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The Canadian Engineer

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The Canadian Engineer.

ISSUED MONTHLY IN THE INTERESTS OF THE CIVIL, MECHANICAL, ELECTRICAL, LOCOMOTIVE, STATIONARY, MARINE, MINING AND SANITARY ENGINEER, THE SURVEYOR, THE MANUFACTURER, THE CONTRACTOR AND THE MERCHANT IN THE METAL TRADES.

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CONTENTS OF THIS NUMBER:

CANADIAN TRADE WITH SOUTH AFRICA.

A steamship has been chartered to convey Canadian exhibits to the Exhibition to be held shortly in the city of Graham's Town, Cape Colony. She will remain at Quebec till the end of the month to load exhibits. We understand that further information may be obtained from the Department of Agriculture at Ottawa regarding the Exhibition, and that exhibits will be carried and returned free of charge. South Africa is a promising field for Canadian trade. It has been exploited very successfully by American manufacturers and by a limited number of Canadian firms who have had the enterprise to invade that field. For the information of our readers we may mention that the population of Cape Colony at the census of 1891 was 1,527,000, of which 377,000 were whites. The population of Natal was 555,500, of which 42,759 were whites and 43,000 East Indians. The population of Pondoland was 200,000, of Zululand 146,000, Amatongaland 38,000, Swaziland 60,000, Basutoland 218,000, and of Betchulana-land about 66,000; these native territories having so far but a limited white population. The colonies and dependencies just enumerated are all British, but besides these there is the Transvaal Republic under the suzerainty of Great Britain, having a population of about 850,000, of which over 160,000 are whites. Besides the Transvaal there is the Orange Free State with a population of about 210,000, of which 78,000 are white. In the early days of sewing machines the Canadian Wanzer Machine was among the most popular in use in South Africa, and Canadian stoves, office and school furniture, sashes, doors, and house-building material, window shades, bicycles, type setting machines, agricultural implements and other lines of Canadian manufacture, have found greater or less favor in those colonies. American manufacturers, however, have hitherto had the lion's share of the trade because of their greater facilities for shipment and because of their greater enterprise. There is a large market, however, for Canadian goods in South Africa, and it only requires a little investigation to commence on, and a little courage and enterprise to follow it up, to develop a large and steady trade in that quarter of the world. The bulletins which the Canadian Manufacturers' Association propose to publish should serve a very useful purpose in directing Canadian trade into new channels abroad, and in the meantime much can be done by judicious exhibits at such exhibitions as that at Graham's Town.

PURIFICATION OF SEWAGE.*

BY E. G. BARROW, CITY ENGINEER, HAMILTON.

There are few questions of more interest than that of the best manner of disposing of the sewage of our towns and cities, and it may be also said few questions are beset with greater difficulties. When it is considered that this subject has occupied the minds of some of the most practical analysts, engineers and scientists of Europe for many years back, and even at the present day there still exists a great diversity of opinion as to the best method to be adopted, it may well be pronounced a question difficult of solution. It would seem wisdom to avoid becoming a partizan of any particular system, because it frequently happens that the surroundings of a city, the nature of the soil in its vicinity, value of land, etc., dictate the best methods to be adopted in each particular case.

The methods of purification best known at the present time are: 1st. Broad irrigation, or the distribution of sewage over large tracts of land, having in view the growth of useful crops, called sewage farming. This system will take 4,000 to 6,000 gallons per acre per day. 2nd. Land filtration, in which purification is obtained by the passage of the sewage through light soil with little or no attempt to grow crops; 60,000 gallons may be used to the acre on this plan. 3rd. Chemical precipitation, in which the purification is obtained by means of certain precipitants such as lime, alum, salts of manganese, sulphate of iron, which precipitate all the suspended matter in tanks, and also remove a small part of organic matter in solution.

Combinations of the above are frequently made. To these methods have been lately added the septic tank system adopted at Exeter, England; the biological method, by which the purification is sought to be obtained by means of bacteria contained in filters, generally made of coal, coke, polarite, etc.; the treatment lately advocated by Mr. Adeney, of Dublin, Ireland, in which after precipitation with salts of manganese the effluent is treated with nitrate of soda to complete purification.

Ordinary city sewage is a mixture of a very complex character and is derived from the discharge taking place

*A paper read before the Canadian Association of Stationary Engineers.

from water closets, sinks, and also manufacturing wastes, and in those cities having the combined system of sewerage, various substances from the streets. The quality of sewage in different cities varies considerably, the difference being largely caused by the nature of the manufacturing wastes which are received into the sewers. A gallon of ordinary sewage contains about 100 grains of solid matter, 30 grains being in suspension and 70 in solution, 60 grains of which are mineral and 40 organic matter, the analysis of which would yield to each 100,000 parts the following results :

Total Solids.	Suspended.	Alum.	Free Ammonia.	Organic Ammonia.
140	40	20	5	1

What is required to be done is the removal of all matter in suspension and as much as possible of the organic matter in solution. The organic ammonia or albuminoid ammonia is generally considered by chemists to be the most reliable index of the amount of polluting matter present in the sewage. The removal of the suspended matter is at present best done by means of chemical precipitation, but the effluent so obtained still contains organic matter in solution, which unless discharged into a large body of pure water is liable to set up secondary decomposition. The removal of the organic matter in solution contained in the tank effluent may be almost completely done by filters composed of either coal, coke, polarite, land, etc.

The advocates of the biological method of purification say that the matter in suspension may be liquefied by liquefying bacteria, which are cultivated and sustained by the air and sewage contained in the filter, and by this means the sludge would be entirely done away with. But grave doubts are expressed by sewage experts as to the ability of these bacteria or micro-organisms to perform this office, or in plain language they do not believe that they can "get away" with the sludge, and the opinion is generally held that with average town sewage there will be the sewage sludge accompaniment. A writer on this subject facetiously remarked that if the bacteria can be utilized to eat up the sludge, what a pity it is they cannot be trained to drink up all the liquid.

TANKS.

Precipitation tanks are made both circular and rectangular—their capacity being based on the maximum daily flow of sewage. If the quiescent system is adopted the tanks should be so arranged as to permit the liquid sewage to have at least a rest of 1½ hours. If the continuous flow system be adopted, then sufficient capacity must be allowed so that two hours at least will elapse during the passage of the sewage through the tanks. Provision has also to be made for the tank when not in use, and for the first part of storms. Experience has demonstrated that they should be of medium size, as very large ones have been found more difficult to manage. The parts in contact with the liquid sewage must be smooth, and the sludge drains should have quick slopes towards the sludge well. Experience has shown that no danger from freezing may be apprehended in this latitude in winter time. The precipitants most commonly used are lime, alum, soluble salts of manganese, sulphate of iron.

FILTERS.

A well-designed and well-operated filter, all agree, is a most excellent and efficient purifier of sewage. Formerly it was believed that its action was merely mechanical, or that of a fine strainer. Subsequently it was found that those polluting organic matters in solution contained in the sewage which had an affinity for oxygen underwent chemical decomposition and were transformed into new products of an innocuous nature, and this result was brought about by minute living organisms called nitrifying bacteria, so that in fact the purification was chiefly due to these bacteria. A filter should be so constructed that air can permeate its whole structure. It must also have periods of rest. The most modern way is to allow the clarified tank effluent to completely fill the filter so that the liquid just appears over the top of the filter; after remaining there for about an hour it is discharged by opening a valve situated at the bottom of the filter. Very good results have been obtained, however, by allowing the sewage to be distributed over the surface of the filter by means of gutters, and allowing the liquid to filter slowly through. The filters should be several in number and each allowed a period of rest. The very best results have been obtained from filters composed of coal, the depth being about 4 feet and the sizes varying from ½ inch cubes to 1-16 inch cubes. It is said that coal produces a better effluent than any other substance experimented with, having a chemical as well as bacteriological action. I have been making experiments with coal filters and also with mixtures of coal and slag, and with sand and coke, and certainly the effluent from the coal filter is the best. It is necessary that all suspended matter be removed before the effluent reaches the filter. Sewage disposal has been more studied and has made more advancement in England, Germany and France than in any other parts of the world, but this has probably been caused, especially in England, by dense populations situated on the banks of comparatively small bodies of water (this does not apply to those cities situated on the seaside); whereas in America with the huge fresh water lakes and gigantic rivers into which the sewage is discharged, evil effects are not felt for many years, and it is only when the cities reach a large size that sewage purification becomes necessary and imperative. Now, both in the United States and Canada, cities and towns are beginning to feel the necessity of disposing of their sewage. Much may be learnt by experience gained in Europe, still I am of opinion that climatic differences and other purely local conditions will lead the American and Canadian mind, so prolific in invention, to perhaps improve on the European methods of purification, or at any rate to evolve some plans which will be particularly adapted to the needs of our climate and country.

The following practical deductions from the consideration of this subject suggest themselves: The sewage farm should only be selected when land situated near the city is suitable in character, and below or very little above the sewer outlets, and of reasonable price. If such land is not available and a high rate of purification is required, clarification in tanks by chemicals, followed by filtration, is the best plan. Collect by means of intersecting sewers all sewage to one station, so that all can be under one management. If part of the sewage needs pumping and part could be carried to purification station by gravity without pumping, then two stations might be the most economical. Such would be our case in Hamilton. In building a filter select the very best material, which I would say, without hesitation, is coal. It will give a better effluent and necessitate a less area than any other material.

The researches and experiments made by Mr. Adeney, of the Royal Dublin Society, on polluted waters, are of great value to the subject of sewage purification. He examined the gases contained in polluted water and the changes which took place in these gases, due to fermentation. These changes were caused by living organisms, and he discovered that it was necessary to supply them with oxygen in order to promote healthy bacteriolysis.

This oxygen he supplied by adding pure water (which always contains a certain amount of dissolved oxygen) to the polluted sewage water, and if sufficient was added purification was completed, but if not, putrefactive fermentation would take place. His examination revealed two distinct stages of bacterial fermentation; the first he called carbon oxidation, and the second nitrification or nitro-oxidation. The first takes place much quicker than the last and the liquid during the last stage will generally take oxygen from the air quicker than the organisms take it from the liquid. The conclusion which Mr. Adeney draws is that if the first stage, viz., bacteriolysis, can be made to take place at the disposal works, then the final stage can be allowed to take place in the river or lake into which the effluent is discharged, provided these bodies of fresh water yield the necessary amount of oxygen to complete the last stage of purification. I have thought that the method of purification advocated by Mr. Adeney is worthy of great consideration, as filters in our climate may not be successful unless covered over, and then the cost of roofing would be very great and require frequent repairs. Especially would this be the case in very large works where the filters would cover many acres. The buildings at the sewage disposal works should be neat in appearance, well lighted, ventilated and provided with al modern conveniences for the employees. Garbage destroyers should be built near the disposal works, so that the heat generated may be utilized to raise steam to run the machinery of disposal works, light the works and dry the sludge where precipitation works are in use.

Before concluding this paper I would draw your attention to one very marked improvement effected by our disposal works. Formerly at the outlet of the Ferguson avenue sewer, large quantities of excreta, animal substances, orange peels, paper, rags and offensive matter imprisoned in grease were discharged from the sewer, and at times were deposited by the wind along the shore where it became putrid and rendered the shore of the bay most offensive. Sometimes huge masses floated out into the bay and were deposited at the beach. Now this has been entirely done away with, and although we contemplated putting in filters at Ferguson avenue works, still I believe very good work has been already done.

SANITARY EXCESS.

BY WM. WATSON.

The Surveyor of London, England, reports an important meeting of municipal engineers held in Greater London, on Feb. 25th, to discuss the various methods of deodorizing and ventilating sewers, and to decide upon a uniform system throughout the municipalities, of public sewer ventilation. The meeting was necessary on account of the difficulties encountered by the municipalities (which have unwisely adopted the United States sanitary system) through the almost constant discharge of sewer gases from the ventilation grates in the centre of the street, and the failure of many expensive experiments made with the object of remedying the evil.

The examinations of the drainage plans of a recently built school in the South of England show the dangerous practices persons will resort to to act up to the fashion of the age. The drain in this case is taken the longest way round to the water closets and lavatories, bending squarely three times, and at each bend there is a catch pit or inspection chamber. There is also an interception trap, a breather, and large inspection chamber, which form impediments to the flow of the solids from the closet to the street sewer, causing a sluggish stream, that deposits the filthy matter at each and every angle and at the interception traps, there putrefying and generating gases that will find somewhere an exit and contaminate the atmosphere. The proper way to have drained the school was to avoid any impediments and run the drain pipe lines as straight and direct as possible from street to lavatories and then vertically above to the highest point of the school roof, having all rain-water leaders branched into the sewage pipe line.

The placing of interception traps on private drains cuts off the ventilation of public sewers, which they formerly secured through the house soil pipe that was carried forward through the roof, and the untrapped drain water leaders which, when in action, discharge large volumes of atmospheric air into the public sewers each time the sewage was discharged down the soil pipe, or when rainwater passed down the leader pipes. Then each and every soil pipe and rainwater leader formed a ventilation up cast shaft for the street sewers at short distances of only a few yards apart, which compelled the rapid circulation of fresh air down the surface grates of the streets and up the local pipes to the housetops. All this purifying element is abolished when the American system of sewer construction and the interception trap is adopted. Most cities and towns of Great Britain which have employed that system have to provide for the deodorizing of large quantities of foul gas that is constantly generating in the sewers, because they cannot now get the circulation of air needed to prevent the sewage and solid matter the sewage contains from putrefying during the time they are passing through the sewers to the outfall at the sewage disposal works. Thus we find that the natural ventilation is prevented. On the other hand it is proved that if sewage be not immediately treated by aerating influences it will commence at once to putrefy in the sewers and work mischief, and artificial methods of aeration or deodorizing must be resorted to or the public health will quickly suffer. It is known by experience that artificial means cannot be relied upon, though they are very expensive.

Under the old dispensation, when owners were permitted to put in their drains of broken pipes, bricks, or wood, with no regard for grading, for fall, or tight jointing, often pointing towards and following quite in the wrong direction, and when there were no general rules or designs adopted for the sewage disposal of the municipality on a comprehensive plan, a large number of such drains were totally useless as sewage carriers, and were nothing but cesspools generating sewer gases and distributing poisonous fluid into the surrounding subsoil. The Government became alive to the dangers of these evils and gave permission for each municipality to enforce such improved sanitary regulations as would effectively stamp out such dangerous practices and compel all drains to be constructed with good material and expert workmanship. When the Act of Parliament became operative a swarm of professional theorists, sanitary appliance manufacturers, interested tradesmen and public works contractors gathered round the various municipal authorities and pointed out to them that it was necessary to thoroughly remove the old sanitary abuses, that intricate and costly appliances, coupled with extremely drastic regulations that required an extensive staff of inspectors and other arrangements to apply them, were needed. Most unfortunately for the public health many municipalities were guided by such advisers and adopted their extreme ideas and thus spoiled the good work begun by overdoing it.

When the unnecessarily drastic regulations were enforced they naturally created a necessity for appliances to counteract the evil done. The natural ventilation which

the sewers formerly secured by the large volumes of air carried down the soil pipe by the sewage and rainwater leaders was shut off. The usual and constant circulation of air which formerly passed down the surface grates placed at intervals on the streets, and upward through each soil pipe and rainwater leader to the housetops out of everyone's way, was stopped and the public sewers were then changed from purifiers and destroyers of filth, to receptacles for the accumulation of foul matters and the rapid generators of poisonous sewer gases, which are now found to be very difficult to handle.

To try and destroy the evils thus created, various methods have been tried, and amongst a large number a few of the principal ones may be here mentioned, viz.: The flushing of sewers by water wagons and also automatic flushing appliances, and by creating a current of air with the heat from gaslights burning in the sewers; by connecting the head of each line of sewer o a tall ventilating shaft, or to a manufacturer's mill chimney, or into the ashpit under the steam boilers; by building vaults under the surface, ventilating grates in the streets, and installing deodorizing chemical evaporating machines intended to destroy the foul odors. When these artificial means are put in practice it is found they have each disadvantages unknown to the old natural ventilation processes. It is proved that having one ventilation shaft at the terminating head of each line of sewer is not sufficient, that air shafts are needed between each and all the street grates; that gaslights cannot be made reliable, for they occasionally either smother or blow out and then add to rather than reduce the nuisance. Flushing sewers allow plenty of time for the manufacturing of sewer gases between the periods of flushing, and ventilation is needed even when flushing is adopted. When chemical evaporating machines are used they need to be numerous, one for each grate, and even then the pressure in the sewers due to the want of circulation of air is often such that it forces the poisonous gas through the interception traps, which then passes either into the dwelling through the fixture traps or out of the breather pipes in front of the buildings on which they are placed at a level of within one foot of the ground line. All such apparatus are expensive besides and require constant attention and renewal.

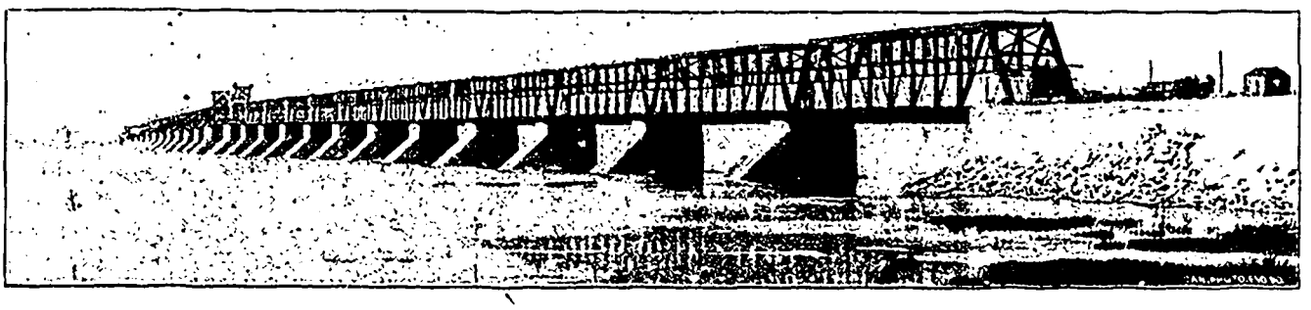
The meeting of municipal engineers and surveyors already mentioned, after discussing the advantages and disadvantages of the different artificial methods of deodorizing sewer gases, decided to advise all municipalities to adopt so much of the old system of sewage ventilation as to ventilate each private drain by taking a branch pipe from the sewer side of the interception trap up to and above the top of the buildings. This is very good by just so much as it returns to the former systems of natural and local ventilation, but it still leaves the interception trap in each private drain that forms a catch bag, and often retains the solids of the sewage that passes through them, and in a short time chokes the private drain and totally disorganizes the house sanitary appliances; it also spoils and destroys the ventilation of the house soil pipes, because when there is any interception between the street sewers, and the terminating end of the soil pipe above the roof, it prevents the warm air of the street sewers from constantly moving upward through the vertical soil pipe and carrying along with it any foul gases that might generate in the waste pipes. To rely upon an upward circulation through a breather pipe placed at the foot of a house drain often fails altogether, because the current of air is sometimes changed to pass down from the roof to the ground line in place of passing upwards, first by the sewage passing down the soil pipes and carrying down large volumes of air with it, which is discharged at the ground line by the breather; second, then very often the breather pipe is not in working order through being choked, and third, by the variations in the temperature of the atmosphere.

