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The Canadian Engineer

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CONTENTS OF THIS NUMBER:

THE INTERCEPTION TRAP.

BY W. M. WATSON.

For THE CANADIAN ENGINEER.

About forty years since I began to learn the sanitary trade, many private drains were built with rough stone, bricks, broken pipes and wood; they were totally void of any scientific arrangement or rule; no regard was paid to grading, and often the level turned the wrong way, which of course made the channels useless as carriers of sewage. Such private drains only distributed the poisonous sewage among the subsoil of the premises they were laid under, making the ground a cesspool of impurities that generated foul gases and contaminated the living rooms of the dwellings.

This state of things caused an appalling death rate among young children, who spent most of their time in such polluted atmospheres. To add to the leaky and unsanitary state of such private drains it was only in a few of the best plumbing jobs that either the soil pipe, the waste pipe or the head of the drain pipe line, was continued upward to above the house roof with a view of ventilating the plumbing, the private drain line and the public sewer.

To have cured this defect was simple enough, by having the drains laid with good sound pipes, tightly jointed and scientifically laid by competent workmen, and the terminating head of every drain, soil pipe and drain pipe carried up to above the highest point of the roof of the building, so as to ensure a good circulation of air from the street sewer upward through the line of pipes. However, the usual methods of tackling such difficulties was adopted. Professional engineers and scientists made a big thing out of the sanitary cow, and meetings and lectures were many, to make a remedy for so serious an evil, and the result was that W. P. Buchan, Glasgow, got the pull and inaugurated the system in 1872 of placing an interception trap in all private drains at a point where the private drain entered private property, or buildings. His argument was that no poisonous sewer gas could pass from the public sewers to the private house, if this shut-off valve or interception trap was fixed into the private drain; but he took no note of the fact that the putrid matter that poisoned the dwelling was under the dwelling, and not in the street sewer at that time, and if the street sewers were so badly laid that they generated poisonous microbes, the very best way was to provide plenty of means to draw off the foul gases to a point of the atmosphere above the house tops, where they would at once die, for dangerous microbes can live only where there is no circulation of air, and no better carrier of air or gas can be found than the warm moistened walls of a sewer or soil pipe.

Our Glasgow friend no doubt was a thinking man, but he evidently was not sufficiently well informed to know that when public sewers are scientifically laid, they are self-cleansing and self-aerating. When that is accomplished the sewage is kept moving until it reaches the sewage outfall, on that ground the foul matter entering the sewers cannot breed or incubate microbes, nor generate foul gases of any kind, because such putrefaction can only take place in very sluggish streams and cesspools, two things that are not admissible in a well laid drain. Then with regard to aeration of the sewers, if both the sewers, the private house drain, and the plumbing be scientifically designed, and worked out, every pint of sewage discharged from the house fixtures into the drain will carry with it into the main sewer about one quart of fresh atmospheric air, about sufficient to clean out and purify it. When the time arrives that a reasonable amount of common practical knowledge is used when constructing sewer drains and plumbing, the sewers themselves will do a great deal towards cleaning and purifying, by the help of bacteria, the foul liquid that is put through them. The system of Mr. Buchan prevents all this good work by placing the interception traps on all private drains, because the drains cannot have the proper and natural ventilation, nor can the sewage carry air into the sewers; moreover the sewers cannot be self-cleansing, in fact, it turns the whole system of sewers into a poisonous gas making machine, that has already sent many to a premature grave and will send many more before the fad works itself out.

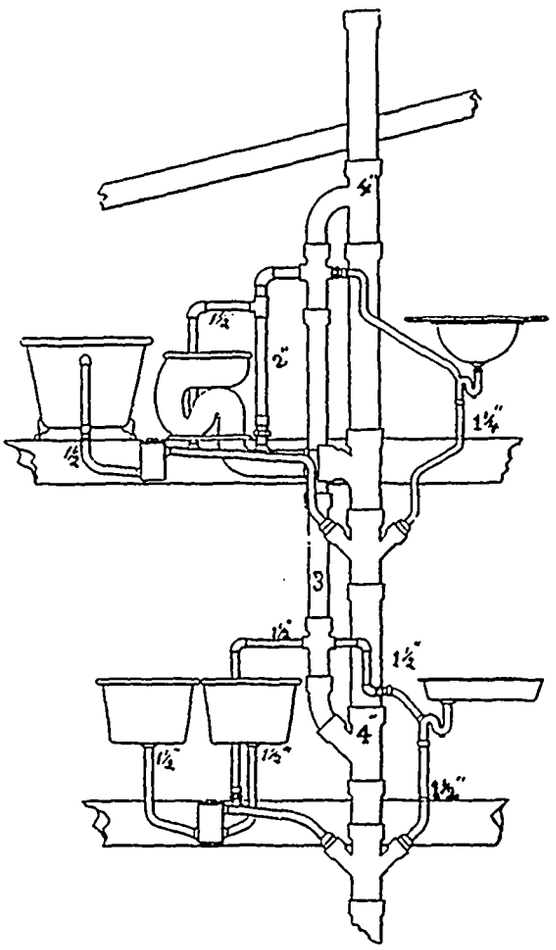
The time is ripe for reliable statistics to be published showing the sickness and death rate of the inhab-

itants living in houses having the interception trap on their drains, and similar houses that have not, so that the public would be enabled to judge for themselves whether or not it is a dangerous innovation. Though this would only show a small part of the danger and the injury done, because the whole sewage system of the town is fouled for the want of the ventilation which the interception trap prohibits.

The introduction of the interception trap has given sanitary theorists a large field wherein they have introduced many kinds of machines to try and aerate the drains, and flush the sluggish sewers, and by so doing prevent the generating of foul gases, but at every point they have met with poor success, and many of the public streets are charged with foul odors coming from the sewer manholes, and people living in elevated places where the town sewer gas is driven have often to suffer contagious illnesses, simply because the town sewers are not ventilated by natural principles, or in other words let me say that nature is not allowed to perform her appointed duty; if it was, then the making of obstructions in the flow of sewage and sewage aeration would cease. Sewage ventilation would be fully secured by using the simple and natural means that is at hand when the interception trap is left out. To do this all private drains must be inserted in the crown of the street sewer, and continue on a rising grade free from any obstruction until the line arrives above the roof of the building, and all the waste pipes of all the conveniences on the premises must be connected with the vertical soil pipe separately by a short branch and trap.

There are more injurious excesses and unscientific obstructions placed in the sewage and plumbing appliances at the present period, than I have ever witnessed during my forty years' experience, and these excesses are as expensive as they are useless, and many of them are dangerous to the public health.

Fads being catching it is only the excessive cost that has prevented many councils from destroying their present system of ventilation by compelling their townspeople to adopt the interception trap principle in their house drains. To show the excess that plumbing has arrived at I ask the reader to study a drawing of R. M. Starbuck's, published in The Sanitary Journal of New York, which is a fair drawing, showing how plumbing must be put together in many cities and towns which consider their sanitary business the acme of perfection. The drawing shows at least twice the amount of pipes and joints that are necessary to make safe and first-class sanitary jobs that will work freely. It also shows the waste pipes from the conveniences to be arranged and carried out to the soil pipe connection in a way that cannot meet with approval of an expert experienced plumber. There is too much pipe used, and it is not well arranged. I gave sketches, and the reasons for making this remark in my article on plumbing in February issue of 1899 and September issue, 1898; these two articles give detail reasons for several assertions made in this paper. The 3-inch main line ventilation pipe shown to be joined by a branch to the 4-inch soil pipe near the washtubs, and again at a point just under the roof, cannot have any circulation of air, for no current passing up the soil-pipe can be made to branch off and return into the soil-pipe again without the use of force. It is possible to turn the air round the 3-inch by-pass, by placing a stop valve in the 4-inch soil pipe, somewhere between the two 3-inch branches, but by no other natural way, so we can safely say that the so-called 3-inch ventilation pipe, together with its five branches that lead to the five different conveniences, are no ventilation pipes at all. The only office they can perform is to form a relief, so that when the contents of the pipes contract or expand they will throw out, or take in the small quantity of air needed to balance the space.



But there is another duty that they are credited with performing, viz., they prevent the key of water (that forms the air valve in all traps), from being syphoned out. When plumbers arrange the waste pipes from the bath and sinks in the way they are shown in this sketch, they do their level best to coax the traps that serve the fixtures to be syphoned, but there are reasons why they never do syphon, when used in the usual domestic way, they never did syphon nor they never will, but if the waste pipes were connected to the soil pipe in a proper mechanical way, they could not be syphoned, if every pipe, including the soil pipe, was running full bore at one flush, which is an action that can never happen in the usual way of using them. Experiments have been repeatedly made, and the results have shown that such vent pipes are no use, but on the other hand do much harm, and are responsible for many premature deaths; this, too, has been personally proved.

The oldest plumber never found a trap on a house pipe dried out by evaporation before the fad of venting all traps was introduced, because the drying influence of the atmosphere on the house side of the trap was balanced by the condensing of the sewer air and moisture present on the sewer side of the same trap. When a vent pipe is connected to the sewer side of the trap it

abolishes the moisture feed that the trap formerly had, and applies another drying influence into the traps, so that evaporation is going on both on the house and sewer side of the water seat, that is lodging in the dip of the small trap, therefore, it is only a matter of a few hours for the seal of the bath trap to become broken, and a passage is then open to introduce the gas from the sewers into the sleeping rooms, and it is by this method that some of our best houses have diphtheria and typhoid.

It may be safely said that where one trap can be found with its seal broken, because it has been syphoned, fifty traps can be found that have had the seal broken and dried out by evaporation, caused by the air coming in contact with the water on both sides of the trap, and on account of having a ventilation pipe placed on the sewer side of the trap, as has been shown.

SOUTH AFRICA, ITS PEOPLE AND TRADE.

CAUSES OF THE BOER WAR.

ARTICLE V.

(Continued from last issue).

A word as to the commercial situation. In the year 1884 the revenue of the Transvaal was £161,596, and the expenditure, £184,820. The population at that time was about 45,000, of whom 35,000 to 37,000 were Dutch. That was the year when Kruger went to England to obtain the new convention. The finances of his country were in bad shape, and remembering what England and Englishmen had done to rehabilitate the country financially during the three years of British administration, he had a letter published in the London papers inviting British capitalists, miners and merchants to come and settle in the Transvaal. They accepted the invitation, and in 1885—86 the De Kaap and Witwatersrand fields were discovered, with the result that the revenue for 1898 was £3,329,958, practically all of which is derived from the energies of the Uitlander. In the face of this, Kruger now asks, and the pro-Boer organs throughout the world echo the question: "If the Uitlander does not like the treatment he gets, why does he not stay away?" The Uitlander, upon Kruger's invitation, came to the country, discovered the gold, and built up the industry. Should he be robbed of the business he has created? And if prior occupation is urged by the Boer, how about the Kafirs, whom he has dispossessed of their lands? But while an unnecessary revenue, such as this, is squeezed from one element of the population, the expenditure has gone on to keep pace with it. This year the civil service list amounted to £1,216,294, or enough to give £40 to each male inhabitant of the country. The ordinary expenditure last year was £3,476,844. A large part of this, as stated, goes to build up a military power to overawe and oppress the very people whose exertions provide the money; much of it, according to Cecil Rhodes, has gone as a bribery fund to influence elections in the Cape Colony, and carry on the propaganda for seducing the Cape Dutch from their allegiance to Britain. A huge secret service fund* is used largely for political purposes in Europe to the same end; while a large but unknown sum is given by the President himself, as "doles," to Boers in the back districts, ostensibly to help farmers in distressed circumstances, but in reality to keep burghers loyal to him. The various monopolies also yield large bribery funds. The dynamite monopoly, by which the sole right to make or sell dynamite was given to one man (afterwards a syndicate), who was permitted to charge 200 per cent. over what the article would cost in the open market, filches from the Witwatersrand mines alone £600,000 a year. Space forbids reference here to the other monopolies, but it may be noted that these monopolies are given to Kruger's favorites on articles that are chiefly imported from Great Britain, or are used chiefly by British subjects. This is one of the numerous violations of the conventions, which provided that the taxation should be equal to all classes. It may also be noted that President Kruger has not only defended these monopolists under all circumstances, but in the numerous cases in which boodling schemes have been unearthed, and scandals exposed —sometimes by honest men in his own party—he has invariably shielded the boodlers and not infrequently promoted them or given them fresh opportunities.

A great deal might be said on the external relations of the Transvaal. The convention of 1884 fixed the boundaries of the Transvaal exactly, and the republic undertook solemnly to respect the independence of native chiefs outside its territory. Scarcely a year has passed without the violation of the convention in this respect. One of Kruger's first acts was to invade part of the British Protectorate and proclaim it a portion of the Republic, following up the operations of some of his free booters. And he only withdrew because of Mr. Rhodes' protest and the Warren expedition, which cost the British Government over £1,250,000. Then the Boer Government turned its attention to Zululand, which, after an intrigue with Dinizulu against the other chiefs, it invaded and attempted to upset the settlement made by Lord Wolseley. Next they invaded the country of the Matabele whom they had driven out of the Transvaal originally, and who were now under British protection, and they were only turned back by the tact and firmness of Dr. Jameson. Again they tried to lay hands on Tongaland, but the Queen Regent would have nothing to do with any country out England, whose protection she had sought. The invasion and spoliation of Swaziland was another Boer outrage, which Great Britain, from a mistaken notion of keeping peace with the Boers, condoned.

Such are a few of the features of Krugerism in South Africa, and the reader can judge whether they are such as to justify the interference of Great Britain.

It is a subject of wonder to many that the Boers persist in a course which a large number of them must know to be wrong, and stand out against the whole might of the British Empire in so doing. It must be remembered, however, that the vast majority, who never read a newspaper, or a book, except the Bible, are as ignorant of the outside world as the Hudson Bay Indians. Perhaps not ten of the whole body of burghers ever saw a man-of-war or visited England or Europe. Even Kruger and the other members of the Volksraad, who visited England, saw little of its resources; and it must be admitted of Kruger, who is a man absolutely without fear, that if he had the clearest realization of Britain's power, it would make no difference with his policy, so convinced is he that the Boers are the only favored nation of Heaven. What can be

done with a man who believes (as Kruger argued with Dr. Hertz, and a deputation of Johannesburg Jews, who came last year to plead for educational freedom), that the Boers are the direct descendants of Isaac, and the Jews the descendants of Ishmael, and that, therefore, it would be against the Scriptures for both people to inherit the land together! It must also be understood that, whatever the Boer leaders know, the Boers themselves are convinced that when the Gladstone Government gave back the country in 1881, it was through fear, and that the profession of generosity or justice was merely a cloak for this fear. And they point, in confirmation, to the fact that when Mr. Gladstone, after denouncing the annexation, in his Midlothian speeches in Opposition, came into power, he refused all along to restore the Boer Government until he had the experience of Majuba Hill. The leniency with which the British Government treated the Transvaal in its repeated violations of the two conventions, and the way in which they were allowed to despoil the Swazi tribe, were to the Boer mind only so much accumulating evidence of this fear, apparent to him as the years went on. Perhaps Kruger himself thought the Transvaal was a match for Britain, as J. P. Fitzpatrick relates the following, in his "Transvaal from Within:" "The late W. Y. Campbell, as spokesman of a deputation from Johannesburg, addressing President Kruger, stated in the course of his remarks that the people of Johannesburg 'protested' against a certain measure. The President jumped up in one of his characteristic moods, and said: 'Protest! Protest! What is the good of protesting? You have not got the guns! I have.' And Mr. Campbell, in reporting this in Johannesburg, remarked: 'That man is sensible; he knows the position. I claim to be sensible, also, and I know he is right; you can take my name off any other deputations, for we'll get nothing by asking.'"

We have evidence that several members of the Raad would have given the Uitlanders, not all, but some of the rights they vainly sought, but Kruger had become too powerful an autocrat, and they were no match for him either in diplomacy or determination. But though the Boers were ignorant, they were not so ignorant as to fail to realize that if the franchise was granted to Uitlanders, and a clean, honest administration inaugurated, these "doles" to burghers would cease, and they would no longer be able to live in ease at the expense of the hard-working alien. Hence, their determination to do what would otherwise appear insane—to risk the destruction of the Republic itself rather than to do justice at the cost of giving up control.

(To be continued).

CANADIAN NICKEL-STEEL.

The nickel-steel age, spoken of by Prof. Roberts-Austin before the British Association for the Advancement of Science, as being the next great period in the industrial progress of the world, is now entered upon. The most learned metallurgist in the world, whose opinion we have just quoted, also predicted that Canada would take a leading part in the developments which would characterize that epoch. There is no reason why the nickel-steel supplies of the world should not come from Canada. We can make iron cheaper than anywhere else in the world. We have the greatest and cheapest nickel supplies, because Canadian nickel contains enough copper to pay for getting it out and treating it, therefore the nickel-steel can be produced by us at prices which defy competition.

Hamilton, Ont., is to be the seat of great metallurgical industries. To the iron smelter and rolling mills already there, is now being added the Hoepfner Refining Co.'s works, which will refine zinc, copper and nickel. To operate this plant 3,600 electrical horse-power will be required, which will be furnished by the Cataract Power Co. J. Patterson stated publicly on March 1st, that contracts had been made with the Canadian Nickel Company, the Nickel Copper Company of Ontario, and the Hoepfner Refining Company, for the refining of nickel matte, the contractors to supply sixty tons of matte a day to the Hamilton works. As soon as the Hoepfner Co.'s plant is an accomplished fact, which will likely be in the coming spring, the nickel-steel plant will be started, and the cost of the buildings and machinery will be about $6,000,000.

For THE CANADIAN ENGINEER.

PEAT AS FUEL IN CANADA.

BY A. G. ARDAGH.

Peat or turf is usually associated in our minds with the old home-land, but there are many who do not know that in our country we have peat bogs of similar character. Swamp land, as we know, is widely distributed in the Dominion, but the product is not recognized by old country people as turf, which is generally the product of mosses; of the latter there exists, nevertheless, large deposits in Ontario and other Provinces. Both kinds of peat can be utilized as fuel. These peats are decomposed mosses, sedges, aquatic plants and other vegetable matters. Dana says: "In temperate climates it is due mainly to the growth of mosses of the genus sphagnum. This plant forms a loose turf, and has the peculiar property of dying at the extremity of the roots below while it continuously grows and increases above the surface, and by this process a bed of great thickness is gradually formed." In "older" peat there are a few traces of fibrous matters, but it presents a pitchy, shining hue when cut. It will dry out more or less brown. In "recent peat" the fibrous condition is closely marked and the color brown.

In general the older peat is underneath, but the lower stratum may be immature peat. This is the case in the Ellice marsh, nine miles north of Stratford, Ontario, where there is a bed of several thousand acres of sphagnum peat about six feet deep. The moss has been burnt off the surface long since. On the great bog in the County of Welland a number of acres are still covered with the original sphagnum moss. It is curious that these marshes are usually to be found on the watersheds. Peat contains in undrained marshes about 90% of water. It parts with its water very slowly on exposure to the air when in the shape of bricks and out of contact with the bog. On the peat moors of Ireland, Scotland and Northern Continental Europe, turf has been, since time immemorial, cut out in brick form and marketed locally in its crude state, although previous to this many fruitless efforts have been made to compress it economically and on a commercial scale. In this way the

efficiency in burning power would be increased, the dust in handling and using avoided, and shipments to a distance could be easily made.

