The Railway Committee of the Privy Council having had the case of the Thistle street bridge, at Sarnia, under consideration, have decided that there is no reason why the bridge should not be built.

The Robb Engineering Co. of Amherst, N.S., are equipping David Wheaton's saw mill, at Midgic, N S, with machinery, including an Armstrong engine, Monarch boiler, a rotary mill and an edge trimmer

Donald Fraser's new sawmill at River du Chute, N B, is to be fitted with engines of 150 horse-power. The main building is to be 130 x 45 ft., besides engine and boiler house, and annex 60 x 25, with fire-proof roof

The Brockville Gas Light Co. is applying to the Ontario Government for power to change its name to the Brockville Light and Power Co (Ltd.), to increase the capital stock to $250,000, and make its charter perpetual.

A correspondent of the St. John's, Nfld., *Herald* says that the Newfoundland and N. Western Ry. of that island has already been of immense importance in developing the resources of the interior. Several mills, producing 20,000,000 feet of lumber, are the creation of the railway, and other branches of trade that would not have existed without it are being opened up.

The Canadian Typograph Co, Windsor, Ont., are applying for incorporation, with a capital stock of $250,000 They will manufacture the Rogers typograph.

Albert McLaren, who is to be manager for the new Pressed Brick Co., of Buckingham, Que., says the works will be equipped with the best and most modern machinery.

The Hamilton, Ont., Sanitary Association has elected the following officers: President, A. G. Ramsay; vice-presidents, Dr. Burns and Adam Brown; treasurer, Dr. Rennie; and secretary, M. W. Hopkins.

The National Bakery Co., formed for the purpose of supplying Montreal with cheap bread, will begin the erection of their bakery very shortly, and hope to be able to start operations in a couple of months.

M. E. Keefe has the contract for building the new R. C. theological school and ecclesiastical seminary at Halifax The contract price is $30,272, and the building is to be finished by November 15th. J. C. Dumaresq is architect.

The Board of Works of the Toronto City Council recommends the widening of Queen street subway, and the diversion of Dufferin avenue to the intersection of Queen street and Gladstone avenue. The estimated cost of the work is $141,000.

J. Muckleston & Co., wholesale and retail hardware merchants, Kingston, Ont, are asking their creditors for an extension of time. Liabilities $35,000, with assets considerably in excess of this sum, though not immediately realizable.

The council of the municipality of the city and county of St. John have voted in favor of an Act authorizing the borrowing of $5,000 for the purpose of providing Fairville, N. B., with a supply of water, fire engines, etc., for the protection of the town.

Montreal Fire Committee will ask this year for $209,178. They want a new steam fire engine, hose and covers. Over $21,000 is needed for the fire alarm department. The committee also ask for $60,000 for a new station in the West Ward, and $16,000 for one in St. Mary's Ward.

The following have been elected officers of the E. B. Eddy Company (Ltd.), Hull, Que.: President and managing director, E. B. Eddy; vice-president, S S. Cushman; general superintendent of works and director, G. H. Millen; solicitor and director, J. J. Gormally, Q C.; secretary-treasurer and director, W. H. Rowley.

The Goldie Milling Co. (Ltd.), headquarters at Ayr, Ont., are applying for incorporation The capital stock is $180,000, and they will carry on manufacturing and business connected with flour and oatmeal milling. The applicants are David, John, and George E. Goldie, and R. Neilson, all of Ayr, and Hugh McCulloch, sr, of Galt, Ont.

Charles Thackery & Co. have the contract to construct an incinerator in Montreal for $39,000, of which $32,000 is to remain in the hands of the city treasurer for sixty days, and be paid only when the incinerator shall have proved satisfactory. It will be placed on the Gregory Farm. If satisfactory, two other similar incinerators are to be built for $36,150 each.

Early in April, all the men working on piece work at the Ontario Rolling Mills and the Iron Forging Company's works, at Hamilton, went out on strike against a reduction in wages, which the managers say is necessary owing to alterations in the tariff. Within two or three days, however, many of the strikers had returned to work, considering it better for them to get wages, even though they were reduced, than to forfeit their positions.

The Mullin Building, Montreal, occupied by T. Hocking, machine and die maker, and the Imperial Waterproof Paper Co, has been burnt out. Loss on building and plant about $14,000. Partly covered by insurance. The fire was caused by the boiling over of a cauldron of tar in the Imperial Waterproof Paper Company's premises A fire-ladder wagon on its way to the scene of the fire collided with an electric car, and one of the horses was so badly injured that it had to be killed.

Contractors who are not acquainted with the Quebec laws will be instructed by reading the following case which was recently decided in Montreal:—Judgment was delivered in the case of Sieyes *versus* Cure Sentenne *et al.* Plaintiff was leased the premises now occupied by the Compagnie Generale des Bazars, but he was not allowed to enter on the date fixed. He sued and was awarded $149.784 as damages Cure Sentenne then sued the contractors in warranty and they were condemned as follows: Canadian Bridge and Iron Company, $122 28; Pauze and Lamarche, $146.70; Pelletier & Co., $86 73; Brodeur & Lessard, $134 86; Bourgouin & Cadieux, $400.50; Jeremie Dufresne, $881. The costs amounted to $525.

J. N. GREENSHIELDS & BROS, of Montreal, propose to start a large manufactory near the dam at Richmond, Que., it is said. The nature of the proposed industry has not been made known.

THE contract for the erection at Amherst, N.S., of a building for the care of the harmless insane, has been let to Chappele Bros, of Tidnish, the price being $7,450. It will be two stories and a half high, and is to be completed by December 1st.

MR. ALAN MACDOUGALL, C.E., is laying out a system of sewerage for the town of Goderich. The small sewer system will probably be adopted. The sewage can be readily purified by downward intermittent filtration through sand, the sub-soil being well suited for that purpose.

THE Toronto Type Foundry Co. have been appointed agents in that city for the Kerr Water Motor Co., of Niagara Falls, Ont. The Kerr Motor Co. have published a table giving the various falls or pressures of water required to develop a given power or speed with a motor of a given price.

THE Lawton Saw Co., which was recently reorganized at St. John, has been removed to Johnson's wharf, where they have a three-story building 100 x 40 ft The power is supplied by an electric motor. The company, says the *Sun* intend to increase their force from 12 to 25 hands this year.

IT is understood that William Wheeler, formerly a prominent man in the directorate of the Pender Nail Works Company, is organizing a new company, who will soon put in operation a factory for the manufacture of wire nails. The capacity of the new works will, it is said, be 50,000 kegs per year.—*St. John Sun.*

A NEW foundry for architectural iron work, called the Dominion Ornamental Iron Co., has been started in Nazareth st., Montreal, under the management of T. J. Baldon, for several years with H. R. Ives & Co. John B. Rose is interested with Mr. Baldon, and the new firm should have a good field.

A. H. B. MACGOWAN, of Vancouver, has formed a company in Montreal, with a capital of $50,000, whose object will be to convert the offal of the salmon canneries on the Fraser River into oil and guano by a new process, the invention of Prof. Schweizer. The company will be called the B. C Oil and Guano Co.

THE Canada Paper Company say that if the corporation of Windsor Mills, Que., will build a dam on the river, the company will expend $40,000 on a plant and put in water-wheels and dynamos for a supply of power sufficient to run their entire works. Then they will build a pulp mill at an expense of about $60,000.

THE Montreal Glass Works, employing about 500 men, are likely to close down unless a reduction of wages is agreed to by the men. Alterations in the tariff are alleged to be the cause of this state of things The Hamilton and Burlington Glass Works, all, like the Montreal factory, operated by the Diamond Glass Co., are also closed down.

H S MAY'S hardware store at Huntsville, Ont., has been burned down. Loss about $20,000; insured for between $10,000 and $12,000 The conflagration, which originated in a burning rubbish heap setting fire to some coal oil, rapidly spread until the chief portion of Huntsville was in ashes Loss, besides the above, about $110,000; insurance, $30,000

JOHN BALLANTINE'S proposed foundry at Preston, Ont., for the manufacture of woodworking machinery, will be a two-storey stone building, 200 x 100 feet, and will cost, including equipment, about $20,000. Preston municipality has granted Mr. Ballantine one acre of land exempt from taxation for ten years, and a loan of $10,000 to be repaid in ten equal instalments. Mr. Ballantine was formerly with Cowan & Co. of Galt.

CLARK, SKILLINGS & Co., who recently established a large spool wood factory at Newcastle, N.B., referred to in this journal, now have two saw-mills employed preparing the wood. They are getting out about ten million feet this year, all the wood being white birch. The headquarters of the firm are in Boston, Mass., and Glasgow, Scotland, and nearly all the spools are shipped to the latter city for the thread trade. The manager at Newcastle is Chas. D. Manny.