The result of the surveyors' meeting proves that the expensive sanitary excesses and the interception trap is a total failure, but that the cost of the system has been thus far heavy and the standing and the reputation of the theorists have to be shielded, so that the intricate and obstructive system must be withdrawn slowly, even if by so doing they still further increase the cost of sanitary appliances. Let sanitarians compare the United States sanitary methods which have been adopted by Greater London and a few other towns of Great Britain, with the large stuff manufacturing city of Bradford, England. The authorities of that city have done everything possible to assist nature to keep their sewage sweet and odorless in the sewers until it arrives at the outfall of the sewage disposal works at Frizenall. The city is crowded to excess with large manufactories and dyeworks that discharge an enormous quantity of dirty or greasy water into the common sewers daily. And 90 per cent. of the population are employed in close greasy factories or other workshops; they live in houses closely built together, yet the inhabitants enjoy general good health, and their death and sickness rate will compare favorably with any other town, even where that town enjoys much more favorable circumstances. This can be largely attributed to the plain and efficient sanitary regulations enforced, and to the adoption of nature's laws in carrying out the principle of domestic sanitation. They do not allow bath or other small waste pipes to be connected directly with the street sewers, but each delivers its contents into an open grid and gully trap which conveys the sewage to the street drain. No sewer pipe which is connected in a direct way with the street sewer enters under any building except to serve a w.c.; then it is constructed of heavy lead or other good metal and joints. Soil pipes that serve water closets in upper rooms are run up outside the building when practicable, and the w.c. bend is taken through the outer wall at the nearest point and connected with the soil pipe outside, and the pipes fixed in this way work all right in frosty weather though the city is visited with long and severe frosts and snows in winter. They also put in as short a length of soil pipe as possible to do the work efficiently; weeping tile drains are never connected with any sewer drain, but deliver on to an open gully grate outside at the bottom of an area window if convenient. The sewage collecting sewers are generally taken along the back lane when the whole of sanitary appliances are in the rear rooms of the dwellings. If allowance be made for the smell that must come from the numerous open privy middens and the slop-water closets which Bradford still uses in many houses, then the city of Bradford is about the sweetest and healthiest manufacturing town that can be found. I may also say that they do not as a rule use back air vents to water closets; and it is unnecessary to use them for the traps, serving baths and any other small fixtures, because they are not connected directly with the sewers.

John Burke, Esq., North Bay, has secured a contract for lighting the streets of North Bay by electricity, and has placed an order with the Canadian General Electric Company, for a 25 light wood arc dynamo, and 15-double carbon brush arc lamps.

THE VICTORIA JUBILEE BRIDGE.

The Victoria Jubilee Bridge, on which such rapid progress has been made during the past few months, is well under way towards completion; in fact, it may be already said to be completed as far as being self-supporting is concerned, for no portion of it is now dependent upon the erection trusses, and the double line of rails will be laid throughout, just as soon as the old tubular bridge is removed. The work of erecting the superstructure of the first span from the westerly end was commenced on the 8th December, last year, and it was completed on the 25th of the same month; but as it was almost impossible to carry on further operations during the winter season, the work of erecting was suspended until last spring. The second span was commenced on March 23rd, and the work progressed steadily during the season, with the result that on the 19th August the central span, which was the last one to be done, was all coupled up and resting upon its own bearings, thus practically completing the bridge proper. This has certainly been rapid work in bridge erecting, considering that between the 23rd March and 19th August, twenty-three spans, of 254 feet each, for double railway tracks and double tramways, and one 348 feet central span, of similar capacity, were erected in place, and that during this period of five months the aggregate amount of time that the present single-track bridge was closed to train service was only twenty-five hours.

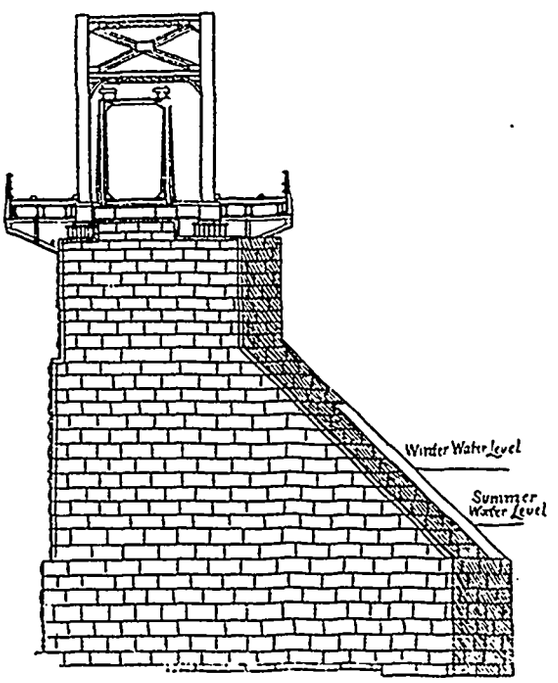


VICTORIA JUBILEE BRIDGE, MONTREAL, SHOWING UNFINISHED CENTRAL SPAN. THE VIEW IS FROM THE ST. LAMBERT SIDE, ABOVE THE BRIDGE.

The method of erecting the 254 feet spans has been described from time to time, and was carried on throughout on the same general principles. A temporary truss of as light a character as was compatible with what was required of it, was erected in proper axis on the ground at the entrance to the present bridge, and traveled across the tube by means of a series of trucks moving on the rails on top of the tube. Blocking was placed on these trucks to carry the truss by means of its top members, and the wheels were so placed as to distribute the weight as uniformly as possible in passing over the tube. The temporary truss was then drawn across the tube by means of block and tackle, worked by a stationary engine, securely placed on the top of the next tube.

As instance of how perfect the arrangements were for the moving of this temporary truss, it may be stated that the time occupied in the actual passage from pier to pier was only from four to six minutes in each case. After this truss had been placed exactly over its bearings on the piers it was lowered into place and the entire weight removed from the tube. During its passage over the present bridge and until it was securely placed upon its own bearings on the piers no trains were allowed to pass through the tube. This temporary truss being twenty-six feet two inches wide and thirty four feet ten inches high, centre to centre of post and chords was therefore completely clear of the tube, and was then used as the staging for the erection of the permanent bridge. There were two erection trusses, one on each side of the centre, and as each permanent span was completed, the erection truss was moved in a similar manner for the erection of the next one.

The central span being so much greater than the others required a different method for the temporary work, and therefore the two erection trusses were used to form one. The plan adopted was unique; the one used on the westerly side of the centre was cut in two, and one portion of it removed to the easterly end of the one used on the easterly side. On the portion that remained some extra members were placed, forming a cantilever arm, and it was moved forward into position over pier No. 12, and securely anchored to the permanent bridge. On the half that was taken to the easterly side a similar cantilever arm was attached, and on August 7th the erection truss which had not been divided was traveled westwardly over the centre tube intact, in a similar manner to the others, and the pins driven connecting it with the west cantilever arm. The east end cantilever was then moved over pier No. 13, and after it was adjusted to proper position the pins were driven connecting the cantilever arm with the truss and it was firmly anchored at the east end to the permanent bridge.



THE ELEVENTH PIER AND SECTION OF TWELFTH SPAN.

The blocking on the trucks which supported the truss and carried it across the tube was then removed and this temporary span then rested on its own bearings, all foreign weight being entirely removed from the tube. Notwithstanding the exceptional care which had to be exercised in placing this truss, the time that the present bridge was closed to traffic was only five hours.

In regard to work remaining to be done in connection with the bridge proper the removal of the old tubes will be

the most laborious; the first span of the tubular bridge has already been taken away and it may therefore be said that that portion of the new structure is now in active use. The cutting of the rivets of the old structure and the removal of the various plates, girders, etc., entails an immense amount of labor, and it is of such a nature, and the field for operation is so limited, that the greatest care and caution have to be exercised in this particular part of the work, more especially on account of the incessant traffic moving in either direction.

VICTORIA JUBILEE BRIDGE, MONTREAL, SHOWING OLD TUBE SURROUNDED BY NEW STRUCTURE.

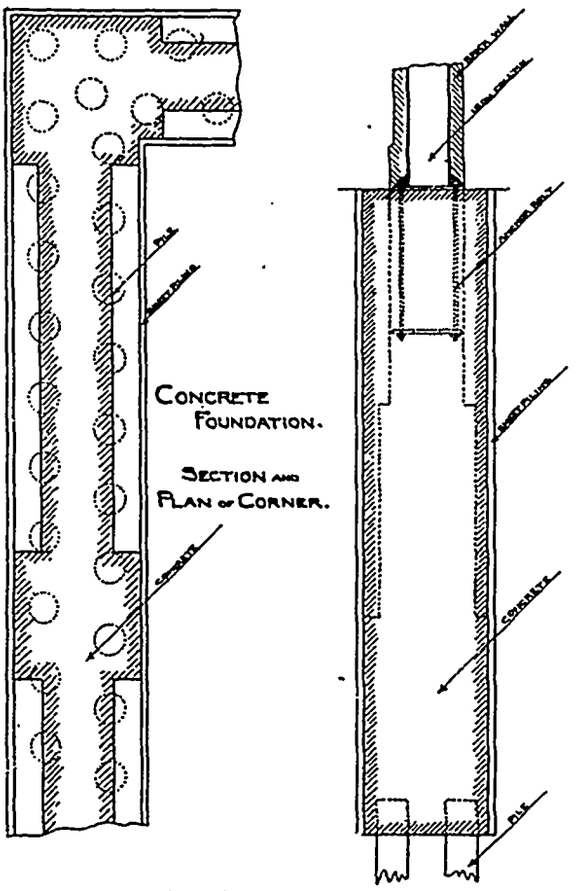
The old tubular bridge, as is well known, is a single-track structure, with a minimum clearance in height of only 15 feet. The new bridge will have a double line of railway tracks and a clear headway of 22 feet 6 inches. It will also have a team roadway and sidewalk on either side of the bridge outside the main trusses, which will be carried by the floor beams extended beyond the trusses. The total length of these floor beams is 66 feet. By way of comparison it may be interesting to note that the weight of iron-work in the old structure is 9,044 tons, whilst the new contains 22,000 tons of steel. Amongst other work yet remaining to be done is the widening of the embankment approach to accommodate the team traffic, but that is a minor matter, and will not interfere during its construction with the train traffic, nor yet with the bridge itself.

A CONCRETE FOUNDATION.

A somewhat unusual foundation has just been built for a new generating house the Consumers Gas Co. is erecting on Parliament street, Toronto. We believe it is the first of the kind in Canada. The building is to replace one that had to be torn down on account of the numerous cracks and settlements developed by faulty foundations. The foundations for this heavy building were simply rubble stone walls in lime mortar, walls that were built without any through bonders, plenty of "shiners," straight joints, parts laid up dry and all small stones; consistently with such work the walls were largely built on a soft made up bottom, one wall was carried down indeed sixteen feet below the ground level as if in search of hard bottom, which not only caused useless expense in the first instance, but also made the expenditure greater in the new work. Had piles been driven from four or five feet below the surface all round the building until they either gave an equal frictional resistance or reached hard pan, the first building would have cost less than it did and still be standing. This is a glaring instance of the greater costliness of rule of thumb methods in building over more scientific ones.

When the old foundations were removed the architects had test piles driven at intervals of about ten feet along the trenches and found the bottom to be so soft that the piles sunk to rock without practically developing any frictional resistance. Calculations were made therefore on the basis of the piles acting in direct compression, and from data thus gained it was determined to drive a double row of piles in the trenches at two feet centres staggered. These piles averaged a depth of about twenty-six feet from the ground level. They were cut off perfectly level twelve inches above the bottom of the trench and concrete filled in between to an even surface with the tops of piles, this thoroughly keyed the piles together and gave a good bed to build on.

On the recommendation of the architects, Bond & Smith, Toronto, solid concrete walls were then built to the ground level, part being sixteen feet deep. With walls such as this the loads from the superstructure (a steel skeleton building) are quite evenly distributed on the piles; Another point is that the column bolts are bedded right in the concrete mass and the whole is cohesive and rigid. The walls were stepped up in thickness from 3 feet 6 inches to 2 feet 3 inches.



The method of mixing and laying may be of interest: The concrete was formed of five parts of small broken stone, two of gravel and one of cement. After carefully examining tests of various cements a Canadian brand was specified by the architects, the Samson brand of the Owen Sound Portland Cement Co. All proportions were carefully measured in barrows of equal capacity, the stone was thoroughly wetted before being mixed with the other materials, the mixture was turned over four times to ensure thorough covering of the stone, only enough water was allowed to be added to make the mass cohesive, it was

then placed in the trench and tamped until the water came up to the surface. The walls were made in layers of not more than eight inches and wherever a joint occurred the layers above lapped over at least five feet in either direction; always before starting a new layer the lower one was "ragged" up, swept clean and watered thoroughly.

It is somewhat strange that this method of concrete foundation walls has not been more extensively used, for it is no only superior to an ordinary bonded wall, but has been found to be cheaper than a stone wall properly built in cement; doubtless though we shall see it adopted more often in the future now that a beginning has been made.

Some difficulty was experienced in carrying out this work through the heavy generators bearing on the ground a few feet from some of the trenches. On this account before allowing the old walls to be removed three-inch sheet piling was driven sixteen feet down. As the stone was taken out wales were placed along this and carefully strutted. At one of the other trenches it became necessary to underpin the stone wall of adjoining building before proceeding with the work.

CANADIAN ASSOCIATION OF STATIONARY ENGINEERS.

NINTH ANNUAL CONVENTION.

The ninth annual convention of the Canadian Association of Stationary Engineers was held at Hamilton, on the 8th, 9th and 10th August. The hotel headquarters were at the new Waldorf House, and the meetings were held in Oddfellows' Hall, John street.

The first session opened at 11 a.m., on Monday, 8th, with president, Bro. E. J. Philip, of Toronto, in the chair, and vice-president, Bro. W. F. Chapman, of Brockville, in the vice-chair. The other executive officers present were, J. G. Robertson, Montreal, secretary; R. C. Pettigrew, Hamilton, treasurer; G. C. Mooring, Toronto, doorkeeper. The delegates present from the branch associations were: Charles Moseley, John Fox, Wm. J. Webb, and Thos. Eversfield, of Toronto No. 1; John M. Dixon and John J. Richardson of Toronto No 2; Thos. Ryan and Peter McNaughton of Montreal No. 1; Geo. Mackie of Hamilton No. 2; Chas. Asselstine of Kingston No. 10; Wm. Allan, of London No. 5; John Grundy, of Brockville No. 15; Wm. Bear of Dresden No. 8; Wm. Oelschlager of Berlin No. 9; Thos. Pilgrim of Brantford No. 4; and John L. Wendell of Waterloo No. 17.

Other members reported present were the officers of Hamilton No. 2, consisting of Robt. Mackie, president; W. R. Cornish, past president; Thos. Chubb, vice-president; Joseph Ironside, recording secretary, James Carroll, financial secretary: Wm. Nash, treasurer; W. I. Stevens, conductor, and Thos. R. Carter, doorkeeper; Peter Stott, T. Cook, C. Hurton, J. Webb, T. Elliott, C. De Mille, W. Morris, J. Wadge, J. Clair, J. Fielding, David Hunter, Robert Stewart, J. M. Morris, and G. Epps, all of Hamilton; Geo. Gilchrist, Geo. Bradley, A. M. Wickens, Samuel Thompson, Walter G. Blackgrove, J. G. Bain, John Ruse, P. Trowern, all of Toronto; F. G. Mitchell, of London.

Among the visitors present were J. E. Taylor, representing the International Correspondence Schools, Scranton, Pa.

Executive treasurer Pettigrew, having introduced Mayor Colquhoun, and Aldermen Carscallen and Nelligan, of the Hamilton city council, the Mayor came forward, and in the name of the council and citizens, welcomed the association to Hamilton. The duty demanded of him was a pleasing one, for societies with such high ideals as this should meet with hospitality and friendship, wherever they convened. His chief regret was, that owing to the restrictions of a city by-law, which was as unchangeable as the laws of the Medes and Persians, he could not offer them the use of the City Hall as a meeting room, but he was glad to see they had comfortable quarters and plenty of room here. He hoped the delegates would carry back with them the most kindly recollections of their visit to Hamilton. They would be welcomed and "taken in"—using that phrase in a hospitable sense—and they would find the people of Hamilton kind and fraternal. Hamilton was a city to be proud of; it was of no mushroom growth; there had never been a boom since 1856, but its growth had been a steady, legitimate one, and that was what they wanted. Hamilton was now becoming known as one of the prettiest cities on the continent of America—an assertion with which the visitors would agree, he believed, before the convention was over. He might say more, but he was not an adept at figures of speech. As a banker he was more familiar with the figures that could not lie (laughter). In conclusion, he welcomed the delegates collectively and individually, and trusted their convention would be both pleasant and profitable.

Alderman Carscallen wished to emphasize the welcome extended by the Mayor, and was glad the association had seen fit to choose Hamilton as a convention city. He had been struck with the principles of this association, as announced in the preamble of the constitution, which he begged leave to quote: "This association shall at no time be used for the furtherance of strikes, or anyway interfering between its members and their employers in regard to wages, recognizing the identity of interest between employer and employee, not countenancing any project or enterprise that will intertere with perfect harmony between them; neither shall it be used in any manner for political or religious purposes." As long as this association is conducted on those principles, it would have the respect of every right-thinking man, and he would admonish all the members to adhere to those principles. He had always been in favor of organized labor, for the improvement of the condition of the workingmen, and as a means of obtaining their rights; and he had no hesitation in saying that the organization of labor had been the means of lifting men up. Union for mutual help and defence of interest was reasonable and seemed to prevail. As a councillor of some years' experience he would advise them never to be hasty in amending the constitution. A proposition might appear reasonable at first sight, but on second thought it would be seen to be a mistake. He hoped their deliberations would redound to the credit of the association.

Alderman Nelligan also expressed the pleasure it afforded him to join in welcoming the association to Hamilton. In the city council he was an advocate of day labor, as a means of getting good and efficient work, instead of awarding municipal work to contractors, who would squeeze the men and get all the profit there was in a job for themselves. He hoped the delegates would have a good time, and be pleased with their stay in the city.

Bro. Robert Mackie then read an address of welcome on behalf of the Hamilton branch, as follows:

"On behalf of the Hamilton Association No 2, I have a great deal of pleasure in extending to you, delegates of the Canadian Association of Stationary Engineers, at our 9th annual convention, a hearty welcome to our city. We might say that you are not strangers in a strange land, for you have been here at a former meeting of this kind, the Executive having been formed in our city. The continual growth of the association, however, has brought with it a larger number of delegates. It is not necessary to go into details of the advantages of engineers belonging to such organizations as ours. The members of the Hamilton branch received a great deal of valuable information last winter by a series of addresses and papers on subjects in which we are all deeply interested, given by the best authorities we could procure. In conclusion, we trust your stay with us will be a very pleasant as well as a profitable one."

The president appointed Bros. Ryan, Wickens and Blackgrove a committee to draft a reply to the addresses of welcome.