Peat ignites easily, requires practically no draught when once the fire has taken hold, gives intense heat, and a banked fire will not burn out nor will it go out until the fuel is consumed. It burns with a flame for some time, and then for a longer period in red hot coals. The gases emitted in the initial stages of burning are not only innocuous but considered by some medicinal, especially against lung troubles. The percentage of ash will vary with the deposit from which the peat is taken. The following analysis was made of samples of compressed fuel made from the product of the Welland bog with the moisture reduced to a suitable amount:

Moisture	12
Volatile matter	58.20
Fixed carbon	26.
Ash	3.80

The absence of soot, clinkers and practically of smoke (when burned under proper conditions) are qualities which will appeal to all classes of consumers. Peat in its crude state varies very much in weight—about 600 lbs. to the cubic yard may be taken as a fair density. The fuel as consolidated by the Dickson press will weigh from slightly under soft coal to slightly over hard coal, neither frost nor a damp atmosphere will affect it, but it should be protected from rain.

The Dickson Press, which is the result of many years patient experimenting, and the expenditure of a large amount of money on the part of the inventor, A. A. Dickson, of Toronto, commends itself by its simplicity. The peat, after being broken to a powder in a breaker, is disposed automatically by gravitation towards the lower and stationary dies or moulds, which consist of two steel tubes about twelve inches long, of uniform bore and open at both ends, into which work two punches. Each charge of peat which flows in when the punch rises is compacted into a solid block on the top of the previously made blocks which occupy the lower two-thirds of the tube, and this column of blocks is forced down a distance equal to the depth of the block made, and thus each time one drops out at the bottom. The resistance thus obtained is yielding, and the formative pressure is always the same. *These ideas presented themselves to Mr.* Dickson after the failure to press the peat in a closed mould, as this substance offers more resistance and friction in a dry, cold, and disintegrated state than any other natural ligneous substance known; Processes which involve the consolidation of the crude peat in a wet or hot state leave it subject to disintegration upon drying or cooling.

It may be interesting to know that during the past summer factories have been erected at the following places in Ontario: Kirkfield on the Trent Valley Canal, Picton, Perth, Beaverton, Brockville, Galt, Barrie, and on the Ellice marsh north of Stratford, to manufacture compressed peat fuel with Dickson presses. It has been largely an experimental year in many ways. Some of the factories have not yet run, but the fuel placed upon the respective markets in small quantities has been very favorably received, and large factories would be required to meet the evident desire of the public for the fuel, Although much can be accomplished by natural drying in the wind, the question of artificial drying is being speedily and satisfactorily solved, as the Trent Valley Peat Fuel Co. has installed a Cummer Dryer, which promises to render their manufacturing in a much larger degree independent of the weather. There are several other dryers to be installed elsewhere. Although for perhaps several years the fuel will be largely consumed domestically, yet as a steam-rising fuel it has proved its worth unequivocally.

The process of excavating and drying the peat as performed on the Ellice marsh last summer was as follows: Trenches were staked out 3' 8" wide, and at intervals two men, side by side, were set digging with the ordinary steel spades with lifting handles. The peat was dug out one spading deep at a time and spread along the bank, when this was dry on one side it was stacked in small stooks of four or five with the wet sides out, three or four pieces on end and one on top. Subsequently these stooks were gathered into larger piles to make way for the spreading of a second spading and so on. To gather in the dry peat, portable tracks were laid over the ditches and the peat thrown into trams carrying from ¾ of a ton to one ton and conveyed to sheds or huge stacks to be thatched with lumber or moss.

The use of dredges and other machinery may reduce the cost of the operations up to this point. The peat will be either taken dry from the shed or dumped wet into the dryer. It will be pulverized before gravitating to the compressing machinery. It will be carried mechanically through all the processes before compression, and also from the machine to the railway car or store-house.

THE TORONTO MUDDLERS BUILD AGAIN.

The people of Toronto are about to spend money in printing the city by-laws. So far as concerns codifying and printing the building by-laws, the money would be better spent in publishing them in the daily papers, so that the people might notice that they are entirely without protection from many of the dangers which threaten the city dweller from the incapacity or crime of those entrusted with building operations, either as owners, architects, or contractors.

We showed, in a former article, that the building regulations of Toronto were a farce, and the office of building inspector a sinecure. The daily papers republished our statements and commented upon them, but no action was taken. The by-laws, which no one knows anything about, and which are entirely inapplicable to present day building, are still supposed to be in force, but in almost all buildings on the business streets these by-laws are entirely ignored.

We will repeat one statement from our former article which shows, as no argument could, the position of affairs: "There are no rules for steel construction in the building regulations of the city of Toronto."

An example of how the building inspector in Toronto guards the public safety is shown by the fact that the city finds its new market building at a standstill, because the steel contractor has refused to erect the roof upon the brick piers provided by the city's architect, and of necessity approved by the building inspector, without whose approval nothing could of course have been done.

If the Dominion Bridge Co., the steel contractors, had gone on with the work, and it had fallen, as they

claim it must, the resulting damages against the city for loss of life would have been very heavy. There can be no doubt that the city is liable for damages to person and property for any accident arising in any way through a cause peculiar to the steel type of building.

If a steel girder in a Toronto building fail, no matter from what cause, the city is responsible because its presence in the building is not in accord with the city by-laws. Such buildings as house the large departmental stores in Toronto are most flagrant violations of the building laws of Toronto.

There are of course, rules for the building of kitchen chimneys, etc., and they are such as the fire underwriters enforce in the farm houses in Muskoka. It is a mistake for the good aldermen of Toronto to build a market; their business ability would find scope rather in growing cabbages which they might vend upon the city hall steps.

CANADIAN SOCIETY OF CIVIL ENGINEERS.

FOURTEENTH ANNUAL MEETING.

The fourteenth annual meeting of the Canadian Society of Civil Engineers opened at the society's rooms, Montreal, on the 31st January.

The president, W. T. Jennings, of Toronto, occupied the chair, and there were present the following members: From Montreal, C. H. McLeod, secretary; Wm. McNab, librarian; H. Irwin, treasurer; J. G. G. Kerry, Geo. Hall, L. J. Marion, C. de B. Leprohon, Percival W. St. George, Frank T. St. George, T. W. Lesage, E. Marceau, E. Fusey, L. S. Pariseau, R. S. Lea, E. C. Amos, Geo. Holland, Alfred Dedman, E. Berryman, E. S. M. Lovelace, Lewis Skaife, R. Forsyth, G. H. Duggan, R. H. Balfour, A. E. Smaill, R. E. Hunter, G. L. Law, F. P. Shearwood, H. A Burson, E. E. Gagnon, E. A. Wallberg, W. J. Sproule, Prof. H. T. Bovey, F. E. Came, Herbert Wallis, J. W. Heckman, E. P. Hannaford, P. A. Peterson, Stuart Howard, W. McLea Walbank, Wm. Kennedy, L. J. Papineau, N. Hanson Greene, Arthur Crumpton, Geo. Janin, John Kennedy, Duncan MacPherson, John R. Barlow, J. S. Vindin, L. A. Desy, Chas. H. Osler, F. L. Wanklyn, Thos. Kirk, J. T. Lemire, R. M. Hannaford, H. B. Stuart, J. S. Costigan, James Ewing, C. S. Leech, Fred Thomson, J. A. U. Beaudry. From Ottawa: Col. W. P. Anderson, Geo. A. Mountain, Wm. Crawford, E. J. Walsh, C. Thomson, A. Campbell, R. F. H. Bruce, C. A. Bigger, Wm. McCarthy. From Toronto, W. T. Jennings, Willis Chipman, C. H. Rust, H. F. Duck, C. J. Crowley, H. W. D. Armstrong. From Quebec, L. A. Vallee, Charles Baillairge, E. A. Hoare, Armitage Rhodes, Thos. Breen, F. X. Berlinguet, Henry O'Sullivan. From Lorette, Owen O'Sullivan. From Brantford, T. Harry Jones, C. A. Waterous. From Berlin, Herbert J. Bowman. From Halifax, C. E. W. Dodwell. From Iroquois, F. R. Wilford, G. J. Desbarats. From Kingston, Prof. W. R. Butler. From Owen Sound, Jas. C. Kennedy. From Coteau Landing, Thos. Monro, Alex. Grant. From Boston, Freeman C. Coffin. From Sault Ste. Marie, Wm. Crawford. From Black Lake, Que., J. S. Costigan. From Valleyfield, J. H. Sullivan.

On calling the meeting to order the president congratulated the society on the large attendance and on the prospects for a good convention. The secretary then read the programme of the meeting, after which the minutes of the last annual meeting were read and confirmed.

The president then nominated Messrs. Howard, Costigan, Stuart, Lovelace, Heckman and Lesage as scrutineers of the ballot for the election of officers. Messrs. Walbank, Berryman and Ewing were appointed scrutineers of the ballot for the Nominating Committee.

A large part of both forenoon and afternoon sessions was taken up by a discussion on the balloting methods of the society, and the greater security of the system from errors in the future. On motion of F. L. Wanklyn, seconded by P. W. St. George, it was decided that in future when more than one ballot is cast, the color, size and all other details of the papers and enclosing envelopes shall be alike; and on motion of J. G. G. Kerry, seconded by C. H. Rust, it was resolved that no list of the ballots cast shall be made before the closing of the ballot, and that no member other than a scrutineer shall be permitted to know who has cast a vote.

REPORT OF COUNCIL.

The following is the substance of the report of council on the work of the society during the past year: The elections in the ordinary course comprised one honorary member, eleven members, twenty-six associate members, four associates, and one hundred and eight students, in all one hundred and fifty Four associate members have been transferred to the class of member, and thirteen students to the class of associate member. Two members, removed from the roll for non-payment of dues, have been reinstated upon payment of their arrears. The elections under the Quebec Act, Vic. 62, Chap. 32, comprised three members, and fifty associate members. One associate was admitted to the class of member, and thirteen students were admitted to the class of associate member, under the Quebec Act. Resignations have been received from two associates and five students. Three members, four associate members and fifteen students have been removed from the roll for non-payment of dues. The deaths have been: Honorary member—Sir John William Dawson, C.M.G., LL.D., F.R.S. Member— Walter Shanly. Associate—Hugh Ryan. Associate Member—Emery Lafontaine. Students—F. X. Mill and M. A. Bucke. At present the membership stands as follows:

	Non-Res.	Res.	Total.
Honorary members	6	1	7
Members	247	61	308
Associate members	198	91	289
Associates	26	14	40
Students	99	104	203
Total			847

This is an increase over last year of 14 members, 57 associate members, 61 student members, and a decrease in associates of 1, making a total net increase in membership of 131 over last year. There are pending 11 applications for admission. Fourteen ordinary meetings of the society were held during the year, and one special general meeting at which the following resolution was unanimously carried: Moved by C. H. Rust, seconded by J. R. Barlow, "That the council be and is hereby instructed to purchase the property, No. 877 Dorchester street, making use of the Building Fund, amounting to $4,500, for this purpose, and also to raise $6,500 by mortgage on the property, in order to complete the purchase price of $8,000, with an additional sum of $3,000 for repairs and improvements." It was also resolved that the entrance fees, less the examination expenses, be credited to the Building Fund.

Additional subscriptions to the Building Fund were called for by circular, and the following amounts received to date: Subscriptions prior to 1899, $4,656.73; subscriptions received during 1899 and 1900: Collected, $2,984.44; uncollected, $618; total, $3,602.44.

The obligations assumed in connection with the new home are as follows: Purchase price and expenses, $8,011.30; total amount of contracts, $7,475.50; estimated cost of fittings, etc., $755; Architect's fee, $616.25; total, $16,858.05.

In connection with the work of the committees on legislation it was reported that an Act was brought before the Ontario Legislature in the early part of last year, but, owing to opposition, arising chiefly from a misunderstanding of the Act, it was withdrawn after the second reading to be introduced again during the current session. The by-laws under the Quebec Act were sanctioned by Order-in-Council on February 24th, 1899. The Board of Examiners, composed of E. Marceau, S. Duval, T. Breen, C. H. McLeod, R. J. Durley and R. S. Lea, held its first meeting, November 7th, in accordance with the Quebec Act, and reported two candidates as having passed the examination for admission to practice.

The Library Committee reported a number of gifts of books and pamphlets from members and friends. Books were given by Angus M. Stewart, A. D. Watson, G. Barnett Smith, F. C. Coffin, A. Crumpton, Gabriel Henry, Wm. McNab and George Brush. Two volumes have been acquired by purchase, viz.,

Railway Track and Trackwork, by E. E. Russell Tratman, and Railway Engineering, by C. B. Smith. Pamphlets and reports on various subjects have been received from A. V. Ramachandra Aiyar, C. Baillairge, C. E. Good, G. Henry, T. C. Keefer, C.M.G.; John Kennedy, R. Steckel, P. W. St. George, F. M. Baker, Wm. R. Hill, H. B. Seaman, W. Murdoch; various exchanges were also effected. The books of the library have been appraised at $3,750, and the library furniture at $1,250. The new quarters will furnish more library accommodation, and enable the committee to carry out many improvements.

FINANCIAL STATEMENT.

The following is an abstract of the receipts and expenses for the year ending 31st December, 1899:

Balance from 31st December, 1898		$ 5,893 22
GENERAL RECEIPTS.		
Subscriptions—		
Arrears	$1,186 00	
Current	2,944 50	
Advance	381 65	
Entrance fees	480 00	
	$4,992 15	
Transactions sold	7 50	
Two dividends on Canada Permanent Loan Company's stock	9 00	
Refund on printing	9 25	
Refund on engraving medal	0 75	
Bank interest on current account	53 85	
Bank interest on deposit receipt	69 03	
	$ 5,141 53	
		$11,034 75

GENERAL EXPENDITURE.

Part payment for house, No. 877 Dorchester street	$ 3,400 00
Transactions printed and published	712 80
Advance proofs	98 75
Printing, stationery and binding	376 52
Charter, by-laws and list of members	124 00
Postage and post cards	244 64
Messengers and telegrams	18 26
Cabs, cartage, etc	8 75
Secretary's salary for year	300 00
Assistant secretary's salary for year	480 00
Caretaker's wages for year	144 00
Keeping rooms open at night and Saturday afternoons	118 00
Rent of rooms for year	700 00
Telephone service for year	30 00
Bank commissions on cheques	8 00
Water rates	26 68
Electric lighting for year	72 12
Books, magazines and library expenses	51 30
Expenses re legislation, Quebec province	263 40
Expenses re legislation, Ontario province	225 75
Expenses during annual meeting	83 15
Printing and engrossing diplomas	52 35
Gzowski medal and engraving	7 30
Office furniture and repairs	49 05
Rent of drawer in bank vault for year	5 00
Gas for grate fire	3 10
Part entrance fees transferred to Building Fund	430 00
Treasurer's expenses, car fares, etc	15 00
Petty cash in hands of assistant secretary	7 59
Examiners' fees	50 00
Ice for season	5 00
Insurance on 877 Dorchester St. till Aug. 27th, 1902	25 00
Insurance on present rooms till 18th Sept., 1902	14 40
Builder's risk on 877 Dorchester St. for three months	15 00
	$ 8,164 91
Balance on hand	2,869 84
	$11,034 75

D. MacPherson,
E. Marceau,
Auditors.

H. Irwin, Treasurer.

The treasurer's statement of the Building Fund showed assets of $22,250, made up of cash in hand from general fund $2,869, from Building Fund $2,431, arrears of fees and subscriptions to Building Fund about $1,948; value of house, land and improvements, $10,000; books and furniture, $5,000 The expenditure on the house during the year was $6,812. The report was adopted.

The report of the Committee on Legislation was presented by Willis Chipman, as follows:

The Committee upon Legislation appointed at the last annual meeting of the society to promote the passage of an Act respecting civil engineers, a draft of which was laid before the society at the last annual meeting, begs to report as follows. Several meetings of the committee were held in January, February and March of 1899, and several conferences were held with the Minister of Education of Ontario and our solicitors, the result being Bill No. 136. The bill was introduced into the House as a private measure, and the fee ($100), paid. The Bill was referred to the Private Bills Committee two or three days before the House prorogued, and was referred back by the committee. The bill was opposed by Prof. Harris, of Queen's, and by Mr. Bell, secretary of the Canadian Mining Institute. The Government refunded the committee the $100 deposited when the application was made for introducing the bill. The committee has held two meetings during this month, and has gone carefully over the bill of last year, making some alterations that should remove the opposition from the members of the Mining Institute and mechanics.

The president observed that the opposition in Ontario was largely due to popular ignorance of what the society's aims were. Some of the labor organizations were under the apprehension that the society was opposing their interests; but when they see that this society will prove a help and not a hindrance to the legitimate aims of all labor organizations, whether skilled or unskilled, they will no longer oppose it.

Mr. Chipman said it must not be supposed that because the committee had not accomplished much they had been idle. Legislation of this kind was slower of accomplishment in Ontario than in Quebec, and the work of last session had at least disclosed where the opposition lay. Ottawa and Kingston had both been centres of opposition; in the latter case from an ex-professor of the Military College. Whether there would be time to organize our forces for the pending session of the Ontario legislature was a question.

The committee on the Gzowski medal reported that no award had yet been made, and the matter was left with the council.

Mr. Sproule stated that the committee on titles of engineers was not ready to report and asked that the committee be continued.

The committee appointed to investigate the complaint of Henry A. Gray that his paper on the lake levels had not been printed in the transactions of the society, reported to the effect that that gentleman had made considerable use of extracts from the reports of the American Government engineers and other authorities without giving credit or using quotation marks, and that such omissions had justified the editorial committee in withholding the paper from the transactions; but the committee recognized that Mr. Gray's paper contained a great deal of valuable information on the lake levels that was not accessible to members of the society, and recommended that, if he would indicate the extracts by quotation marks and give credit to the authorities to whom he was indebted, the paper be printed in the transactions. The report was accepted and the council was instructed to communicate with Mr. Gray.

After adjournment at noon Mr. Kerry reported on behalf of the committee on "Fees" appointed to investigate the question as to whether city members obtained more than their fair share of the benefits of the society. The committee, composed of Messrs. Irwin, Howard, McLeod and Kerry went over the treasurer's statements for the past five years and selected from them all expenditures which are at all of a local character. These are: Rent, janitor, night librarian, water, gas, telephone, electric light and meetings. It is not easy to say what portions of these expenditures would have to be made by the society for the conduct of its general business if it had no local membership, but in such case the expenses of a head office

and library would probably be at least $500. Deducting this sum from the totals of the items above noted the following are the local expenditures, and the income from the extra fees paid by resident members and associate members for the years under consideration:

	Fees Received.	Expenditure
1895	$162	$256
1896	166	267
1897	176	202
1898	276	552
1899	304	509

The increase in expenditure in the last two years was due to renting an extra room and to the opening of the rooms at night. It would appear from these figures that the local fees do not fully meet the local expenditure as figured out on the above basis, but that basis is itself only an estimate, and on the other hand no value can be placed upon the service rendered by the local membership to the society in general in conducting much of its business and keeping alive its meetings and committees, duties which in some cases have become so arduous that the society must shortly expect to place paid assistants at the disposal of the treasurer and librarian. The letters which caused the appointment of the committee seem to have been written under a fear that with the opening of the new society house, the local expenses would greatly increase, but it does not appear to your committee that any expenditure upon the furnishing and maintenance of the house which may tend to advance the dignity and standing of the society as a professional society ought to be opposed by any member, whether resident or non-resident. On the other hand your committee feel that any expenditures which are not proper to a society constituted solely for professional purposes, but belong rather to the province of an engineers' club, should not be chargeable to the general funds, and would, if permitted by the council, furnish valid ground of complaint to all members not benefiting by such expenditures. Your committee would suggest that this report be made a subject of discussion at the annual meeting, as it does not feel that the committee itself is sufficiently representative to make any recommendation based on the facts above presented.