R. H. BUCHANAN & Co, Montreal, have placed five 600 h p. condensers and two pumps and receivers for the Montreal Street Railway Power House; one large and powerful pump for the Standard Life Insurance Co., Montreal; two for the Richelieu and Ontario Navigation Co.; two for the Chemical Works at St. Henri, and five for the Parry Sound Railway. They are Canadian agents for the Worthington Old Reliable Duplex Steam Pump. One 10,000,000 imperial gallon pumping engine has been supplied for Montreal works this year.

Railway and Marine News.

WORK is going on quickly now on the new wharf at Roberval, Que.

THE Canada Eastern extension will be built as far as Black Brook, N.B., during this summer.

THE St Lawrence & Chicago Steam Navigation Co. (Ltd) are increasing their capital from $100,000 to $200,000.

THE car shops at Charlottetown, P.E I, are busy getting rolling stock in readiness for spring and summer traffic.

J. W. MUNRO, Pembroke, Ont., has the contract for all the bridge work on the C. P. R. between Pembroke and Port Arthur.

J. E. HUDDART has becomed convinced that the best British port for the proposed fast steamship line would be Southampton.

THE G.T.R. will erect engine sheds at South Quebec this summer—probably on the site at present occupied by the cattle market.

THE sheriff's sale of the Montreal and Sorel Railroad, which was to have taken place early last month, was again stopped at the last moment.

THE Canada-Atlantic and Plant Steamship Company has decided to have one of its steamers call at Shelburne, N.S., once a week on their route to Halifax.

THE Kingston & Pembroke Railway Company will perhaps build an extension of their line through the valley of Constant Creek and Perrault to Eganville

THE British Columbia Tug Company (Ltd.) has been incorporated. Capital stock $15,000, with power to increase to $100,000. Headquarters, Victoria.

SHERBROOKE, Que., will grant Quebec Central Railway exemption from municipal taxation for twenty years if they will permanently establish their workshops there.

ALMONTE, Ont., town council are being petitioned to submit a by-law in favor of the corporation taking $40,000 stock in the proposed line between Bridgewater and Carp.

WM. R. CHADSEY is going to England on business connected with the proposed extension of the C P.R. over the old air line of the Milwaukee & Superior Railway into Chicago.

THE Robb Engineering Co., Amherst, N.S., are putting in a hoisting engine, operating windlass and other steam outfit in Capt. D. S. Howard's new vessel at Parrsboro, N S.

INCORPORATION is being sought for the Toronto Junction Railway Co., who will build a line from Cayuga or Welland on the M.C.R.R. to Hamilton, and from there to Toronto.

THERE is keen competition among British ports for the position of port-of-call for the new fast Canadian line Cork, Queenstown, and Milford Haven are among the competitors.

THE contract for from 10 to 14 miles of the Lotbiniere and Megantic Railway from St. Jean des Chaillons to Glen Lloyd, Que., has been awarded to D. G. Lomis & Sons, Sherbrooke, Que.

THE O. A. & P. S. construction from Barry's Bay to Long Lake, a distance of 35 miles, will now be pushed on as rapidly as possible. It is hoped November 1st will see it completed.

THE Albert Steamship Co., Hopewell Cape, N B., have elected W. O. Wright, W. D. Bennett, and E. W. Lynds, directors. The company are endeavoring to procure a boat for the Petitcodiac River service.

STEPS are being taken by some of the Ontario county councils to make the first class railway rate not exceed a rate of two cents per mile, the maximum second class rate to be one and a quarter cent per mile.

MINISTER HAGGART says the Government has no intention to close the Welland Canal, as reported; but that the services of a considerable portion of the canal staff will be dispensed with in about 18 months, as the opening and closing of the gates will then be probably operated by electricity.

THREE different Arctic expeditions are to set out this summer from St. John's, Nfld. One will be a relief party to Bowdoin Bay, where Lieut. Peary is wintering. Another party will be under the leadership of Prof. Stein, and, besides making scientific observations, will endeavor to locate B. Kalstenius, who was lost near Smith's Sound last year. The third expedition will be sent out by the United States' Government to Lady Franklin's Bay It proposes to spend four years in scientific research.

THE Franco-Canadian Steamship Co. have discontinued running boats between Quebec and France, not having found the enterprise a pecuniary success.

GEORGE COLLINS has been appointed general superintendent of the Central Ontario Railway Company, in place of J. D. Riddell, who resigned. R. H. Spencer has been appointed treasurer.

IN the Montreal courts recently, actions were taken against several vessel owners for neglecting to have their ships' boilers inspected. They were chiefly owners of tug-boats and were fined $25 each.

P. MCARTHUR, of Westbourne, Man., will begin the work of building a new steamer to replace the one burned on Lake Manitoba last year. Mr. McArthur is interested in lumbering on the lake.

R G. REID and others are applying to the Newfoundland Government for a subsidy for a steamer to run between North Sydney and Port au Basque, where a connection will be made with the railway now in course of erection.

THE Walkers have decided not to extend the L. E. & D. Railway to St. Thomas this summer Chief Engineer DeGurse, of that road, says that owing to the stringency in the money market no construction work will be done by them the present season.

THE people of Prescott and Russell counties are agitating for the construction of the Montreal and Ottawa Railway this summer. They want Parliament to insert a clause in the bill providing that the line shall be built as far as Alfred by Nov. 1st and completed to Ottawa within two years thereafter.

THE Pembroke Southern Railway Co. are applying to Legislature for power to change their route to Renfrew. The following municipalities have granted bonuses. Westmeath, $30,000; Ross, $15 000, Portage du Fort, $5,000. Horton, also, gives a certain amount, and the Government $30,000. Work will probably begin early in summer.

THE Great Northern Railway Co is applying to the Ontario Government for $80,000 bonus to aid in the construction of a bridge across the Ottawa at Hawkesbury. This company's line, when completed and connected with the Canada Atlantic or Parry Sound, will form a new trunk line 550 miles long between Quebec and Parry Sound.

THE estimates for the fiscal year 1894-5 include $126,650 for railways and canals, $206,900 for ocean and river service, $525,720 for lighthouse and coast service, and $26,000 for steamboat inspection. These items, with the exception of the last-named, which remains the same, show a considerable decrease on the estimates for the past year.

THE new steamer "Thistle," built by James Andrew, of Oakville, for the Toronto Island Ferry Company, was launched at Oakville on the 12th April. The company have also built another large steamer for the island business, the "Shamrock," which is now in Toronto having her engines put in by the Doty Engineering Works Company. These steamers are both double enders

THE Ontario and Rainy Lake Railway, which is amalgamated with the Port Arthur, Duluth and Western, will use the 60 miles of the latter which have been constructed from Port Arthur to Sandy Lake From the last named place it is proposed to run the railway southwest to Moss township, then to French Portage, the Articokan River, Sturgeon Falls and Fort Francis, terminating at the mouth of Rainy River, a distance of 310 miles

A NEW engine of 150-horse power and two boilers has just been put in at the G. T. R. foundry at Hamilton. At this foundry the average output of car wheels is 180 per day, in addition to about fifteen tons of general casting; besides this enormous number of wheels and castings, however, there were manufactured during last year 472 tons of track bolts, nuts, rivets, etc., and 581 tons of track spikes The pay-roll amounts to between $95,000 and $100,000 each year. The *Evening Times* one day last month had a very interesting description of these works.

W. NICKERSON, C.E., has completed surveys and specifications for the Wiscasset & Quebec Railway. As projected, the road will run from Wiscasset, Me., north via Alna, Whitefield, Windsor, China, Albany, and Unity Plantation, to Burnham, 42 miles. It is proposed to continue the line from Burnham north to Pittsfield, using the Sebasticook and Moosehead line to Hartland. Surveys have been made for a line north of the latter place through St. Albans, Ripley, Cambridge, Parkmoore, and Guilford. A further extension is proposed from Guilford to Onawa, on the C.P.R., a distance of 22 miles. The portion from Wiscasset to Burnham, and a branch from China to Oakland, will perhaps be built this year.

A NEW ferry-boat has been built for Indian Town, N.B., by Elijah Ross, of Carleton. Her dimensions are 39 ft. keel, 41 ft. on water line, 15 ft. beam, 5 ft. 5 in. hold, and 43 feet over all. She has a hurricane deck 10 ft. wide and 28 ft. long, and her capacity is estimated at about 200 people.

THE revenue coming in last year from Montreal harbor was $318,937, and the expenditure $232,300. The profits therefore amounted to $86,636, which were applied to the construction of new works. The revenue for 1893 showed an increase of $26,508 upon that of last year.