The president gave his annual address as follows:

I have the honor and pleasure to welcome you to this the 9th annual convention of the C.A.S.E. The subordinate associations have chosen you to represent them at this convention, and to look after their individual interest in particular and the whole society in general. The second meeting of the executive—it was really the first, the previous one being only a meeting to get into shape—was held in this city, and I little dreamt at that time that I would occupy the president's chair

at the next meeting in Hamilton; therefore, it is with pleasure that I greet you, the new members and the jolly good fellows I have met before. While this meeting should be a criterion by which we can judge the growth of the association, we must not forget the conditions under which the C.A.S.E. is carried on. First, it is not a labor organization, nor is it an insurance society, and it cannot be called a secret or benefit society, nor is it a political or religious order, it is purely an educational institution. Therefore the growth of the order is limited for several reasons. First, we have not the attraction that insurance, secret, benefit or labor organizations have. The field from which we draw our members is limited and scattered, and there are few places where there are plants enough to get a number of engineers to join an association; another reason is the fact that as boys at school hate to be taught, so we grow up, and it is hard to get a man to realize that he has much to learn, and as education is the only object for joining the association some object to letting the public know that there is anything yet for them to learn. Now, while the growth of the order is apparently small, at the same time the percentage of good done its members is much greater than any other order that I know of, as many can testify to. We meet again here this year to try and work out other ideas for the benefit of the order and each member individually. I hope you will all give your attention to the business that will come before you, that our meeting here may result in profit to ourselves and prosperity to the society. The prospects for the coming years are brighter than for years past; times are good in this country, and when the war is settled the big country to the south of us will brighten up and their prosperity will add to ours. So that if we grew in the past few years we will boom in the next. Hard times have had their effect on this order like all others, but hard times are a thing of the past in this country, and will be for some time to come, if I am any prophet, and if those who have been the stay of the association in the past will keep on pushing they will reap the harvest they have been looking for. Better work has been done in the subordinate associations during the past year, in the line of reading papers and making the meetings entertaining and instructive than other years; and it is noticeable the improvement in lodges where this matter is thoroughly carried out. I am pleased to state that Hamilton No. 2 is carrying this work out to perfection. There was one new association formed during the year in Toronto. It is a good live association and will materially help the order in Toronto and vicinity. The matter of a hand-book taken up last year was completed this. The secretary will no doubt make you a full report on the matter. I have not had the time to give to executive business that I would like, from the fact that this has been the busiest year with me that I have ever experienced, in fact, it was very difficult to get away to attend this convention; in consequence of this the work has all devolved on the secretary, and, as in past years, the secretary is by far the more important officer of the executive. So much so that it has been suggested that a permanent secretary be appointed, or at least have the secretary hold office for more than one year. As it is now, it takes a man the entire year to get accustomed to the work, and then he is changed, making confusion and loss of time to both executive and subordinate lodges that would be avoided by a permanent secretary. In conclusion, brethren, I hope you will give me the support that you have given the chair in the past, and that you will attend strictly to business while there is business to be done. I wish it were in my power to do all for the C.A.S.E. that I would like, and place it at the head of all societies, where it belongs, because it is founded on education.

Bro. Wickens regretted that duties in Toronto would call him away from the convention for the following day, but as he took a fatherly interest in the organization, having been one of its founders, he desired, with the president's permission, to make one or two observations before leaving. There were many different associations in existence, with various objects in view, but no association bearing on trade could be named which existed for the special purpose of educating its own members. The C.A.S.E. did this, and spent hundreds of dollars for the educational advancement of its members. How to extend and develop the educational plans of the association was a problem. Many engineers were scattered over a wide extent of territory in Canada, in many places it was not possible to form a branch association, and how to extend these advantages to such engineers was a problem worthy of consideration. He was glad to see city aldermen here, and would be glad to see city fathers in other places take an interest in our association. It was well for them to know that this association existed as much for the steam user as for the engineer. If the ideals of the association are lived up to, there was nothing to prevent it from becoming one of the greatest organizations in the country.

Secretary Robertson then read the minutes of the last convention, which, on motion of Bro. Moseley, seconded by Bro. Mooring, were approved.

President Philip nominated Bros. McNaughton, Mooring and Geo. Mackie to be the Committee on Credentials.

In the absence of Bro. Risler, of London, Bro. Allan, of the same branch, was appointed conductor.

Bro. Oelschlager, of Berlin, said, that as he would not be able to remain throughout the convention, he would take this opportunity of inviting the members to hold the next convention in his town. Berlin could not boast a big river or lake, but it had other attractions, and was becoming known as a convention town. Berlin was a prosperous manufacturing town, and he could assure the members that if they accepted his offer they would find a hospitable welcome.

Bro. Wickens approved of the idea, as Berlin and Waterloo, which were almost one, had each a branch association, and the Berliners knew how to take care of a convention.

The formation of committees was then proceeded with, as follows, the first-named member in each case being chairman:

Committee on Audit—Bros. Webb, McNaughton and Bear.

Constitution and By-laws—Bros. Ryan, Mooring, Allan, Pilgrim and Geo. Mackie.

Good of the Order—Bros. Dixon, Chapman, Eversfield, Moseley and Richardson.

Mileage—Bros. Pettigrew, Robertson and Fox.

Bro. Ryan gave notice of motion to have the following changes made in the constitution and by-laws:

1st. That the per capita tax paid by the different sub-associations be reduced from 70 cents per member, as at present, to 50 cents per member. .....

2nd. That with a view to reduce the expenses of the Executive Council, the meetings of the Executive be held biannually instead of annually.

3rd. Also with a view to reducing expenses, that the election of doorkeeper and conductor be dispensed with, and that these offices be filled at the convention by any delegates appointed by the president.

4th. That no District deputy be appointed by the president, but that all the executive officers fulfil the duties of District Deputy in different localities at any time.

5th. That all past presidents be competent to form part of the Executive Council with full powers and privileges, but that no mileage or hotel expenses be paid to any past president.

Bro. Wickens gave notice of motion that the Committee on Constitution and By-laws be requested to formulate a set of by-laws for the subordinate associations, and report the same at next convention.

The convention then adjourned till

TUESDAY, 9TH AUG.

The first business of the day was the presentation of the executive secretary's report. Secretary Robertson reported that during the year a new branch association had been formed in Toronto, known as Toronto No. 2, and they had succeeded in resurrecting the two defunct branches, Stratford and Wiarton. From Guelph, Ottawa, Winnipeg, Kincardine and Peterboro no report had been received as to per capita tax. The receipts of the year were $555.99, and after paying expenses the association had a balance on hand of $290.04. These figures did not include the expenses and receipts of the new handbook, which had not been issued long enough to enable them to make collections. This handbook had been compiled with a view to making it as useful as possible to the average engineer, and it had been exceedingly well received. It was acknowledged to contain more information than many books of five times its price. It was too early yet for the association to reap the full benefit from it, but that would come in the future. The financial results from it would be fully reported on at the next con-

vention, and meantime he might say that he hoped to turn in several hundred dollars to the association from it.

On motion of Bro. Pettigrew, seconded by Bro. Allan, the report was adopted, and Bro. Robertson and his co-compilers of the handbook were congratulated on their excellent work in producing such a valuable book at so much labor and trouble to themselves.

The Treasurer's report was as follows:—

The Treasurer begs to submit the ninth report of the Association.

Balance from last convention and receipts of the year	$559 99
Expenditure	269 95
Balance on hand	290 04

ROBERT C. PETTIGREW.

Auditors: W. J. Webb, Wm. Bear and P. McNaughton.

On motion of Bro. Mooring seconded by Bro. Asselstine, the report as passed by the auditors was adopted.

Bro. Ryan presented the report of the committee on constitution and by-laws as follows: This committee recommends unanimously the following:

1st. That the per capita tax be reduced to 50 cts. per annum for all members in good standing.

2nd. That the doorkeeper and conductor be not elected but appointed by the president from the delegates present at each meeting of the Executive Council.

3rd. That in article 10 section 1 the word "deputy" shall be struck out and "Executive Officer" inserted.

4th. That all past presidents remain members of the Executive Council with full privileges, but they must defray their own expenses.

5th. That the committee does not see its way clear to hold its conventions bi-annually.

Bro. Dixon presented the following report of the committee on Good of the Order. Your committee appointed to consider this important portion of our Society's life and development, have given due thought to the many suggestions that have been presented, and would submit the following conclusions to the mature judgment of the convention.

The president's report in a spirit of fraternity, welcomes all to take part in the convention. He further adds that our society is neither a trades or insurance association, and consequently our expenses should be reduced to a minimum. The educational portion of our meetings should have some form of systematic teaching, and all who are able should be asked to participate in this necessary and useful work. We believe that an advance in this direction would be instrumental in raising our organization to a permanent and educated membership.

We believe the time inopportune to change the per capita tax as the executive have liabilities which must be met for the current year, and any action taken in the matter might be a source of discredit to the order at large.

The suggestion of bi-annual meetings we regard as a fatal blow at our very existence. The vitality of a society consists as much in its intercourse and annual settlement as it does in its financial strength, and while the desire to economise may be commendable, yet we regard this step as one which in a measure would be suicidal.

The cutting off of doorkeeping and conductor proceeds from the desire to further economise, but we submit that such a course may act prejudicially, inasmuch as the conferring of this honor on members of small or remote associations keeps a thread of connection that is frequently of eminent service to the Order.

The services of district deputies should be dispensed with, and in the locality requiring the service of an executive officer, any member of the executive should be delegated to discharge the duties of the office.

The bulletin at present issued monthly to the associations should be enlarged to an 8 page Journal. It could be made an avenue of interest and information to our membership, besides it could be placed in the hands of those eligible to join our ranks, and possibly add materially to our numerical strength. We are further of opinion that such a sheet, by proper management, could be issued free of expense by a judicious system of advertising.

The office of executive secretary is one that should be held for more than one year, as a greater degree of perfection could be reached in secretarial work by a continuous service. The price of stationery as furnished to primary societies is on the side of excess, and we would suggest that a reduction of 10 or 15 per cent. should be made on all future sales.

It is a matter of regret that our bill in the Dominion Parliament was thrown out on a technicality; but we trust the combined wisdom of the present convention will devise some method wherein our profession may have due recognition and legal protection.

Both reports were received, to be discussed in detail later on. In the meantime a general discussion took place on the effect of the proposed changes.

Bro. Ryan said other organizations larger than this had got into trouble through fixing their per capita assessments too high, and there were some members of the Montreal association with whom this was a serious matter. Bro. Moseley wanted to know, if this tax were reduced, where the funds would come from to make up the deficiency. Toronto No. 1 had no complaint to make, as it had double the membership of any other branch; but a reduction all around would leave a shortage. He thought it should be left for another year. Bro. Pettigrew was in favor of a reduction and the association was now in shape to make it. Bro. Dixon said that big societies could afford to have a low assessment. He wished to be on the side of economy, but the present time was not opportune, and the branch association should be consulted in such a matter. Bro. Robertson said that as far as the immediate future was concerned, the association at large really depended for its income on the handbook just issued.

After further discussion Bro. Dixon moved, seconded by Bro. Richardson, that the executive secretary issue a circular to all the branch associations, asking them to state their financial position and express an opinion on the question of reducing the per capita tax, a report to be presented on the subject at the convention of 1899.

In speaking to this motion, Bro. Ryan said Montreal No. 1 had already instructed him on the matter. Bro. McNaughton said the dues to the branch associations barely covered the expenses, and if the per capita tax were reduced it would give them a fund to work upon. Bro. Moseley said Toronto No. 1 had been able to make way and pay out $200 in sick benefits in the last two years besides. Bro. Asselstine said Toronto was exceptionally well fixed. In Kingston, they found the tax quite a burden. Bro. Robertson said the big branches should help the little ones, if they wanted to see the institution grow; but he did not see how they were going to reduce the tax. President Philip, in reply to a question, said the proposed change in the officers would take off about two-thirds of the average loss from the reduced tax. On motion of Bro. Robertson, seconded by Bro. Moseley, the discussion was deferred; Bro. Dixon's amendment being lost.

On resuming discussion on the report of the Committee on Constitution and By-laws, the first clause, proposing to reduce the per capita tax, was defeated.

On the second clause, Bro. Dixon thought that if these offices were retained, the delegates elected—especially if from a small branch—would go back to their branches as apostles of the association. Bro. Ryan held that there were as good men in the small branches as in the big ones for any office, but as these offices could be filled by any delegate present, it was only throwing money away to have them as a part of the executive machinery. On being put to vote, the clause was rejected, and the offices of doorkeeper and conductor retained.

Clause 3 was adopted, the effect being to do away with the "district deputies," and make each executive officer an organizer in the district in which he may be visiting, or may reside.

Clause 4 was also carried, giving past presidents the right to vote, etc., at conventions, but without transportation allowance.

Clause 5 was also approved, maintaining the conventions annually, as at present.

On taking up the report of the committee on "Good of the Order," the president said Mr. J. E. Taylor, of the International Correspondence Schools of Scranton, Pa., would like to address the convention on the educational question. Permission being given, Mr. Taylor gave a history of the begin-

ning of this institution, which was founded by T. J. Foster, first as a means of preparing miners and mine engineers to pass the examination required by the State of Pennsylvania, and afterwards as a more comprehensive system of technical education for steam engineers and firemen, electricians, machinists, mechanical draughtsmen, designers, etc., to be carried on by correspondence in any part of the world. When the State law, requiring the examinations, was passed, many of the miners were in a difficulty, and Mr. Foster was asked to help them out by a set of questions and answers. It was thought that a class of 300 might be obtained at first, to cover expenses, but when the plan was placed before the men, 1,200 applied, and the idea has since developed, till now the I. C. schools have 50,000 students throughout the world. The student is taken right from the a b c of arithmetic up through algebra, etc., and as a correspondence is carried on personally with each student, a fair chance is given to backward pupils. The postage bill of the institution averages over $1,000 per week. Recently a kind of employment bureau has been started for obtaining situations for students, after they have passed, and a case was cited where the institution had been the means of obtaining situations for three young tool makers, at wages of $3.50 per day. The schools have 15 printing presses run by electric motors, and consume about two tons of paper per week.

A special discount was now offered to members of the C.A.S.E., and Mr. Taylor was prepared to explain all details to members interested. A branch office is being opened in Toronto, particulars of which are given in another column.

On motion of Bro. Dixon, seconded by Bro. Richardson, it was decided to recommend the methods of this school to the consideration and support of members.

On the question of continuing the issue of the "Bulletin," published for the past four months, Bro. Robertson explained that it was got out to advertise the work of the Engineer's Handbook, 1,000 copies per month being printed. It had served that purpose well, and the question now remained as to its continuance, either as a 4-page or an 8-page paper.

After further discussion, a committee, composed of Bros. Ryan, Dixon and Robertson, was appointed to confer with the publishers of THE CANADIAN ENGINEER in regard to the issue of the bulletin.

The convention then adjourned to hold an excursion on the steamer "Acacia" during the afternoon. About 50 joined in the trip, the steamer crossing Hamilton Bay and making a trip several miles out into Lake Ontario. A lunch was served on board, and the trip was enlivened by song and dance.

At the evening session E. G. Barrow, C.E., city engineer of Hamilton, read a paper on sewage disposal, which is printed elsewhere in this issue.

In complimenting Mr. Barrow on his instructive paper, President Philip said this was an important subject for Canadian cities and towns, and one that must be studied more seriously by our municipal authorities. Toronto, among other cities, stood in need of reform in its sewage system. There was one question he would like to ask Mr. Barrow, and that was the effect of the filtering operations on the coal used in the filters.

Mr. Barrow replied that after being used for two years in the filters, the coal was found to be as good for burning as before—in fact its burning qualities seemed to be improved, probably owing to the oily matter absorbed during its use. In reply to another question he said any kind of coal could be used, but it must be of small size.

Bro. Moseley asked what was meant by giving the filters a "rest?"

Mr. Barrow said that it meant the exposure of the material to the open air and sun, for an hour or more.

Bro. Geo. Mackie asked as to the relative value of coke or charcoal as a filter medium.

Mr. Barrow replied that they were not considered so efficient as coal. Replying to Bro. Mitchell, he said the sewage to be treated could be made to go up through the filter by pressure or down through it by gravity. The first layers of coal were coarse, and then finer coal was put on down to 1-16 inch. In reply to Bro. McNaughton, he said that in carrying out the irrigation system, it was desirable to make the area of ground broad enough to absorb the sewage without soaking the ground too much. On this account, in some localities, and in wet seasons, it resulted in too much soaking of the soil. The sewage was distributed over the ground by carriers. In the method of underground filtration, the most successful work was done at Berlin, Germany, where the soil was light and porous, and readily absorbed all the sewage. Replying to a question of Bro. Stott, he said that with the lime treatment a disagreeable smell developed, unless the treated material was quickly removed, but it was not so when the material was treated with manganese, which made a better precipitant.

J. M. Williams, of the chemical laboratory of J. Winer & Co., wholesale druggists, Hamilton, then read a paper on "Oils in the Engine-room." This paper will be found elsewhere.

The president, in complimenting the reader of the paper, said it was exactly in line with their work, and although many of them did not pay much attention to the composition of oils, all used them, and should be well posted on their nature.

Bro. Mooring would like a simple test of engine oils.

Mr. Williams said an oil was good, according to the degree of its viscosity, or body, and to test this in a simple way take a can and make a hole large enough to let out a drop at a time. Take a standard oil and count the drops that will come out of this hole per minute, and compare that with the outflow of the oil to be tested. To make the test fair, you must use the same can and the same hole, with the same amount of oil and at the same temperature for both oils. It is still better if two tests are made, one at a high temperature, and one at a low temperature. A viscometer is a desirable apparatus for such tests. As to testing the volatile properties of an oil, this can be done by placing a given quantity in a wide, open vessel and letting it stand a given time to see how much it will lose in bulk by evaporation. The oil that evaporates most is the poorest for lubricating purposes. Coal oil, for instance, which is very volatile, is of no use at all as a lubricant. Neither should an oil be gummy. Heating it in a vessel will disclose whether an oil is gummy, but this trouble will be found chiefly with oils that are derived from fish, or from animals and vegetables, and as most lubricating oils in this country are now of mineral origin, this difficulty is not common.

Bro. George Mackie asked if the volatility of two samples could not be disclosed by placing a drop from each on the cylinder and seeing which dried up the sooner. Mr. Williams replied that such a test was practical and convenient.

The president observed that some oils will run very slowly and yet be of no use on a heavy fast-running journal. He was one of the first who began to use light oils, and though he found the first trials unsatisfactory, one of the representatives of the Standard Oil Co. came around, and, after carefully going into the matter, proved that the difficulty arose, not from the new oil, but from the oils previously used, and after the bearings were cleaned of the former oils, all went well.

Bro. Moseley thought the best test of an oil was the crank-pin of a high-speed engine, running at 270 revolutions per minute.

In reply to Bro. Geo. Mackie, Mr. Williams said that any oil having resinous constituents (that is, of the nature of rosin), adds to the resistance in the bearings and increases the coal bill. In reply to Bro. Mitchell, regarding cylinder oils, he said there was no doubt that wet steam prevented lubrication in the cylinder. If the flash test was low it would be found that the oil, when put into the cylinder, would vaporize, or turn into a sort of steam, and therefore be no good as a lubricant. After discussing a particular experience of Bro. Mitchell, in testing a new cylinder oil, he would say that the flash test should not be too far in advance of the temperature of the steam in the cylinder, at 100 lbs. pressure. In response to a request for tests for oils, together with the usual ones of exposure to high temperatures for volatility, and drying, he suggested to have a bottle marked into thirds and shake together one-third of the oil in question and one-third clear lye (made by dissolving commercial canned lye in water and decanting); after standing mineral oil will rise to the surface, any animal or vegetable oil will be saponified and remain in the lower layer with the lye.

On motion of Bro. Moseley, seconded by Bro. Ryan, a vote of thanks was passed to Mr. Barrow and Mr. Williams for their interesting papers, and for the quiet way in which they had stood the cross-examination of members.

Bro. P. McNaughton then read a paper on "Evaporation and the Raising of Steam in Boilers," which will be found in another part of this issue.

President Philip said this paper disclosed a more than usual amount of study on this subject, and the reader had exhibited the qualities of his race in closely observing the small things in nature which ordinary people would pass over without notice.

On motion of Bro. Mooring, seconded by Bro. Mitchell, a vote of thanks was passed to Bro. McNaughton.

Bro. Chas. Moseley next read a paper on "Economy in the Boiler Room," which will be found elsewhere in this issue, and received a hearty vote of thanks, on motion of Bro. Pettigrew, seconded by Bro. Mackie.

The convention adjourned at 10.30 p.m.

WEDNESDAY, 10TH AUG.

On reassembling at 9.30 a.m., Bro. Dixon brought up the report of the committee on Good of the Order for discussion. With regard to the publication of the bulletin, Bro. Robertson said he had sent a copy, during the preceding four months, to every engineer whose address he could obtain, from Halifax to Vancouver, and where he could not get addresses, he addressed them to the waterworks engineer of the town or village. The question whether they should be sent to the branch associations and distributed to members from the rooms, or be sent direct to the private addresses of members, was discussed, it being the opinion of the majority that it would be better to send it to the houses of members, and each branch should have an address book in which the house addresses should be kept.