Mr. Kerry added that local members had to pay an extra fee of $2 for the more frequent use they were supposed to have of the rooms. He said the policy of the society was to become the general engineering society of Canada, and nothing could be more injurious than to spend money in a way to bring no benefit to members outside the city. The library was a necessity, and we should have the best equipment in this respect that it was possible to get, but the general society should not be taxed for the pleasures of a club for the advantage of local members. During the discussion reference was made to a card room used by local members. The president and Mr. Peterson expressed surprise that a card room existed, and hoped that this feature of the rooms would be done away with at once, otherwise the local membership of the society would degenerate into a club.

Mr. Dodwell, speaking as an outside member, thought the society should not begrudge the cost of proper quarters. He had not been here for two years, and might not be here for another two years, but he was quite willing to pay his share of the cost of maintaining a proper home for the society.

Mr. St. George said it was the intention in the new quarters to provide sleeping accommodation for two; this was for outside members, who might prefer to lodge at the society's rooms instead of going to an expensive hotel. After further discussion the following resolution was passed on motion of Mr. Sproule seconded by Mr. Kerry: That no expenditures from the society's funds shall be incurred either in purchases or maintenance, which are not necessary to the carrying on of the business of the society as a whole, and in the direct interests of the general membership, and that this resolution be transmitted to the council as the expression of the annual meeting.

The president made a feeling reference to the deaths of Sir William Dawson and Walter Shanly as old and highly honored members of the society, and it was decided to send formal resolutions of condolence with the families of the deceased, and of other members who had passed away during the year.

The secretary read the results of the circular postcards, which had been sent out soliciting the opinion of members as to future conventions. The following was the list of questions, and the total number of answers for and against:

1. Are you in favor of continuing the present arrangement of holding the annual meeting in Montreal in January of each year?—Yes, 95; no, 103.

2. Shall the society hold a summer convention at different places each year?—Yes, 177; no, 19.

3. If in favor of summer convention, in what month should it be held? Of the total answers 28 were in favor of June, 25 of July, 36 of August and 32 of September.

4. If such convention is held should the annual meeting be at the same time and place?—Yes, 119; no, 70.

It was moved by W. J. Sproule and seconded simultaneously by L. S. Pariseau, Duncan MacPherson and T. Harry Jones, that $200 of the society's funds be devoted to the National Patriotic Fund. This was carried by a standing vote, the members singing "God Save the Queen."

The scrutineers for the nominating committee reported that the following had been chosen for this work:

Quebec—L. G. Papineau and C. de B. Leprohon.

Ontario—C. H. Rust, J. Galbraith and Geo. A. Mountain

Manitoba and N.W.T.—Col. H. N. Ruttan.

Maritime Provinces—Dr. Martin Murphy.

Newfoundland and Foreign—Lewis Skaife. Messrs. W. T. Jennings, W. G. McN. Thompson and T. C. Keefer, the three last presidents, are ex-officio members of the committee.

President Jennings then delivered his annual address as follows:

On retiring from office I take this opportunity of again thanking the society for the high honor conferred in electing me to the presidential chair, and to express regret at my inability to have given the duties of the office the full attention they demanded. However, if not frequently in attendance, I have had the society and its objects fully in mind, and my constant desire has been to see the society attain a position where from its standing and activity in the advancement of scientific education, coupled with wise regulations and a high standard of ethics, it will command the hearty support of engineers in all branches of the profession, and also the respect of the public at large.

Referring to our inception, formation and advancement, I may briefly remind you that the society was established by a Dominion Government charter early in 1887 "for the object and purpose of facilitating the acquirement and interchange of professional knowledge among its members, and more particularly to promote the acquisition of that species of knowledge which has special reference to the profession of civil engineering, and, further, to encourage investigation in connection with all branches and departments of knowledge connected with the profession." The society was also empowered "to acquire and hold all land and property necessary and requisite in order to carry out the objects and purpose for which incorporation was sought." The numerical strength of the society during the first year (1887), was as follows: 188 members, 45 associate members, 19 associates, 83 students; in all 335 members. During the same year the sum of $2,480.77 was paid in to the treasurer, principally on account of annual subscriptions.

From the secretary's returns it appears that the membership for 1899 numbered as follows: 7 honorary members, 308 members, 289 associate members, 40 associates, 203 students; in all a total of 847 members, and showing a total net increase since the year of the formation of the society of 512 members of all grades, while the receipts from entrance and annual fees, etc., amounted to $5,141.53. This sum, added to the amount of $5,893.22, brought forward from general fund account, makes a total credit balance at the end of 1899 of $11,034.75, which sum has, as you will notice in the treasurer's statement, been largely drawn upon for building account.

Permanent withdrawals from membership have been few, and due in most instances to removal from the country. Removals by death have cost us many worthy members, among whom we sincerely regret, Sir John William Dawson, C.M.G., LL.D., and two past-presidents, namely, Mr. Samuel Keefer and Sir Casimir Gzowski. Mr. Walter Shanly may also be included in the number of past-presidents, as he was on several

occasions offered the nomination, but invariably declined. As is well-known, these gentlemen were of the highest professional and social standing, and heartily entered into the scheme for the formation of the society, and did their part nobly to advance all its interests from the date of its formation up to the time of their decease. Others have departed who, although perhaps not as prominent before the public and in our midst, acquitted themselves honorably in the profession and faithfully as members.

The society, having carried out the second provision in its charter, is now to be congratulated on the acquisition of its own premises (as referred to in the treasurer's report), at a total estimated cost for improvements, etc., $8,846.75; building and land, $8,011.30; total, $16,858.05. Of this amount there has been obtained by special subscriptions from members and friends the sum of $8,259.17. The balance of $8,598.88 has been temporarily provided for by loan from the general funds of the society.

It is confidently hoped that monetary aid sufficient to extinguish the whole building account item of $16,858.05 will be secured, thereby enabling the society to apply moneys now temporarily loaned from the general funds to other useful purposes, notably the enlargement of the reference library, which is now valued at $3,750, or, with furniture and fittings at a total of, say, $5,000, all of which can be inexpensively removed to our own premises, which it is hoped will be ready for occupation by the 1st of May next. The benefit to be derived from having one's own professional home will doubtless strike every member as the beau ideal of seclusion and comfort. We now know that we have a headquarters, where we can meet and discuss topics of professional interest, or where we may individually rest by times when here. It has been stated by some of our members that the establishment has involved too great an expenditure, and that only local members would profit by it. I would remind these gentlemen, that, as before stated, a large proportion of the cost was subscribed by members and friends for this particular purpose, which the society has had in contemplation from the outset.

I am satisfied we will do more individually and collectively in this way in the near future, and that we will doubtless soon have the pleasing duty of determining whether our surplus funds are to be devoted to the wider distribution of engineering information beyond that emanating from papers by our own members, or expend it in additions to our reference library, or, finally, stop the accumulation of funds by decreasing the annual subscription fee. I cannot think that the latter course would meet with the general sanction of the members, because, as time wears on, coupled with the general growth of the country, an ever-increasing demand will make it imperative that our members be promptly informed of the latest engineering advances. However, as we have not yet reached that stage, it is unnecessary to further enlarge on the subject, and I only mention the matter as food for thought and discussion later on.

As to the second part of the assertion, that only local members would really profit by the establishment of our home, I may say that such must necessarily be to some extent the case, and we who are not at headquarters can only hope that those who are so fortunately situated will take full advantage of the opportunities afforded. Members should look on this feature in a broad light, and recognize that, while distant from the home, yet the advantages of it are apparent, in that the library is open to us should we at any time desire information as recorded in our reference volumes, by simply making application to the secretary for the loan of the required work, which, if too voluminous to transmit, and the subject matter required not too extensive, there is no reason why arrangements should not be made for its transcription and transmission to the applicant. In this and many other ways can the "home" be made a bond of usefulness to the members of the society, while its firm establishment means that the Canadian Society of Engineers has become a permanent and fully recognized institution of the country.

The advancement of economic mining has had the effect of attracting experienced mining engineers to the country, and of inducing a large number of students to take up that branch of the profession, with the result that a separate society, called the Canadian Mining Institute, has been successfully formed, and, as it is desirable that all branches of engineering should be embraced in the Canadian Society of Engineers, it is hoped that this valuable branch will be united with us in the near future.

Acknowledgment as a corporate body has been obtained from the Legislatures of the provinces of Quebec and Manitoba. An effort has been made in the same direction in the province of Ontario, but so far without success. It is, however, hoped that substantial advancement will be made in this respect during the coming session of the Ontario Legislature, and it is not difficult to see that the carrying out of the provisions in our bill will not only benefit the profession and the operative, but also assist all intelligent and well-disposed persons by the elevation of the educational standard and general proficiency of the civil engineering profession of this country. In connection with our desire for provincial incorporation, it has been stated, by those opposed to the measure, that our common object is to thoroughly entrench ourselves behind the Act in order that we may the more successfully wage war on those now practicing who have not thought fit to ally themselves with the society; also to legally enable us to exact enhanced fees for services, and generally to place a curb on free and untrammelled labor, be it professional or otherwise.

In reply to this and other like statements, I would briefly point out that the old days of casual study as a pupil principally carried out in the office, field or on works, and generally based on theoretical education of a more or less complete character, are almost past and gone, and while recognizing and upholding many good features in the old system, yet the near future will find only men in the profession who are graduates of schools of engineering or of this society.

Therefore (while not wishing to interfere with any one now engaged), the society seeks incorporation (in the provinces) particularly for the purpose placing the foot of the student firmly on the first rung of the ladder by insisting that he shall have the foundation work of his profession securely laid in the form of a good academical education, and that his further ascent may be made under the guidance of experienced engineers, whose duty it will be to encourage him, until time and experience in actual service enable him to become a full corporate member, and competent to stand alone and unaided.

In the matter of fees for professional services, the society has not made special provision, and it is desirable that a plan be formulated whereby satisfaction and uniformity may be obtained in this respect, as is customary in other professions.

When one thinks of the duties and responsibilities vested in an executive engineer, in charge of extensive and costly works, and often acting in a judicial capacity as between Governments, companies or municipalities, as against each other or contractors, and compares the returns they receive with those obtained by our judges and leaders in mercantile pursuits, we certainly cannot be charged with placing a high estimate on ourselves.

As to interference with skilled or ordinary labor, I hold that the reverse is the case, as by the better and more systematic education of our engineers we create a competent force to guide and assist skilled artizans and mechanics, in advancing their interests, either as inventors, operators or overseers, of the laboring masses, who thereby cannot fail to obtain improved conditions.

As an index of this feature, it is only necessary to point to the valuable assistance rendered by schools of technology in Europe, and on this continent, where the ordinary mechanic may, by evening study under engineers, chemists and other suitable professors, secure for a trifling sum such knowledge of a scientific character as will enable him the more clearly and effectively to study out and improve upon present machinery and methods of manufacture, and generally bring under the control of the hand of man the powers and material of the physical world.

The ethical principles which should be observed between members are not difficult to determine, and may be summed up in the tenets of the "Golden Rule," and are largely provided for in our by-laws. It has, however, been suggested that members enjoying permanent positions, and whose compensation is in consideration of the occupation of their whole time, should discontinue outside professional practice in so far as the interests of the country or municipality will permit.

It is to be hoped that the "transactions" of the society will

be increased in volume by the addition of articles other than those emanating from members of our own society.

I have thus briefly touched upon society matters rather than those of a specifically engineering character, as has been the custom heretofore by retiring presidents, feeling that at this time, when we are entering upon a new and more extended era, it would appear advisable that our members should be reminded of the objects of the society, and of the duties and obligations of its members to the public, and to each other in order that we may the more fully understand our position.

In concluding, I can only express a hope that our efforts will continue to meet with success, and that each member will personally feel that the society is of real value, and of benefit to our country.

On motion of P. A. Peterson, seconded by Thomas Monro, the thanks of the society were tendered to the president, who, in his suggestive and instructive address had taken an entirely new line of thought in presidential addresses.

John Kennedy, who had been moved to the chair, complimented the president on the practical features of his remarks. The address would prove not only helpful to members, but to the general public, who might wish to know the aims and purposes of this society.

The election of officers for the ensuing year resulted as follows:

President—H. T. Bovey.

Vice-Presidents—G. H. Duggan, Percival W. St. George and E. H. Keating.

Secretary—C. H. McLeod.

Treasurer—H. Irwin.

Librarian—E. A. Rhys-Roberts.

The Council (the returns for which could not be presented till after the meeting), was as follows: John Kennedy, C. H. Rust, Thos. Monro, G. A. Mountain, Duncan McPherson, T. H. Tracy, St. George Boswell, James Ross, E. Marceau, H. Wallis, Prof. J. Galbraith, R. Hering, J. M. McCarthy, W. McNab and C. E. W. Dodwell.

Prof. Bovey in thanking the society for electing him to the presidency, said he had not sought the position, but was, in fact, in England when he was nominated. He therefore felt the honor to be all the greater, and would do his best to show that it was merited.

On motion of Herbert Wallace, seconded by Stuart Howard, a hearty vote of thanks was tendered to Mr. Jennings for his services as president during the past year.

The meeting for business then adjourned till Feb. 6, when the returns of the scrutineers for members of the council, as given above, were received.

After the business of the day the members to the number of sixty or seventy left by special train, placed at their disposal by the Grand Trunk, for Boston. Owing to press of other matter an account of the visit is held over till next issue. One of the events of the trip was the annual dinner, a report of which follows:

THE ANNUAL DINNER.

The annual dinner of the society was held at the Hotel Brunswick, Boston, and proved an occasion to be remembered by all who attended.

The chair was occupied by the president-elect, Prof. H. T. Bovey, Dean of the Applied Science Faculty of McGill University, who had on his right C. Frank Allen, professor of railway engineering in the Massachusetts Institute of Technology and president of the Boston Society of Civil Engineers, and on his left, Desmond Fitzgerald of Brookline, late president of American Society of Civil Engineers, and engineer of the Sudbury Department of the Metropolitan Water Board.

Among the members and guests of the society present were: Leonard Metcalf, S. E. Tinkham, Henry Manley, H. Bissell, Prof. Geo. F. Swain, Howard A. Carson, Frederic P. Stearns, John E. Cheney, E. W. Howe, Prof. Gaetano Lanza, L. F. Rice, Chas. W. Sherman, Geo. A. Kimball, A. B. Corthell, W. W. Cummings and L. J. Hirt, of Boston; W. E. McClintock, of Chelsea, Mass.; Prof. Ira N. Hollis and Prof. D. L. Turner, of Cambridge, Mass.; T. Howard Barnes, of Medford, Mass.; Alex. H. French, of Brookline; Geo. B. Francis, of Providence, R.I.; Prof. C. H. McLeod, Duncan MacPherson, Stuart Howard, John Kennedy, Percival W. St. George, J A. U. Beaudry, Fred. Thomson, A. E. Smaill, R H. Balfour, H. Rutherford, T. H. White, F. L. Fellowes, Alex. Pringle, E. C. Amos, L. G. Papineau, Lewis Skaife, T. W. Lesage, J. S. Vindin, Wm. McNab, F. P. Shearwood, R. L. Hunter, Gordon Grant, F. E. Came, Joseph W. Heckman, Alex. J. Grant, Arthur Crumpton, R. S. Lea, Sidney Hosmer, of Montreal, C. H. Rust, H. W. D. Armstrong, E. B. Biggar, of Toronto; Charles Baillairge, Louis A. Vallee, Armitage Rhodes, F. X. Berlinguet, Henry O'Sullivan, of Quebec, C. Thomson, A. Campbell, Col. W. P. Anderson, Chas. A. Bigger, of Ottawa, C. E. W. Dodwell, of Halifax, N.S.; Prof. W. R. Butler, C. B. O. Symons, of Kingston; T Harry Jones, C. A. Waterous, of Brantford; G. J. Desbarats, F. R. Wilford, Iroquois, Ont.; Herbert J. Bowman, Berlin, Ont.; Wm. Crawford, of Sault Ste. Marie, Ont.; Owen O'Sullivan, of Lorette, Que.; Chas. J. Crowley, of Chaudiere, Que., and J. H. Sullivan, of Valleyfield, Que.

Among the invited guests who were unable to be present were, Messrs. Charles M. Hays, general manager Grand Trunk Railway; F. H. McGuigan, E. H. Fitzhugh, G. B. Reeves, W E. Davis and F. W. Morse, of the Grand Trunk Railway; T. A. McKinnon and Lucius M. Tuttle, of the Boston and Main system; W. A. Ritchie, of the Pullman Palace Car Co.; J. F. Wallace, president, and C. W. Hunt, secretary, of American Society of Civil Engineers; Wm. Jackson, city engineer of Boston, H. M. Whitney, president Dominion Coal Co.; J. E. Hardman, president, and B. T. A. Bell, secretary, of the Canadian Mining Institute, and Prof. S. H. Capper, president Quebec Association of Architects.

After full justice had been done to an excellent dinner the chairman proposed the "Queen," and in doing so expressed his regret that the last days of our beloved Queen should be distressed by the horrors of war, but there was one consolation for the sufferings of the South African war, and that was that it had manifested the solidarity of al parts of the British Empire, and it was bringing about the solution of more than one of the problems of that Empire. After the toast had been duly honored Prof. Bovey proposed the "President of the United States." He said the imaginary line between Canada and the United States marked no division in the hearts of the people who, though they might criticize each other in a friendly way, realized there was a kinship in sentiment as well as in blood. He never came to Boston without feeling loth to go away, and without carrying in mind some happy reminiscences of his visit. He hoped the Boston society would return this visit, and so increase those good relations which should subsist between kindred societies. The "Star Spangled Banner" was then sung, followed by "He's a Jolly Good Fellow."

"The Engineering Profession" was briefly responded to by C. H. Rust, city engineer of Toronto, who after returning hearty thanks said he wished to give place to L. J. Hirt, of the N. E. Gas and Coke Co. Mr. Hirt said Boston was practically the pioneer American city in developing the electric railway, having in the course of that development changed the types of motors five times. Boston was also one of the most advanced cities in solving problems of water supply and sewage, and owing to the number of rivers the difficulty of these problems had been increased. In the case of their own gas works they had to tunnel under the river, the work being done by compressed air. The iron pipe was laid concentrically in a wooden tube, and one of the unforeseen difficulties after the tunnel was finished was the sweating of the iron pipe. In the main pipe under the river this sweating amounted to six or seven barrels of water per day. In concluding Mr. Hirt laid stress on the value of practical and technical education; and spoke in high praise of the value of Nova Scotia coal in the work carried on by the company he was connected with.