A MEETING was held in Moncton the other day, under the auspices of the local board of trade, to boom the dock scheme described in these columns in March. Resolutions were passed calling on the Dominion Government to assist, and a delegation has been appointed to go to Ottawa

THE Railways and Canals Department's blue-book shows that the number of completed miles of railway in Canada last year was 15,320, besides 2,012 miles of sidings. This shows an increase upon the previous year of 1,764 miles of main line, and 333 miles of sidings. The paid-up capital of all the railway companies amounted to $372,156,475, an increase of $85,708,664 compared with last year.

THE Montreal city council has at last decided to authorize the Finance and Road Committees to proceed with the new east end station. It was also decided to make a grant of $300,000 to the Grand Trunk Railway Company to do away with level crossings The estimated cost of the new station is one million and a half of dollars It will be built on Berri street, near Viger Gardens.

A GREAT convention of the railway employees of Canada, the United States, and Mexico, is to be held on May 27, 28 and 29, in the Lenox Lyceum, New York. The object of this convention will be chiefly to consider how best to obtain legislation to protect their interests. They will also endeavor to establish a system of arbitration in order to settle disputes, in exchange for the present mode of striking.

ARRANGEMENTS are being quickly completed for the line of steamships to run from Yarmouth, N.S., to New York, in connection with the Shelburne Railway. A dock has been secured at New York, and a large cold storage warehouse will be built. They have bought from Parker, Eakins & Co. their commercial wharf property at Yarmouth for $10,000, which they will rebuild to accommodate their steamers.

THE towns of Port Arthur and Fort William are asked by an American syndicate, backed, it is rumored, by the C. P. R., for a bonus, to aid in building a smelting and rolling mill plant, capable of turning out 40,000 tons of pig iron, and 30,000 tons of steel rails per annum At a joint public meeting representing the two towns it was resolved that each ought to be able to contribute $100,000, together with a free site. Exemption from taxation was also proposed.

A. P. KILGANON, of Little Current, Ont., and others, are petitioning the Ontario Government for a mileage grant to the Manitoulin and North Shore Railway to run from Little Current to Wahnapitae in Nipissing district, a distance of 88 miles. Thirty miles have already been subsidized by the Dominion Government, but the projectors want to get $30,000 per mile on 58 miles more. The line, it is claimed, will be one of the most important in the district, and will form a considerable feeder to the C.P.R., which it will cross at Nairn. It will also tap the mineral district north of Sudbury.

ALD. HURTEAU, of the Montreal city council, now a member of the Montreal harbor board, has revived the old scheme of constructing a basin for steamships at Hochelaga, the same to be 2,000 feet long and 1,200 feet wide, and connected with the river by a canal 500 feet in length and 100 in width. Mr. Hurteau estimates that the work will cost $2,000,000, and if the west end is not satisfied another million can be spent at Windmill Point, the whole to be borrowed by the harbor commissioners. The scheme is not likely to be carried out immediately.

THE C. P. R. Co. have re-elected the old board of directors as follows: Sir Donald Smith, Montreal; Wm. C. Van Horne, Montreal; Thomas G. Shaughnessy, Montreal; Richard B. Angus, Montreal; Edmund B. Osler, Toronto; Sandford Fleming, C.E., C.M G., Ottawa; Lt.-Gov. Geo. A. Kirkpatrick, Toronto; Gen. Samuel Thomas, New York; Geo. R. Harris, Boston; Richard J. Cross, New York; Wilmot D. Matthews, Toronto; Donald Mac. Innes, Hamilton; Thomas Skinner, London; John W. MacKay, New York. Mr. Van Horne has been re-elected president, and Mr. Shaughnessy, vice-president of the company.

GEDEON BEAULIEU is having a new wharf built at Bout de l'Isle, on the east of the island of Montreal.

ARRANGEMENTS have been made with the C.P.R. to operate the Tobique Valley Railway of New Brunswick, which is now open.

THE Dartmouth, N.S., Ferry Co. have given a three years' contract for 5,000 tons of coal per annum to the Dominion Coal Company

THE Dominion Government have appointed Mr. Vanasse shipping master of the port of Montreal, which position was rendered vacant by the death of Henry Mackay

THERE is not a vessel in course of construction up the Parrsboro shore. This is something entirely new. The prospects are poor for any shipbuilding operations this year.—*St John Sun.*

THERE are in Ontario 7,339½ miles of railway, including those now under construction or contract Of this total 1,447½ miles were finished before Confederation, 4,659 1-5 miles since Confederation, leaving 1,232¾ miles under construction or contract.

THE Atlantic and North-Western Railway Co. now have power to lease their line to the C P R The road runs from Montreal to St. John, and it is intended to extend it from Montreal to a point on Lake Superior.

APPLICATION is being made for power to construct and maintain a wharf or pier in Lake Ontario in connection with a new park and club to be formed at Winona, Ont. The capital of the company who hope to carry out the work is $20,000.

DAVIS & SONS' new plant for the Sheik's Island dams, Cornwall, is expected to arrive about the middle of the month, and will consist of a locomotive, a steam shovel, new steel rails and a number of dump cars. Excavation on the lower dam has already begun.

IT is understood that the B. C. Government will guarantee the cost of building a spur line from the main line of the Nakusp and Slocan Railway into New Denver. This is virtually granted by a letter from the Attorney-General to the petitioners for the line. It is not likely, however, that the main line will be completed to Carpenter Creek Forks this summer.

THE keel was recently laid at the yards of William Denny & Sons, Dumbarton, of a new steamer to be delivered at Vancouver within ten months, for the Canadian Pacific Railway Company, to be placed upon the Victoria-Vancouver run. She will be a side-wheeler, 200 feet long, and having a speed of 18 knots per hour.

THE Government steamer "Druid," which was in course of being fitted with new engines at Carrier, Laine & Co.'s establishment at Levis, Que., met with an accident last month, her hull being pierced by a heavy piece of ice. She sank in about 15 feet of water within a few minutes, but not very much damage was done.

CONDUCTOR DANIEL HOLMES, of the G.T.R., London, has a unique experience. He entered the service of the Northern Railway May 3, 1854, and, therefore, on the 3rd inst. he has completed forty years of unbroken service. After running on the Northern two years he entered the employ of the Buffalo, Brantford and Lake Huron, where he remained seven years, going thence to the Great Western Railway. His present run is to Suspension Bridge. At one period "Dan" ran twelve years without a lay-off. For thirty years the run averaged 165 miles every day in the week, and it is easy to compute that fully 2,000,000 miles have been traversed during this work of more than an average generation, and this equals journeying around the earth eighty times. He never injured a passenger, and never had but one accident, and that was due to the mistake of a telegraph operator.

ACCORDING to the Winnipeg *Commercial*, no railway project has excited so much interest in Manitoba as the proposed Winnipeg & Northeastern, which will, it is hoped, be laid from that city to the northwestern shore of Lake of the Woods, a distance of 106 miles. Not only will this line probably be a section of another outlet to Lake Superior and the east, but it will prove of vast importance to the lumbermen of the Rat Portage district, who, if their hopes are realized, propose to move their mills from the shores of Lake of the Woods to the banks of the Red River, thus locating in a wonderfully rich pine timber section, and saving a deal of unnecessary transportation of their logs. The company ask a bonus of $1,000 a mile for the construction of the road, and a guarantee of $10,000 a mile from the Provincial Government, for which they hand over a land grant of 6,400 acres a mile, one-third to be timber land.

F. H. HUTCHINSON, general manager of the Queen's County Telephone Company, proposes to construct an electric railway from Liverpool, N.S., to the pulp mill.

Mining Matters.

J. HILDRETH is establishing a stamp mill in the Rainy Lake gold fields.

THE Danville, Que., Slate Company have bought the Jeffrey asbestos mines.

ALL operations are suspended at the Joggins Mines, owing to the strike of 300 men.

MINING and smelting machinery not at present made in Canada will be free up to May, 1896.

THE Memramcook Gold Mining Company will erect a $5,000 chemical mill at Dorchester, N B.

THE dam, ditches and sluice boxes at Forty-Nine Creek, B.C., are being put in readiness for work.

THE Poorman silver mine, Cœur d'Alene district, B C, has been sold to an English syndicate for $500,000.

WHARTON, HARRIS & KELLY are negotiating for the sale of the "Reco" mine, Nakusp, B.C., for $70,000.

R. E. LEMON, of Nelson, B.C., has purchased the Richmond mine and a half interest in the "White Elephant."

THE Le Roi mine in the Trail district, B C., is open to a depth of 200 ft., where the gold ore is said to be richer than it is at 100 ft. higher.

THE Canada Iron Furnace Company, of Radnor Forges, Que., are setting their old foundry in order preparatory to the resumption of work.

THE property near Mission City, B.C, which the Tacoma Smelting Co. have just bought, shows $49 in silver and $49 in gold to the ton.

THE American Lithograph and Asbestos Co. are getting ready for extensive operations in the summer at their lithograph stone quarries at Marmora, Ont.