On motion of Bro. Geo. Mackie, seconded by Bro. Fox, the whole question of the bulletin was left in the hands of the committee appointed on the previous day.

On the subject of the laxity of branch associations in sending in reports of their meetings and recording their progress generally, Bro. Webb suggested that a printed form of report be sent to the various branches, on which they could report every month, and the Executive Secretary was authorized to prepare such a form.

On the clause of the report relating to the office of secretary, Bro. Dixon moved, seconded by Bro. Chapman, that the Executive Secretary be elected for a term not less than two years. In the discussion it was thought that the association lost much by having a new secretary every year, as by the time one secretary had become proficient in his work, a new man was elected, and the thread was broken. Organizations that had a capable permanent secretary showed better results. The resolution carried.

On the question of the price of stationery supplied to the branch associations, Bro. Robertson stated that the gross receipts of the year from stationery amounted to about $40, and the net profit amounted to about 25 per cent. In view of the smallness of this item it was decided, on motion of Bro. Mackie, seconded by Bro. McNaughton, to allow the present prices for stationery to stand.

The subject of the Bill brought before the Dominion Parliament, for licensing stationary engineers, was then brought up. Bro. Chapman, as one of the delegation sent to Ottawa, reported that along with Bros. Wickens, Mitchell, Ames and Simmons, he had obtained the active help of Mr. Wood, the local member, and the deputation was introduced to the Minister of Justice during the last session. The Minister of Justice showed, by the B.N.A. Act, that the Dominion Parliament had no jurisdiction on this matter, and that it must be brought up in the provincial legislatures. Through the different branch associations about 50 individual members of parliament promised to vote for the Bill, but the opinion of the Minister of Justice blocked the measure, and on the advice of their friends in parliament, it was not introduced into the house.

Bro. Ryan said a number of members of Montreal No. 1 had taken a lively interest in the Bill, and got the Montreal M.P.'s to favor it. Meantime the Bill had been dropped by the Ottawa delegation, who, instead of reporting the result, had allowed Montreal No. 1 to go on working and spending time to no purpose. This was a case of downright negligence, and was the cause of a good deal of annoyance to Montreal members, who should have been informed of the failure of the delegation.

Bros. Mooring, Chapman and Dixon agreed that the deputation to Ottawa were to blame, and should have reported the result of their visit in writing; and Bro. Chapman considered that every engineer in Ontario was to blame for not working harder to secure the passage of a Provincial Engineer's License Bill.

On motion of Bro. Pettigrew, seconded by Bro. Fox, the following were appointed a committee to take up the matter again, and endeavour to secure the passage of the Bill: Bros. Dixon, Allan, Webb, McNaughton and the mover.

An invitation was here received from the Hamilton Literary and Scientific Association to visit their museum on Main street.

The Mileage Committee reported that the total of the mileage allowances paid to delegates was $179.10, leaving a surplus still in the hands of the Executive of about $100.

Bro. Pettigrew was then requested to read the following reply to the address of welcome:

"To his worship, Mayor Colquhoun and Aldermen Carscallen and Nelligan: Gentlemen—We, as a body of engineers, extend to you our hearty appreciation of your cordial and kindly address of welcome to your pleasant and prosperous city, at our ninth annual convention. We, as a body of working men, do not believe in the furtherance of strikes or labor trouble of any kind. We are organized for educational purposes, in order that our employers may be benefited thereby, and thus ensure for them efficiency, carefulness and stability to reduce operating expenses generally. It is our aim to advance the interests of those by whom we are employed. It may be interesting for you to know that there are members of this association who are worth 100 per cent. more to their employers to-day than they were ten years ago, thus showing that their admission to the society was to their benefit as well as to their employer's. It is not our intention to laud our society as being the best on earth in regard to benefits, such as insurance, sick benefits, etc., but we do maintain that our society is the best organized for the advancement of its members in their calling. We are pleased to meet in your beautiful city, and trust that our meeting here may be beneficial to you and the manufacturer and steam user, as well as to ourselves, and hope that we may meet here again some time in the future. We wish to thank you for the hearty reception you have accorded us, and we assure you that we feel entirely at home here. We shall endeavor to conduct our business in the best manner possible, and trust our deliberations may be profitable to one and all. Again thanking you for your kind and enthusiastic greeting, we are yours respectfully, Thomas Ryan, Montreal; A. M. Wickens, Toronto; W. G. Blackgrove, Toronto."

Bro. McNaughton wished to ask the president what was meant by a "member in good standing."

The president replied that it was a member who was not six months or more in arrears with his dues.

Bro. Webb said that branch associations, by paying capitation tax on its delinquent members, obtained representation at the conventions to which they were not really entitled.

Bro. Mooring said this was a burning question in Toronto, and there ought to be some uniform policy adhered to in this matter.

The president said the real trouble was that the branch associations did not take off their books members who fell in arrears without special cause.

Bro. Webb said that in Ontario all associations were under the Ontario Assessment Association Act, and must give a member due notice of his suspension. In the case of Toronto, a good many members had been notified of their arrears time and time again. Members in arrears for one term before the convention have from the second meeting in June until the end of the month as a last chance. This was sufficient opportunity, and there ought to be no representation here from dead members.

Bro. Ryan said that in Montreal no member in arrears was carried on the books of the association unless he could show cause for non-payment.

On motion of Bro. McNaughton, seconded by Bro. Allan,

it was resolved that the local secretaries be instructed to enforce the by-law regarding members in arrears.

A question arose as to the numbering of the recently formed Toronto association, and Secretary Robertson said it was entered as "Toronto No. 2," at the request of the association itself. It was pointed out by some members that another branch being already known as No. 2, this would lead to confusion.

Bro. Geo. Mackie moved, seconded by Bro. McNaughton, that when the present stationery ran out, the name of Toronto No. 2 be changed to No. 18. Carried.

Bro. Dixon thought that locally the new Toronto branch could still be known as No. 2, and the No. 18 could be used in convention matters.

The convention then adjourned till afternoon, when Bros. Dixon, Asselstine, and Grundy were appointed scrutineers for the election of officers. The election resulted as follows, the first three being returned by acclamation:

President, W. F. Chapman, Brockville.
Vice-president, R. C. Pettigrew, Hamilton.
Secretary, J. G. Robertson, Montreal.
Treasurer, G. C. Mooring, Toronto.
Conductor, Wm. Bear, Dresden.
Doorkeeper, John L. Wendell, Waterloo.

Bro. Robertson moved, seconded by Bro. Dixon, that the next annual convention be held at Berlin.

Bro. Fox moved, seconded by Bro. Bain, that the next convention be held at Toronto.

Upon a show of hands the question was decided in favor of Berlin.

The installation of the new officers then took place, Bro. Ryan being appointed installing officer.

In the absence of the Mayor, Judge Snider performed the ceremony of pinning the past president's jewel on the breast of the past president, remarking as he did so, that he had heard of past president Philip's intelligence and uprightness in the discharge of his high office, and it gave him, therefore, especial pleasure in being the medium of presenting the jewel. Bro. Philip replied in suitable terms. The work of the officers was carried on under difficulties, and the only way to make it a success was for each one to do what lay in his power.

Bro. Ryan was then asked to present himself before Judge Snider, and was evidently surprised at the request. He was still more surprised when a past president's jewel was taken out of a case and pinned on his breast. Judge Snider assured Bro. Ryan that this token expressed the feeling of reverence and esteem in which the association held him for his past efficient services.

Bro. Ryan said he could hardly tell how surprised he was at this manifestation of good-will, and he could only say just now that he would persevere in his efforts to promote the good of the association.

On motion of Bro. Dixon, seconded by Bro. Mackie, a vote of thanks was passed to Judge Snider for his kindness in attending at this function; and a similar vote to Bro. Ryan for the way in which he had fulfilled his duties as installing officer.

On motion of Bro. Mooring, seconded by Bro. Mackie, a gratuity of $25 was presented to Bro. Robertson for his efficient services as secretary.

The price of the new handbook was fixed at 25 cents to members, and 50 cents to outsiders.

On motion of Bro. Dixon, seconded by Bro. Philip, a vote of thanks was passed to THE CANADIAN ENGINEER for its report of the convention, and the interest it had taken in the progress of the association.

Bro. Wickens, who now arrived, being asked as to the license bill, said a circular had been sent to all members explaining the proposed Bill and soliciting their support. About 50 promises were received, but when the deputation went before the Minister of Justice, he held that under the B.N.A. Act, the Dominion Parliament had no jurisdiction. The Marine Engineers were brought under license from the Federal Government, because they were a part of the machinery of the trade and commerce of the country, over which it had jurisdiction, but it was not so with Stationary Engineers. Hence the Minister argued that the Provincial Government only had the right to pass such a law. The Ontario Association of Stationary Engineers had put up the expenses of the deputation, to the extent of $200, and they had appropriated $150 more for prosecuting the measure in the Ontario House.

After some discussion it was decided that the committee of this association should co-operate with the committee of the Ontario Association of Stationary Engineers, with a view to obtaining the necessary legislation.

On motion of Bro. Philip, seconded by Bro. Fox, a hearty vote of thanks was passed to Hamilton No. 2, for its hospitality and the pains it had taken to make the convention a success. Bro. Ironside said that it would afford him pleasure to convey the resolution to his association.

On motion of Bro. Ryan, seconded by Bro. Fox, it was decided that the expenses of the hall be paid for out of the funds of the Executive.

After a vote of thanks to the city press, the convention closed, and the delegates went on a trip of observation around the city, visiting the new sewage disposal works (described in THE CANADIAN ENGINEER of Jan., 1897), where they were shown the various processes by Bro. Robt Mackie, the engineer in charge; and visiting also the Victoria Yacht Club's establishment, the House of Refuge and the Street Railway power house. The delegates were presented at the City Hall with a copy of the handsomely printed "Souvenir of Hamilton," and in the evening they were the guests of the Hamilton Street Railway Co., in a ride about the city on a special car.

THE BANQUET.

The proceedings of the convention were brought to a close by a very successful banquet, given in the large dining-room of the Waldorf. This was the maiden dinner in the new hotel, and the impression made by the management was certainly very favorable. Over 190 guests sat down to the dinner, which was presided over by Robt. Mackie, president of the Hamilton branch, who made an excellent chairman. He was assisted by the following members of the Hamilton branch, who acted as dinner committee: J. Ironside, secretary; W. R. Cornish, W. Stevens, R. E. Chilman, Thos. Chubb, and Geo. Mackie.

After reading letters of regret from Mayor Colquhoun and others, who were prevented from attending, the toast list was taken up. The "Queen" was followed by "Canada our Home," to which Stuart Livingstone responded, referring to the romantic and stirring incidents that abounded in the three and a half centuries of Canadian history. He gave a glowing eulogy of the U. E. Loyalists, those heroes and heroines who left all to maintain their allegiance to the empire, who, having no houses, no villages, no post offices, no railways or telegraphs, and no newspapers to record the story of their wrongs, followed the northern star, and worked out their destiny in pain and trial, but with a never faltering loyalty. It was the thought of what these loyalists had done for Canada that nerved us to the struggle of 1812, and had inspired us to every high national endeavor since; and there was no man here who could not be thrilled with the story of brave Laura Secord, who threaded her way 20 miles through the dense woods to warn Lieut. Fitzgibbon, and enable him to capture a force of Americans of ten times his own. The speaker referred to the many Canadians who had achieved fame abroad—in India, Egypt, and other remote lands—and to the vast opportunities there were for great achievements in our own wide domains, which our fathers won by right of purchase, but which we have by right of birth. "The Mayor and Corporation" was replied to by Ald. Nelligan, and ex-Mayor Blaicher. The former regretted the absence of the Mayor, who was in Toronto attending his duties as member of the legislature. His statement that a copy of the "Souvenir of Hamilton" was being presented to each delegate was received with cheers. He concluded by hoping that in the near future the convention would come back to Hamilton. Ex-Mayor Blaicher was pleased that the convention had received a hearty welcome, and he commended them for their principle of non-interference in strikes, which had done a great deal of harm to Hamilton in days gone by. He was proud of the scenic beauties of Hamilton, and its neighboring country, so famed for its orchards and vineyards, and was equally proud of the fact that the manufactures of Hamilton now commanded the confidence of the whole Dominion, while some of its products were known and esteemed in foreign countries. "The Manufacturers" was responded to by ex-Ald. A. H. McKeown and J. H. Clappison.

of the Clappison Pipe and Boiler Covering Co. Mr. McKeown said the manufacturers of Hamilton had confidence in this association, knowing that if they employed a member, they were sure to have an efficient engineer, and generally a trustworthy man. The manufacturers recognize that in this way the association has been a great benefit to themselves. Mr. Clappison expressed the pleasure it gave him to reply to this toast. Being a manufacturer himself, he was proud to realize the truth of the statement already made that Hamilton now took a leading part in the industrial development of this country. The quality of Hamilton's special manufactures was constantly rising in the estimation of the people. He was glad that the delegates were going away pleased with their reception, and he hoped when the next convention was held here, that they would come in three times their present numbers. The toast of "Educational Interests" was coupled with the name of W. H. Ballard, public school inspector; J. M. Williams and Percy Domville. Mr. Ballard said if citizens of Hamilton were proud of their advance in educational matters, they owed it to themselves. The school attendance in the city had increased 70 per cent. in the last 13 years, and the general work of the schools had doubled in the last 10 years. Over $250,000 was now invested in school property. Mr. Williams referred to the pleasure he took in being with the association, as while he may have taught them some things he had also learned from them. Mr. Domville, in his speech, advised steam engineers to learn something about electricity, which was creeping into so many lines of manufacture. In a few days they would have the electric current, generated 30 miles away, turning wheels in Hamilton. Some went so far as to say that electricity would do away with steam altogether, but he did not think this would come to pass, as there were plants that could be run more cheaply by steam even when the electric current was brought into Hamilton. "The Executive Head" was responded to by past-president E. J. Philip, who was glad to say that the Executive was in better shape this year than for some years past, and he hoped it would be in still better shape next year. He was always glad to come to Hamilton, for he thought very highly of the city and its citizens. President W. F. Chapman followed, expressing his pleasure at meeting the people and the engineers of Hamilton, who should be proud of their beautiful city. As president of the association, he hoped to follow in the footsteps of their popular past-president. Secretary J. G. Robertson and treasurer G. C. Mooring also replied, complimenting the Hamilton branch on the good work it had done. Telegrams were read from Albert E. Edkins, of Toronto, and John J. York, of Montreal, both past presidents, conveying their felicitations to the assembled guests. "Sister Associations" was responded to by J. M. Wickens, representing the Ontario Association of Stationary Engineers. He referred to the new Cataract Power Co.'s works, and pointed out that through the work of the C.A.S.E., there were plants in this city that had got the cost of steam down to such a point that the new electric power company could not displace it. Another thing the C.A.S.E. had accomplished was the institution of technical branches in the high schools of Ontario; while the establishment of the Toronto Technical School, which had shown such excellent results, was also due to it. "The Press" was replied to by E. B. Biggar, of THE CANADIAN ENGINEER, and by Messrs. Reid and Kirkpatrick, of the Spectator and Times. "The Ladies" were championed by Thomas Ryan, Montreal, J. M. Dixon, Toronto, and P. McNaughton, Montreal, and while all three spoke extremely well, it was admitted that Mr. Dixon's was the speech of the evening, and he came off with honors, both as an orator and entertainer. "The Host and Hostess" concluded the toast list, and the company broke up about 2 a.m. The musical part of the programme was well rendered by James Jardine, Geo. Allan, E. T. Martin, W. W. Barlow, J. Grant, and J. M. Dixon, R. Arthur being accompanist.

W. F. Chapman, president of the Canadian Association of Stationary Engineers, was born at Gananoque, Ont., and was in business for some time with his father, John Chapman, who operated a cheese and cheese box factory there. He picked up a knowledge of engineering in his father's factory, and having studied electricity, gained enough knowledge of that business to instal the electric plant for Cooke Bros. at Lachute. After running this plant for some time he installed a plant at the Taylor & Walton Carriage Co.'s Works, this company being also owners of the Gananoque Electric Light and Water Supply Company. He then went to Brockville, and was appointed

W. F. CHAPMAN, PRESIDENT, C. A. S. E.

engineer of the Canada Carriage Company, which position he has filled till the present time. That Mr. Chapman has the esteem and respect of his fellow engineers is evident by his appointment to the highest honor in the association.

R. C. PETTIGREW, VICE-PRESIDENT, C. A. S. E.

A biographical sketch of Robert C. Pettigrew, who has been elected vice-president of the C. A. S. E., has already appeared in The Canadian Engineer. Mr. Pettigrew, who is in business as a coal merchant in Hamilton, has not only been a generous helper in all that concerns the progress of the C. A. S. E., but has for many years taken a lively interest in the municipal affairs of Hamilton. He was for three years on the School Board, and is now an alderman, representing Ward No. 7, having been returned at the top of the poll.

G. C. MOORING, EXECUTIVE TREASURER, C. A. S. E.

G. C. Mooring, executive treasurer of the C. A. S. E., was born at Evenly, Northampton, England, and came to Canada in 1874, when he obtained employment with Thompson & Williams, of Stratford, as machinist. Having learned the business there, he came to Toronto in 1878 working successively at the

Toronto Reaper & Mower Works, the Massey Company's Works, the Toronto Bridge Works and the Standard Woolen Mills. For the last nine years he has been in the employ of the Methodist Book Room, as engineer of their large printing and binding establishment. His father was also an engineer.

J. G. Robertson, executive secretary of the C. A. S. E., was born in St. Johns, Que., and on reaching the age at which he felt able to make his own way in the world, went to Chicago and apprenticed himself to Crane Bros., the large valve makers of that city. After living in the United States in various cities, as machinist, for about 17 years, he returned to Canada about twelve years ago and settled in Montreal. He was appointed engineer of the Montreal General Hospital, a position he has ably filled ever since.

WM. BEAR, CONDUCTOR, C. A. S. E.

William Bear, conductor of the C. A. S. E., is a native of the State of New York, but came to Canada at the early age of 3 years, and may therefore be considered a Canadian. Mr. Bear has been fourteen years an engineer, all of which time he has served in Dresden, where he is now chief engineer of O & W. McVeane's spoke and hub works.

JOHN L. WENDELL, DOORKEEPER, C. A. S. E.

John L. Wendell, doorkeeper of the C. A. S. E., is a native of the thriving town of Waterloo, Ont., and represented the Waterloo branch of the C. A. S. E. at this year's convention. Mr. Wendell has been about six years an engineer, and is now assistant engineer at Seagram's large distillery in Waterloo.