With this toast the chairman particularly associated the names of Desmond Fitzgerald, late president of the American Society of Civil Engineers; Prof. Hollis, of Harvard University, and Prof. Lanza, of the Massachusetts Institute of Technology. Mr. Fitzgerald in thanking the chairman for his kind words said he felt all engineers were brothers, no matter to what part of the continent they belonged. He loved Canada, because he had often fished her rivers, climbed her grand mountains and explored her forests; but he never loved her as he did now. The Canadian Society of Civil Engineers was an honor to the pro-

fession, and he was surprised to learn that it now numbered 800 members. This fact showed the enormous development of the material resources of Canada. He spoke of the fine physique of Canadians, and remarked that when introduced to the first member he had to look up in the air to see his face. Engineering was the noblest of the professions, not even excepting law, divinity or medicine; for engineering was founded on horse sense, and this was the requisite of all. The engineer was the great unifier of the human race, for his work joined country to country, brought health to cities in pure water supplies, spanned the widest rivers and bridged the ocean itself by the steamship lines, which joined continent to continent. Mr. Fitzgerald's speech was enlivened with gleams of real Yankee humor, and was warmly received. Mr. McNab then gave a capital recitation from Dr. Drummond describing how Batisse came home from his sojourn in the States, and was followed by Prof. Hollis, of Harvard University, who said he was glad to meet the members of the Canadian Society of Civil Engineers at dinner, and to renew in this meeting the pleasant memories of his visit to Montreal under their auspices several years ago. It was to be hoped that this visit was only the beginning of many others, and that we may become neighbors indeed. Speaking to the toast he thought the words of an old friend would be very apt in this connection. This friend said, "Your profession bids fair to become the great profession of civilized nations. It provides for the homes, the material welfare, and the general well being of all people. The engineer will surely cure the tariff more effectively than the legislator, because he will by his labor saving machinery make tariffs unnecessary, and bring us to free trade." It struck the speaker that his function in modern times is far wider even than this. Mr. Fitzgerald had spoken of the railroads. Have we ever thought that the railroad system is more important in uniting the Atlantic and Pacific coasts of this continent than even a constitution framed by the people who live here? The States are bound together far more effectively by the steel rail and the telegraph wire than they could ever have been by written agreement. The Canadian Pacific is doing for Canada just what the Union Pacific has done for the United States. In contrast to the railroads in this country we have the necessity of marine transportation to Great Britain and her empire. The striking changes which have been effected by the engineer are seen in the readiness with which your country transports to South Africa an army of 200,000 men with their equipment, artillery and horses. This is almost beyond imagination—six thousand miles by sea made possible by the constructors of ships and machinery. It is no exaggeration to say, therefore, that the British Empire, or better still, its vast confederation of colonies, can be held together by means of the sub-marine cable and the steamships. It is this thought that should make us all proud of our profession and glad to belong to it. The presence in Boston at this time of the Canadian Society impressed him strongly with feelings of deepest sympathy for British people in the trials which war has brought upon them. He held by the English, as he believed that their cause is the cause of the Anglo-Saxon race, which stands as the great bulwark of civilization and individual freedom. He was sure that he spoke the thoughts of thousands of his countrymen when he expressed the deepest grief for our losses and the most heartfelt sympathy for us in this trouble. He for one followed the course of the war from day to day with the same interest and sympathy as he did two years ago that of their own war in Cuba. Time and acquaintance have brought England and America together. In Cambridge, four miles from here, he lived not far from a milestone marked "Eight miles to Boston." It was put up when this was an English colony, and the journey from Cambridge to Boston was made through Charlestown, and by ferry across the Charles River. We have many of the old colonial customs and institutions in Cambridge, and we cherish much of the old affection for English soil. No wonder then that we are drawn together at this time of trial to your people. Concluding, he hoped the two societies would soon meet again. Prof. Hollis' speech was received with much enthusiasm. Prof. Lanza on being called on said it was hard to believe Prof. Bovey was not a Yankee. He emphasized the unity of the two peoples. Referring to the toast he said the day was now past when law, divinity and medicine could monopolize the culture of the country. The great object of the professions was the best good for man, and the engineering profession stood for absolute truth, therefore, it must stand as the science of all sciences. With this great aim the engineer did not stop to consider party, and was not tied within the boundaries of a country, but aimed for truth and the good of man in general. He remembered how royally the American Society of Mechanical Engineers was welcomed in Montreal some years ago, and was glad such visits as these made the ties between the two peoples closer as time went on. After the singing of "Soldiers of the Queen," by Stuart Howard, of Montreal, F. P. Stearns, chief engineer of the Metropolitan waterworks, was called on and spoke of the work done by the State Commissions appointed by Massachusetts to deal with the water supply of cities and with the liquor traffic. The work of these commissions had been most satisfactory to the public, because the appointments had been kept out of politics, having been made by the governors, who had fortunately been able and upright men.

John Kennedy, harbor engineer, Montreal, then proposed the "Boston Society of Civil Engineers," and spoke in high praise of the hospitality of the Boston engineers, whose thoughtful attentions to the Canadian visitors had delighted them all. He was much struck by the evidences of strength and prosperity shown by the Boston society, which now numbered 500 members, many of whom took such high rank in the profession in the United States. Boston was not only a pioneer in the development of electric lighting and the electric railway, but was to the front in dry docks and other harbor works. These advances were due to the able work of engineers, and he heartily wished every success to the Boston society.

Three hearty cheers were then given for the Boston society, and Lewis Skaife followed with the song "The Absent-Minded Beggar," to which he added the following original topical verses:

When you've feasted at the Brunswick, when you've kept it up o' nights,
  When you've dined and wined the Boston engineers,
When you've swung around the circle and have seen the Boston sights,
  And have listened to the wisdom of the seers,
You'll be absent-minded beggars for a day or two at least,
  And your wits will have a tendency to leave you,
So you'd better stay in Boston with the wise men of the East,
  Who have done a lot o' little things to please you,
You stay, I'll stay—stay till we sober down,
  Montreal can wait for us till some other day,
Each of us doing our country's work surveying this Boston town,
  We've found the service pleasant, and we'll stay, stay, stay.

Some day they'll come to see us, these same Boston engineers,
  And we'll find a way to keep them when they come,
We'll dine them at the Windsor and we'll drink the cup that cheers,
  And we'll make them feel exceedingly at home.
We will build a solid highway from St. Lawrence to the Bay,
  We'll be brothers in behavior as in blood,
We will join in an alliance that will never pass away,
  And we'll face the world together for its good.
We'll join, they'll join, allies forevermore,
  A hundred million freeborn men here and over the sea,
Each of us helping the common cause (and this shall our motto be)
  Liberty, fraternity, and the world as it ought to be.

Prof. C. Frank Allen replied to the toast, saying it seemed queer for himself and members of the Boston society to be playing the part of guests in their own city, and the situation seemed to show that it was more blessed to give than receive. He spoke of the intimate and pleasant relations of the men of Boston and Montreal, an intimacy that had largely been brought about by the work of engineers, starting with Stephenson, whose achievement in building the great Victoria bridge had opened up direct railway communication between Boston and Montreal. He had not thought it possible to get as much enjoyment out of the visit of the Canadians as he had got, and he hoped this would not be their last visit.

Mr. O'Sullivan, chief of surveys of Quebec, after referring to his very pleasant trips to Boston, the first having been made in 1856, gave a comic song, "The Old Irish Stew" to the tune of the "Red, White and Blue," which was sung with a rousing chorus.

Howard A. Carson, engineer of the subway, was called on and in a thoughtful speech referred to the imaginative faculty of the engineer, who must have in his mind a conception of the structure or work he sets himself to do before it exists in fact. The imagination must of course be bound by the laws of nature, or the engineer would find himself as disappointed a man as the southerner who recently conceived the

idea of setting monkeys to pick cotton. Judging from the deftness of monkeys he thought he could revolutionize cotton picking, as one man might look after 20 monkeys, who could pick ten times as fast as the human cotton picker; but when he got to work he found it took about 20 men to look after one monkey, and the problem baffled him. He predicted that the work of the engineer would obliterate tariff walls, and while we might have our local governments and institutions, we did not want to have any fellow looking into our trunks when we crossed a boundary, but we wanted our horses, our timber, our coal and other products freely exchanged between the two countries.

Prof. Swain, of the Massachusetts Institute of Technology, also spoke of the satisfaction it gave him to know that the Canadian society had chosen Boston as the objective of their excursion. The ties between Canadians and Americans were growing, and they have never been so strong as they are at the present time.

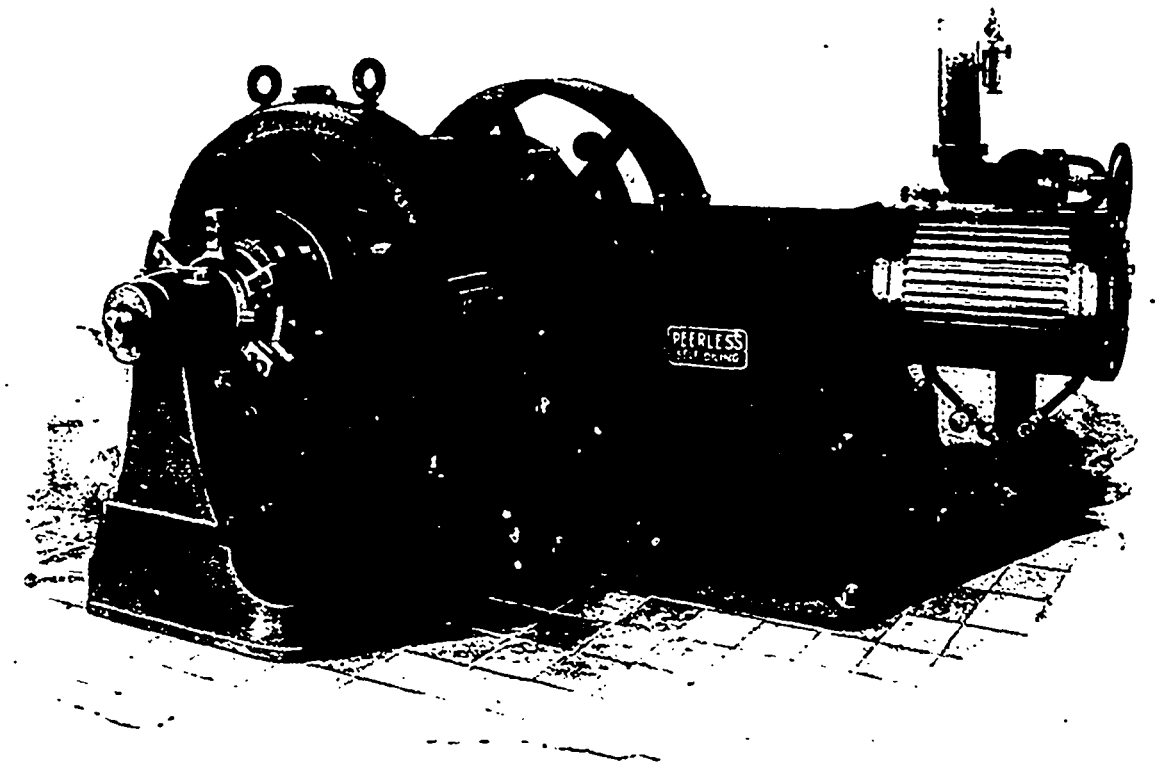
Mr. Dodwell, of Halifax, then sang "In Cellars Cool," and in response to an encore gave "Simon the Cellarer"

Prof McLeod, of McGill University was called on to reply to the toast of "Our Society" Briefly returning thanks he laid down for himself the law that as secretary of the society his work was to do and not to talk

THEELECTRIC LIGHTING AND POWER PLANT OF VICTORIA HOSPITAL, LONDON, ONT.

One of the most efficient electrical equipments installed during last season was that of the Victoria Hospital at London, Ont. A rigid specification was prepared by the Gilbert Wilkes Engineering Co., of Detroit, under whose supervision the work was installed and tested. The plant, consisting of two direct connected engines and generators of 43 h.p. and 32 k w capacity respectively, were to be of noiseless operation, to have a regulation within two per cent. limit, and a capability of being overloaded to twenty-five per cent. for several hours without injury The contract was secured by the Electrical Construction Co., of London, Ltd., who have installed the entire plant, which has been in use now about five months, giving the very best of satisfaction.

Being a duplicate plant it has been customary for the engineer-in-charge to run each unit for twenty-four hours alternately with the other, as light and power are required continuously throughout the building. However, beginning with 17th February, one of the generating sets was started on a 7-day continuous run night and day, at the end of which temperatures were taken showing the following temperature rise of the different parts above the surrounding atmosphere: Commutator,



DIRECT CONNECTED ENGINE AND GENERATOR, INSTALLED AT VICTORIA HOSPITAL, LONDON, BY THE ELECTRICAL CONSTRUCTION COMPANY OF LONDON, LIMITED, AND E. LEONARD, ENGINEERS, LONDON, ONT.

Charles Baillairge consulting engineer of Quebec city, was also called on and compared the work of the engineer with other professions, with the conclusion that engineering was the head of all professions A general had to look at things around and facts that were visible, but an engineer had to look into and through things, and to draw inferences from things that were not visible or but dimly known When one looked about him he would see that all the comforts of modern life were due to the skill of the engineer.

Prof. Bovey here proposed the health of Mr. Metcalf, who had personally done so much for the visitors, and the toast was drunk with "He's all right."

"The Ladies" were remembered in a humorous speech by Col. Francis, resident engineer of the N. Y., N. H. and Hartford Railway, and by T. H. White, of Montreal.

Before separating the president reminded the company of the forthcoming convention of the American Society of Civil Engineers, to be held this year in England, and he hoped not only that the attendance of Americans would be large but that many Canadians would join.

11° C., armature core, 17° C., crank pin journal, 17° C.; left bearing of engine, 13° C.; right bearing of engine, 11° C.; oil of engine, 16° C., field coils of dynamo, 9° C. Considering that a limit is allowed in general engineering practice of 40° C., and sometimes 50° C., the above figures are exceptionally satisfactory. During the week the load had varied between ten per cent. overload and one fifth of full load, no adjustment of the brushes being necessary nor was any special attention required.

The engines which are supplied by E. Leonard & Son, of London, are of their new Peerless self-oiling type, and are lubricated automatically in all parts without attention. Renown engine oil being used for all bearings, and Capital Renown for the cylinder. A description of the principal features of this new engine, which is having a large sale, was given in our December number.

The equipment is electrically controlled by means of a handsome Tennessee marble switch-board, provided with ten light circuit switches, five motor circuit switches, main switches, pilot lights and rheostats, etc., making a very compact and well arranged board. The plant also furnishes power for two direct

connected elevator equipments installed by Malloch & Co., of London. The electric motors and controllers of which were furnished by the Electrical Construction Co., of London, Ltd., who also installed two motors direct belted to fans, which are used to exhaust the air from the entire building. The fan motors are of the bi-polar type, and have a speed controller. The smooth running of the engines, and the steadiness of the voltage of the electric plant, have called forth high compliments from the many visitors to the new institution. The engineer and mechanical superintendent is Samuel S. Glass.

THE ENGINEERS' CLUB, TORONTO.

The annual dinner of the Engineers' Club of Toronto, took place at the Rossin House, Toronto, February 8th, and the following gentlemen were elected to the various offices for the ensuing year: President, Kivas Tully, vice-president, Prof. Jno. Galbraith; directors, C. H. Rust, representing the civil engineers; R. W. King, the mechanical engineers, and T. R Rosebrugh, the electrical engineers, treasurer, T. B. Speight, secretary, Wilhs Chipman. Among the members who participated in the annual dinner at the close of the business meeting were the following: Kivas Tully, C. M. Canniff, C. E. Cooper, — Brodie, W. A. Clement, Henry F. Duck, Jno. A. Duff, Fred. G. Durnford, J. A. Ellis, W. A. Johnson, Henry A. Gray, — Gordon, Jno. Galbraith, G. H. Hanning, R. W. King, E. H. Keating, Geo. R. Mickle, J. G. Maybee, E. Phillip, Rod. J. Parke, Jno. G. Ridout, C. H. Rust, T. S. Scott, T. B. Speight, R. T. Tate, Geo. White Fraser, Jno. Williams, C. H. Wright and P. M. Wickens. The usual toasts, with music, concluded a very successful entertainment.

CANADIAN ASSOCIATION OF STATIONARY ENGINEERS.

PRODUCTS OF COAL.

The monthly open meeting of the Hamilton Branch of Stationary Engineers was held February 20th. The principal feature of the evening was an address by J. M. Williams of J. Wmer & Co., on the subject of products that could be obtained from coal. The address was illustrated throughout by means of blackboard drawings, and specimens of the various substances named were on exhibition for the inspection of the members present. It was demonstrated that after the first product, which was heat, the next two of greatest importance were gas and coke. From the coke we obtain electric light carbons, and carbide of calcium used in the production of acetylene gas Coal tar was the next production, and as the substances obtained from the distillation of this tar are practically innumerable, the principal products only were touched on.

We first obtain from coal tar a substance called benzol, which, combined with nitric acid, forms nitro-benzol, which is used extensively in the making of perfume. Next we procure carbolic acid, then creosote, a substance used for preserving railway ties, wharves, etc. Then follows naphthaline, used in the manufacture of camphor balls; in exceptionally cold temperatures this substance sometimes blocks up the gas pipes. We then obtain solid paraffins, principally in the form of waxes. The last product obtained through this distilling process of coal tar is pitch.

It was then shown how the articles and productions mentioned were applied to the manufacture of modern commodities of everyday use. The explosives used in modern warfare are composed largely of materials obtained from coal, such as carbolic acid, etc.; naphthaline goes into some of them, and is used in some of the cartridges of the present day. The speaker then exhibited samples of cordite and other explosives, and explained how smokeless powder differed from ordinary gunpowder. It was shown how natural articles of commerce were being imitated by productions from coal tar, such as oil of wintergreen, obtained from carbolic acid, musk, saccharine, which is 500 times sweeter than common sugar, and also artificial perfume resembling flower of lilac. In some diseases saccharine can be used where sugar could not. Gum-benzoic, naturally obtained from the sap of a tree grown in eastern countries, a substance which has been used from earliest times in making incense, and in all probability utilized in the preservation of mummies, is now artificially made in the form of benzoic acid. Mr. Williams had on exhibition a piece of gum-benzoic, which was over two hundred years old. A substance is also obtained from coal tar, which is used for much the same purposes as quinine in medicine.

At conclusion of the address a hearty vote of thanks was tendered Mr. Williams for his trouble in preparing such an interesting and exhaustive address on the subject. L. B. Mann, of Boston, a well known stationary engineer, addressed the meeting before it closed, and announced that he would be present at some meeting in the near future and address the members at some length. H. J. Wickens, of Toronto, made a few remarks, and a paper from him on electricity is looked for in the near future.

DOMINION ESTIMATES.

Railways and Canals.—The amount to be voted is $4,570,902, as against the current vote of $4,855,472. Of this the Intercolonial Railway is to receive $1,545,902, being $95,216 of a decrease. The Prince Edward Island Railway receives $713,500, as against $268,000 for the current year. Canals receive $2,311,500, as against $2,944,454 for the current year. The canal items are:

Soulanges canal, *construction*, $350,000; Sault Ste. Marie canal, construction, $40,000; Lachine canal, construction of lock, $500,000: Lachine canal, dredging between locks 2 and 3 and basin, $21,000; Lachine canal, building slope walls, $11,000: Lachine canal, build a quadrant pontoon gate, $20,000; Lachine canal, installation of electric light, $40,000; Lake St. Louis, forming channel, $14,000: Grenville canal enlargement, $5,000; Lake St. Francis, removing shoals, $5,000; Cornwall canal, enlargement, $60,000; Farran's Point canal, enlargement, $69,500; Galops canal, enlargement, $441,000; North Channel, forming $200,000; Galops Rapids, forming channel, $100,000; St. Lawrence River and Reaches, surveying, buoying, etc., $15,000; Trent canal, construction, $320,000; Welland canal, improvements to Port Colborne entrance, $100,000; total, $2,311,500.