A PROSPECTOR'S class for instruction in mining has been opened in Marmora, Ont. It will be conducted by W. Hamilton Merritt, F.G.S., of Toronto.

A DEPOSIT of a superior kind of volcanic breccia has been discovered at Belmont, Ont. This mineral when polished makes a very pretty material for ornaments.

DUNCAN MCQUAIG, underground foreman of the Egerton Gold Co 's mines at Fifteen Mile Stream, N.S., was killed, owing to the premature explosion of a blasting charge.

THE Canadian Northwest Mining Company have been incorporated as a joint stock company. The company's capital is $2,000,000, and its headquarters Helena, Montana.

GEO. & T. TERRYBERRY will commence operations at once, at the Rip Van Winkle claim, Carne's Creek, B.C. They will drive a tunnel for about 100 ft. to tap the shaft, which now is about 300 ft. from the water.

THE Strathroy, Ont , Petroleum Company (Ltd.) has been incorporated with a capital stock of $90,000. The principals are Geo. A. McGillivray, London; W. B. Lindsay and Charles Grist, Strathroy.

IT is stated that one man in the Rainy Lake gold region found over $2,000 worth of nuggets in a seam. Corner lots in Rainy Lake City sell for $500, and contracts are now let for 200 houses and a large hotel.

THE ore on the Ledyard Gold Mine Co.'s property at Belmont, Ont., runs from $117 up to $922 in gold to the ton. The engine, boiler and crusher have been set in position and active preparations are being made for work.

A UNITED meeting of the Mining Association of Quebec and the Mining Society of Nova Scotia is to take place at Sydney, N.S., during the week commencing July 7th. The visitors will be the guests of the Dominion Coal Company.

THE following have been appointed directors of the Port-au-Port, Newfoundland, Asbestos Co. (Ltd). Jas. R. Hayes, C Macpherson, J. P. Howley, E. G. Hunter, C. Campbell, J. B. Ayre, G. E. Bearns, E. W. Bennett, jr., and Thos Long.

WM. J. LEE, a young man employed in the works of the Canadian Oil Co., at Sarnia, Ont., was two or three weeks ago suffocated by petroleum gas. He was an expert at the work, and it is supposed he had a sudden spasm of asthma (he suffered from this disease), and lost his balance while leaning over one of the oil tanks, and soon lost consciousness.

THE finds of gold in the alluvium of the township of Dudswell, Que., are attracting attention. A nugget worth $80 was taken out of a creek bed a few days ago

CONSIDERABLE progress is being made at the Nelson Hydraulic Company's property on Forty-nine Creek It is expected that when everything is in working order the ground will pay $600 a day.

THE Hamilton Smelting Works propose to obtain a large quantity of their iron ore from the central Ontario iron regions, being well satisfied with the samples obtained. The contract for the erection of the plant has been let to the Philadelphia Engineering Co for $360,000, the works to be ready for smelting by Jan next

THERE are immense reservoirs of natural gas beneath the surface of the earth in the Great Slave district of the North-West. Near Grand Rapids there the gas boils up from the bottom of the river Near Lake Athabasca are enormous beds of tar and natural asphalt, which will be shipped all over Canada when transportation facilities are provided.

Personal.

E. C. AMOS, C.E., has joined the firm of Mignault & Belanger, Montreal.

HERBERT S HOLT has been elected president of the Montreal Gas Company.

FRANK RICE, for some years traveller for the Nova Scotia Steel and Forge Company, of New Glasgow, N S , died recently in Chicago.

RODOLPH FORGET, of Montreal, director of the Richelieu & Ontario Navigation Company, was last month married to Miss Blanche McDonald, youngest daughter of A. R. McDonald, superintendent of the I.C.R.

W. H. SWEENY, of Cote St. Antoine, Montreal, has been promoted from the cashiership in the C P R. treasurer's office to the position of paymaster for lines east. His predecessor, S. E. Taprell, has entered the treasurer's department.

GEORGE M. DAVIS, an employee of the Worthington Steam Pump Company, of New York, who was superintending the fixing of the Worthington engine at Montreal Waterworks two or three weeks ago, has mysteriously disappeared. Foul play is suspected.

FRANK BADGER, jun., son of Frank Badger, the Montreal city electrician, is now manager of the Quebec Electric Light and Power Co.'s works at Montmorency Falls. Mr. Badger, though young, was the successful applicant out of a hundred or more candidates.

JAMES CLARKE, who was superintendent of the machinery of the Canadian department, World's Fair, has renewed his engagement with John Bertram & Sons, machine tool makers, Dundas, Ont Mr Clarke did noble service for Canada at Chicago, and today has few equals in America in the installing and running of machinery

ROSS MACKENZIE, of lacrosse fame, is now manager of the Niagara Falls Park and River Railway. For several years he was assistant to the eastern superintendent of the C.P.R. W. A Grant, the retiring manager, goes to Montreal to take a responsible position in the office of Vice-President Shaughnessy, of the C.P.R. His late fellow-employees presented him with a gold watch and chain.

IN a recent number we announced that G. A. Goodwin had been elected president of the Society of Engineers, London, Eng We have now the pleasure of perusing his inaugural address, which was delivered at the Westminster Town Hall, London, on February 12th. After giving a brief resume of the doings of the society during the previous year, Mr Goodwin gave a full and highly interesting review of the present position of mechanical engineering, in this connection referring to the present state of practice regarding boilers, stoking, marine engineering, iron and steel manufacture, electric and water power, &c., &c These, together with many other subjects, he treated principally with regard to their mechanical aspect, but incidentally many other points were touched upon as well. Altogether it is an address that does credit both to this old-established and well known society and to Mr. Goodwin.

FERDINAND BOURGENOIR, carpenter, while at work on the roof of a house in Montreal, touched a live electric wire. He was rendered insensible, fell down into the street and was instantly killed.

LITERARY NOTES.

THE *Canadian Colliery Guardian*, Halifax, is publishing a series of pamphlets, reprinted from that paper No. 1 is entitled "Cheap and Rapid Coaling in Nova Scotia," and is published under the belief that British and continental shipowners ought to know of the coaling stations on the Nova Scotia coast, where steamers navigating the Atlantic can obtain cheap supplies of coal. A very interesting description of Nova Scotia is included in the booklet, which should be appreciated amongst shipowners and others.

BY a recent re-arrangement of the staff of the *Canadian Manufacturer*, J. C. Gardner has become managing director of that journal Mr. Gardner has for some time devoted himself to the outside work of the paper, and by his industry proved himself well worthy of promotion. Mr Gardner, among other qualifications, is an experienced bicyclist and has got more than one extra contract by the expert use of the treadle. His friends will rejoice in his prosperity.

J. A GRENIER, the well known civil engineer and patent expert, of Montreal, has issued a very neat and instructive little booklet on the subject of patents. It gives much useful information on Canadian and foreign patents, and is, we understand, sent free to seekers after knowledge in this line. Mr. Grenier's card appears in this journal.

WE are glad to see *Grip* again flourishing, this time under the personal control of Mr. Bengough, and we are delighted to see his genius for caricature shining out more brightly than ever after the brief eclipse. Adapting the invocation of Dick Swiveller, we can only say "may *Grip* never moult a feather."

THE N. Y. *Electrical World* recently changed its "make up" to one more convenient for binding, and its new shape seems to be much more pleasing to its wide circle of readers. Its columns are a mine of information to those interested in electricity.

THE *Electrical and Street Railway Reporter* is the name of the latest knight in the arena of technical journalism. Its initial number is admirably printed, and treats of a great variety of topics of special interest to those engaged in electrical and street railway work. It is issued at 136 Liberty St., New York, and the publishers will no doubt be pleased to send sample copies to any one interested.

Electrical Power, of New York, is another paper containing valuable budgets of information for electricians. It has been publishing a very instructive series of articles on the great Niagara Falls electrical plant.

A VALUABLE contribution to Canadian history has been given to the public by C C Morton & Co., booksellers and publishers, of Halifax. This is a "History of Dartmouth, Preston and Lawrencetown," by the late Mrs. Lawson, the work being edited by Harry Piers. This work, which covers the period from 1750 to 1893, won the Aikins prize for the best historical essay relating to Nova Scotia, and gives not merely a dry record of local events, but many sketches of character involving no little of the romance of history. Among these, not the least pathetic, is the career and death of a near relative of the Empress Eugenie. Mrs. Lawson, whose maiden name was Mary J. Katzmann, was otherwise well known as a Nova Scotia poetess, and a lady personally much esteemed.