Thomas Ryan, engineer of the Federal Government buildings, Montreal, who was presented with the past president's jewel at the Hamilton convention of the C. A. S. E., was born in Quebec 62 years ago, and his father and mother before him were both born in the same city. Mr. Ryan served his apprenticeship as a machinist in the shops of Calvert & Tweedall, of Quebec, and after serving his time obtained his first engagement as engineer on the steamer "Blue Bonnet," running from Montreal to Cornwall. He was then less than 20 years of age and was the youngest engineer of his time on any large Canadian boat. After having charge of the engine at the dry dock works of Milln & Milne, Montreal, he was appointed engineer of a dredge under the Public Works Department. After remaining there several years, he was taken into the service of the Ottawa River Navigation Company as engineer of the steamer "Prince of Wales." After remaining with that company for 16 years he entered the service of the Quebec, Montreal & Ottawa Railway Co., now a part of the C. P. R. system. For the past 16 years he has had charge of all Federal Government buildings in Montreal, which responsible position he

THOS. RYAN, PAST-PRESIDENT, C. A. S. E.

has filled with eminent ability. His ripe experience, good judgment and sound practical engineering knowledge have won the confidence of each successive Government. While Mr. Wickens is looked on as the founder of the Toronto branch of the C. A. S. E., Mr. Ryan may be called the father of the organization in Canada, having formed the pioneer association in Montreal about 1883. He, with George Hunt and Harry Wilson are, so far as known, the only members of the original association still remaining. In response to a circular issued by Mr. Ryan, about a dozen engineers gathered in the old Sunderland House, St. Lambert's Hill, in the year mentioned, and there formed the first Association of Stationary Engineers, the constitution being based largely on the National Association of Stationary Engineers of the United States. Mr. Ryan also took part in founding the first association of engineers for the benefit of French Canadians, who from lack of knowledge of the English language, were unable to reap the full benefit of the English Association. Mr. Ryan is a prominent member of St George's Lodge, No. 10, A. F. & A. M., and is a past officer of the Grand Lodge of Quebec.

ANSWERS TO CORRESPONDENTS.

A. W. E., Lennoxville.—We have advised you privately as to the makers of acetylene lamps.—Ed. Can. Eng.

G.—In answer to your question about the fairness of the specifications upon which tenders were called for an electric lighting plant, it appears to us that the specifications of an individual make of apparatus, as the lamp for example, would naturally shut out from tendering the makers of rival appliances. —Ed. Can. Eng.

MECHANICAL STOKER TEST.

The General Engineering Co., of Toronto, Ltd., successors to the Weeks-Eldred Co., are installing six of the Jones Underfeed Mechanical Stokers in the mills of the Laurentides Pulp Co., of Grand Mere, Que.; twelve in the pulp mills of the Maritime Sulphite Fibre Co., of Chatham, N. B.; twelve in the power house of the Toronto Railway Co.; two in the new C. P. R. station at Dalhousie Square, Montreal, and a second order for the Windsor Hotel, Montreal.

A commercial test was made recently on two boilers at the power house of the Toronto Railway Co., for the purpose of determining the saving in fuel effected by the Jones Underfeed Mechanical Stoker. The boilers tested were of the cylindrical, return-tubular, internally fired type, 9 feet 9 inches diameter by 14 feet long, each boiler having two corrugated flues 39 inches inside diameter and 80 tubes 4 inches diameter, 14 feet long. The report of the test published by the company shows a saving in fuel effected by the stoker for equal evaporation of 15.2 per cent., and increased evaporation for equal fuel equal to 17.93 per cent.

THE LATE SIR CASIMIR GZOWSKI.

SIR CASIMIR GZOWSKI.

Col. Sir Casimir Gzowski, A. D. C. to the Queen, died at his residence, "The Hall," Bathurst street, Toronto, Aug. 24th.

Casimir Stanislaus Gzowski was descended from an ancient Polish family, who in the 16th century were ennobled, and who for a period of 200 years after their elevation continued to exercise great political influence in Poland. The father of Col. Gzowski was known in Poland as Stanislaus, Count Gzowski, and held a commission in the Russian National Guard. Sir Casimir was born in St. Petersburg, Russia, in 1813. At a very early age he entered the military college at Kremenetz, Province of Volhynia, where he pursued a course of military engineering, and in 1830, having been in the college eight years, he graduated as an engineer, and was awarded a commission in the Russian army. It was at the time of his first entering the Imperial army that one of the periodical insurrections occurred arising from the discontent of the Polish people at the severe treatment of Constantine, brother of Emperor Nicholas, who was made military governor of Poland. An organized revolution finally broke out, in which most of the Polish officers in the Imperial army joined. This revolution culminated in the expulsion of Constantine, who, with his court and Russian adherents, were driven from Warsaw. Young Gzowski, who had just received his commission at the time of the first outbreak of the insurrection, immediately joined his compatriots, and played a conspicuous part throughout the insurrection, and was present in Warsaw in November, 1830, when the Grand Duke Constantine was expelled.

As is well known, Russia and Austria, after bloody conflicts, lent their assistance to quell the insurrection, and Warsaw was recaptured from the Poles by the allied forces under Count Paskevitch in 1831. The prisoners taken at Warsaw on its fall were either condemned to die or to linger in the mines of Siberia. After the battle of Baremel, Gen. Devernicki's division, to which Gzowski was attached, retreated to Austrian territory, and the division surrendered. All but the officers were allowed to go wherever they pleased, but the officers were condemned to military prisons for some months, when an arrangement was entered into between Austria and Russia, and the whole of them were shipped to the United States, Colonel Gzowski among them. Colonel Gzowski landed with his fellow exiles in the United States without a penny. He found that owing to his lack of knowledge of English his engineering skill would not be very remunerative, so he set to work to learn the language, and for a time taught French and German in New York. Subsequently he articled himself to Parker L. Hall, a lawyer of Pittsfield, Mass., and studied law. During these studies he maintained himself by giving lessons in modern languages, drawing, and fencing, in the local academies. In 1837 he began the practise of law in Beaver county, Pa., and remained there until 1841. From 1841 to 1846 Mr. Gzowski was employed in the Public Works Department of the Canadian Government. In private practice after leaving the employ of the Government, the first great enterprise with which Mr. Gzowski was connected was the St. Lawrence and Atlantic Railway Company, from Montreal to Island Pond. He was appointed chief engineer, and was practically engaged on the construction of this railway. This appointment he resigned when the railway became merged in the Grand Trunk Railway. Subsequently a partnership was formed, the firm consisting of Sir Alexander Galt; the late Luther H. Holton; the Hon. D. L. Macpherson, and C. S. Gzowski. This firm on the 24th of March, 1853, obtained the contract for the construction of a line of railway from Toronto to Sarnia. The work was attended with enormous profit, and was satisfactorily completed. Among other railway works completed by the firm of Gzowski & Macpherson is the line from Port Huron to Detroit, and from London to St. Mary's, in the Province of Ontario. One of the most noteworthy and successful feats of engineering performed by the firm of Gzowski & Macpherson was the building of the International bridge over the Niagara river, at Buffalo. The charters for the construction of this bridge were granted by the Legislature of Canada and State of New York in 1857. The funds for its completion were raised in England in 1870, and the bridge was completed November 3, 1873, the cost of construction amounting to over $1,500,000. He was the chairman of the Queen Victoria Niagara Falls Park Commission.

Sir Casimir was connected with many financial concerns during his long career. He was at various times president of the Toronto Club, for some years president of the London and Canada Loan and Savings Company, president of the corporation of Wycliffe College, and vice-president of the Ontario Bank. He was appointed lieutenant-colonel of the Central Division of Volunteers in Toronto, in 1873. His last and highest promotion was that of full colonel, and in May, 1879, he was appointed aide-de-camp to her Majesty Queen Victoria, being knighted K. C. M. G. a year later.

F. NAPIER DENISON.

F. Napier Denison was educated at Upper Canada College and entered the Toronto observatory, but finding promotion slow, went to Boston and studied electrical engineering. After obtaining a certificate he traveled for six months throughout the United States as electrical expert for the Thomson-Houston Electrical Company. In 1891 he came to Canada and joined the Excelsior Company. During 1892 he spent six months traveling throughout the various countries of Europe, where he obtained much valuable electrical information as well as attending special

F. NAPIER DENISON.

lectures in London. During 1893 he perfected his electric dental engine, which has been patented in many countries, and is being successfully manufactured in Canada, not only for a large home, but also British, trade. This was followed by many others (all patented), including an electric transmitting thermometer, an electric brake, a new grain bin and heat detector, a combined shaving brush and soap holder for travelers. After re-entering the meteorological service in 1895 he devoted his inventive ability to the benefit of this service, and has devised an electric anemograph or automatic instrument to record both, the direction and velocity of the wind, a simple form of "hydrograph," set up at the mouth of the Humber River to record the lake undulation; and as it was thought these undulations were due to atmospheric waves, he devised a self-recording barometer seventeen times as sensitive as the ordinary mercurial type.

which was set up at the Toronto observatory. By studying corresponding records from both instruments, the direct action of atmospheric waves as causing the water undulations was clearly shown. In July, 1897, Mr. Denison devised a combined instrument to record both lake and atmospheric undulations upon the same time cylinder, and set it up in place of the former instrument. This device, which has been termed a "hydro-aerograph," was fully described in a paper read before the Toronto meeting of the British association last year by the inventor, a reprint of which appeared in the October and November numbers of this paper. Last May Mr. Denison constructed for the Public Works Department, Ottawa, another form of hydrograph, which has been set up at the Queen's wharf, Toronto. Mr. Denison has left Toronto for Victoria, where he is to start weather forecasting for the Province of British Columbia, issued in the same manner as those from the central office, Toronto. A sensitive hydro-aerograph is to be installed there, as it is hoped the records from some will tend to assist in warning the approach of storms, which sweep in off the Pacific Ocean.

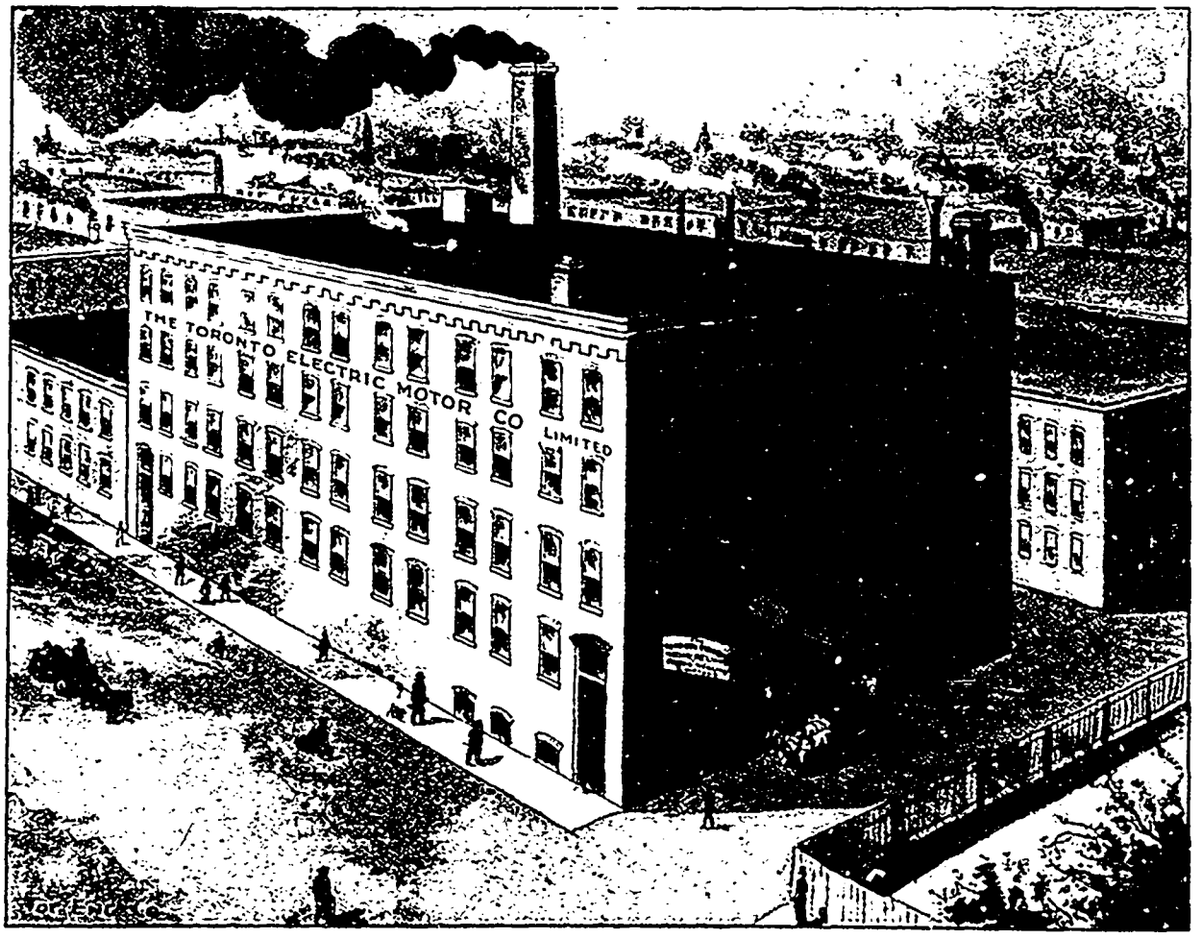
FIRES FOR THE MONTH.

Aug. 3rd The Canadian Rolling Mills, Peck, Benny & Co., Montreal; damages amounted to $75,000; insurance, $152,000. ——Aug. 4th. J. & B. Grier, saw mill, Montreal; loss about $10,000.——Aug. 4th. St. Lawrence Portland Cement Co., Montreal; premises destroyed; loss, $20,000; small insurance.——Aug. 5th. Devine Bros., Killaloe Station, Ont., planing mill; loss, $1,000.——Aug. 9th. Victoria, B. C., Chemical Works; partially destroyed; loss about $20,000; fully insured. ——Aug. 13th. Jenckes Machine Co., Sherbrooke, Que.; damaged to a considerable extent but covered by insurance, business has not been interrupted materially——Aug. 14th. M. Bristol's wood-working factory, Madoc, Ont; loss, $10,000, insurance, $1,000.——Aug. 14th. Biette & Co's saw mill and cheese-box factory, Chesley, Ont; loss, $8,000; insurance, $1,000.——Aug. 14th Miller Bros' paper mills, Glen Miller, Ont.; damaged to extent of $17,000; covered by insurance.——Aug. 22nd. Steamer "Golden City" burned at her docks, Lakefield, Ont.; loss, $5,000; some insurance.——Aug. 26th. J. H. Still's handle factory and unused pipe foundry adjoining, St. Thomas, Ont.; loss, $50,000 on the handle factory, and $10,000 on the foundry ——Aug. 28th. The Parmenter & Bullock Co.'s rivet and nail works, Gananoque, Ont.; loss, $30,000; insurance, $12,000.——Aug. 30th. Some damage was done to the power-house of the London (Ont.), General Electric Co., amounting to about $1,000 ——Sept. 1st. Bertram Engine Works Co.'s shipyard, Toronto, damaged to extent of $60,000; fully covered by insurance.

THE TORONTO ELECTRIC MOTOR COMPANY, LTD.

In this issue we present a cut of The Toronto Electric Company's new factory recently completed and now occupied by this thriving manufacturing concern, which started business some six years ago, and which has steadily increased year by year, until now it is one of the leading firms in Canada in the manufacture of the electric machinery and apparatus for lighting and development of power in all its branches. Beginning with electric motors in a comparatively small way the company has added new lines from time to time as demands required, such as belted C. P. dynamos and direct connected generators for lighting and power service in all standard sizes up to 300 k.w.

In March this year this company amalgamated with the Thompson Electric Company, Hamilton, Ont., thus adding that firm's well-known system of automatic arc lighting dynamos and their several types of arc lamps for constant potential, constant current and alternating current circuits, together with all their machinery and special tools for manufacturing. This company's new works are of the most modern and improved type for the class of work upon which it is engaged. The machine shop is supplied with the latest improved machinery and tools, classified and divided into sections, to best suit the convenience in handling the different classes of work; each section being operated by an independent electric motor. The centre of the shop is provided with a 16-ton traveling crane, for its entire length. The arc lamp department is on the second floor, and is supplied with light machinery and special tools and jigs for turning out accurate and standard work. Then comes



the winding room, which is also a separate department, and supplied with necessary lathes, forms, bucks and special appliances for this particular class of work. In the basement is situated the brass moulding department and steam plant, which operates a direct connected unit that supplies current for the power and lighting of the entire works.

The company is now working its factory overtime to meet the demand for its apparatus. Some of the principal orders now being turned out are: Direct connected generators for the T Eaton Company; complete electric plant for the Verity Plow Company, Brantford, Ont., including a direct connected generator, two incandescent dynamos for the Parkhill Electric Light Company, two 60-light arc dynamos and 80 arc lamps for the Brantford Electric & Operating Company; electric power and lighting plant for the Rat Portage Lumber Company; two 40-h.p. motors for The Mail and Empire Company, 100 arc lamps for the Lachine Rapids Hydraulic & Land Company, Montreal, and numerous smaller orders. Owing to the pressure of business this company will not exhibit at the Toronto Industrial Exhibition this year. Any visitor that will favor the company with a call at the new works, 39 to 45 Pearl street, will be warmly welcomed.

TORONTO ELECTRIC MOTOR CO.'S MACHINE SHOP.

AN UNSANITARY DISCOVERY.

BY W. M. WATSON.

Tourists spending their holidays in Muskoka and other Ontario summer resorts have been considerably exercised on account of offensive odors that have, during the present excursion season, pervaded those districts. We have it on unquestionable authority that large gatherings have abruptly dispersed on account of a sudden passage through the air of a disgusting odor, and which has been stated to be caused by a pest named a stink bug. In the early days of my residence in Canada I was a thorough unbeliever in the power of the animal called a skunk to create a nuisance, but in time proofs came to hand and I was convinced. But not so with the theory put forth to explain the odors that have occasionally contaminated the air, and entered the interior of several of the hotel rooms; before such statements can be taken for granted, at least one of the pests must be caught and produced. I have been engaged to try to give a reliable reason for the foul odors that seem to come, sometimes rather suddenly in the evenings at one of the hotels, and after about 30 minutes time (often less), it completely passes away. It seems only to come after sunset and seldom after the hours of midnight. This almost proves that the cause of the odor either moves in the atmosphere like a bird or the odor is in such large quantities that it moves through the atmosphere in a column, leaving the odor in any place or in any room that it may come in contact with during its passage.

From the information I have gathered I find that there are hotels in that district whose sanitary conditions could be improved, and others that have secured the city advantages of a plentiful supply of good water and almost every modern sanitary appliance necessary for the cleanliness and comfort of their patrons, erected with great care, and high class workmanship. It is one of the last named kind that I was called upon to inspect and try to locate the cause of the occasional unpleasant odors. I was the third party that had been called in for the purpose. Each of the previous firms had thoroughly examined and tested the plumbing appliances and drains, and I believe found them smoke-proof and perfect. This hotel had a private sewage disposal works, that seemed to get all the blame, from the managers and attendants. The settling tank was 100 yards from the house, and well covered up, with an air-tight wooden cover, and sand. It had a breather pipe about one foot high and a 4 inch air discharging pipe, 20 feet high, and on account of a suspicion that the foul gases from the tank were discharged into the air through the two pipes, and traveled into the rooms of the house, they had been plugged tight up, but the smell still continued to come as usual. Then the irrigation gravel sewage filter was over another 100 yards away, situated behind a bend and cliff of land, which had also two tall air vent pipes, which would discharge foul air that might travel to the hotel, but it appeared to me rather improbable.

The boarding accommodation for tourists is erected on low grounds near the sheets of water, and this one had high hills on

two sides acting as a boundary line and shield of the narrow strip of water and foreshore situated between them. The sun during the day heated the surface of the land and the walls of the building, the roofs, and to a certain extent, the face of the water. At sunset the atmosphere cooled quicker than the earth, the walls and roof of the building or the face of the sheet of water. This would cause a depression of the atmosphere, making the upper strata of the air descend and cool the warm places, having the effect of reducing the draughts of chimneys, air and soil pipes, and would also let free and distribute any confined gases that might be accumulated in the sanitary apparatus or foul spots near the dwelling. This depression cannot be avoided, therefore it is the duty of plumbers and sanitarians to so erect and put together sanitary appliances in a way that it is absolutely impossible for poisonous gases to generate, and this can be easily done by using reasonable judgment in arranging the soil pipes, the waste water pipes, and the system of drainage.