In addition to the above which are chargeable to capital, there is $245,927 to be voted chargeable to income. Of this $9,000 is for Lake St. Francis; $17,000 for the Lachine canal, including $3,000 for new steel rollers for Wellington street bridge; $10,000 for St. Ours locks; $31,700 for the Carillon and Grenville canals.

Public Works, Capital.—The amount to be voted is $476,000, being an increase over the current vote of $24,000. Of this $433,000 is for the St. Lawrence ship canal, being the same as the current vote.

Public Works Income.—The amount to be voted is $1,995,423, as against $2,224,576 for the current year. The following appropriations are for Quebec:

Dominion public buildings, $12,000: Grosse Isle quarantine station, $10,000: Montreal public buildings, $5,000; Quebec Citadel, Governor General's quarters, $2,000; Quebec custom house and examining warehouse, $2,000: Quebec immigration buildings on Louise embankment and breakwater, and Queen's wharf buildings, $5,000.

Harbors and Rivers.—Anse aux Gascons (Port Daniel East), breakwater, $1,300; Baie St. Paul (Cap aux Corbeaux), extension and repairs to wharf, $2,000; Beauport, wharf, $4,500: Berthier (en bas), repairs and open shed, $1,000, Carleton, extension of landing pier, $1,000; Grosse Isle, repairs to wharf, $1,500; general repairs and improvements to harbor, river and bridge works, $10,000; Lanoraie, repairs to wharf, and construction of ice breaker, $2,500; Longueuil wharf, reconstruction and repairs, $2,500; Lower St. Lawrence, *removal of rocks*, $1,500: Magdalen Islands breakwater, $10,000; Matane, extension of training pier southwardly, $4,000; New Carlisle, repairs to wharf, $500; Newport breakwater, $7,000; Perce (North Cove), wharf, $10,000; Rimouski wharf repairs, $3,000: Riviere Cap de Chatte, pier, $600: Riviere a la Pipe, wharf on Lake St. John, near mouth of river, $1,000: River St. Maurice, channel between Grandes Piles and La Tuque, dredging, $6,300; St. Alexis, Baie des Ha! Ha! pier, $4,000; St. Alphonse (Bagotville), landing pier, repairs and shed, $500: Ste. Anne de Sorel, ice piers, $2,000: St. Fulgence, pier and improvements, $1,500; St. Jerome (Lake St. John), wharf, $2,500: St. Laurent, repairs to wharf, $700.

ARNOLD MAGNETIC CLUTCH.

In the design of the modern electric power plant it is frequently found desirable to arrange the generators in such a way that they may be readily connected or disconnected to the prime movers according to the exigencies of the service. This requirement of station design has been met by Br. Bion J. Arnold in the system known by his name. As this system requires the use of clutches, Mr. Arnold has worked out a magnetic clutch, a number of which have already been built.

These clutches are in reality friction clutches, yet the friction between the contact surfaces is not due to mechanical pressure, but to magnetic traction. The working parts of the clutches are composed of metal having a high permeability so arranged as to become magnetized upon the passage of direct current through the coils with which they are provided. The two parts of the clutch can be attracted together in this way with a pressure far in excess of that obtained in mechanical clutches, and it is only a question of making the clutches large enough to enable them to transmit power in any desired amount. The energizing circuit is controlled by means of a switch placed at a convenient point, which is quite a decided advantage over the ordinary friction clutch. It thus becomes possible in throwing a generator in or out of service to control it entirely from the switchboard, where all the regulating devices and measuring instruments are within the reach of one attendant. These magnetic clutches also possess the advantages of neat appearance and compact design. Even in the larger sizes the amount of space occupied upon the shaft is not much more than twice the diameter of the shaft, and by using a flange forged solid on the end of the shaft, they can be made to occupy even less space when used as cut-off couplings. Owing to their having no projecting surface or parts to catch the air when in operation the windage resistance is negligible. The greatest advantage, however, of this form of clutch over others is the fact that it is self-contained—the "action and reaction" being within the clutch itself, and consequently there is no resulting end thrust upon the shaft bearings and no additional friction load due to the operation of the clutch. The illustration, Fig. 2, shows the largest magnetic clutch in the world. It is 100 inches in diameter, and is capable of transmitting 3,000 h.p. at 150 revolutions per minute. This clutch is one of three now in use connecting the engines and generators in the central station of the Imperial Electric Light, Heat & Power Company at St. Louis, a view of the equipment of which is shown in Fig. 1. The experience with this plant demonstrates that this form of clutch is applicable to the large size units now being installed for power station purposes, whereas the ordinary friction clutch becomes especially unwieldy and unsightly after passing the 500-h.p. size.

The current is carried to the clutch coils through contact rings upon the side of the clutch, and carbon brushes held by insulated brush holders. The electrical connections are simple and easily accessible for inspection. The clutch requires no more current than would be used by four 16-c.p. incandescent lamps, and the loss in the clutch due to the continuous use of the electric current while the clutch is in operation amounts to only one-hundredth of 1 per cent. of the power transmitting capacity.

A number of these clutches have been made to connect large synchronous motors to their load in such a way that they can be quickly disconnected in case of accident, and they have also been built for use upon line shafting. They are also particularly applicable to use in connection with gas engines, as they would eliminate the flywheel problem of the gas engine in many cases, which of itself would be a distinct advantage. Indeed, there would seem to be no limit to their use wherever it is desired to transmit power from one shaft to another.

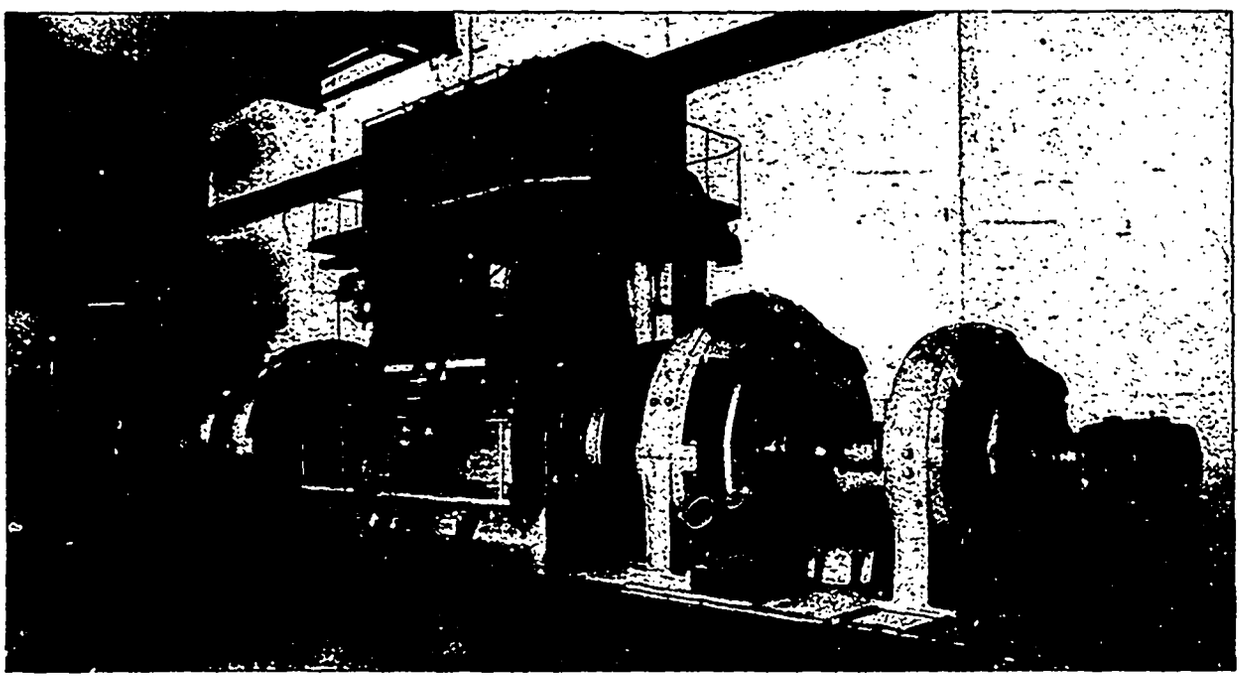


FIG. 1. THE IMPERIAL ELECTRIC LIGHT, HEAT AND POWER CO.'S PLANT, ST. LOUIS, U.S.

ELECTRIC TRAVELING CRANES

One of the subjects discussed at the Engineering Conference of the Institution of Civil Engineers in England last year was "Cranes and the Power to be Used with Them." The debate was opened by Walter Pitt, who spoke strongly in favor of electric power; indeed, he recommended it for all cranes, except those used singly, or with a great range of portability. Of course his views did not go unchallenged, seeing that he allowed but little future for the hydraulic crane, which is eminently adapted for certain classes of work. But he carried his audience with him entirely when he said that electric driving was the only one to use for overhead travelers. This is a matter which admits of no argument; the great requisite of an overhead crane is convenience in use and manipulation. There are others, but this is the chief, for a crane which can be used quickly and easily will very soon save its cost in a works. There are no travelers which fulfil this condition like those driven by electricity, particularly when the designer has had the courage to avail himself to the full of the agent which he employs. The early cranes had one motor, and the power was distributed from this to the hoisting barrel, and to the longitudinal and traversing gears by belts or other mechanisms. The arrangement was an improvement on the familiar square shaft, but still it was very faulty. It showed that the designer feared the electric motor

would give trouble, and, therefore, he thought it wise to restrict himself to a single one. No doubt he was right; motors have been immensely improved of late years, and in no respect more than by the use of the carbon brush. Without that it would have been a difficult matter to have brought the electric tramcar to the point of commercial success which it now enjoys, and other forms of motive power transmission would have failed, in a greater or less degree, to attain their present established position.

The success of the electric tramway upsets every possible objection which can be raised against the reliability of the electric motor for other purposes. On a car it runs among slush and mud, is stopped and started every two or three minutes, and has often to get into motion under loads many times the normal. It may safely be said that if an electric motor succeeds in such work—and it certainly does succeed—it may be employed with the fullest confidence in every position in an engineer's shop, for there it meets with skilled care, and the greatest demands that can be made upon it are uniformly easier than those found in a tramway. It may be a moot point how far the subdivision of electric power should be carried in the driving of tools, but its applicability and economy of power when used in traveling cranes has passed beyond the stage of discussion. The question of economy in the driving of a crane is, however, of little moment. What does matter is that no time shall be lost at the tools. Lathes, planing machines, and other appliances now represent such an immense capital outlay that it is most imperative that they shall work every available minute, and this can only be done if the work can be lifted in and out with expedition and with certainty. For this work there is nothing on the market equal to the electric crane.

The most advanced practice in overhead travelers is to use a separate motor for each motion. It is not many years that Messrs. Adamson have been making cranes, their original business being that of boilermakers, and it will be interesting if we trace their connection with the new industry, as their experience reflects in a general way the history of the electric crane in this country, says Engineering, London, Eng., in a recent issue. In the early nineties the firm were in want of two additional overhead cranes, and after considerable enquiries they determined that they should be electrically driven, and that they would build them themselves, because at that time the established makers did not recommend this application of electric power. The makers of motors also cast very considerable doubt on the advisability of using reversing motors, while at the same time the cost of the motors was very high. In 1893 one of the firm went to the United States, and soon found that there did not exist the same hesitancy about using reversing motors on the other side of the Atlantic as here, and he returned with the conviction that they might proceed with confidence. On November 5, 1894, they set to work their first three-motor crane, and during the next two years they constructed cranes for their own shop, proceeding tentatively and experimenting at their own cost rather than at that of their customers. In that period they built five or six cranes, not only as regards the ironwork, but also the motors and the electrical equipment. In 1897 they began working for the public, and have since turned out cranes of various sizes.

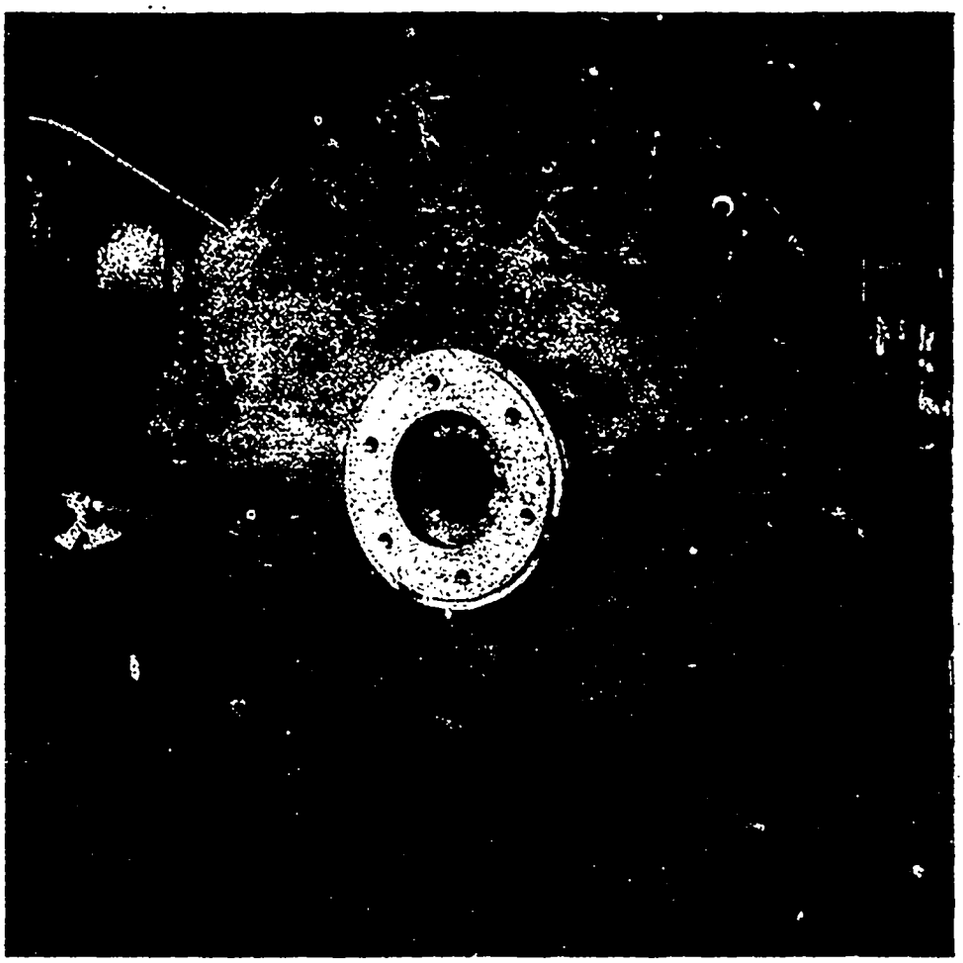


FIG. 2 ARNOLD MAGNETIC CLUTCH.

The latest crane has four motors. Their purposes are respectively to drive (1) the main barrel, (2) the light barrel, (3) the longitudinal motion, and (4) the traverse motion, and all are supplied with current at 220 volts. The main lifting speed is 4 feet per minute, the corresponding motor running at 400 revolutions per minute, and the barrel being 2 ft. 6 in. in diameter, there being three intermediate shafts between the motor and the barrel. All these spur gears are machine cut out of the solid, except the last two, which are of the double helical type, all being of steel. The first motion wheel has a bronze rim bolted on it. The use of keys is avoided wherever possible, the pinions are forged solid on their shafts, and the wheels are keyed on prolonged bosses formed on the pinions to receive them. The load is carried by a steel wire rope 5 inches in circumference, passing in two bights round two sheaves on the hook block. The two ends of the rope are fixed to the drum, and the centre bight is led round an equalizing pulley, thus

giving a true vertical lift. The light lift is intended to deal with loads up to five tons, and has a barrel 1 ft. 4 in. in diameter, around which is wound from each end, a steel rope 2¼ inches in circumference. The speed of lifting is 15 feet per minute, and the revolutions of the motor 300 per minute. The speed is reduced at two steps by one worm reduction and a pair of spur-wheels. The worm has four threads, and gears into a wheel with machine-cut teeth on a bronze rim. The worm runs in an oil bath, and its thrust is taken up in a thrust bearing of the marine type. Both lifting drums are control'ed by electric brakes. These are fixed to the motor shafts, and work automatically without care on the part of the attendant. The brake wheel is pressed on by shoes applied by springs and released by an electromagnet, which is energized when the current is directed to the corresponding motor. Thus, should the current fail from any accidental cause, the brake goes on immediately, and holds the load safely. On the other hand, immediately the attendant sets the crane to lift or lower, the brake is taken off. Should the load, in falling, drive the motor too rapidly, the back electromotive force would reduce the current, and the brake would go on of itself.

The longitudinal motion of the crane is effected by the motor fixed on the end of the main girders, the speed of the motor, 300 revolutions per minute, being reduced at two stages to give a traveling speed of 80 ft. per minute. The traverse motion is derived from the motor. This runs at 500 revolutions, and gives a speed of 40 ft. per minute through two reductions. The power absorbed by the four motors is as follows when the crane is fully loaded. Main hoist, 25 brake h.p.; auxiliary hoist, 12 brake h.p., traversing, 7 brake h.p., and traveling longitudinally, 5 brake h.p. Leaving for the moment the electrical equipment, we will turn to the dimensions and construction of the crane itself. The height of lift is 22 feet, the span is 27 ft. 4 in., and the distance apart of the girders, centre to centre, 7 ft. 6½ in.

THE ONTARIO ASSOCIATION OF LAND SURVEYORS.

The convention of the Ontario Land Surveyors was held on Feb. 28th and March 1st in the Parliament Buildings, Toronto. The attendance was large, and the interest displayed most gratifying throughout, especially in the proposal to explore New Ontario. The election of officers resulted as follows: President, Geo. Ross, Welland; vice-president, James Dickson, Fenelon Falls; secretary-treasurer, Major Villiers Sankey, Toronto; Auditors, Capt. K. Gamble, H. J. Browne. The following were nominated as councillors, election to take place by letter ballot on April 3: Capt. W. F. Van Buskirk, Stratford; Messrs. A. J. Van Nostrand, Toronto; E. T. Wilkie, Carleton Place; W. R. Aylesworth, Belleville; J. W. Tyrrell, Hamilton; H. H. Gibson, Willowdale; A. S. Code, Alvinston; John McAree, Rat Portage.

The next issue of The Canadian Engineer will contain a more detailed report of the meeting.

METAL IMPORTS FROM GREAT BRITAIN.

The following are the sterling values of the imports from Great Britain, of interest to the metal trades, in January, 1899 and 1900:

	Jan. 1899.	Jan. 1900
Hardware	1,538	2,068
Pig iron	361	2,090
Bar, etc	445	1,100
Railroad		321
Hoops, sheets, etc	125	2,005
Galvanized sheets	488	5,736
Tin plates	5,685	14,738
Cast, wrought, etc., iron	997	3,291
Old (for remanufacture)		2,485
Steel	3,770	22,449
Lead	889	1,052
Tin, unwrought	2,515	3,377
Alkali	1,543	2,691
Cement	213	272

THE PROPERTIES OF NICKEL-STEEL.