A *Reference Book of Tables and Formulas for Electric Street Railway Engineers*, by E. A. Merrill, author of "Electric Lighting Specifications," has just been issued by the W. J. Johnston Company, Ltd., New York. It is the object of this reference book to meet a practical need by collecting and arranging in a concise, logical order those tables and formulas which are in constant use by the electric street railway engineer in making estimates, ordering material, on construction work, etc. It takes up successively cars and their equipment, overhead work, track work, and miscellaneous tables and formulas in constant use, but only indirectly related to the main division. Care has been taken in selecting and checking material compiled directly, and several original tables have been added, while many tables and formulas have been extended to meet the conditions imposed by street railway work.

THE annual report of the city engineer of Omaha for the year ending December 31st, 1893, is as elaborately gotten up as any like document we have seen. The frontispiece consists of a picture of the city hall, which, with that in view, we should judge to be a very fine building. Supplementing the report itself there is a series of well executed maps, which from their voluminousness ought to be able to give the peruser a very distinct idea of the city of Omaha.

Romicke & Curtice, 359 Strand, London, Eng., have sent us a copy of what is believed to be the first and only type written journal in the world It is called the *Journal of Universal Information*, and is published weekly at 1d. a copy. The sample before us is certainly interesting. It is all type-written except the cover.

The report of the city engineer of Quebec (Chas. Baillairgé, C E.) for the past two years has just been issued During the two years 5,000 square yards of block stone paving, and nearly eight miles of macadam were laid down, with 660 yards of stone and cement sidewalks and crossings, besides wooden walks. A great deal of work has been done on embankments and retaining walls, which are a large item of expense in a city so hilly as Quebec. The value of street work done in the period was $158,675. A number of streets have been widened or opened at considerable expense. Three new fire stations were built and equipped. Architecturally old Quebec has not stood still, for buildings of various kinds, to the value of $1,841,944, were erected. Mr. Baillairgé, with his usual thoroughness, has provided a clear and serviceable table, giving details of all the work done during the period under review, and he also gives a list of works that are designed to be carried out in the near future.

The annual report of the civic government of Halifax, N. S., has been received It is a document of 230 pages, of which 28 pages are devoted to the engineers' department, presided over by F. W. W. Doane, C. E. Referring to the work on the new low service main to Chain Lakes, Mr Doane mentions that when the pipes were purchased in Scotland, Ewan Morrison, foreman of the department, was sent to Scotland to inspect the pipes before shipment. "It was claimed at the time," observed Mr. Doane, "that no inspection was necessary on the other side, and that the pipes could be inspected more economically after their arrival in Halifax. However, on the recommendation of your engineer, Mr. Morrison was sent, and his arrival at the foundry showed at once the value of his services to the city and the necessity for inspection, by condemning all the pipes then cast. The expenditure of a few hundred dollars in inspection saved us many thousands that must have been paid out after the delivery of the pipes" The work on the dams at Spruce Hill Lakes was continued last year During the year 9,644 lineal feet of sewers were completed, and the substitution of concrete catch-pits for the old holes in the drain is being continued. The sanitary condition of the private houses which, in the absence of regular inspection, was very bad, is now rapidly improving since this branch has been put under the control of the engineer.

We have received from the United States Department of the Interior the "Census Bulletin," dated April 6th, 1894, which gives statistics relating to all the principal industries carried on in that country, comparing 1890 with 1880. Amongst others, we notice the tem "iron and steel" (not including finished products); in 1880 the number of establishments reporting was 1,005, the capital being $230,971,884, and the value of the product turned out $296,557,685, the figures for 1890 being respectively 645, $373,478,018 and $430,954,348. In the nail and spike industry the number of establishments engaged in 1880 was 62, the amount of capital $3,877,805 and the value of product $5,629,240; whereas ten years later, the number of establishments engaged was 138, the capital $24,334,549 and the value $34,227,517. In shipbuilding, the amount of capital increased from $20,979,874 in 1880, to $53,393,074 in 1890, and the value from $36,800,327 to $40,342,115. The "Bulletin" gives a very full and detailed account of all the industries in the United States, the value of the aggregate products of which amounts to $30,000,000 or more, and the number of employees, average amount of wages, cost of materials used, capital, operating expenses, etc, etc, are given for each branch of manufacture, the individual figures being shown for every State of the Union.

ELECTROLYTIC EXTRACTION OF GOLD.

The extraction of gold in a simple and economical manner by an electrolytic process, capable of dealing with every kind of refractory ore, is stated to be the lately accomplished result of long study and experiment on the part of a London chemist. There are several electro-chemical processes already in use for obtaining gold from refractory ores, in which such deleterious substances as sulphur, iron oxide, arsenic, zinc, etc., are associated with the gold. But it is found that no one particular process is available for every class of ore. Hence much money is often expended on an extensive plant for treating a certain kind of ore, which has to be abandoned or supplemented by another plant when the character of the ore changes.

The main requirements in these processes are: First, the circulation of the pulverized ore between positive and negative poles; second, a solvent liquid for the gold; third, means of collecting the electrolyzed gold; and fourth, the construction of the positive pole.

In the new universal process the first requirement is met by having a screw propeller set vertically near the bottom of the ore tank. The solvent is a dilute solution of potassium cyanide, and the collection of the gold is effected by a bath of mercury, which constitutes the negative pole. The positive pole consists of a mixture of powdered plumbago and powdered pitch or resin, consolidated by heat.

In operation, the ore, mixed with a certain proportion of water, is placed in the tank, with the bath of mercury at the bottom. On starting the screw, the mixture circulates down the centre of the tank and impinges gently upon the surface of the mercury. It then travels up the sides of the tank, which are conical, and on which the positive pole is laid, and back, down to the centre, to be again driven into contact with an active instead of a sluggish mercury surface, over and over again, until every particle of gold has been seized and absorbed.

It is stated that some of the most refractory and typically difficult ores have been submitted to this process, and that in some cases over 90 per cent. of the contained gold was extracted.

The chief advantages claimed for the process are that the gold is extracted directly from the ore without any other preliminary treatment than crushing; that the same chemicals are used over and over again; that the process efficiently extracts the gold and silver from the auriferous ores, whether refractory or free; that the precious metals are obtained at once from the amalgam in the metallic state, without further chemical treatment, and that any workable quantity of ore may be treated, in one vessel at one operation, and the gold obtained in one day.

WHAT IS STEAM?

The above question is frequently asked of engineers nowadays, and although they make constant use of steam, very few will answer that "steam is an invisible gaseous fluid, generated by the aid of heat from water." Many of them when told that steam is invisible, laugh and say they know better, because they see it every day. If one of these men who claim the honor and name of practical engineers will take a look at the water glass in the boiler room, if they have one—if not, let them look at the one on their neighbor's boiler, and then tell if they can see any steam inside of it. If the glass should happen to burst while they are making the observation they will, no doubt, see plenty of what they call steam in the vicinity, and they might also see the same if the safety valve should happen to blow off. Why, then? Simply because steam is invisible, and so long as it is confined you cannot see it, but when it is cooled off, as when it comes in contact with the air, and is consequently condensed again to the water from which it originated, it becomes visible to the eye, like water in very small particles, as in a fog. Viewed at such times it has lost its characteristics as steam, and instead of being a gaseous fluid it has become condensed to water in very small particles, which occupy considerable space. When in this condition we see what we call steam, but when an engineer notes the flow of steam, from gauge cock or safety valve, he will notice that near the opening nothing is visible, while at some distance he sees fog The reason of this is that at all times steam is invisible while it remains steam, but by condensation and the formation of water a fog is produced, which can be seen and distinguished in no way from fog which rises from rivers, swamps or other bodies of water during such times as the temperature and other conditions are favorable to its formation.—*Machinery*.

FOR CEMENTING IRON.

The following mixture has been used, says a contemporary, with the greatest possible success for the cementing of iron railing tops, iron gratings to stoves, etc.; in fact with such effect as to resist the blows of a sledge hammer. This mixture is composed of equal parts of sulphur and white lead, with about one-sixth proportion of borax, the three being thoroughly incorporated together, so as to form one homogeneous mass. When the application is to be made of this composition, it is wet with strong sulphuric acid, and a thin layer of it is placed between the two pieces of iron, these being at once pressed together. In five days it will be perfectly dry, all traces of the cement having vanished, and the work having every appearance of welding.

REVIEW OF THE METAL TRADES.

MONTREAL, May 1st, 1894.

There has been a pretty fair local demand in some lines during the last week or two, since the opening of navigation, especially in wire, which is in such demand in the spring. Little is doing, however, in the pig iron and heavy metal trades. Uncertainty with regard to the tariff still blocks the way, no one knowing whether to buy on the new rates, or to wait until the duties are changed once more, or altered back, perhaps, to the old schedule Prices remain practically the same, excepting for the slight advantage gained from freight differences.

THE Banner File Co , Almonte, will add new machinery.

MR BOLTON has started a sash factory at Salmon Bay, B. C.

ISAAC OLIVE has been appointed inspector of hulls at St. John.