In another article which I had written before going to inspect this place, and which is published in another part of this paper, entitled "Sanitary excesses," I have described what is needed to aerate soil and waste pipes. In April, 1897, this paper published an article of mine on sanitary appliances, which also explains how to make sanitary waste and soil pipes safe, and what is particularly necessary to be adopted in summer hotels to prevent gases and foul smells from generating in hot weather. On this account these points need not be repeated here.

The hotel of which I am writing has three separate and distinct stacks of soil pipes and sanitary apparatus in each of the three wings of the house. All the soil pipes are joined together and connected with the main trunk drain at one point. The small waste pipes from the baths, the basins, the slop sinks, and even the drinking fountains placed in the corridors of the house, are I believe each and all connected directly with the nearest line of soil pipes, and on this account none of the pipes can secure the proper amount of aeration necessary to prevent the generation of poisonous gases, and when poisonous gases are created they will in spite of every endeavor made to prevent them, escape and contaminate the atmosphere. This statement was fully proved by the exhaustive experiments made by the city of Cologne, see report on page 62 of the July issue of The Canadian Engineer. Now it is easy to fix a first-class sanitary water closet that cannot possibly require a vent or back air pipe. And experiments prove that back air pipes obstruct soil pipe ventilation, and prevent the ventilation which is necessary to keep the interior of the waste pipes clean and properly purified. No small waste pipes serving water fountains, pipes from ice boxes, underground land tiles, or from small baths, wash basins, wash tubs or slop sinks should ever be connected directly to soil pipes or drains, because the small 1½ inch traps are easily dried out by evaporation in hot weather, and all the sooner when a back air pipe is attached, and if they happen to be dried out when a depression of the atmosphere occurs, then the foul gases will enter the rooms in large quantities. And each and all small waste pipes and fittings can be served and made absolutely safe by an easier and cheaper method. Moreover when there is a decided depression of the atmosphere, the vent pipes cannot prevent the water seals in the small traps from oscillation, and when the water in the seals oscillates it usually wastes a portion of the water over the bends, and of course the seal is broken and a passage of air created. It is just possible that the foul odors that invade the apartments immediately after sunset may be accounted for in this way, but it can be proved only by having the smoke machine attached ready and applied at once, when the foul odor is first apparent.

The plumbing of a large summer hotel requiring several sets of apparatus and stacks of soil pipes cannot be made sanitary by exactly the same methods as a place with only one set of appliances, and soil pipe, and they require much more skill and judgment to insure a thorough upward draught and free ventilation through every waste pipe, which is necessary, to remove any risk of down draught currents.

The contract for the seating of Her Majesty's theatre, Guy street, Montreal, has been awarded to the Canadian Office and School Furniture Co., Preston, Ont.

ECONOMY IN THE BOILER ROOM.*

BY CHAS. MOSELEY, ENGINEER, TORONTO INCANDESCENT LIGHT CO.

The fuel expense is one of the largest in the operation of the majority of plants, and any reduction which can be made in the amount of fuel used, while maintaining the same amount of power, is considered a direct gain. The evaporation of more than nine pounds of water per pound of coal is looked upon with suspicion by many, as it is not thought possible to obtain more than this amount in even the best designed and well regulated furnaces and boilers, especially when the firing is done by hand. Mechanically fed boiler furnaces usually give the most economical results. The actual value of the fuel depends upon the way in which it is used fully as much as on any other factor. The heat unit in the coal should be as much as possible utilized, as in one pound of good steam coal there is about 14,000 B.T.U., and about 10,000 of this amount can be utilized, so that 4,000 heat units are lost. The mixture of gases in a furnace depends on the amount of air used. One pound of coal requires theoretically about twelve pounds of air to burn completely. But in practice about twice this amount is required in the boiler furnace. To cause good combustion coal requires a good draft. The gases are consumed near the fire, and the waste gases carry the heat to the boiler on their way to the stack. The boiler ought to have sufficient heating surface, or the hot wasted gases ought to travel a sufficient distance to be cooled down to about 350° F., which temperature is found high enough to produce a good draft in a stack of at least 100 feet high. It is not necessary for me to state the need of keeping the combustion chambers free from the ash that is carried over with the gases to the chambers. In "Smokeless Heating," as published by the General Engineering Co., there is a paragraph entitled, "Competitive vs. Ordinary Test," which is well worth consideration, and I think we might study it with profit. In nearly all plants where a large quantity of coal is burned per day it is a general rule to employ the least possible number of firemen, and it keeps them very busy going from one boiler to the other shoveling in coal the whole time. It becomes more of the nature of slavery than anything else. Is there economy in this way of working? Let us see. In making evaporation tests my experience has been that there is a large difference between ordinary working and working for short spells, as in making competitive tests. When we were making the tests in our plant, while experimenting with shaking grates, the Hawley Down Draft, and the Jones Underfeed, we did so in many different ways. With the Hawley Down Draft in one particular case we fired that boiler as would have to be done in ordinary practice, and the result was certainly a far different one from that obtained when the man stood by this furnace, and attended to it alone. If we treat the fireman as being a naturally lazy animal, I think we will be on the safe side, and you can rest assured that if he has one boiler that will do the same work as another with half the labor, even though the other takes less coal, this boiler will get the most work, and the boiler that should receive constant attention will get very little consideration from him. Between competitive and ordinary working on a hand fired boiler there is actually a difference of 10 per cent. This I have proved repeatedly, and in many cases it has run up as high as 12 per cent. What does this mean? Does it mean that it would pay to have a man at each boiler, and simply attend to it alone? No. It does not; for the simple reason that the less a man has to do the less he is inclined to do, and this applies more to firemen than to any one else. I might state that when we were testing the Jones Stoker we had long periods where we had competitive tests, and others again when we run as in ordinary practice; that is to say, the firemen doing just precisely as he would do if no test was being made. The coal and water, however, were measured in each case. The results were simply astonishing. In the ordinary running test the Jones Stoker would do about 50 per cent. more work and nearly 25 per cent. better economy, whereas with the competitive test the work done on the stoker was about 25 per cent. more, and 15 per cent. increased economy, which bears out the statement that between competitive and ordinary running we have a difference of 10 per cent. Now which is the correct way to look at this matter? Can we obtain

*A paper read before the Canadian Association of Stationary Engineers.

results right along with hand firing equivalent to those obtained during a competitive test? I do not think so, because firemen, as a rule, do not like to be beaten, and will do their very best during a competitive test to do up the other fellow; but at the same time he is wishing inwardly that the test was over so as to get back the old "style" again.

There are many plants in Canada where very good results are obtained if we take the results as made by the engineers into consideration, several of them showing a usual 14 lbs. evaporation per lb. of coal. This you will readily understand is out of the question. There are also a large number where very poor results are obtained, and these poor results are due to several causes, namely: Boilers in very bad order, dirty tubes, poor setting, poor boilers, poor firemen, etc. The man who sells boiler compounds will in all probability say that you do not use enough of his compound; your answer to that is, of course, that there are compounds on the market that are absolutely of no use whatever, and it is simply throwing money away to buy it. I myself believe in a good compound, but will admit that it is difficult to get it. You may get one barrel (the first from a new maker), fairly good, the second of no use whatever, and so on it goes. A good compound is required, and to my mind to-day we have not such a thing. All compound makers state in their advertisements to send on a sample of your water, and they will give you the very compound you require after analysis. You, of course, know what this means—that if one brand does not work they will send another brand of practically the same stuff with another name and try it. Poor boiler and poor setting; this is attributed to trying to keep down the first cost. Pay a good figure for a good boiler and have it set by competent men. Poor fireman; this is in my humble judgment the most important item, and one that should receive much consideration. The fireman may not be poor, but the work that he has to attend to, namely, firing too many boilers, makes him feel that he is neither more or less than a laborer, and as long as he keeps the steam pressure up, no matter how much coal he burns, or how he does it, there appears to be little or no attention paid to him. There are many places where the fireman is never thought of except when the steam pressure goes down, and when such is the case the usual deputation calls upon him to ascertain if he is asleep or not. A good fireman is really a skilled workman, and should be treated as such. He should receive a fair salary, and his employer should bear in mind that any reduction in his pay is far from being a saving. If he is cut down $2 per week you will in all probability find your coal bill increased about $8, and there is not much economy there. How are we to obtain better results in our boiler rooms? I think by putting in machines to do the work, and having men simply to look after them.

EVAPORATION AND THE RAISING OF STEAM IN BOILERS.*

BY P. MACNAUGHTON, MONTREAL.

From the title of this paper you will notice that it is to deal with two things. First, evaporation, and second, the making of steam in boilers. These two actions are often considered as if they were distinctly different, but, I think, it can be shown that the actions are the same in the end, and that they differ only in the way in which the end is reached. In the following remarks it will be noticed that I have tried to show how the natural action of evaporation resembles the action of making steam for power, because it is always instructive to think out how the processes which we make use of every day, compare with corresponding ones in nature. Some have said that it is wasting time thinking of things in this way; if they really think so it would be wasted time, but to others it would be very instructive and pleasurable. I might say that such thoughts would be to them as salt, which though of little use in itself as a food, still makes our food more palatable. Strictly speaking the term evaporation is used to denote nature's method of changing water into vapor, and making steam in boilers is part of man's method of changing water into vapor through an intermediate state familiar to all of us called steam.

The principal actions in nature in which evaporation plays a part, have been noticed by all of us. They are the disappearing of the dew from the grass on a summer morning, and the frost later in the season; the disappearing of water when left standing in open vessels, and on a much larger scale the raising of water from our rivers, lakes and surrounding ocean. Now it is usually admitted that for every action there is a cause, and the cause of evaporation in nature is the heat of the sun. It will make our problem much simpler if we consider, for instance, a bucket of water as made up of a great number of particles of water. That this is the real state of water will be seen at once if we remember that when heat is applied to water it forms steam, which is particles of water visible to the eye, and if heat be applied to steam the particles of steam are divided into smaller particles called vapor, which is invisible.

Atmospheric air, among other things, contains a certain amount of water vapor, and this water vapor as long as the sun is shining is kept suspended uniformly through the atmosphere by the sun's heat. When the sun has set and its heat no longer acts on the atmosphere this water vapor tends to condense to a slight extent and with this condensation it becomes slightly heavier than the other components of the air, and so tends to sink towards the earth, so that in a calm, clear night in summer that part of the atmosphere lying next to the earth contains more moisture than that which is higher up.

That the above statement points out the true state of the atmosphere at night is proven by noticing the land fogs. If we go up a mountain at the first of daylight on a calm, foggy morning we will notice that as we ascend the fog becomes less dense until when we have gone up about four hundred or six hundred feet we will be out of the fog altogether.

This layer of moist air coming in contact with the cool leaves of trees, plants and other vegetation, the water vapor which it contains is further condensed, thus forming dew. I wish it to be clearly understood at this point that the collecting of dew on the leaves of plants is owing to condensation and not to a falling of water as rain. The fact that dew only gathers on the top side of the leaf, and does not collect in our houses even if all the doors and windows are open, is owing to another action which has no bearing on the subject in hand.

Now we come to evaporation or the disappearing of the dew. We have the air in two layers, the moist one lying nearer the earth and the dry one higher up. The sun rising in the sky begins to send his rays of heat earthward, the layer of air lying next the earth becomes warmed first, and owing to the principle that warm air rises, it rises, and the cooler air comes down to take its place next the earth. The air which is now next the earth is dry or lacking in water vopor, so the lack is made up by absorbing a certain amount of water in a state of vapor from the dew on the plants. This circulation has not continued long before all the dew is evaporated. This process of evaporation in nature does not cease when the dew has disappeared, but goes on continually, because there is always a demand for more water-vapor in the air on account of it being partially condensed in the upper regions of air, thus forming first, clouds, and if condensed further the clouds form rain or snow.

We will now proceed to discuss the making of steam in boilers, and then its change from steam to water-vapor, after which we will compare it with the process described above. For purposes of comparison we will turn water into steam in a boiler open to the atmosphere, that is to say, we will raise steam under a pressure of 14.7 lbs. per square inch. In this we are under the same condition as the dew which was turned into vapor under atmospheric pressure also. We will suppose that the boiler which we are going to use is a small circular vessel, say 6 inches in diameter and 12 inches deep, which may be set over a stove hole, and supplied with a steam tight cover somewhat like a piston, by using which we may vary the pressure. We will now put some water in the boiler and place it over the fire, the cover being left off. Now, remembering that water is made up of particles held together by a force (in this case 14.7 lbs. per square inch, or whatever the barometer may read), which must be overcome before we can have steam, we are called upon to exert a force in opposition to the force holding the particles together. We do this by lighting a fire under the boiler. As the fire burns a certain amount of the energy of the coal is transferred to the water, causing the temperature to rise until, when it has reached about 212° F., the coal has transferred enough of its energy to the water to enable it to overcome the atmospheric pressure and water pressure, and

*A paper read before the Canadian Association of Stationary Engineers.

steam is given off. Now, we have water in a state of steam, which is visible to the eye. If we watch the cloud of steam as it rises upward, it will be noticed that it gradually gets thinner and thinner, until at last it disappears from view. What has become of it? We have produced the invisible water-vapor, and it has been absorbed by the air.

The change from steam to vapor took place like this. In a boiler it is the water which lies next the surface exposed to the fire that is first turned into steam. In order to do this the coal must transfer energy to the water to raise not only the atmospheric pressure, but also the pressure due to the depth of water in the boiler. Now when the particles of steam emerge from the surface of the water they are under a less pressure than when at bottom of the boiler, and so contain more heat than is necessary to keep them as steam. This surplus heat or energy causes an expansion or bursting of steam into the smaller particles, which constitutes water-vapor, which is absorbed by the atmosphere.

This last expansion is on the same principle as when we open a try cock below the water line on a working boiler, it is not water which blows out but steam or vapor We will now sum up these two operations In the first the heat or energy of the sun does work on the atmosphere, thus setting the air in circulation, and as a result of the air circulating water is absorbed. In the second the heat or energy of the coal does work on the atmosphere, setting free the steam, and at the same time storing in the particles steam and energy, which turns the steam into vapor when it rises into the air. From the above conclusions we see that evaporation, or nature's method of making water-vapor, and the making of steam at atmospheric pressure and its change into vapor, differ only in the two forces that produce them.

In reference to making steam in boilers there are two interesting cases besides the one which we have just discussed, namely, making steam under a pressure greater than the atmospheric pressure, and under a pressure less than the atmospheric pressure. Dealing with the first mentioned case, that is, where the pressure is greater than the atmospheric pressure; this condition can be brought about by fitting the steam-tight cover on the boiler mentioned in the first case and putting some weights on it to the amount of 5 lbs. per square inch. Now, instead of steam being given off when the water is at about 212° F., it will not be given off before the temperature is 226° F. This increase in temperature is due to the fact that before steam can form in this case the coal must transmit to the water enough of its energy to raise 19.7 lbs. per square inch instead of 14.7 as before. This condition of things comes about naturally when boiling water in mines, for as we descend into the earth the atmospheric pressure increases, which corresponds to the added weight.

Lastly and briefly we will consider the making of steam under a pressure less than the atmosphere at sea level. For this we would have to exhaust the air from our boiler by an air pump or other means. Then we would find that steam would be given off when the water is at a temperature less than 212° F, according to the amount by which the pressure in the boiler is less than atmospheric pressure. This shows that as there is less pressure keeping the parts together in this case than in the other two it therefore requires less energy to set the steam free. As an example of this in nature it has been noticed by travelers going up mountains that when they got high up it takes a much longer time to boil eggs than on the plain below, although the water in giving off steam went through the same action in both places. This was due to the fact that at the top of the mountain the pressure of the atmosphere was less than at the bottom, and the water though giving off steam did not contain the heat necessary to boil the eggs. I think if these travelers had been engineers they would have piled some stones on the lid of their kettle in order to save time.

In this case it is interesting to notice that although it requires less heat to raise steam at a high elevation than at the ordinary atmospheric pressure at the sea level we do not gain anything by reducing the pressure, because when we sum up the heat required to raise the steam, and the force required to reduce the pressure below the atmosphere, we will find that it will amount to the same thing as if we were making steam at atmospheric pressure.

OILS FOR THE ENGINE ROOM.*

BY JULIUS M. WILLIAMS, CHEMIST, HAMILTON.

This subject is considered as being important enough to justify considerable attention from engineers, and this paper being much appreciated by the local association, it is by their request read before the convention, and it being considered inconvenient to repeat the full text, it is condensed, and samples of oils and the products of their decomposition are for the same reason not shown. The matter is treated in the following divisions:

1. Relation to the machine, the prime object of oil is to reduce friction, consequent to the effort of the motive force to overcome the resistance of the weight, that is the work of the machine.

2. Nature of the material, fluid, capable of passing between tight fitting surfaces either voluntarily or by mechanical means, non-resisting, especially free from abrading particles, and from corrosive qualities.

3. Possessing sufficient viscosity and specific gravity to be of service; absence of viscosity and low specific gravity being in inverse relation to the strain or weight on the bearings.

4 Nature of the machine and its special conditions.—The points of friction usually called bearings, consisting of two close fitting surfaces, one or both moving, either rapidly or slowly.

The conditions being mainly that of temperature, this suggests the division of bearings into two kinds, hot and cold; cold bearings being considered first as being the earliest in use and embracing the largest number, these are exposed to a range of temperature extending from the average of 100° F. at the top of a room to that of winter weather outside; mechanical contrivances dispose of many of the difficulties met with on account of variations due to temperature.

Hot bearings are few and include cylinders, pistons and cut-offs.

5. The requirements or qualities of the oils to meet these conditions:—

They should be clean, free from abrading substances.

Non-resistant, free from resinous constituents.

Non-volatile, permanent, so that bearings will not "go dry."

Non-drying, free from "gumming" propensities.

Neutral, free from organic or mineral acids, the first due to rancidity, the second to the refining processes.

6. Hot bearings.—To meet the conditions of the very high temperatures of the principal hot bearing, the cylinder oils require to be of high stability and especially free from the substances before mentioned, that is, volatile, resinous, and decomposable ones, owing to the fact that fixed oils decompose at 600° F.; in the presence of steam with the production of fatty acids and glycerine it is evident that oils partly decomposed, rancid, are not desirable in a cylinder.

7. The constitutional nature of oils.—They are supplied by the three kingdoms, animal, vegetable and mineral.

The animal oils are of great variety and from many sources, the principal ones being the meat and fish trades; these include the various refuse handling sections of those trades, whence are supplied vast quantities of oil.

There may be enumerated here in the order in which they predominate the animals whose oils we use in this country: The hog, horse and cattle; of the fish, cod, whale, sperm whale, etc.

The vegetable oils will be familiar as olive, castor, cotton-seed, earthnut (peanut), and are variously the product of seeds, nuts, fruit.

The mineral oils constitute by far the greatest part of the oils in use as lubricants, and are used alone or in combination with oils from the other two sources. Mineral oils possess in their wide range of varieties all the requisite qualities of good lubricants.

*A paper read before the C.A.S.E.

FOR THE FIRST PLACE IN AMERICA.

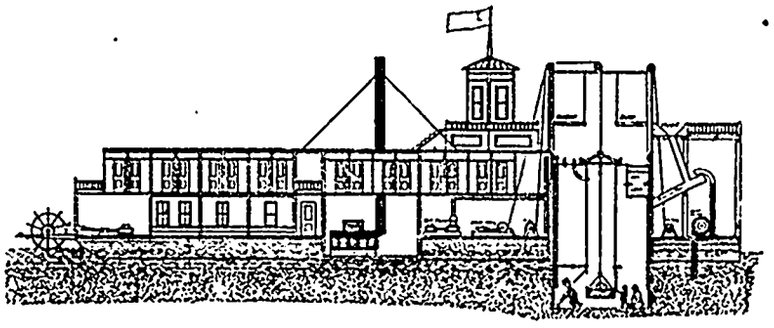
I enclose herewith $1, my subscription for this year, and I am glad to notice the almost monthly improvement in the paper, and congratulate you heartily on the success of your venture. I would like to see The Canadian Engineer competing with The Scientific American for the first place in America.