Brief notices have appeared from time to time in The Comptes Rendus of the French Academy upon M. Guillaume's important researches into the physical properties of the various alloys of nickel and steel, but the complete details of these investigations have not been made public until recently. A paper by M. Guillaume in The Bulletin de la Societe d'Encouragement now describes the apparatus and methods used by him, and also gives the results of his researches more completely than they have been given heretofore. While it is impossible, in limited space available, says The Engineering Magazine in reviewing the article, to examine the work of M. Guillaume at length, the peculiar properties which he has discovered possess sufficient importance to demand a brief indication, and may render the application of the alloys important for engineering purposes in different lines from those previously considered. The principal object in view, in making these researches, was the discovery of the best alloy for metrological purposes, and the investigations covered the density, elasticity, magnetic properties, and behavior under the action of heat. They were not intended to cover the entire magnetic properties of the various alloys, but only to use these as guides to the selection of suitable proportions for further investigation. These tests showed that alloys containing from 0 to 25 per cent. of nickel are irreversible—that is, they possess two different sets of magnetic properties, according to the direction of the preceding temperature-changes, whether ascending or descending. For alloys containing 25 to 50 per cent of nickel, on the contrary, the magnetic properties are reversible, depending at each temperature upon the temperature only, regardless of the preceding condition.

A similar condition of reversibility, or irreversibility, appeared in connection with changes of volume, the irreversible alloys showing, within certain limits, absolutely different changes when subjected to ascending and descending temperatures. The reversible alloys expanded and contracted in the same manner, whether cooled or warmed, but seemed to follow laws altogether different from those governing other metals or alloys. The peculiar behavior of the irreversible alloys can be shown only by a diagram, but the expansion and contraction of the reversible alloys is tabulated in a very interesting manner. The formula for the coefficient of expansion is given in the shape of a constant plus a function of the temperature, but neither the constant or the coefficient remains the same for different alloys. As the proportion of nickel is increased, the coefficient of expansion diminishes until the minimum is reached for the alloy containing 35.6 per cent. of nickel, after which it again increases. At this minimum proportion the expansibility is only one-tenth that of platinum, and less than one-twentieth that of brass. The great value of this alloy, for standard measures of length will be seen at once, especially as it possesses other desirable qualities. The alloy is particularly homogeneous, takes a brilliant polish, remarkably free from flaws, and has a density of about eight and a modulus of elasticity of about 20,000,000 pounds per square inch.

In order to attain the best results, the bar of this alloy is subjected to a prolonged elevation of temperature, lasting for several days, after which the molecules appear to have arranged themselves in the most stable position, so that the subsequent changes of length for differences of temperature are reduced to a minimum. The influence of this reheating also renders the small, but ordinarily somewhat variable, expansion coefficient practically constant. If it is desired to secure a variation of less than 0.001 millmeter in a length of one meter, the bar should be maintained at a temperature of boiling water for 80 to 100 hours. A still greater degree of precision may be obtained by giving the bar a series of prolonged heatings for several hundred hours at successively diminishing temperatures; in this way bars for the measurement of geodetic base lines may be obtained with the temperature error practically eliminated.

A variation of 1 mikron per meter in the length of a pendulum corresponds to less than 0.05 second per day; in fact, a clock with a pendulum rod of this alloy has shown a rate of less than 0.02 second per day for a period of six months.

Although the researches of M. Guillaume are not yet completed, the facts which he has made public are of much value, and his full account of his work will be found both interesting and practical.

NOTES ON THE DEPOSITION AND DEVELOPMENT OF THE GLACE BAY COAL SEAMS.*

BY S. F. KIRKPATRICK, B.SC.

At the commencement of carboniferous times the north-eastern portion of Cape Breton was overlain by a deep clear sea, favorable to the growth of coral and the deposition of limestone and gypsum. At the close of the lower carboniferous age the sea became shallower and towards the end of the formation of the millstone grit we find the rivers depositing clay, coarse sand and gravel. The succeeding age was one of extensive vegetable growth; and the rising sea-bottom became in part a swamp where the successful growth of forests deposited great depths of bituminous matter. The vegetable matter from the land probably accumulated at certain times in the shallow sea in sufficient quantities to form coal seams. When the land slowly sank fine sediment was carried down by the rivers forming shales and sandstones. These are impregnated with fossil remains of plant life and in some cases fossil animal remains.

Later on the former conditions may have been reproduced by a further upheaval or shallowing of the sea. So with the action of time and pressure we have a formation composed of sandstones, shales and marls containing beds of coal. During the ages that have passed since the carboniferous times, part of the coal measures have been worn away, a large area sunk beneath the Gulf of St. Lawrence and the continuity of the beds destroyed by faulting. The strata has also been thrown into undulations, so the dip and strike of the coal seams vary very considerably at different parts of the Cape Breton coal fields. There is reason to suppose that this coal field is only the end of an immense coal area, now underlying the Gulf of St. Lawrence, extending to Newfoundland, and underlying the Magdalene Islands.

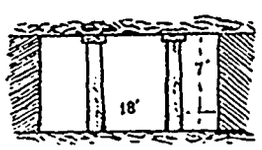
The Glace Bay coal beds, worked by the Dominion Coal Co., form an eliptical basin, the longitudinal axis running nearly due east and west. The greater part of this basin is under the sea; the western end only being available for mining operations. This portion is bounded on the north and east by the sea coast, and on the west and south by the anticlinals of Lingan and Cow Bay. The Lingan anticlinal is also a line of faulting, and it is as yet undetermined if there is a fault along the Cow Bay anticlinal. In this basin there are four seams of coal of considerable thickness that may be worked profitably. They are as follows:

	Approximate thickness.
Hub, coal	8½ feet.
Sandstones, shales and limestones	320 feet.
Harbor, coal	6 feet.
Sandstones, shales and limestones	400 feet.
Phelan, coal	7 feet.
Sandstones, shales and limestones	165 feet.
Emery, coal	5 feet.

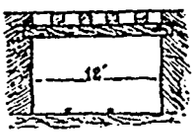
The inclination of the seams vary, but it is usually under six degrees. Of the six collieries hoisting in 1898, four were working the Phelan seam, viz., Caledonia, Dominion No. 1, Old Bridgeport and Reserve.

The question of where to locate the opening of a mine and what form of opening is best generally depends on the property. A thorough knowledge of the extent of the seam, its depth, inclination and thickness are required. These facts may be obtained by examining the outcrop, and boring through the overlying strata, and further verified by slopes and drifts. Usually in mountainous country, where the strata is at a considerable inclination, it is practical to work the coal by tunnels. But in this particular case the choice lies between shafts and slopes. The latter are adapted to seams at a considerable inclination, where the outcrop is on the property, and a cheap development required. Shafts are necessary when the seam is only slightly inclined or when two or more beds are to be worked from the same bankhead. They are also best adapted to mining on a large scale, when quick returns are not so important as the ultimate cost of raising coal per ton. The question of where to sink the shaft depends, to a great extent, on the amount of capital available for development. If the shaft is sunk well to the rise the cost of hauling the coal to the pit bottom is greater, but the cost of sinking less and an early output is available. On the other hand a deep shaft would allow of a less costly system of haulage, but would take more time and money. Up to the present the greater number of the Glace Bay coal pits have compromised by sinking a shaft from 150 feet to 180 feet deep, so at first a large part of the coal could be brought to the pit bottom by gravity. This plan will no longer be followed as the Dominion Coal Co. is engaged in sinking a deep shaft to work more than one seam. Usually the shaft has three compartments, two for hoisting the mine cars and one for a man lift. The dimensions will depend to a great extent on the shape of the mine cars, which is governed by the thickness of the seam and the character of the roof. The former regulates the height of the car and the latter the breadth, because a brittle roof will allow of wider workings and consequently wider cars.

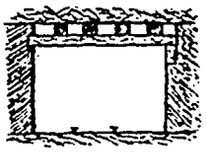
The question of the method to be employed in working the coal now arises. The chief systems are the long-wall and the pillar and stall. By the former all the coal is taken out by cutting along the wall or face of the coal, either commencing from the shaft and working out towards the boundary or by running tunnels or haulage ways to the boundary and working towards the shaft. This would be adapted to shallow seams, especially where there is a sufficient amount of splint slate, etc., in the coal to make supports, called gob-walls, for the roof. Usually, however, the roof is allowed to fall in, then if the surface property is of value there must be a sufficient depth of overlying strata to prevent the cave-in coming to the surface. By the pillar and stall method only part of the coal is removed by cutting out tunnels or rooms and leaving sufficiently large pillars of solid coal to support the overlying strata.

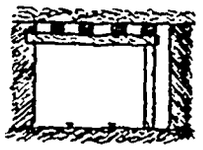


ORDINARY ROOM TIMBERING.



IN LEVEL WHEN NO PROPS CAN BE USED.


ROOF AND ONE SIDE BAD.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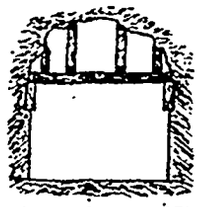
LEVEL OR DEEP AFTER FALL OF ROOF.

At the Glace Bay coal fields almost all the coal is mined in this way, for on account of the thickness of the seam and the small amount of rubbish in the coal they would have to allow the roof to cave in, when much damage would be done to the surface property. Of course it would be possible to support the roof by a system of blocks and heavy timbers, but such a method would be too costly. After sinking to the seam, levels are run out in the direction of the strike of the coal and the deeps, two or more run parallel or radiating from the pit bottom. Both deeps and levels are worked in pairs, that is two parallel tunnels usually 12 feet wide with a 12-foot wall between them. Every 66 feet they are connected by a 9-foot cross-cut, to allow the air to circulate and so ventilate the working face. A large part of the coal around the shaft is not mined but allowed to remain to prevent the settling of the ground under the bankhead and the surface buildings that are generally around the shaft. The rooms or stalls are cut off from the levels, and are worked towards the outcrop parallel to the plane of the coal.

They are about 18 feet wide with a 12-foot wall between them, and are connected every 66 feet by a 9-foot cross-cut. After working some distance down the deeps, levels are turned off as before, and rooms are commenced on this level to cut up

*From a paper read before the Applied Science Society of McGill University, Montreal.

to the higher level. In this way the entire coal area is honeycombed from the shaft out towards the boundary. When the whole area has been worked in this way, part of the remaining 40 per cent. of coal may be recovered by robbing the pillars, that is removing the whole or part of the remaining coal, working from the boundary, allowing the surface to fall in if necessary.

The timbering of a pit worked on this principle is not extensive. The overlying strata is supported by the coal pillars; but the roof of the rooms must be further supported by one or two rows of timber, say 6 inches in diameter, and placed from 4 to 8 feet apart. Occasionally the roof of the haulage ways is supported by cross timbers set in the walls or resting on one or two props. The timbers used in the main airways are usually the best 8 inch props, for there the timber is more liable to rot, due to the large quantity of air that flows past having a very deteriorating effect on them. If the coal pillars at any part of the mine begin to crush on account of the weight of the overlying strata, then very heavy timbering must be resorted to, and a larger percentage of the coal left as pillars. On the traveling roads and haulage ways the old props are frequently replaced by new ones, for the average length of a prop is only from two to four years, and on main airways often not a year. Before the work of development has advanced very far it is necessary to put in some system of haulage. The mine cars here have a capacity of from 1½ to 2 tons, and run on a narrow gauge tramway. They are filled at the working face, and are drawn by horses to the main deeps and levels. The coal mined above the pit-bottom can be let down by gravity, the full cars going down pulling up the empties. When this is not possible some form of rope haulage is employed.

The two chief methods in use in Cape Breton are the tail-rope and endless cable systems. In the former the cars are drawn in trips, that is from eight to fifteen cars hitched together. In this system there is only one track and two ropes, one for hauling the loaded cars to the pit bottom, and the other of double the length of the road passing around a wheel at the end of the level or deep to pull the empties back to the working face The engines are usually situated underground, near the pit bottom, and turn two drums of equal diameter, so that the one will be taking in the main rope, while the other is letting out the tail-rope, and vice versa. The main rope is a much heavier cable than the tail-rope, and will be as long as the road, the tail-rope will be twice this length. In the second system there is a double track and an endless cable kept moving at the rate of about two miles per hour along one track and back the other. The cars are attached to the cable by friction grips. The full cars are drawn to the pit bottom on one track and the empties taken back on the other. The advantages of this system are: 1. Less wear on cable and on roadbed due to slower speed. 2. The tubs arrive at the pit-bottom one at a time, and the strain on the cable is more equalized on account of the cars being fairly equally spaced. 3. The cable is only double the length of the road. 4. Only one engineer is required to manage three or four endless cables.

The disadvantages are: 1. A double track is required, therefore, the deeps and levels must be wider than in the single track system, and the initial cost of roadbeds and tracks more. 2. The initial cost of the power plant will be greater. 3. Cost of maintenance of roadbed more. 4. The cable will be damaged by the grips, and accidents are often caused in the deeps by the grips slipping. When the mine car is hauled to the pit-bottom it is run on to the hoist, where it is held by an automatic clutch; it is lifted to the bankhead, and dumped, and then lowered at the same time, as the next full car is being hoisted in the adjoining compartment. The lifts are run thus in balance, the weights of the cars and cages counter-balancing. The mine is usually kept dry by draining the deeps with compressed air pumps discharging into a sump or reservoir at the pit-bottom, and from there it is forced to the surface by a steam pump.

In all mines of this class some form of artificial ventilation must be employed. There are at least two openings to the mine, and it is so arranged by leaving walls of coal and walling up passages, that the air entering one shaf is divided so that some of it will pass through each part of the mine before finding its way up the second shaft During the earlier stages of development, and in certain cases of deep shafts it may be economical to force this current of air by heating the air in the upcast shaft by a fire at the foot, and so rarifying the air that it tends to rise and draw air through the mine from the other shaft. More often, however, some form of fan is used to exhaust or compress the air in one of the shafts.

GENERAL ENGINEERING COMPANY VS. THE DOMINION COTTON MILLS COMPANY AND AMERICAN STOKER COMPANY.

In a reference in our last issue to the litigation now going on between the General Engineering Company, of Toronto, and the American Stoker Company some errors occurred which we very much regret. In referring to the progress of the case it was stated that, "it was carried by the defendant companies from one court to another until it reached the Exchequer Court." The fact was that the action brought by the General Engineering Company was begun in the Exchequer Court, and all the proceedings have been in that Court. By a slip of the pen it was stated that an "injunction" had been granted instead of a "judgment" given. The substance of this judgment was given in our issue of October last, but it appears that formal judgment was not taken out, an application for a new trial having been made in the meantime by the defendants. This application first came up at Osgoode Hall on the 5th of July, and was enlarged at plaintiff's request until the 19th of September. Between these two dates the American Stoker Company applied for a writ of *scire facias* asking for the repeal of one of the Jones Stoker patents on the ground that it had expired. Judgment was given in this action in favor of the General Engineering Company on the ground that a writ of *scire facias* was not the proper remedy. The application for a new trial was then renewed by the defendants, and an order given by the Court to the following effect: That a new trial may be had on condition that the defendants pay plaintiff's costs to date, that the previous judgment be set aside, that at the new trial new evidence should be limited to the issues as to whether letters patent No. 40,700 in plaintiff's statement of claim had become void by expiry at the time of the infringements alleged, and prior to the institution of this action. It will be seen that there is no judgment now standing in the case, no damages were ever awarded, and no injunction was ever issued against the American Stoker Company. The Exchequer Court has as yet expressed no opinion, as to whether or not the patent in question is still in force, or has become void by expiry. The public are not restrained by injunction from putting in the stokers of the American Stoker Company, and the American Stoker Company is not prohibited from doing, business in Canada.

NEW LAND SURVEYORS.

Commissions as Dominion Land Surveyors have been granted to C. W. MacPherson, O.L.S., Barrie, Ont.; R. Rinfret, B.A.Sc. (McGill), P.L.S., Montreal, Que.; F. J. Robinson, S.P.S., Toronto, O.L.S., Barrie, Ont.; J. N. Wallace, B.A. and B.C.E. (Dublin), O.L.S., Hamilton, Ont. The following candidates were admitted as pupils: R. H. Cautley, Ipswich, England; F. W. O. Werry, B.A. (Toronto), Ottawa, Ont.

At the recent meeting of the Board of Examiners for Ontario Land Surveyors the following candidates were admitted to practice: Wm. Walter Stull, Sudbury, Ont.; William Howard Fairchild, Simcoe, Ont.; John Henry Shaw, Pembroke, Ont., and Melville Bell Weekes, Brantford, Ont. Leonard Oswald Clarke, of London, passed the preliminary examination, and received a certificate admitting him to apprenticeship.

IT BENEFITS READERS.

Editor CANADIAN ENGINEER:

I am very much pleased with your paper, and although I have only received two numbers as yet I have derived a great deal of benefit from them. Yours sincerely,

Providence, R.I., Feb. 13th, 1900. G. A. HAMILTON.

Waring, Chapman & Farquhar, New York, have prepared plans for a system of sewerage for Ashly, a residential town now building by the Dominion Iron and Steel Co., near Sydney, C.B.

THE USE OF BOILER COMPOUNDS.*

BY ALBERT A. CARY.

To the majority of steam users, anything that is put into a boiler to lessen troubles due to the formation of scale, is a "boiler compound;" and the fact that these various so-called compounds act differently in their endeavor to accomplish their purpose is not as generally understood as it should be by those who persist in their use. Such nostrums may be divided into three classes:

First—Those attacking the scale-producing material chemically, and acting as re-agents, combine with the matter precipitated from the feed water, forming a third substance different from either the original precipitated solids or the "re-agent," the theory being that the new substance will not form into a hard, resisting scale, and therefore can be more easily removed by blowing off or by the cleaning tools used after the boiler is "opened up." Second—Those acting mechanically upon the precipitated crystals of scale-making matter soon after they are formed. Such "compounds" are of a glutinous, starchy or oily nature, and become attached to the surface of the newly formed crystals (precipitated from the water) surrounding them, as the skin does an orange; and when these crystals fall together they are thus robbed of their cement-like action, which frequently occurs when they are allowed to come in immediate contact. Third—Those acting both mechanically (as just described) and also as a solvent, the latter action partially dissolving scale already formed, and by this "rotting" effect (as it is often called), preparing the scale for easy removal.

The "compounds" under the first division (which act chemically upon the scale-forming matter) also frequently accomplish this same rotting effect upon scale formed previous to their use. Still other divisions or subdivisions might possibly be made, but the above will suffice for a good general idea of the subject. Taking up our first division of this subject, we find that the principal ingredients used in such "compounds" are soda ash (or carbonate of soda) and tannin matters, while we sometimes find caustic soda, sal soda, acetic acid and numerous other active agents which are generally less efficient in their action on the scale-forming matter and more harmful to the boiler and its fittings. In order to disguise these very cheap chemicals and help the "compound" vendor get prices for his powder or liquid, whichever, it may be, there are often added other substances which generally render the active agents less efficient, and they frequently fall unchanged to the bottom of the boiler with the scale, thus increasing the deposit and aggravating the trouble. Such added substances include clay, chalk, sand, etc., and sometimes merely coloring matter is used to disguise the original chemicals, such as tobacco juice, iron scraps, lamp black, spent tan, etc.