THE Sydney and Louisburg Railway is having new 80-lb. rails laid.

A SYNDICATE is doing some preliminary work on the newly discovered nickel ground at Trill, Ont.

THE Dominion Government will likely build a new cruiser for the protection of fisheries, at a cost of $75,000.

WORK has been resumed at the old manganese mine at Chemical Hill, near Hopewell Hill, N.B , by Benj. Fales and others.

PLANS are being prepared for the construction of the City and Suburban Electric Railway from Toronto Junction to Weston

THE Montreal Electric Street Railway Co. will erect a building for the reception of motor cars on St Denis street, at a cost of $14,000

THE new marine railway in Esquimalt, B C , is complete, and the first test was made a short time ago and appeared satisfactory. W. F. Bullen is the manager

THE Garlock Packing Co , who have recently removed to new premises, 35 John st. north, Hamilton, report business better during the last three months than for a long time past

JAMES SHERIDAN, the well-known Montreal contractor, died a few days ago at the age of 73. During his time he carried out a deal of Government and corporation work

MR. NICKLIN, of Stewartown, Ont , has formed a joint stock company for the purpose of establishing a tannery at Georgetown. Buildings are now being erected for that purpose.

THE C.P R. agrees to spend $100 000 on the Montreal and Ottawa Railway, on the portion lying west of Point Fortune, within eighteen months, and within thirty months another $100,000.

MR. MUMFORD, of Dartmouth, N. S , has purchased R. Brownell's foundry and machine shop, at Oxford, N.S , and will add considerably to its plant. He will, perhaps, also add forge works.

THE C. P. R have decided to erect four new piers for the bridge over the Grand River, at Galt, Ont. , at present the bridge is 750 feet long, in five spans. The new piers will reduce each span to 75 feet.

THE bill for the incorporation of the St. Clair & Erie Ship Canal has passed The proposed canal, which was described in this paper last year, will save 56 miles for vessels bound from Lake Huron to Lake Erie.

A FIRE occurred a few days ago in the yard of the Western Ontario Lumber Company at Rat Portage, Ont. Ten million feet of lumber were destroyed. Loss about $125,000 , insurance, $80,000. It is believed that the fire was of incendiary origin.

WHIPPLE & COOPER, brass founders, Hamilton, are now putting on the market a new metal specially adapted for car journals and similar work It is called the "999" mix, and is being adopted by leading railways

JOHN STARR, SON & Co , Ltd., of Halifax, have not only sold the "Starr" incandescent lamps all over Canada, but have recently built up quite a trade in South America. These lamps are neat in appearance, and the curled filament adds to their attractiveness.

FOR the excellent photographs of the interior of the Civil Engineers' Society's rooms, and the group taken in front of the building, we are indebted to J. W Heckman, B E. Mr Heckman is an expert photographer, and has taken many hundred views along the railways with which he has been connected as engineer. The souvenir will be appreciated by members of the society.

THE St. Alban, St. Casimir and St. Anne bridges were carried away in a flood which ensued a few days ago after a large landslide near St Alban, Que. About six miles of solid earth fell into the St Anne River, which was diverted by this means some miles from its old course.

THE Burrell-Johnson Iron Company have just had the S S. "St. Pierre" on their slip at Yarmouth for repairs. They built the "St. Pierre" nine years ago, and she has never had a regular overhauling in all these years till now, though constantly afloat She is a steamer of 500 tons, and has been running during this time between St. Pierre and Halifax. Her record speaks well for the work of the Burrell-Johnson Iron Co.

HORACE R. RIDOUT, Montreal, writing us concerning his "Stick Fast" belt dressing, says: "Stick Fast" is meeting with great success amongst all classes of manufacturers, electric light companies, machine shops, cotton and woolen manufacturers, boot and shoe manufacturers, saw and planing mills, and in fact any place where they have belting. Large quantities have been sold in Quebec City within the last few days amongst all kinds of manufacturers "Stick Fast" is manufactured by Horace R. Ridout, Montreal, and Alonzo W. Spooner is the agent for Ontario and Western Canada. Blackadar and Lear are the agents for the Lower Provinces.

METAL IMPORTS FROM GREAT BRITAIN.

The following are the values in pounds sterling of shipments of metals, etc., from Great Britain to Canada, as shown by the British Board of Trade returns for March and for the three months ended March, compared with the same periods of last year:

	Month of March.		Three months ended March.	
	1893.	1894.	1893.	1894.
Hardware and Cutlery	£ 8,281	£ 5,958	£19,135	£17,172
Pig iron	1,802	274	4,100	2,366
Bar, etc	2,420	1,276	4,995	4,333
Railroad	1,648	1,520	11,620	8,537
Hoops, sheets, etc	975	636	4,526	4,986
Galvanized sheets	3,313	1,797	5,059	6,007
Tin plates	7,388	8,454	24,449	38,781
Cast, wrought, etc., iron	7,075	4,254	15,445	12,741
Old (for re-manufacture)	9,725	282	13,609	1,380
Steel	11,579	3,886	27,084	17,204
Lead	195	255	459	588
Tin, unwrought	1,033	1,628	1,665	4,495

THE Yarmouth, N S., Woolen Company have recently rebuilt their dye-house and washing and fulling mills, and re-laid with brick the foundation of the extractor. They added last summer a Stillman wool and waste duster, a 6/4 Paragon steam press. At present they have under contract a new boiler, which will be delivered early in May. This boiler will have a capacity nearly double the one now in use, and will give the company additional power, which they much need. It is built by the Burrell-Johnson Iron Co.

IT is stated in the *Metallarbeiter* that iron can be coppered by dipping it into melted copper, the surface of which is protected by a melted layer of cryolite and phosphoric acid, the articles to be thus treated being heated to the same temperature as the melted copper. Another process consists in dipping the articles into a melted mixture of one part of chloride or fluorine of copper, five or six parts of cryolite, and a little chloride of barium. If the article, when immersed, is connected with the negative pole of a battery, the process is hastened. A third method consists in dipping the articles in a solution of oxalate of copper and bi-carbonate of soda, dissolved in 10 or 15 parts of water, acid ified with organic acid.

BY last mail we received a copy of THE CANADIAN ENGINEER, a monthly journal published at Toronto and devoted to the interests of the mechanical, electrical, marine, locomotive, stationary and sanitary engineer; the manufacturer, the contractor and the merchant in the metal trade. It is a well-written, well-printed and most instructive and entertaining paper, and, we think, should find many readers in St. John's. Prominent among the articles in this month's issue is one from the pen of E. C. Willis on "The Asbestos Fields of Port au-Port." As the subject of asbestos mining has lately been claiming the attention of the public here, we gladly give it a place on the third page of this issue, feeling confident that it will be read with pleasure by those interested. Any one wishing to see a copy of the magazine can do so by calling at the *Herald* office. —*Evening Herald, St. John's, Nfld.*

A METHOD is described in *La Semaine des Constructeurs* for preserving cast-iron from liability to rust, at the same time insuring a pleasing surface. In accomplishing this, the casting is first thoroughly cleaned, washed in dilute acid, and, when dry, the surface is well rubbed with a metallic brush or a file, and then painted several coats with raw petroleum, care being taken that each coat be thoroughly dried before the next is applied. On the last coat becoming dry, it is to be well rubbed with a stiff hair brush, the result being an attractive dull polish, capable of resisting a high degree of heat and not susceptible to any attack by rust. This condition may be indefinitely preserved and improved by the occasional application of a single coat of petroleum, followed by brushing.

H. A. ROYCE has described an interesting adaptation of electric welding to the filling in of "blow holes" in steel. The placing of a plug of steel into the blow hole so as to secure a union between the plug and the mass—a plan formerly practised—was often found to be attended by great uncertainty. The next idea was to place small steel scrap or filings in the hole and to melt them by the electric current; but the chilling effect of the walls was too great, and the metals would not weld. The difficulty was at last conquered by heating the mass in an oil or gas furnace, and then utilizing the electric arc for melting steel filings introduced into the hole. In this way, in a few minutes, so perfect a union is established between the plug and the walls of the existing metal that no line of demarcation was apparent when the piece was planed down.

THE Northey Manufacturing Co. of Toronto are preparing to open a branch in Montreal for the sale of their well-known pumping machinery. The office and warerooms will be situated in St. James' street, nearly opposite the *Star* office, where skilled attendants will be on hand to set forth the details and working of their machinery. A stock will be kept on hand for immediate delivery. They will also be prepared to quote on entire plants, including pumping, piping, valves, etc.