Yours sincerely, E. ROCHESTER.

54 Rochester street, Ottawa, Aug. 16, 1898.

A NEW GOLD DREDGE.

A number of tests have been made at Vancouver, B. C., recently, of the model of the pneumatic caisson and air lock elevator, invented by Garrison & Wood, and which has been built by them for test purposes there. In every case the tests have proved the invention to be most valuable for the recovering of gold from the bars and beds of rivers and creeks. The model of the caisson and elevator are built into a scow for temporary purposes, but the permanent machine is to be placed



THE CAISSON ELEVATOR IN OPERATION, SHOWING MEN AT WORK IN BED OF RIVER.

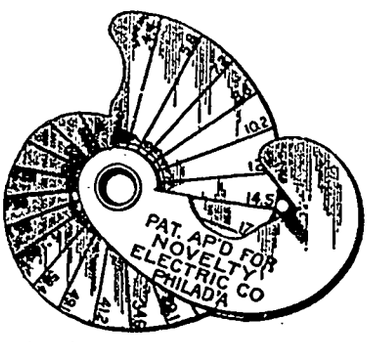
on a sternwheel steamer. The model itself has a caisson 5 feet by 8 feet, but the complete machine will be built of steel, and the caisson will be 10 feet by 20 feet, so as to allow six men to be at work at one time. Entrance to the upper air-closed chamber is obtained through an opening in the top, and when the workmen are all in, the opening is sealed up and the clamps over the opening to the lower chamber are removed, and the bed of the river is reached by means of a ladder. Before the workman goes on board, however, all the water will be removed from all the chambers by air pressure, which will vary from 2½ lbs. to 15 lbs. per square inch according to the depth to be reached. On reaching the river bed, clamps are removed from the elevator shaft and the workmen begin excavating, and shovel the dirt into a bucket in the elevator. When the bucket is full the elevator shaft is closed tight, a signal is given, and the shaft is opened at the top, the bucket is hauled up and its contents emptied on to the dump. It is then lowered into the shaft, which is again hermetically closed at the top, a signal is given and the fastenings below are removed, so that the whole process can commence again. C. C. Bennett, of F. C. Innes Co.'y, Ltd., Vancouver, B. C., is the agent of the invention for Canada.

REFRIGERATING MACHINES.

A correspondent of Fairplay, London, writes: As a result of the recent extensive additions J. & E. Hall, Limited, have made to their works at Dartford, Kent, which, by the way, is the third time this has been necessary during the past few years, I hear that they have been turning out refrigerafor machines on their patent carbonic anhydride system for the last four months at the rate of fifteen per month, that is to say, a total of sixty machines in four months. This is a result that they may well be proud of, as many of the machines were of large size, such as those for Houlder Bros. & Co.'s two latest ships, which have a capacity for over 2,000 and 3,000 tons weight of meat respectively; also those for the White Star Line for their S.S. Nomadic and Tauric for the carriage of chilled beef; machines for the United Steamship Company of Copenhagen for the carriage of about 900 tons of butter and bacon in each ship; and for Thos. Wilson, Sons & Co., in the same trade. The British Admiralty have had several more machines from Messrs. Hall, and the new Japanese battle ships have been fitted by them. For the carriage of fruit and preserving provisions, etc., Messrs. Hall have executed further orders for the Union Steamship Company and Donald Currie & Co. Other machines have been supplied to the Oriental Steamship Company of Japan, the Nippon Yusen Kaisha, Baron Rothschild's new twin-screw yacht, the Atmah, the Russian Volunteer Fleet, and many other vessels. They still have in hand orders for no less than 75 machines, either fitting or to be fitted on board ship, besides a large number of machines for land purposes, which comprise almost every trade for which refrigeration is required. It is interesting to note that J. and E. Hall have fitted and have on order for the largest steamship companies no less than nine installations each for two of those companies, also orders from seven other companies that run into from four to six installations apiece, and orders for ten, seventeen, eighteen, twenty-three, twenty-eight and thirty installations respectively, for other companies. A description of some of these machines will appear in another issue of The Canadian Engineer. The London office of the company is at 23 St. Swithin's Lane.

HOW TO USE THE ELECTRIC WIRE GAUGE.

Place the wire in the V-shaped opening between the movable arm and the edge of the gauge. Move the arm around until the wire is tightly bound against the edge. On the front of the gauge the figures above the short, square shoulder, near the centre, show the American (B. & S.) gauge of the wire. The figures on the outer edge of the gauge on small line, show the amperes the wire will safely carry before heating to 30 degrees above the temperature of surrounding air. On the back of gauge the ohms resistance is given of a foot of copper wire, of any size, as shown by the gauge. To find the resistance of a foot of iron wire, multiply the resistance of a foot of copper wire by seven (7). To find the resistance of a foot of German silver wire, multiply the resistance of a foot of copper wire by thirteen (13). To find the number of lamps a wire will carry: Bear in mind that a 50-volt lamp takes 1 ampere, a 75-volt lamp ¾ of an ampere, and a 110-volt lamp ½ an ampere of current. From the gauge, get the size of wire and its safe carrying capacity in amperes. The wire will carry as many lamps as the current of one lamp of a given voltage is contained in the ampere capacity of wire, as shown by gauge. Example.—The safe ampere capacity of No. 12 copper wire B. & S. Gauge is 14½ amperes, and one 110-volt lamp requires ½ ampere of current; therefore, $\frac{14\frac{1}{2}}{\frac{1}{2}} = 29$, the number of lamps a No. 12 B. & S. gauge, copper wire, will carry. To find the size of wire required to carry a given number of lamps, at a given distance, at a given loss.—Taking the formula as stamped



on arm gauge: Let V represent the volts loss, C represent the total amperes and D represent the distance in feet (both ways). Example.—Desiring the size of a feeder-wire that will carry 20 amperes at a loss of 10 volts, 400 feet (800 feet both ways); V = loss in volts, which, in this case, is 10; C = total amperes, which, in this case, is 20; D = total distance in feet, both ways, which, in this case, is 800. Therefore, $\frac{10}{20 \times 800} = \frac{10}{16{,}000}$ .000625, the resistance of one foot of copper wire. Having this result, place the square shoulder of the gauge-arm on line with the nearest resistance to said result that is found on the gauge, and the square shoulder on the reverse side will indicate the B. & S. copper wire gauge desired; in this sample case, it will be found to be No. 8 wire. For sale by Aikenhead Hardware Co., 6 Adelaide street East, Toronto.

James Stewart & Co. are at work on the foundations of the new bridge to be constructed across the Niagara River at Lewiston.

The St. John, N. B., Globe says: The building of the Cushing Sulphite Pulp Company's mill is now an assured thing, for one English paper maker has taken three-quarters of the stock and more than one-half the remainder has already been subscribed by local capitalists.

METAL IMPORTS FROM GREAT BRITAIN.

The following are the sterling values of the imports of interest to the metal trade from Great Britain during July and the seven months ending July, 1897, 1898 —

	Month of July.		Seven months ending July.	
	1897	1898.	1897.	1898.
Hardware and cutlery	£5,825	£2,372	£37,755	£14,290
Pig iron	942	928	3,807	7,105
Bar, etc.	786	502	5,799	7,239
Railroad	17,368	8,190	37,654	23,007
Hoops, sheets, etc.	8,313	7,843	31,003	24,466
Galvanized sheets	6,083	8,294	25,458	32,461
Tin plates	5 989	12,123	94 942	85,598
Cast, wrought, etc., iron	1,943	2,295	19,277	18,637
Old (for re-manufacture)	1,080	499	2,577	3,574
Steel	6,099	5,040	29,537	32,897
Lead	3,699	4,170	10,959	16,460
Tin, unwrought	345	1,638	10,179	12,423
Alkali	2,289	3,587	17,649	24,597
Cement	1,934	2,270	8,489	12,222

THE USE OF IMPROVED METERS IN ELECTRIC LIGHTING.

It has been found by experience, it is stated, that a central lighting station can supply 30 per cent. more customers on the meter than on the flat rate. This 30 per cent. really represents wastefulness, which is inherent in the nature of the average customer, and the flat rate. The investment in meters, and their proper care, makes the plant equivalent to one 30 per cent. larger. A central station which is in the electric lighting business for the profits on its investment can easily realize the great advantage in the use of meters. That many small villages and cities make but a small profit, or the income only sufficient to pay actual running expenses, is not surprising, in view of the waste and extravagance of the flat rate. These same stations may, by proper and economical use of meters, be made profitable. It is not necessary to point out the evils of the flat rate; but it is self-evident that many customers never take the trouble to turn out all or part of their lamps, and in places where the plant gives all-night service the lamps are left burning all night. A fallacy in flat rates is the basing of charges on 50-watt lamps. A 50-watt 16-c.p. lamp is somewhat of a rarity in the market, 60 watt being about an average, and many lamps are used taking more even—70 or 80-watts. In most small stations the voltage is kept above what the lamps were made for; even in the case of a 50-watt lamp the consumption will be higher. It has been found that most small stations, if they use 50 volts, keep the voltage at 55 or 60. These wastes are impossible to avoid in the flat rate. A meter measures the actual consumption of current. The central station gets paid for actual service given the customer, and it behooves the consumer to use his lights in the best and most economical way.

New Scheefer watt-meter for alternating current has been devised to correct various faults which were in the Scheefer meter, which has given such good results, states the Packard Electric Company in a recent circular. As will be noticed, the meter is round and has a rubber band placed around the circumference, over which is placed the other case. This rubber band should always be used, as it makes the meter perfectly dust and bug proof. It has been found that meters with cases of ordinary fitting are hampered with dust and dirt; and with such cases it is impossible to keep meters correct, necessitating frequent overhauling and cleaning. The Packard Company's new meter, if the case is properly put on with the rubber band, is perfectly air tight, and gives an assurance of its permanency. The binding posts will be seen to be insulated in a thorough manner, ordinary holes not being depended upon. The holes in the binding part are closed on end and insulated by hard rubber, making it impossible that anything can get through the post; and also making it unnecessary to tape or plug any holes. The moving parts are extremely light—at the same time not too delicate. The iron circuit in the magnetic system is practically a closed one, preventing stray lines of force from acting on other parts of the meter, and is therefore unaffected by outside influences. This closed circuit gives the maximum effect with the minimum energy possible in construction, the shunt winding taking about 1-3 to 1-2-watt on 15,000 alternations, and not exceeding ½ to ¾-watt on 7,200 alternations. This meter is also said to be correct on inductive loads, and therefore can be used on fan motors or induction motors, arc lamps, etc.

Industrial Notes.

Joseph Carrington is building a large addition to his tannery at Kingston, Ont.

Mayor Roy, of Levis, is negotiating with Montreal capitalists for funds for an aqueduct for that town.

Dr. Bryce of the Ontario Board of Health has reported that additional sewers are needed at Kincardine, Ont.

The Ontario Silver Co., Humberstone, Ont., has installed a second gas engine recently; the new one being 40 h.p. capacity.

H. Mooers & Co., of Kingston Ont., are about to build a new flour mill, which will be run in connection with their elevator.

Lancaster, Ont., village corporation is looking for some industry or industries to locate in the town. Good inducements are offered.

It is said that a shoe factory is soon to be established at Fredericton, N. B.; $20,000 of the required capital has already been subscribed.

McDonald & Allen, manufacturers of door knobs, Kingston, Ont., have closed out. The plant has been bought up by Mr. Spencer, who will reorganize the business.

M. Fauteux has the contract of building the new hospital at Sault Ste. Marie. The work is estimated to cost $20,000, and is to be completed by the 10th of January, 1899.

Engineer C. H. Mitchell, Niagara Falls, Ont., writes that the town is about to construct 8,700 lineal feet of 6, 8 and 10 foot concrete and brick walks, together with stone curbing and crossings.

The Peterboro, Ont., Light & Power Co., is about to commence the erection of a large water power station. The new station will cost between $30,000 and $40,000, and the company expects to develop about 2,000 h. p.

The contracts for the new iron bridge over the River Raisin at Lancaster were let, and Williams & Fallon, of Cornwall, Ont., have commenced work on the abutments. The Dominion Bridge Co. will supply the structural work.

The Ontario Board of Health has given Fort William, Ont., permission to take the supply of water from the Kaministiquia River three miles above the town, provided that the sewer outfall should be a quarter of a mile from the mouth of the river, emptying into the bay.

It has come to our knowledge that certain bogus or fraudulent firms in Holland are entrapping Canadian manufacturers in the iron trades, and we would sound a note of warning that no goods be shipped without security in some form. Could not our boards of trade look into the matter?

The demand for Clappison's magnesia sectional covering has been so great that it has become necessary to greatly enlarge the factory at Hamilton, Ont. Another story and a new engine room—an entirely new front—new machinery, etc., having been added. This goes to prove that a really good article, once used, is sure to be appreciated.

The hydraulic jacks recently shipped to the Intercolonial Railway Co. by the Lancaster Machine Works, are reported to be first-class articles giving great satisfaction. These jacks, although retaining the main original features of the Tangy jacks, have several improvements that place them ahead of all other makes. They are made in all sizes by the Lancaster Machine Works, Lancaster, Ont.

In the paragraph last month referring to the transfer of certain oil properties to the Bushnell Co., Ltd., of Sarnia, omission was made of the transfer of the National Oil Co., of Petrolia (owned by John Macdonald), at $65,000. The price at which the Empire Oil Co., of London (owned by J. R. Minhinnick), was transferred was stated to be $4,000 instead of $28,000.

The Athens, Ont., Methodist congregation will build a new $10,000 church.

Newmarket, Ont., has carried a by-law to give $5,000 to the Office Specialty Manufacturing Co. to extend its buildings.

The contract for the Ashburnham waterworks system has been awarded to McQuillan & Co., of Toronto, at $6,295.

The new ranges of the Dominion Rifle association at Rockcliffe, Ottawa, are provided with acetylene gas lights instead of electric lights.

J. E. Webb, who was contractor for the masonry on the Union station, Toronto, is building a large generator house for the Consumers' Gas Co., Toronto.

Jno. Galt, C. E., Toronto, has made preliminary surveys and examinations at Stayner and Bolton, Ont., for the proposed installation of waterworks in those towns.

The matter of the contemplated bonus to the proposed rolling mills in Belleville, Ont., will not come before the ratepayers for some time, as a great deal of opposition has recently developed itself locally.

Dr. P. H. Bryce, secretary of the Ontario Board of Health, reports that the residents of Niagara-on-the-Lake are taking the sewerage question into serious consideration, and hope in a short time to have a modern system in operation.

Alex. P. McKee, proprietor of a glass factory in Anderson, Ind., was recently in Hamilton, Ont., with a view to establishing a factory there. The report that the Diamond Glass Company proposed to move to Toronto was the cause.

In St. John, N. B., the city engineer is carrying on the annual clearing of the city water mains. In the leading Ontario cities when the water mains become choked up with sediment they lay new and larger ones.

The waterworks just completed in Mount Forest, Ont., were tested August 30th, and found entirely satisfactory. The work was carried out at a cost of about $30,000 by Clark & Connelly, contractors, Toronto, upon plans prepared by Jno. Galt, C. E., Toronto.

D. S. Collins, manager of the Fossil Flour Company's mills at Bass River Lake, Castlereagh, Londonderry, N. S., is pushing the works, and the product that is now coming from the mill is said to be most satisfactory. The mill is turning out from 10 to 13 tons of refined silica every day. It is brought over the Pole Railway to the wharf at Bass River for shipment.

The Brockville Pork Packing Company has been organized with W. H. Comstock as president; Mr. Packingham, treasurer; Mr. McLennan, secretary, and E. C. Manning, formerly of Dublin, Ireland, as manager. The buildings for the new company are being got into shape, and the factory will soon be running.

Last month an article appeared in the columns of The Canadian Engineer describing the Sterling Hack Saws, which are a great labor-saving device; the makers' name and that of the parties selling same in Toronto were omitted. The Diamond Saw & Stamping Co., of Buffalo, manufacture these goods, and samples will be sent free and prices quoted on same by Aikenhead Hardware Co., 6 Adelaide street east, Toronto.

The Britannia Co., of Colchester, Eng., have sent us a neat souvenir in the form of a nine inch rule with one edge beveled to form a letter opener. This company manufactures various specialties in tools, and has just issued leaflets descriptive of their lathes with turret rests and capstan rests, for milling machines, and headstocks for the same, dividing appliances, engineers' vices, turret screw cutting lathes, boring machines, shapers, etc.

The General Engineering Co., of Toronto, Ltd., are prosecuting an action, taken out last July, against the Dominion Cotton Mills Co., of Montreal, and the American Stoker Co., for infringement of patents. The statement of claim sets forth that the plaintiffs are owners of patents granted in 1892 and subsequent years for improvements in boilers and furnaces and for mechanical stokers, known as the Jones Underfeed Mechanical Stoker, which patents the defendants have infringed. Damages are sought for these infringements, and an injunction is asked for restraining the defendants from using such mechanical stokers, etc. The action is taken in the Exchequer Court.

A bonus of $2,500 is offered for the erection of a 50-barrel flour mill at Carnduff, Assa.

D. W. Karn & Co., Woodstock, are erecting a $3,000 addition to their organ factory.

Charters Smith, Durham, Ont., has his foundry, which was burned down some time ago, in operation again.

Geo. H. Hees & Co., Toronto, window shade manufacturers, have taken out a building permit for a three-story brick factory to cost $9,000, and a three-story brick warehouse, beside the factory, to cost $7,000.

Oshawa, Ont., has instructed Jno. Galt, C. E., to make preliminary surveys and estimates for a system of water supply and sewage disposal for the town, to cost about $100,000. The water supply is to be by gravity from springs in the Oak Ridges.

The difficult work of taking down the old Victoria bridge, Montreal, is being made somewhat easier by the use of pneumatic machines to cut the old rivets. The Ontario Rolling Mills Co., Hamilton, Ont., has bought the material of the former structure.

A great many elevators are being built in the Northwest this season. The Northern Elevator Co. has ten elevators under construction at the following points: Oak River, Varcoe, Pettypiece, Cypress River, La Salle, Starbuck, Elm Creek, Somerset, Swan Lake and Union Point, Man. Each of these will have a capacity of 30,000 bushels, and a few others will be erected later on in the season. When those mentioned are completed the Northern Elevator Co. will have 102 elevators in the province and Territories. Besides the five to be built for the Lake of the Woods Co., E. J. O'Reilly has about completed an elevator for the Richardson Grain Co., of Kingston, at Sydney, to replace the one destroyed last winter. The Manitoba Grain Co. will also erect a number, and it is understood the Dominion Elevator Co. will add to their storage capacity. Bready, Love & Tyron will spend about $50,000 in erecting elevators at thirteen or fourteen provincial and Territorial points.

The Dodge Manufacturing Co., Toronto, Ltd., has been incorporated and will carry on the business hitherto conducted by the Dodge Wood Split Pulley Co., with works at Toronto Junction, and warerooms and city offices at 74 York street. The Dodge Manufacturing Co. will continue to manufacture the Dodge Wood Split Pulley. It will also do a general foundry, engineering and machine shop business, making a specialty of power transmission machinery, such as shafting and pulley equipment, jack shafts, floor stands and friction clutch pulleys. The firm will also make a specialty of grain elevator machinery and rope driving. The Dodge Co. has every facility for turning out high class work quickly, and are prepared to make plans and submit estimates and give information on all kinds of special machinery. The company issues a 270 page catalogue which will be mailed free on application.