The principal scale-making impurities precipitated in boilers are carbonate of lime ($CaCO_3$), carbonate of magnesium ($MgCO_3$), sulphate of lime ($CaSO_4$) and sulphate of magnesium ($MgSO_4$), and, although there are generally other precipitates, notice of these alone will be sufficient for the present consideration. The chemical action taking place when some of the above named active agents are used may be traced as follows: Soda ash is a dry impure carbonate of soda, from which the pure alkali is afterwards made. The carbonate of soda (Na_2CO_3) is used to act upon the sulphate of lime and magnesia, as shown in the following chemical formulae:

	Sulphate of Lime	and	Carbonate of Soda
(a)	$CaSO_4$	+	Na_2CO_3=
		form	
	Carbonate of Lime	and	Sulphate of Soda
	$CaCO_3$	+	Na_2SO_4
	Sulphate of Magnesium	and	Carbonate of Soda
(b)	$MgSO_4$	+	Na_2CO_3=
		form	
	Carbonate of Magnesia	and	Sulphate of Soda
	$MgCO_3$	+	Na_2SO_4

Leaving this treatment for a moment, it would be well to note that both the carbonate of lime and carbonate of magnesia are held in solution through the presence of carbonic acid gas dissolved in the water, which unites with them and changes the mono-carbonates into bi-carbonates (which are only known to exist in solution), as shown thus:

Carbonate of Lime
$CaCO_3$=
composed of

Oxide of Lime	and	Carbonic Acid		
CaO	+	CO_2		
Carbonate of Lime	and	Carbonic Acid	and	Water
$CaOCO_2$	+	CO_2	+	H_2O=

form
Bi-Carbonate of Lime
$CaO(CO_2)_2H_2O$

Bi-Carbonate of Lime Generally Expressed
$CaO(CO_2)_2H_2O$ = $CaH_2(CO_3)_2$

In a similar manner the bi-carbonate of magnesium is formed from the mono-carbonate thus:

Carbonate of Magnesium
$MgCO_3$=
composed of

Oxide of Magnesium	and		Carbonic Acid	
MgO	+		CO_2	
Carbonate of Magnesium	and	Carbonic Acid	and	Water
$MgOCO_2$	+	CO_2	+	H_2O=

form
Bi-Carbonate of Magnesium
$MgO(CO_2)_2H_2O$

Bi-Carbonate of Magnesium Generally Expressed
$MgO(CO_2)_2H_2$ = $MgH_2(CO_3)_2$

The mono-carbonates (or single carbonates) of lime and magnesia are but slightly soluble in water, whereas the bi-carbonates, or double carbonates) are very soluble in cold water, and this fact will account for the presence of the large quantities of lime and magnesia in boiler waters as carbonates.

When waters containing the bi-carbonates are heated, the rise in temperature drives off the extra carbonic acid gas and leaves behind the practically insoluble mono-carbonates, which are precipitated.

When a temperature of 180 degrees Fahr. is reached, a considerable percentage of the bi-carbonates is precipitated (as insoluble mono-carbonates), and at 290 degrees Fahr. (a temperature corresponding to 43 pounds gauge pressure) the precipitation is nearly completed, after a thorough boiling.

Scale formed from the mono-carbonate of lime is seldom very troublesome, if not allowed to accumulate in too large a quantity, nor allowed to remain in the boiler for a long time; while the precipitated mono-carbonate of magnesia gives slightly more trouble, due to the fact that it seldom is found in scale as a mono-carbonate. All the contained carbonic acid (CO_2) is generally lost from the bi-carbonate of magnesia ($MgO(CO_2)_2H_2O$) by the time it forms a crust, leaving behind the hydrate of magnesia ($MgO + H_2O = MgO_2H_2$), which acts as a cement and binds closely together (though not very strongly) whatever precipitated matter it may come in contact with. This hydrate of magnesia is very fine and light when precipitated and requires a comparatively long time to settle.

(To be continued).

*Reprinted from the American Machinist.

THE RED CROSS FUND.

BIGGAR, SAMUEL & CO.,
PUBLISHERS CANADIAN ENGINEER.

Gentlemen,—I desire gratefully to acknowledge your handsome donation of $36, the profits on the sale of the 5th edition of your pamphlet on the Boer war. The donation is especially opportune at this time when so many of our brave fellows—Colonial and Imperial—are being wounded in their heroic efforts to uphold the cause of equal rights and true British liberty. Very sincerely yours,

J. GEORGE HODGINS,
Hon. Treas. of the British Red Cross Society, Canadian Branch.
Toronto, February 28th, 1900.

Collingwood, Ont., will vote on May 30th on a grant of $115,000 bonus to Chas. Cramp, Philadelphia, the well-known shipbuilder, to establish a smelter, capacity of 200 tons a day, in that town. There is to be an open hearth steel plant of three Wellman furnaces, and a rolling mill capable of making armor plates.

Industrial Notes.

Brantford, Ont., wants a steam road roller.

The Kingsville, Ont., glass factory will use natural gas as fuel

A large tobacco factory is being built at Kingsville by local capital.

The town of Smith's Falls paid A. Foster $35,000 for the waterworks system.

The Massey Harris Co., Ltd., Toronto, has given $5,000 to the Patriotic Fund.

Wages of machinists employed by the C.P.R. in Toronto and Toronto Junction have been advanced.

The Reids are going to build a modern hotel, with some 200 rooms, in Fort William, St. John's, Nfld.

West & Peachey, Simcoe, Ont., have received orders recently for two of their Alligator warping tugs.

One hundred and fifty 60,000 lb. freight cars are building in Nova Scotia for the Dominion Iron & Steel Co.

The Carborundum Co., Niagara Falls, N.Y., has issued an interesting booklet, "Many Expressions, One Opinion."

The Collingwood Meat Co., Ltd., will put in at once 150 h.p. engine, and a refrigerating plant of 150 tons capacity.

Members of the board of trade, Arnprior, Ont., have subscribed $9,000 towards building a flour mill in that town.

A. J. Moxham, manager of the Dominion Iron and Steel Co., Sydney, C.B., will build a $30,000 residence at Colby, C.B.

The Walkerville, Ont., match factory is being equipped with engines and boilers by E. Leonard & Sons, London, Ont.

A well-known firm in Great Britain desires to be placed in communication with users of all kind of iron and steel tubing in Canada.

The Hamilton, Ont., Wheel and Foundry Company has advanced the wages of its moulders, the raise taking effect on February 16th.

The Keewatin Lumber & Mnfg. Co. has been closed down for a short time to build a new flume which will give a much improved power.

The Connors syndicate has awarded the contract for the elevator at Montreal to Barrett & Record, Chicago. It will cost about $1,500,000.

Essex county, Ont., has appropriated $16,000 to build a poor house. The site has not yet been chosen. Leamington offers free fuel and light.

The Manitoba Government engineer has recommended the construction of a steel bridge over the Little Saskatchewan River at Rapid City, Man.

There is reported to be a great scarcity of labor in Sault Ste. Marie, Ont., where F. H. Clergue is promoting a number of very extensive works.

The Marshall, Wells Hardware Co., Ltd., of Duluth, is incorporating a branch house, under the same name, to do business in Winnipeg, Man.

Application has been made for a charter by the Stony Plain Milling Co., Edmonton, N.W.T., to run a sawmill at Stony Plain; capital, $4,000.

The St. Charles Condensing Co., St. Charles, Ill., has established a branch in Ingersoll, Ont. The engines are Corliss, built by J. Inglis Co., Ltd., Toronto.

An association of those interested in cold storage and refrigeration is being formed in London, Eng. The secretary is S. M. Leonard, 19 Ludgate Hill, London, E.C.

The Smart Eby Machine Co., 195 Barton street east, Hamilton, is placing on the market a shaking and dumping grate bar concerning which some strong claims are made in the advertisement in this issue.

A new type of wood pulp grinder, manufactured by McOuat & McRae, Lachute, Que., is noticed in another column. This will be described in next issue; meantime those interested will get particulars on writing to the firm.

Ottawa, Ont., will spend $80,000 additional to the huge appropriation already made in its main drainage scheme. Part of the drain will be built outside the city limits.

The Fensom Elevator Works, Toronto, have the contract for the elevators for the South African Mutual Life Insurance Co.'s building at Port Elizabeth, Cape Colony.

S. B. Best has succeeded as manager of the Canadian Typograph Co., F. S. Evans, who has recently become manager of the National Cycle and Automobile Co., Toronto.

The Nickel Steel Co. is applying for powers similar to those conferred by the Railway Act upon railways, enabling it to expropriate lands, build railway lines, sidings, etc.

The Goldie & McCulloch Co., Ltd., Galt, Ont., has begun the year well. There have been sold 29 engines in the first 43 days of this year All other departments are also very busy.

The contract for the new public buildings at New Westminster, B C, has been awarded to Bourque & Des Rivieres, Ottawa, Ont. The amount is in the neighborhood of $60,000.

St. Louis, Que., will grant a bonus to the Phoenix Bridge and Iron Works if they build a $25,000 building, put in a $50,000 plant, employ at least 150 men, and pay $60,000 a year in wages.

There were during February 1,063 boarders at the Dominion Iron and Steel Company's dining-room, Sydney, C.B. The company have appointed nine new policemen to watch the works.

A sewage disposal plant is desired for the west end of Hamilton, Ont. E. G. Barrow, C.E., has recommended filtration as cheapest in operation. The plants already installed are chemical precipitation.

The contract for the locks, etc., at St. Andrew's Rapids, near Winnipeg, Man., has been let to T. Kelley, contractor, Winnipeg. The work will cost between one-half and one million dollars before it is completed.

C. H. Rust, city engineer, Toronto, has drawn plans for the proposed Yonge street overhead bridge. The width is 32 feet, having a 20-foot roadway and two 6-foot sidewalks. There is a double line of street railway tracks.

The Canadian Steel Co. is applying for incorporation to do a general mining, smelting, rolling mill and general construction business. Operations are to be carried on in Welland, Ont., and Hull, Que., and elsewhere.

W. M. Watson, 92 Dundas street, Toronto, whose articles on sanitary matters have interested our readers for some years past, is going to England at the end of this month to examine into the latest ideas in sewage disposal, etc.

The Canadian Canoe Co., Peterboro, Ont., has been running overtime since January 1st., and has already booked a larger number of orders than during any previous season. The No. 16 canoe is proving very popular, as in past years.

At the Montreal Rolling Mills Co.'s annual meeting the following were elected officers: A. Allan, president; E. S. Clouston, vice-president; H. M. Allan, H. Archibald, Hon. G. A. Drummond, J. S. McLennan, and W. McMaster, directors.

The chief of the fire brigade in Montreal has written the city council demanding that the high buildings in that city be compelled to put in stand pipes. This is now not the case, and such buildings are in some cases entirely beyond the reach of the fire fighting apparatus.

The R. Woodman Mnfg. and Supply Co., Boston, Mass., is famous as makers of light railroad and mill supplies. The advertisement of patent speed indicators on another page will be read with interest by all engineers and machinists. A more detailed description of these specialties will appear in our April issue.

The Austin Separator Co., Detroit, Michigan, manufacturers of the Austin Steam and Oil Separators, have just shipped an order of seven 7-inch new pattern, Fig. E., iron, horizontal receiver machines for use in the immense new power plant of the London & Bristol Tramway Co., London, Eng., in connection with Allis engines. As this is one of the most important and complete power plants installed during the past year in Great Britain, the selection of these goods is a distinct honor to American industry.

H. B. Cann, R. Caie, S. A. Crowell, A. Cann, C. W. Cann, C. C. Richards, J. H. Killam, W. Law, B. B. Law, H. Crowell, Yarmouth, N.S., and C. Burrill, Weymouth Bridge, N.S., have applied for a charter as the New Burrill-Johnson Iron Co., Ltd., to carry on the business of the Burrill-Johnson Iron Co., Ltd.; capital, $50,000.

R. S. Hodgins, Sydney, C.B.; F. Macdougall, Christimas Island, C.B.; Malcolm Macfarlane, Montreal; R. B. Van Horne, Sydney, C.B., and others have been incorporated as the Cape Breton Mnfg. Co., Ltd.; capital, $10,000; to make bricks; chief place of business, Sydney, C.B..

S. R. Poulin, Ottawa, Ont.; J. Bourque, Wright & Co., Hull, Que.. A. M. Calderon, architect; J. M. Cromwell, L. O. Joly, Ottawa; C. E. Graham, M.D., Hull, Que.; W. G. Mulligan, Aylmer; J. S. Allen, Ottawa, J. Piche, Hull, Que., are to be incorporated as the Gatineau Junction Brick Co., Ltd.; capital, $20,000.

The suit brought some time ago by the Colliery Engineer Co., of Scranton, Pa., conducting the International Correspondence Schools, against the American School of Correspondence, of Boston, Mass., was recently dismissed by Judge Lacombe, of the United States Circuit Court, the plaintiffs refusing to argue the case after several postponements of the trial.

In the town of Middleton, N.S., a sewage company has been formed to provide sewage disposal for a few subscribers to the company. The capital is $1,000. There are a great many towns where partial installations could be very beneficially undertaken in this way. The rights of the municipality in its own streets being of course properly protected.

The Syracuse Smelting Works, manufacturers of babbitt metals and solder, Montreal, have announced to the trade that they have bought the supply of raw material which they expect to use this year, and advise all their friends to place their orders promptly for any raw or manufactured goods they may require, as the works expects prices to be considerably higher.

Among this year's sales of the Goldie & McCulloch Co., Ltd., Galt, are one large Wheelock engine for the Midland Elevator Co., one for Collingwood Meat Co., one for the Beaver Portland Cement Co., Marlbank, Ont.; one for the Gutta Percha and Rubber Mnfg. Co., Toronto; three for the Linde British Refrigeration Co., Montreal; one for J. Oliver & Sons, Ottawa, Ont., and several others.

The Acetylene Manufacturing Co., of London, Ont., control the rights for a number of different types of acetylene gas machines. This company has put in a 300-light plant at the Walker House, Berlin; and a 380-light plant in a town in Manitoba. Mr. Stinson, of this company, has made some interesting experiments with acetylene gas as a fuel, which will be described in our next number.

Letters of incorporation have been granted to the Artesian Ice Company of Toronto, Ltd.; capital, $1,000,000; the provisional directors are: J. R. Barber, Georgetown; S. F. McKinnon, Dr. G. S. Ryerson and J. Flett, Toronto, and J. J. Long, of Collingwood, Ont. The company proposes to equip a factory for the manufacture of ice, with a capacity of over 100 tons per day, and to provide refrigerator and cold storage accommodation.

The Imperial Paper Co., Sturgeon Falls, Ont., it is announced has sold to Lloyds, of London, Eng., the owners of The Daily Chronicle, part of its concession from the Ontario Government for three-quarters of a million dollars. The purchase of a part interest in the company by the Lloyds means that the bulk of the output of the mills will be used in The Chronicle office and that of the other newspapers controlled by Lloyds. It is known that other great English papers are negotiating for the production of their paper supply in Canada.

We are informed that the net earnings of the New England Gas and Coke Co.'s plant for December amounted to $20,000. This showing was made on an average of less than 200 coke ovens in operation during the month, with an average price of but $2.57 received for coke and with but very small sales of gas. It is estimated that net earnings for January will reach $30,000 with an average of less than 250 ovens in commission. The company is gradually increasing its coke and gas output and it is expected that by the latter part of February its entire 400 ovens will be in operation, and that it will be supplying gas to Dorchester and Charleston in addition to Jamaica Plains and Brookline.—Boston Financial News.

Harrison Watson, Canadian section Imperial Institute, London, Eng., has had the following enquiries and invites replies: 1. A northern firm of importers wishes to hear of Canadian manufacturers of gig spokes, wheels, and hickory hammer shafts. 2. A Glasgow firm points out opening for Canadian nuts and bolts, and asks for names of manufacturers; American makers are finding a market here for same. 3. An Irish firm can contract for 50,000 sets spruce box boards cut to dimensions for manufacture of patent butter boxes. 4. A Midland manufacturer of anchors and chains is prepared to appoint a resident Canadian agent. 5. A Welsh firm wants immediate quotations for 150,000 spruce and white wood boxes cut to dimensions: Tops and bottoms, 18 x 11; sides, 18 x 9; ends, 10 x 9; quotations c.i.f. London; delivery before 31st May; cash, less 2½ per cent. against B.L. and insurance policy.

Electric Flashes.

The Ottawa Electric Railway Co. made last year a net profit of $85,280.37.

The Shelburne Power Co., Ltd., is applying for a Nova Scotia charter to develop power on the Rosemay river, near Shelburn, N.S.

A firm of electrical instrument and machinery makers in the United States is negotiating for premises in Brantford, owned by Wood Bros.

W. D. Snowball and others are being incorporated as the Chatham Electric Light Co., Ltd.; capital, $50,000; chief place of business, Chatham, N.B.

Jack & Robertson, electrical supplies, Montreal, have sent us a very handsome blotting pad, which combines the useful features of a desk calendar.

The Sherbrooke Gas & Water Co. intends to install new machinery in the lighting station the coming summer, which will increase the lighting capacity by 8,000 lights.

J. C. Eyres, of Woodville, Ont., president of the Victoria Telephone Co., which controls an independent system, with headquarters at Woodville, Ont., is building its line to Lindsay, Ont.

James McElliott, a former employee of the Lachine Rapids Hydraulic and Land Co., has entered an action claiming from it $5,000 damages for injuries received by coming in contact with a live wire while working in its service.

Montreal Street Railway proposes to put its electric wires under ground. The manager in a communication to the Road Committee of the Council, stated that the company had decided to expend some $200,000 on this conduit system.

The Electrical Maintenance and Construction Co., of Toronto, has opened a branch at 143 King street east, Hamilton, with a very attractive show room, under the local management of H. J. Wickens, son of A. M. Wickens, engineer of the Ontario Parliament Buildings.

St. Catharines, Ont., is asking the Ontario Government for power to raise $150,000, wherewith to acquire water powers for the development of electrical energy, for acquiring land, for the erection of buildings, etc., all of which is intended to induce manufacturers to locate in that city.

Major Gray, Government engineer, has reported in favor of, and the Railway and Canals Department has ordered a storage battery equipment to be put in, to swing the radial railway bridge at Burlington Beach, Ont., and also to light the canal in case of accident to the radial's supply wires.

Assistant Secretary Spaulding, of the United States Treasury Department, has announced that he would not decide the question of the dutiability of electricity brought into the United States from the Dominion of Canada. He admitted that he did not feel justified in taking up the matter at this time, and it is probable that the question will never be passed upon.

The London Cold Storage Co. is putting in a lighting plant, direct connected to Leonard self-oiling engines. The Electrical Construction Co., Ltd., London, Ont., has the contract.

The London, Ont., Electric Light Co. has just put in four new boilers, and the Berlin, Ont., Gas Co., one new boiler. The Kingsville Electric Light Co. is putting in a Leonard self-oiling engine.

A company to build electric launches is being organized in Hamilton, Ont., by S. R. Sintz, Chicago, and A. Ives, Detroit. The batteries will be built by the Volta Storage Battery Co., Hamilton, Ont.

The E. B. Eddy Co., Ltd., has contracted with Conroy Bros., Deschenes, for 800 electrical horse-power at $15. The use which is to be made of this large amount of power by the E. B. Eddy Co., has not been allowed to become public.

Application will be made to enable the Buffalo Ry. Co., or the Buffalo and Niagara Falls Electric Ry. to acquire the franchise and business of the Niagara Falls Park and River Ry. Co., the Clifton Suspension Bridge Co., the Queenston Heights Suspension Bridge Co., and the Queenston Heights Bridge Co.