THERE are 24 salt manufactories in Canada in the following places: Goderich, Clinton, Seaforth, Kincardine, Blyth, Wingham Brussels, Park Hill, Courtwright, Exeter, Hensall, Sarnia and Port Frank. The total consumption of salt in Canada is about 900,000 brls. The total sales of Canadian salt are about one-third of this, or 300,000 brls., the balance being imported from England and the United States. The Goderich *Star* estimates the output of Goderich salt in 1892 at 80,000 barrels, leaving only 220,000 barrels for the other twelve towns, or an average of about 18,000 each.

The Patent Review.

44,598 Aaron H. Sensenig, Hummelstown, Pa., axle box.
44,601 Alfonso L. Jaynes, Buffalo, N.Y., time recorder.
44,602 and 44,603, Orville H. Lawrence, Waverly, N. Y., pipe elbow, also pipe-bending machine.
44,606 Bell Telephone Co., Montreal, Que., telephone.
44,607 Peter St Mary, Portland, Ore., damper regulator for steam furnaces.
44,611 Rudolf Diesel, Berlin, Prussia, German Empire, gas and petroleum engine.
44,614 Ole H J. Krag, Kongsberg, Norway, magazine firearm.
44,615 Max A. T. Boehncke, Centineala, Cal., brick kiln.
44 617 Wm. T. Mackey, Vancouver, B. C., device for tightening wheel tires.
44,618 Lester B. Kenney, Dansville, N.Y., car coupler.
44,621 John S. MacArthur, Glasgow, Scotland, process of extracting gold and silver from ores and the like.
44,622 Wm. Brooks, Liverpool, N.S., dredging machine.
44,625 James V. Burke, Chicago, Ill., smokeless furnace.
44,626 Geo B. Hussey, Providence, R. I., life raft.
44,630 John D. Billings, New York, N.Y., machine for forming horse-shoe blanks.
44,631 William R. Funk, Lexington, Neb., spike.
44,632 Albert C. Seibold, Mount Vernon, N.Y., electrodes for arc lamps.
44,638 Robert H. Martin, New York, N.Y., non-conducting covering
44,641 Wm. F. A. Kolle, Stuttgart, Germany, gas stove for cooking.
44,643 Carl Mohring, Pankow, Prussia, Germany, firebar.
44,650 Herbert W. Kincaid, Athens, Ont., metallic shingle.
44,652 George Lunge, Zurich, Switzerland, process for producing basic lead salts and obtaining certain lye products.
44,658 Cyrus F. Noble, Baldwin, Maine, chain coupler.
44,662 John H. Carson, New York, N. Y., hose coupling.
44,663 Hugh Williams, Victoria, B. C., generator for gas.
44,665 Alexander D. Hall, San Francisco, Cal., screw propeller.
44,666 Henry F. Braum, Denison, Texas, car brake.
44,668 Jasper Finney, Goulding, Fla., means for guiding logs down streams and rivers.
44,670 William Yound, Peebles, Scotland, illuminating gas.
44,671 James Roots, High Holborn, London, Eng., petroleum or liquid hydro-carbon engine.
44,675 Louis E Howard, Plainfield, N.J., electric arc lamp.
44,677 James Hargreaves, Farnworth-in-Widnes, England, electrolysis of salts
44,682 Patrick Fitzgibbon, Oswego, N.Y., generator for steam.
44,689 Carl Hoffman, Charlottenburg, Germany, rock drill.
44,693 George C. Young, Washington, N.J., signal for railways.
44,694 John Clingman, Dayton, Ohio, carburator.
44,696 Alonzo B. See, Brooklyn, N.Y., electric elevator.
44,697 Thomas Craney, Bay City, Mich., electrolytic apparatus, also 44,698 for electrolysis of metallic salts.
44,700 Joseph H. Brady, Kansas City, Mo., heating, cooling, and ventilating system.
44,702 William Peter Bettendorf, Davenport, Iowa, metallic wagon frame.
44,705 Christian Erdbrink, Paderorn, Westphalia, Prussia, blast-pipe for locomotives.
44,706 Thomas C. MacAdam, Ferndale, Pa., snow plough.
44,714 Frank P. Ziegler, Milwaukee, Wis., gas heater.
44,715 Beniah M. Dunson, Kenton, Ohio, heating apparatus.

44,717 Edward H. Seddon, Sale, Chester, Eng., tire for wheels.
44,723 Orford Copper Co., New York, N.Y., method of obtaining sulphide of nickel.
44,726 Hugh Calhoun, Hot Springs, Ark., method of chloridizing muffle furnaces.
44,733 J. W. Powers, Sycamore, Ill., steam engine.
44,734 Alex. C. Humphreys, Philadelphia, Pa., apparatus for manufacturing gas
44,737 Arthur K. Evans, Toronto, Ont., rope grip.
44,741 Fred. L. Creighton, Somerville, Mass., presser foot for moulding machines.
44,746 Geo. W. Scott, Belton, Mo., harvester.
44,747 William Main, Brooklyn, N.Y., storage battery.
44,748 John C. West, Simcoe, Ont., sleigh.
44,750 Frank M. Hughes, Milford, Mass., combined water tower and fire escape.
44,751 Henry Sewrey, Barrie, Ont., metal driving belt.
44,752 V. I. Francois, *dit* Provencal, Black Lake, Que., brake and coupler for railway cars.
44,754 William Cavers, Owen Sound, Ont., combined shaft support and anti rattler.
44,756 John Prentice, Lanark, Scotland, governor for engine.
44,757 Edward D. Kendall, Brooklyn, N.Y., process of treating gold and silver ores and a composition of matter for the same said process.
44,758 Gostav Henoch, the Gotha Mines, Germany, process of and apparatus for classing pulverized ores.
44,759 John T. Crawford, Wiarton, Ont., ore crusher.
44,760 Edward B. Hyre, Elk Fork, W. Va., car coupler.
44,762 Oscar E Beardsley, Trempealeau, Wis., valve for pumps.
44,768 Henry G. Rockwell, Washington, D C., rotary brush.
44,769 Wm. H Crackel, Saginaw, Mich,. car coupler.
44,770 George R. Scates, Knoxville, Tenn., furnace
44,771 Hugh Calhoun, Hot Springs, Ark., method of extracting metals from ores.
44,774 Dominion Wire Mnfg. Co., Montreal, Que., reel for wire-working machines
44,776 Louise Jane Doty, Toronto, Ont., thrust bearing for shafts.
44,778 Robert Ferguson, Melbourne, Victoria, Australia, milking machine.
44,780 Francis G. du Pont, Wilmington, Del., smokeless explosive.
44,784 Edward E. Gold, New York, pressure regulator.
44,785 and 44,786 John B. Cleveland, Indianapolis, Ind., wire braiding machine and for braided fence wire.
44,787 James Fleming, Buffalo, N.Y., shifting device for elevators
44,788 Joseph Ledoux, Montreal, Que., carriage axle.
44,793 Joseph W. Hester, Citronelle, Ala., nut lock.
44,794 Earl E. Gould, Belvidere, Ill., ice velocipede.
44,795 Fred C Blackwell, Enniskillen, Ont., coupler for pump rod
44,796 John A. Hertel, Toronto, Ont., telephone attachment.
44,806 Sheppard Mfg. Co., Louisville, Ky., truck for railway cars
44,807 Orford Copper Co., Constable Hook, N.J., process of obtaining pure sulphate of nickel
44,808 Thomas I. McMacken, Boston, Mass., electric car fender.
44,811 Henry C. Buddenderg, Cincinnati, Ohio, catch basin water closet.