The Hon. A. A. Thibadeau, R. Wilson Smith, G. H. Meldrum, Montreal; T. B. Stillman and H. Hall, New York, are being incorporated as the Electric Fire-Proofing Co., of Canada, Ltd.; capital, $300,000; headquarters, Montreal; to carry on the business of treating timber, wood and other substances so as to render the same fireproof.

The Hoeffner Refining Co., Hamilton, Ont., has placed an order with the Canadian General Electric Co. for two 1,500 amp., 120 volt generators, to be used for electrolytic purposes. These machines are to be direct-connected with Stanley motors, and the power will be supplied by the Cataract Power Co. from the DeCew Falls transmission lines.

At the annual meeting of shareholders of the Hamilton Electric Light & Cataract Power Co., Ltd., the officers and directors were elected as follows: Hon. J. M. Gibson, president; Jas. Dixon, vice-president; John Moodie, treasurer; John Patterson, secretary; J. W. Sutherland, John Dickenson, M.L.A.; J. A. Kammerer, Toronto, and Allan B. Forbes and Edward P. Smith, Chicago.

At the annual meeting of the Lachine Rapids Hydraulic and Land Co., a satisfactory statement was made, and the directors re-elected. The directors' report stated that the company's revenues had been dependent on private consumers hitherto but that they hoped to secure a city lighting contract at an early date. The lighting contract is now held by the Royal Electric Co.

Mayor Wilson, of Winnipeg, Man., has prepared a by-law voting $300,000 for the purchase of the plant now operated by the gas company, or the erection of a new one; also for the securing of the franchise for private electric lighting by the city. The Mayor states that the unqualified success of the city in handling the waterworks and the street lighting proves the utility of municipal ownership, and warrants the city in securing other franchises.

The Central Passenger Association has granted a special rate of a fare and one-third, on the certificate plan, from all points in its territory to Chicago and return, for delegates and friends attending the twenty-third convention of the National Electric Light Association, to be held in Chicago, Ill., May 22nd, 23rd and 24th. It is expected that the various other passenger associations will announce the same concession at an early date.

J. Patterson, J. Moodie, J. Dixon, W. W. Osborne and the Hon. J. M. Gibson, Hamilton, Ont.; J. Dickenson, Glanford, Wentworth county, Ont., and J. A. Kammerer, Toronto, have been granted incorporation to manufacture carbolite and products from its manufacture, and to utilize slag for its production, under the name of Carbolite, Ltd. The capital of this company is $1,000,000, and the head office is to be in Hamilton, Ont.

At the annual meeting of the Canadian General Electric Company the stockholders sanctioned the issue of $300,000 in new stock. The financial statement showed remarkable increases in business during the year. The annual report showed that the net profits for 1899 were $281,995, out of which $108,000 were paid in dividends, $69,358 written off machinery and other assets, $100,000 transferred to reserve fund, and $58,437 to profit and loss account. The reserve fund is now $140 000.

The Royal Electric Co. is supplying the electrical equipment for the Pratt & Letchworth iron works in Brantford, Ont.

The town council of Neepawa, Man., in accepting the electric light power plant recently installed by the Robb Engineering Co., passed the following resolution. "That this council has much pleasure in bearing testimony to the efficient manner in which J. F Porter has installed the engine and boilers in connection with our electric plant, and that a copy of this resolution be sent to the Robb Engineering Co." Carried.

J. S. Clark, Ayr, Ont., vice-president and managing director of the Grand Valley Railway Company, which proposes to build an electric line from Port Dover to Goderich via Brantford, Paris, Galt and Berlin, says the company has behind it some well-known capitalists in New York and London, Eng., including D. W. McNair, J. Acton Lomax, Charles R. Sickles, Dr. Sanger, of New York; Hon. Jas. Roche, late of the Alaska Boundary Commission; and O. McNair, of the Warsaw Bank, Buffalo. Mr. Clark says that he completed arrangements for buying the charter of the Preston and Berlin Electric Ry. Co. He has also bought the toll road from Ayr to Paris, Ont.

At 11 o'clock on Tuesday night, January 9th, fire occurred in the power house of the St. Jerome Light and Power Co., St. Jerome, Que., which destroyed its electric plant. On Wednesday afternoon at 3 o'clock the Royal Electric Co. was instructed by the St. Jerome Co. to forward as quickly as possible, a 75-k.w. S.K.C. generator complete with exciter and switchboard; the whole went forward that evening, was received in St. Jerome Thursday morning at 10 o'clock, the destroyed plant was removed and the new one put in its place, and the lights turned on as usual at 5 p.m. on Friday, or 48 hours after the receipt of order by the Royal Electric Co. in Montreal, lights were again burning in St. Jerome.

Marine News.

The Yarmouth Marine Railway Co. has declared a seven per cent. dividend for the year.

F. Cormier, Moncton, N.B., has invented a rudder to be carried and shipped in case of accident to the regular rudder.

Thomas Henry, Canadian freight agent of the Northern Pacific Railway, has been appointed general traffic manager of the Richelieu & Ontario Navigation Co.

The St. Lawrence Terminal & Steamship Co., Ltd., is applying for incorporation to build wharfs, docks, elevators, etc., at Sorel, Que., or some other point on the Richelieu River.

G. R. Walker, formerly on the engineering staff of the Manchester Ship Canal, is now in Canada in the interest of the proposed Georgian Bay Canal.

The Cape Island Steamship Co., Ltd., is being formed for the purpose of doing business on the south shore of Nova Scotia, with Clark's Harbor as the chief place of business; capital, $10,000.

The Davis Dry Dock Co., Kingston, Ont., has the contract to build a steam yacht for the St. Lawrence Yacht Club. It will have a draught of not exceeding two feet, will be 65 feet by 13 feet beam, and 4 feet deep. The boilers will be Davis' water tube, carrying 200 lbs., the engine 8 inch by 8 inch cylinders. The speed is to be ten miles an hour.

A large and influential deputation from Port Hope, Ont., and Cobourg, Ont., recently interviewed Hon A. G. Blair, and asked that the Trent canal plans be altered so that instead of the canal being constructed from Rice Lake to Trenton, a distance of 64 miles, it be cut from Rice Lake to Port Hope, a distance of 10 miles.

R. Pickford, W. A. Black, G. W. C. Hensley, C. S. Pickford, W. A. Black, Halifax, N.S. (of whom Robert Pickford, William Anderson Black and George William C. Hensley are to be the first or provisional directors of the said company), are being incorporated as Pickford and Black Steamships, Ltd.; capital, $600,000.

The Davis Dry Dock Co., Kingston, Ont., has closed a contract with C. Lewis, Keewatin, Ont., to build the framework of a 70-foot passenger steamboat, all ready to set up at Keewatin.

It is announced that Mr. Petersen, of the firm of Petersen, Tait & Co., the firm which secured the contract for a fast Atlantic line from the Canadian Government, contemplates establishing a through steamship service for the carriage of grain from Lake Superior to England as soon as the deepening of the St. Lawrence canals to 14 feet of clear draught is completed.

A delegation of about twenty of the most prominent owners of lake vessels on the Great Lakes went to Washington recently, accompanied by H. D. Goulder, the attorney for the Lake Carriers' Association. Their object being to induce the United States Congress to take steps toward the formation, with Canada, of an international commission which should have charge of all matters affecting the water levels of the lakes. The reasons why they are active in the matter at this time are the completion of the Chicago Drainage Canal, the construction of the "Soo" power canal, and the proposed building of a dam in Niagara.

The plans for the improvements in the Red River, about fifteen miles from Winnipeg, call for a dam across the Red River 800 feet in length, a canal 1,900 feet in length, one set of locks 215 feet in length, and dredging in the river for a distance of some 400 feet. The lock will be 215 feet long, 45 feet broad and the solid concrete will be 38 feet deep, giving the locks a high water depth of 30 feet, while at low water the depth will be 11 feet. The gates of the lock will be of steel. The approach to the locks will be by a canal from a point on the west bank of the river, a distance of 1,500 feet. The canal will be 100 feet wide, and have a depth of 11 feet. The distance to the canal from the river will be of partly wooden crib work, filled in with stone and will be 290 feet in length. The canal extends 400 feet north of the lock to the river, which will be dredged to a depth of nine feet for about 100 yards. The dam to regulate the river will extend from the east side of the locks 800 feet, to a point on the east bank of the Red River. It will be of concrete, granite faced, 32 feet at the base and 18 feet 5 inches at the top. The dam is provided with seven piers and two abutments, and also with sluice gates. The piers and abutments can be used as the base of a service bridge and from this could be worked a system of shutters and movable frames, by which the height of the dam could be increased 12½ feet. The bridge and shutters, however, will form a separate contract.

Mining Matters.

Alex. Dick, mining engineer, of Halifax, N.S., has moved to Toronto.

A valuable copper mine has been discovered at Mill Brook, Pictou county, N.S.

The Cordova Exploration Company's gold mine in Belmont, Ont., is also producing largely.

The proposed mill to be erected at Goldenville, N.S., to handle the quartz from the Palmerston, Mayflower and other properties, it is stated will be 100 stamps.

The Atlas Arsenic Company has been incorporated to do business in Belleville, Ont., with a capital stock of $750,000. The directors reside in Ohio.

The Canadian Gold Fields Company's mill at Deloro, Ont., is said to be turning out three tons of arsenic daily. The gold product is over $300 per day.

The annual meeting of the Canadian Mining Institute is to be held in Montreal on the 7th, 8th and 9th inst. The annual dinner will be at the Windsor Hotel on Friday evening, the 9th March.

A. McElwee, L. A. May, J. R. McDonald, H. G. Catlin, New York; M. Lodge and W. B. Chandler, Moncton, N.B., are applying for incorporation as the New Brunswick Cannel Coal Co., Ltd.; capital, $1,000,000.

An estimate made shows that there are close on a hundred companies employing over 2,000 men, engaged in development and mining work in the Lake of the Woods, Seine river and Manitou districts.

J. C. Calhoun, W. S. Logan, J. E. Calhoun, C. S. Daley, New York, and H. F. Puddington, St. John, N.B., are being incorporated as the Provincial Coal Co., Ltd.; capital, $1,000,000; chief place of business, Moncton, N.B.

M. J. Galvin, Buffalo, N.Y., manager of a blast furnace at Charlotte, N.Y., making foundry pig for magnetic iron ores of good quality which could be conveniently shipped from Belleville or Trenton, Ont., has recently made a search in central Ontario.

A decision of great importance to Quebec mine owners has been given by the Quebec Government regarding the exemptions from taxation of mining property. In 1890 exemption was granted the mines for ten years, and now an extension of the exemption for another ten years has been granted.

Iron ore yielding 64 per cent. of iron, and 7 per cent. of sulphur has been found near Ten-Mile Creek, some 22 miles up the bay shore from St. John, N.B. A lease, covering five square miles, has been taken by W. E. Skillen, St. Martin's, N.B., and he proposes to do development work.

Charles Howard, in behalf of himself and other stockholders of the Vermillion Mining Company, of Ontario, is suing the Canadian Copper Company, the Anglo-American Company, Stevenson Burke, C. W. Bingham, Henry McIntosh, Cnas. Baird and J. B. Wright, executors of the Cornell estate, and all stockholders of the Canadian Copper Company, for $1,350,000 damages.

At the annual general meeting of the shareholders of the Cumberland Railway & Coal Company the annual reports of the company were presented by the secretary, H. R. Drummond, which were found highly satisfactory to the shareholders. The election of officers for the ensuing year resulted as follows: President, R. Cowans; vice-president, the Hon. G. A. Drummond; general manager, R. J. Cowans; secretary, H. R. Drummond.

Toronto and Nova Scotia capital has taken up the stock, $750,000, of the Port Hood Coal Company, and bonds to the amount of $750,000 have also, it is said, been issued. The company has the assurance of their engineers that the coal, amounting to 160,000,000 tons, is as good as the Sydney coal for steam. Work will begin in the early spring, and shipping will be made from Port Hood, 100 miles nearer the St. Lawrence ports than Sydney.

K. Ludloff, a German geologist, who, since last summer, has been living in Cariboo, B.C., in the interests of Russians who wish to replant the fir forest in Litonia, from British Columbia cones, has made a discovery of great importance. Herr Ludloff is in the camp on Woodpecker Island, in the Fraser River, a considerable distance above Quesnelle, where he has been collecting seeds. While doing so he is said to have discovered extensive deposits of gold-bearing conglomerate, intersected by veins of quartz, bearing gold and iron pyrites, similar to the gold in the Transvaal. He has also found deposits of red hematite, bearing free gold. This find is in the upper Fraser valley, about twenty or thirty miles south of Fort George. The formation is Archaean.

The Bureau of Mines has commissioned Prof. Courtney de Kalb, of the Kingston School of Mines, to prepare an exhaustive report on the salt industry in Ontario. The report gives a detailed account of the extent of the salt beds, present output, purity of brine and the various grades of commercial salt put on the market, methods of working and refining, with suggested measures for the further extension of the uses of the raw material in the manufacture of soda, soda ash and salts, soaps, etc., for home consumption. A detailed report on the peat industry in Ontario will be issued shortly by the Bureau of Mines, giving an account of the extent of the numerous available peat beds, analyses of raw and manufactured peat as made into briquettes by the Dickson compression patent, with the probable value of peat as a fuel for domestic and commercial purposes. This report will be of great interest to people in the coal and wood trade.

Railway Matters.

The Canada Atlantic Railway proposes to build a 5,000,000 bushel elevator at Sorel, Que., and is asking Government aid.

Owing to the large increase in business the C.P.R. has decided to erect new freight sheds in Toronto, at a cost of about $25,000.

The C.P.R. is said to be about to tunnel under the Nepean Point Park, Ottawa, to get a western entrance into the Central depot.

It is reported that the contract for 11½ miles of the Southern Railway, has been awarded to John W. McManus, of Memramcook, N.B.

Application is being made for an Act to authorize the Kingston and Pembroke Ry. Co., to extend its line from Renfrew, Ont., across the Ottawa river to Bryson, Que.

Incorporation is asked for a company to build a railway from Batchewana Bay on Lake Superior to the C.P.R., and to James Bay at or near the mouth of the Albany river.

Ce LeB. Miles, C.E., is making a survey for a line of railway from Bristol to Foreston, N.B., a distance of some fifteen miles. The road is intended to give the lumbermen in the vicinity of Foreston a means of transport for their lumber.

Application is being made by the Montfort and Gatineau Colonization Ry. Co., for leave to extend its line from the Great Northern Ry., near St. Canut, Que., to the Union Jacques Cartier Ry., near Montreal, passing through the counties of Two Mountains, Laval and Jacques Cartier, and connecting with the Union Jacques Cartier Ry.

It is said that a syndicate will make an offer for the purchase of the Kingston locomotive works, now in liquidation, and that among those concerned in the purchase are Mackenzie & Mann, of Toronto; James Hammond, of Fort William, and others. It is said that the Ontario & Rainy River Ry. would require the manufactures of the works for the next ten years.

An unexpected turn has been given to the discussion on Erie canal enlargement by the offer said to have been made by S. R. Callaway, president of the New York Central Railway Company. He has offered, it is stated, to transport free to shippers all the grain they may send across the State of New York for export if the State will pay its road four per cent. on the $60,000,000 proposed to be expended on the enlargement of the Erie canal. The interest on that sum would amount to $2,400,000 per annum.

John M. Nicol is the projector of the Quebec & Lake Huron Ry., the proposed air line between Georgian Bay and Atlantic tidewater. He said in a newspaper interview: "The line will be about 461 miles in a straight line through a new and unsettled portion of Canada, and would shorten the grain haul from Chicago and Duluth to the seaboard by fully 500 miles. The rail route would be about the same length as that from Buffalo to New York, saving all the lake distance between Georgian Bay and Buffalo. From Quebec to Liverpool is called 2,660 miles; from New York to Liverpool, 3,130 miles, giving us another 470 miles saved on the ocean, or nearly 1,000 miles less distance over our road to Liverpool from either Duluth or Chicago than over the present routes."

Very satisfactory progress is being made on the Inverness and Richmond Ry., which Mackenzie & Mann are building from Port Hastings to their mines at Broad Cove on the west coast of Cape Breton. The company owns extensive coal areas there, and the railroad is to carry the coal to Port Hastings on the Strait of Canso, which is to be the shipping point. Construction was started at the Strait in July last, and by December 1st the rails were laid over the first thirty miles. It is expected trains will be running over the whole line by December next. W Z Earle is chief engineer, and Ryan & Macdonell, of Montreal, are the contractors for the whole work, having as their manager Hugh Dokeny. The sub-contractors are, M. J. O'Brien, Renfrew, Ont., and Pegnem & Doheny, of Montreal.

LITERARY NOTES.

The Canadian Almanac for 1900 is issued as usual by Copp, Clark & Co., Ltd., Toronto. The historical diary contains more than usual, and a list of titled Canadians is given.

The Canadian General Electric Co., Ltd., has sent its friends a large wall calendar, which shows a number of views of the company's handsome new offices on King street, Toronto.

A graduates' magazine, "The Technology Review," has just been issued by the recently organized association of Class Secretaries of Mass. Inst. Tech. It is an octave volume of 140 pages, and of the best workmanship. The cover, designed by Hapgood, and printed on Army brown paper, is very handsome. The first number contains the announcement; a photograph with biographical sketch of President Crafts, articles on the Function of the Laboratory, by Prof. S. W. Holman, and on the Pierce Building, by Prof. E. B. Homer, the architect; reprints in fac-simile of early institute documents and letters—all in the first and more general half. The latter half, seventy pages, is given to news of the institute, of the undergraduate and graduate classes.

THE TORONTO TECHNICAL SCHOOL.

At the inaugural meeting of the Toronto Technical School Board, C March was elected chairman for the year, and Ald. Hubbard vice-chairman. The committees were elected as follows:

School Management—D. J. O'Donoghue (chairman), L. J. Malone, R. Y. Ellis, A. F. Wickson, Ald. Urquhart.

Property—John Tweed (chairman), Ald. Hubbard, W. A. Langton, William Henderson and Thomas Cannon, jr.

Printing and Supply—Robert Glocking (chairman), James Wilson, Ald. Ward, William Rowe and A. M. Wickens.

Finance—C. Moseley (chairman), Mayor Macdonald, J. D. Allen, Ald. Leslie and F. B. Hayes. The treasurer's report for the year showed expenditures $12,294 and receipts $11,391.

CANADIAN PATENTS.

The following patents which are of interest to the engineering and mechanical trades have been recently granted in Canada. Full details of each device, together with the explanatory drawings, are published in the Canadian Patent Office Record, which are on file in our Toronto office, and may be examined by any of our readers who wish to call for that purpose.

No. 63,756—F. H. Pitkin and J. Thompson, Chicago, Ill.; a machine for making expanded metal, having a number of cutters arranged in converging series.

No. 63,757—The Ingersoll-Sergeant Drill Co., New York; a coal-cutting machine.

No 63,762—C. de L. Rice, Hartford, Conn., gear cutting machine.

No 63,763—R V Sill, New York, an electrical heater.

No. 63,764—D Crane, Ruthland, Vt.; a guard rail chair.

No. 63,769—W H. Tobey, Tupperville, Ont.; water feed regulator for boilers, by means of a float.

No 63,778—R. Lohnston, River Falls, Wis.; hoisting apparatus.

No. 63,793—C. F. Bancroft and P. F. Sullivan, Lowell, Mass; systems of preventing collisions on electric railways in which a feed wire on a trolley line, provided with turnouts, has in each branch an insulated section, so that when a car passes one turnout the power is cut off from an approaching car.