44,812 Emmet B. Raymond, St. Louis, Mo., hydro-carbon burner.
44,813 Thomas L Willson, Leakville, N.C., electric smelting of refractory ores.
44,814 Paul Bubiau, Marseilles, France, steam generator.
44,816 Charles H Stainton, Toronto, Ont., fender for street cars.
44,817 Phelam McCullough, Toronto, Ont., underground conduit for electric wires.
44,818 Robert Rushton, St. Thomas, Ont., locomotive boiler.
44,821 Charles F Lavender, Toronto, Ont., axle bearing for wheels.
44,826 Bell Telephone Co. of Canada, Montreal, Que., multiple telephone switchboard system, and four other patents relating to multiple switchboard system for telephone exchanges, telephone exchange apparatus, and switch for telephone exchanges.
44,833 Benj Ewing, Brighton, Ont., milk agitating machine.
44,834 Wm Hewitt, Brantford, Ont., cultivator.
44,842 Herman F. Dernell, Athens, N.Y., combined clod crusher and land roller.
44,843 Jacob R. Hikesell, Charlotte, Mich., thill coupling.
44,844 Everett F Morse, Trumansburg, New York, roller bearing.
44,850 John B. Davids, North Dartmouth, Mass., marine vessel.
44,855 Wm S Kinsinger, Bantan, Ohio, wire connector.
44,860 Fred. Hart, Poughkeepsie, N.Y., steam turbine.
44,862 Albert Hillerscheidt, Berlin, Prussia, self-locking hoisting device.
44,866 Edward E. Roberts, Red Bank, New Jersey, generator for steam.
44,868 Samuel W. Martin, Springfield, Ohio, wind engine.
44,870 Dixon Best, Peterboro, Ont., steam boiler.
44,877 Wilson R. Smith, Beloit, Wis., friction clutch.
44,879 Louis E. Dubois, Toronto, Ont, fender for cars.
44,880 William Doran, Skowhegan, Me., device for raising and lowering electric lamps.
44,883 Fred. R Nies, Swampscott, Mass., external joint for escape pipes, etc.
44,893 Stanley C. Peuchen, Toronto, Ont., tire for bicycles.
44,897 Consolidated Car Heating Co., Albany, N.Y., rotary engine.
44,899 John P. McCloskey, Sarnia, Ont., crank shaft.
44,902 Wm. H Brownlow, Brockville, Ont., car brake.
44,903 Johan M. Olsen, Christiana, Norway, roofing and roofing tile.
44,905 Heath Rail Joint Co., Minneapolis, Minn., rail joint.
44,908 Robert L. Sentinella, London, England, metallic flux for refining iron.
44,909 and 44,910, Bell Telephone Co of Canada, Montreal, Que., test system for multiple switch-boards, for multiple switch-board system.
44,916 Arthur S. Atwater, Cleveland, Ohio, arc lamp.
44,917 James H. Mason, Brooklyn, N.Y, electric battery.
44,918 Maurice Lorois, 5 Avenue Allard, Nantes, France, gas engine.
44,919 Alexander Phillipsborn, Berlin, Prussia, overhead conductor for electric railways.
44,922 Bell Telephone Co. of Canada, Montreal, Que., station apparatus for telephonic and telegraphic purposes.
44,925 Lawrence Electric Co., New York, N. Y, electric engine.
44,930 Frank H Cornell, New York, N.Y., oil injector.
44,937 L H. Weronneau, Montreal, Que., switch and frog for railways.
44,941 D. G. Bolton Cooperstown, N.Y. snow and ice velocipede.
44,943 Minian C. Smillie, M. D, Gaspe Basin, Que, machine for preparing gas.
44,946 George Low, Ottawa, Ont., lock for mail bags.
44,949 Charles E. Munro, Washington, D.C., explosive.
44,950 Thomas A. Macdonald, Paterson, N.J., device for utilizing water power.
44,952 Julius Begtrup, Ridgeway, Pa., governor for engines.
44,959 Thomas Harris, Detroit, Mich., electric railway.
44,960 John Duncan, Toronto, Ont., ticket and machinery for issuing ticket.
44,961, 44,962 and 44,963 Riley J. Hosner, Romeo, Mich., track for sliding doors, for a door hanger, and for a stay roller.
44,964 Wm. Pratt, Montreal, Que., sheet metal vessel.
44,970 Sylvester P. Denison, Belleville, N.J., autographic telegraph

44,975 James Alfred Crane, Villa Road, Stafford, Eng., tool.
44,977 Harriet Carmont, Helmsdale, Eng., propeller and brake for vehicles
44,979 Arthur K. Thyll, New York, electric cutting machine.
44,981 William H. Sowell, Althouse, Oregon, car coupler.
44,983 Jno E Walsh, New York, N.Y., hoisting machinery.
44,984 Imle E. Storey, Brooklyn, N.Y., electric motor.
44,987 Thomas F Handly, Allegheny, Pa., fire extinguisher.
44,988 Ernest R. Esmond, New York, electric motor.
44,990 Edward F Gordon, Concord, N H., pulley.
44,992 Samuel E. Burlet, Red Bank, N.J., switch lock
44,993 Curt J Balthasar, St. Louis, Mo., heater.
44,994 Wm H. Longsdorf, New York, N.Y., electric motor.
44,995 Fowden Printing Telegraph Co., Trenton, N J., system of electrical transmission.
44,997 Thomas Parker, Toronto, Ont., pulverizer.

AMERICAN PATENTS.

The following is a list of patents recently granted in the United States to Canadians. They are specially furnished to THE CANADIAN ENGINEER by H B. Willson & Co., Patent Attorneys, Washington, D C.

John Bell, Toronto, ball-bearing axle, No 514,434.
Jules E Fortin, Que., leather-measuring machine, No 514,821.
Joseph A. Harris, Moncton, N.B , tie-plate, No. 514,828.
Alexander R. Lamb, Fenelon Falls, Ont., reversing-gear, No. 514,479.
Ernest A. LeSuer, Ottawa, electrolytic cell, No. 514,681.
John Morrissett, Vancouver, car brake handle, No. 514,763.
Robert Matier, Winnipeg, folding bag holder, No 514,481.
Aleck Saunders, Goderich, Ont., hot water generator for stoves, No. 514,732.
Aleck Saunders and J. Story, Goderich, Ont , wood carving machine, No. 514,731.
Ernest J. Wasbrood, Montreal, castor, No. 514,526.
Thomas S. Whitman, Annapolis, N.S., curing and drying fish, No. 514,578.
Fergus Black, Uxbridge, Ont., air pump, No 514,900.
Romaine Callender, Bradford, Ont., electrical circuit controller, No 514,108.
Romaine Callender, Bradford, Ont., electrical circuit controller, No 515 109.
Romaine Callender, Bradford, Ont., automatic signaling transmitter, No. 515,110.
Louis Cote, St. Hyacinthe, Que., heel-stiffening machine, No. 515,114
William Houghton, Paris, Ont., wrench, No. 514,993.
Arthur W. M Keen, Montreal, belt fastener, No. 514,998.
The Economical Gas Apparatus Construction Company, Toronto, apparatus for spraying oil or other liquids, No. 514,952
Louis Primeau, Beauharnois, Que , hay press, No. 515,013.
Austin S. Hatch, Windsor, electric heater, No. 515,401.
Andrew B. McKay, London, Ont , vehicle tongue, No. 515,407.
Frederick S. McKay, Hatley, Que., clothes-line, No. 515,354
William E. Ward, Kingston, Ont., lamp shade, No. 515,385.
Ephraim Alpaugh, Preston, Ont., land roller, No. 516,175.
Alexander Costigan, Montreal, office file, No. 516,523
Thomas Davies, Toronto, street car fender, No. 516,266.
Alpheus Hamlin, Almonte, Ont , churn, No 516,305.
Thomas McCrossan, Winnipeg, Canada, washing machine, No. 516,443.
George P. Harrison, Windsor, rotary ash shifter, No. 516,971.
Charles E. Lavender, Toronto, wheel tire, No. 516,790.
Felix Melouche, jr , Montreal, combination lock, No. 516,685.
Sydney J Sanford, Barrie, Ont., fire telegraphy, No. 516,710.

GERMAN PATENTS.

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

Draught regulator for furnaces; Chr. Voss, Neumunster.

Steam-water discharge pipe, with hollow float, open at the top; A. Haas, Moosch.

Spiral boiler for hot-water heating-installations; Joseph Unzeitig, Vienna.

Electric light installation, with incandescent lamps of several threads; Paul Scharf, Vienna

Detachable telephone apparatus, with call apparatus that places itself automatically in circuit; F. Edmund Thode & Knoop, Dresden.

Chain-link, with hook-shaped ends catching into each other; R. A. Breul, Bridgeport.

Stuffing-box, with radial pressure of the packing material; Arnold Schroder, Burg a. d. W.

Apparatus for the manufacture of effervescent beverages containing carbonic acid; Surth Engineering Works, Surth.

Appliance for the removal of furnace ashes from fire-tubes; A. Eschenhagen, Kottbus.

Detachable Gall's chain; A. Stotz, Stuttgart.

Lifting-valve, with walls protecting the seat from wear; Engine and Boiler-fitting Works, late G. Louis, Strube, Madgeburg.

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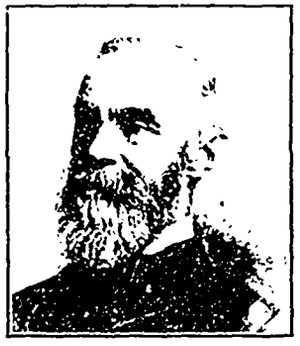

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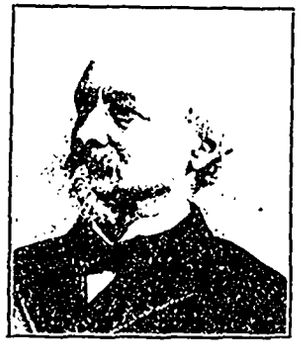

*O. CHANUTE.

*W. HASKINS.

W. MCNAB, Librarian

K. W. BLACKWELL, Treasurer.

*H. ABBOTT

H. PETERS

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* Those marked with an asterisk are members of the Executive Council.