Freeman C. Coffin, engineer to the city council of Carlottetown, P. E. I., prepared the plans adopted by the Sewer and Water Commissioners for a complete sewage system for the city. The system decided upon is the common separate water carriage system with intermittent discharge into the sea by means of a reservoir, cast iron pipe and the channel of the Hillsborough. There will be a pumping station at a low point both on the east and west sides of the central high gravity area, which location of pumps will altogether obviate the use of siphons and at the same time carry away the sewerage from the lowest levels to the eastern and western portions of the city. From each of the pumping stations already mentioned, and the tank connected therewith, the sewerage will be pumped through a cast iron pipe to an elevation of about 20 feet on the high gravity area, where it will enter an earthenware pipe of a large size to enable it to flow freely with the other sewerage passing at the same level into the outlet reservoir. It is proposed to erect an outlet reservoir at or near the head of Pownal wharf, 40 feet by 90 feet inside measurement. This reservoir will be covered with an arch roof of concrete, to effectually guard against the escape of any foul odors. From this reservoir, running between Pownal and Connolly's wharves, there will be a 20 inch cast iron outlet pipe of the approximate length of 700 feet, or until it reaches well out into the channel of the Hillsborough.

Parry Sound, Ont., has ordered a rock crusher.

The village of Gatineau Point, Que., has voted to establish water-works.

The contract for the new breakwater to be constructed at Goderich, Ont., has been awarded to Sneeth & McGillicuddy.

J. A. Savoie, box manufacturer, Brompton, Que., will move his factory to Sherbrooke, where he will employ about fifty men.

J. E. Wilson, St. John, N.B., has received from the C.P.R. the contract to furnish 3,000 steel buckets for the new elevator conveyors.

Mayor Andrews, of Winnipeg, has gone to England to float a bond issue to provide for the construction of a city water-works system.

It is proposed to erect the new dynamite works of the Ottawa Dynamite Company on a site between the Ottawa river and the Richmond road.

The Waterloo township, Waterloo County, Ont., by-law to raise $9,000 for the purpose of replacing the bridges swept away, was carried last month.

A by-law to provide $40,000 for waterworks purposes, repealing the by-law for $35,000 already voted, was defeated in Fort William last month.

Voting on a by-law for the establishment of a waterworks system, took place at Prescott, Ont., Aug. 18th, and it was carried by a majority of 124.

Berlin, Ont., has an old hand fire engine that has a history. It was purchased on December 19th, 1857, from George Penny, of Montreal, for £219 9s. 11d.

The contract for the building to be erected on the site of the old City Hall, Quebec, has been awarded to Joseph Gosselin, of St. Joseph de Levis, at $75,000.

A bylaw to raise the sum of $30,000 for the purpose of erecting new municipal buildings, in place of those burned last November, was carried at Stratford recently.

Wm. Thompson, expert of the Caledonia Iron Works, reports that he is making rapid progress with the installation of the waterworks plant at Rat Portage, Ont

A Dominion charter is asked for a company to build a general traffic bridge over the Ottawa from a point in Ottawa city, between Bank and Kent streets, to the city of Hull, Que.

Recent fires in Montreal have caused an agitation for fire tugs, which are necessary to the protection of a harbor, and are in use in all the chief harbors of the United States.

An elevator is being erected at the linseed oil works, Winnipeg, and considerable new machinery has been installed in the works, increasing the capacity and efficiency of the industry.

The acetylene gas plant installed this summer in the Algonquin hotel, Stanley Island, Ont., by the Hamilton Acetylene Gas Machine Co., is giving complete satisfaction. There are 150 lights.

Dickson Bros., iron founders and machinists, Campbellford, Ont., have been awarded the contract for the steel bridge across Crow River, eight miles north of Campbellford, for $1,900.

The People's Light & Power Co., Halifax, N. S., has added to its plant by purchasing through the Halifax office of the James Cooper Mfg. Co., another 50-h. p. Lidgerwood hoisting engine.

The contract for the re-building of the portion of St. Bernard's Convent, Antigonish, N.S., destroyed by the recent fire, has been awarded to Angus McDonald & Son, Truro, N. S. Their tender was $11,342.

The W. C. Edwards Co., Ottawa, is erecting a retort for the manufacture of calcium carbide gas from sawdust and limestone. A description of the process will appear in an early number of the CANADIAN ENGINEER.

The Reids of Montreal have laid before the Newfoundland Government their plans for the erection of a pulp mill at Grand Lake. It is to be a company with a capital of $2,000,000, which has already been subscribed. The mill is to have the capacity of 162 tons of dry pulp per day, and for this purpose will use 450 cords of spruce daily.

The assets of the Cascapedia Pulp & Lumber Co. were sold at auction recently. R. H. McLelland, of St. John, N.B., bought the saw mills and machinery for $15,000, and the Salmon River timber limits for $2,900.

An order has been placed with the James Cooper Mfg. Co., Ltd., Montreal, by the Canadian Construction Co., Farrans Point, Ont., for two of the Lidgerwood type double cylinder double drum hoisting engines, complete with boilers.

Architects are asked to compete for plans for a Presbyterian church, Windsor, N. S., seating capacity 500 or thereabouts, and of schoolroom 250, of wood, to cost not more than $12,000 fully finished, including lighting and heating; if of stone, to cost not more than $16,000, finished, lighted and heated.

The Nova Scotia Glass Co., South Trenton, N. S., has sold its works and plant to the Diamond Glass Co. The works have been closed since 1892.

Later reports show that the damage to the works of the Jenckes Machine Co., at Sherbrooke, Que., by fire on the night of the 13th of August, was very much exaggerated. The fire was confined to the machine shop building, and the other departments, foundry, boiler shops, etc., were in operation as usual on the following Monday. A few days later a portion of the machine shop was started up, and the whole was in running order in a very short time. The patterns, drawings and office records were preserved practically intact, and all orders for work are being accepted as usual. The principal item requiring replacement is the roof of the machine shop; this, however, is well under way. The whole of the work is being pushed with much energy, and the numerous orders in hand will suffer comparatively slight delay.

The International Correspondence Schools, of Scranton, Pa., have decided to place representatives in the Canadian field, and will in a short time open an office in Toronto for the extension of their business. This is an institution that wants the consideration of all steam engineers, as they aim to give a technical education in engineering to all who will study. For starting as they do at arithmetic, they are prepared to teach anyone who can read and write. No previous knowledge of the subject is required, and anyone who will study can learn. Two of their representatives, Geo. Carruthers and J. E. Taylor, have been in Toronto for some time, and are very much encouraged by the interest shown in the schools. Their address at present is 226 Jarvis street, and they will be pleased to answer any enquiries, personally or by mail, regarding the various courses taught. They have some 1,400 students in Canada, and will be glad to give the names and addresses of any of these for reference.

Marine News.

A. Nichols, of Carleton Place, has bought a steam yacht.

The Chateauguay and Beauharnois Navigation Company, Ltd., capital $9,100, has received a Quebec charter.

Wm. Thomson & Co. are negotiating for the purchase of a steamship of 5,800 tons dead weight to be ready for delivery in November, to replace the Arbela.

The steamer "S. L. Tilley" has come out of the Kingston dry dock, where she has been undergoing extensive repairs. She has started for the upper lakes.

M. J. Hogan, of Section 12, Soulanges Canal, has placed an order with the James Cooper Mfg. Co., Ltd., of Montreal, for three of the latest type Sergeant drills.

M. A. Cleveland, contractor, of North Channel, found that he has considerably more work than anticipated, and has put in three more Ingersoll-Sergeant drills.

The steamship Leuctra Company has applied for a New Brunswick charter to own and sail the steamer Leuctra; chief place of business, Rothesay, N. B.; capital, $160,000.

The engines have been placed in the new C. P. R. steamer Queen City, and carpenters are busy finishing her deck house and fittings. She will be ready for service in about a week.

The machinery has been taken out of the steamer Carleton at Carleton Place, Ont., and the hull is to be fitted up as a barge for carrying passengers in tow of the Commodore.

The steamer Macassa was run into recently by the Ella Merton, owned by Elias Rogers & Co. The Macassa had the front part of the upper deck and the wheel house demolished. The schooner suffered the loss of her sails and jib-boom.

The Harbor Commissioners of Montreal invite offers furnishing them with land suitable for the site of a dry dock. The land must be on the north bank of the River St. Lawrence, between the Sugar Refinery and the Longue Pointe church. Lots offered must have a depth of not less than 600 feet from the boundary of the harbor lands to the Quebec Turnpike road, the breadth required being about 600 feet.

C. Giguire, under contract with the corporation of Quebec, has just built a large pontoon for the Champlain market wharf, for $9,186. This pontoon, the third of the series of new ones for the market and ferry boats, plying to the city wharf, is like the other two which were built in 1896 and 1897, 120 feet in length, 40 feet broad and 8 feet high or deep, conformably to plans and specifications prepared by C. Baillairge, city engineer, and under his superintendence and that of Foreman Verrault.

The K. M. T. & T. Co. and the Lake Bennet & Klondyke Navigation Co., have amalgamated, at least so far as their transportation business is concerned. Hereafter the latter company will have charge of all transportation matters, the steamer Amur, owned by the K.M.T. & T. C., being run by them in connection with their river steamers Oro, Nora and Flora, plying between Dawson and Bennett. The K. M. T. & T. Co. taking the offices in the Five Sisters Block and the Bennett Lake & Klondyke Company removing to the Government street offices.

The Esquimalt Marine Railway, Ltd., has sold out the plant and ship building business to a company which has been formed under the name of the British Columbia Marine Railway Co., Ltd. The new company, which has been incorporated with a capital of $200,000, has taken over the business as a going concern, the sale dating from July 27th. In addition to the large plant at Esquimalt which is capable of handling ships up to 2,500 tons, the new company intends to put up a smaller plant in the inner harbor for handling smaller vessels and will extend its business too to Vancouver, where it has already secured a site.

The new slip docks at Port Stanley, Ont., the contracts for which were awarded by the Lake Erie & Detroit River Railway Company late in May, will be completed and ready for use in a few days. The contracts called for their completion on Aug. 1, but unavoidable delays prevented their being finished in that time. The docks are being constructed immediately to the west of the light-house piers, and with the tracks and grading of the approaches, they will cost in the neighborhood of $55,000, the estimated cost of the docks alone being $45,000 and of the approaches $10,000. The contractors are the Hamilton Bridge Company for the iron work, and Babcock & Flook, Windsor, Ont., for the woodwork.

Railway Matters.

The new I. C. R. station at Moncton, N. B., was opened to the public, August 1st.

Trains are now running on the New York and Ottawa Railway between Ottawa and Cornwall, Ont.

Track laying on the Swan River extension of the Dauphin railroad is now going on, about 35 miles of grade being ready.

The new Grand Trunk offices in Montreal are to be a magnificent structure, the largest railway offices in the world. R. A. Waite, Buffalo, is the architect.

Mackenzie & Mann let to E. F. Farquhar, Toronto, the first 25 miles of work on the Ontario & Rainy River Railway. Locating parties are already in the field. Thomas White is chief engineer.

At a recent meeting of the Board of Directors of the Canadian Pacific Railway Company, dividends of 2 per cent. on the preference stock and 2 per cent. on the common stock for the half year ended 30th June last were declared, payable 1st October.

It is stated that the proposed railway from Brandon to Deloraine will be built this year, with a spur to the coal district south of Deloraine, where it is said a plant for mining coal will be put in.

Casper Braun, contractor, Berlin, who erected the G. T. R. depot in that town, has been asked by the Grand Trunk authorities to tender for the erection of a large round-house at Sarnia, to house 30 engines in.

The Brandon Southwestern Railway survey party has been gradually working its way north to Brandon, and has now reached that town. It is expected that the road will connect with the Great Northern at Bottineau, U. S.

With a view to completing the double track on the Montreal and Brockville section the Grand Trunk Railway authorities are at present engaged in widening the bridges at St. Annes and Vaudreuil, in order to place an additional track on each.

Work is progressing satisfactorily on the Restigouche & Western. A large force of men is employed under C. L. B. Miles, engineer in charge. It is expected that ten miles of rails will be laid early in October, and a second ten miles graded. The first sod was turned August 12th.

The Brotherhood of Locomotive Firemen will, this month, celebrate in Toronto its twenty-fifth anniversary, and the sixth bi-ennial convention, beginning on the 12th. The Locomotive Firemen's Magazine has issued a handsome illustrated supplement showing a number of views of Toronto and portraits of the officers.

Application will be made at the next session of the Ontario Legislature for an Act to incorporate the Haliburton, Whitney & Mattawa Railway, to construct a railway from a point at or near the present terminus of the Grand Trunk Railway at Haliburton, to a point on the Ottawa, Arnprior & Parry Sound Railway, at Whitney, Ont., and in a northerly direction to Mattawa on the Ottawa River, with power to equip and operate it by steam or electricity.

The Grand Trunk Railway is making considerable additions to its rolling stock at the present time. It has just received from the Pullman Company twenty passenger coaches, which will be used on the western division of the road. Mammoth engines are being specially purchased to haul these new coaches. The company is now busy building 500 box cars in its shops at Detroit, and also 250 new stock cars.

E. C. Walker has been elected president and managing director of the Erie & Huron Railway, S. A. King vice-president, and J. H. Walker treasurer. John Forman remains secretary The following appointments have been made in the office at Walkerville: William Woollyatt, general superintendent and traffic manager; A. Leslie, accountant and auditor; J. H. Coburn, solicitor; Owen MacKay, engineer; S. Austin, mechanical superintendent; H. Morris, road master.

The Sooysmith Co. finished pier No. 8, the last of their work in connection with the Cornwall bridges of the O. & N. Y. Railway, last month. In less than seven months' work time ten piers, averaging about 1,000 yards of masonry in each, and four concrete abutments have been built, and with the single exception of the killing of Johnston by the falling of a tower, not the slightest casualty has occurred, nor a man been sent to the hospital.

W. T. Jennings, C. E., engineer of the James Bay Railway Commission, has returned to Toronto after making a preliminary survey of the Temegami & Wahnapitae districts to the Height of Land, having made a canoe journey of 700 miles. Mr. Jennings sent Mr. Sankey on to James' Bay to examine the bar at the mouth of the Moose River, and to report on the possibilities of constructing harbors on the south shore of James' Bay. Mr. Sankey is expected back as we go to press, and Mr. Jennings' report will be awaited with interest.

An important railway deal was closed Aug. 20th, when the Toronto General Trusts Company, representing the estate of the late John Leys and other trust interests in their keeping, negotiated the sale of the Port Arthur, Duluth & Western Railway to Mackenzie, Mann & Co., for a price said to be in the neighborhood of a quarter of a million. It is understood that it is the intention of Mackenzie & Mann to extend the

read forty or fifty miles into Minnesota to connect with the railway systems of the Northwestern States. It is also intended to connect it with the Rainy River Railway, a charter for which Mackenzie & Mann have secured and on the construction of which they are now working.

Mining Matters.

A 30-barrel oil well has been struck on the farm of F. W. Smith, Dunwich, Ont.

It is said that a valuable deposit of copper has been discovered at Wickham, Que.

A placer strike has been made on Rover creek, near Nelson, B. C., and many claims are being staked out.

The Libbey mine, Brookfield, N. S., cleaned up in July over 350 ounces of gold aside from the concentrates.

There is a report that gold in paying quantities has been found near Pinmaukin, on the head waters of the Rivers Shipshaw and Bersiamites, Labrador.

A natural gas well has been struck on the farm of Jacob Smith, near Ryckman's Corners, Ont. James Marshall, Barton, Ont., is the owner of the well.

The Nova Scotia Steel Co. has an order for 70,000 tons of iron ore from a German smelting company. The ore will be shipped from the Belle Isle mine.

Very rich mica has been discovered in the neighborhood of Kazabazua, Ottawa county, Que. The mine is turning out mica large enough, it is said, to cut 14x22 inches.

It is reported that a seam of anthracite coal has been located at Macadam's Lake, about 15 miles from Sydney, C. B. Dr. Gilpin gives an opinion that is favorable to the find.

The Trail Smelter, Trail, B. C., is increasing its boiler plant and has placed an order with James D. Sword, representing the James Cooper Mfg. Co., Ltd., Montreal, for another 80-h.p. boiler, to be added to the present battery.

The Hall mines, Ltd., Nelson, B. C., is re-equipping its tramway line with a complete new set of buckets, and has placed the order with James D. Sword, of the James Cooper Mfg. Co., Ltd., for 810 buckets. Delivery is to be made within eight weeks.

The James Cooper Mfg. Co., Ltd., is now erecting for the Whitewater Deeps Mining Co., Whitewater, B. C., complete 10-drill Ingersoll-Sergeant air compressor plant of the belt driven type, and installing Pelton water wheels with half a mile of converse lock-joint pipe and a mile of air line pipe.

It is said that the United States prospectors who are boring for oil at Lake Ainslie, C. B., have reached a depth of 1,600 feet, and were compelled to desist for want of further appliances to work at that depth. It is reported that the indications continue to be favorable and numerous as to the presence of petroleum in this neighborhood.

The Council of the Canadian Mining Institute has decided to hold the next meeting of the members at Nelson, B.C., early in October. Although it is yet too early to indicate a programme, we understand that already a number of papers have been promised, among the writers being: W. Blakemore, Crow's Nest Coal Co., Coal Creek; Wm. Braden, M.E., Pilot Bay; J. G. Gwillim, M. E., Slocan City; H. Perry Leake, M.E., Revelstoke; J. L. Parker, Rossland; O. E. S. Whiteside, M.E., Anthracite; H. A. Guess, Keewatin, Ont.

The Bannockburn, Hastings County, Ont., mine has just placed an order with the James Cooper Mfg. Co., Ltd., for a 30-horse power Lidgerwood hoisting engine with necessary boiler, pump, etc. This firm's erecting engineer has just returned to Montreal after completing the installation of a plant for the Regina Canada Gold mines, Ltd., Rat Portage, Ont. This consists of a 15-drill cross compound condensing Ingersoll-Sergeant air compressor, battery of boilers, ten drills, etc. Secretan & O'Boyle, Rat Portage, Ont., have increased their plant by ordering through the James Cooper Mfg. Co.'s Ltd., agent at that point, Ingersoll-Sergeant drills.

The Chatham Oil Company are boring three new wells at Thamesville, Ont. The large well struck by this company some time ago is still pumping fifty barrels per day.

The Noble Five Mining Co., Sandon, B. C., has just installed a new 7-drill compressor plant supplied by the James Cooper Mfg. Co., Ltd., Montreal, together with 1½ miles of pipe line and necessary accessories for the plant.

The Dufferin mine, Salmon River, N. S., plant is now running at its full capacity. It consists of an Ingersoll-Sergeant 15-drill cross compound condensing compressor, one 40-horse power and one 50-horse power Lidgerwood double drum double cylinder hoisting engine, battery of boilers, complete complement of drills, mountings, etc., all supplied by the James Cooper Manufacturing Co., Ltd., Montreal. This enterprising firm has received an order from the North Brookfield, N. S. Mining Co., for two more hoisting engines, one to increase the present plant, and one for new property that is being opened up. The Broad Cove Coal Co., of Broad Cove, C. B., has just installed an Ingersoll-Sergeant piston inlet air compressor, and complete coal cutting plant purchased through the Halifax office of the James Cooper Mfg. Co., Ltd.

The Rossland, B. C. branch office of the James Cooper Mfg. Co., Ltd., reports that its erecting engineer has returned from Anaconda, B. C., where he has been erecting a 12-drill compressor plant for the British Columbia Copper Co. The Athelstan Gold Mining Co., Rossland, B. C., has placed an order with J. D. Sword, representing the James Cooper Mfg. Co., Ltd., for preliminary plant, consisting of hoisting engine, boiler, pump, etc. The Liberty Mining Co., with headquarters at Rossland, B. C., has installed an Ingersoll-Sergeant piston inlet compressor with full complement of drills, etc., having purchased this through the Rossland branch of the James Cooper Mfg. Co., Ltd. The B. A. Corporation, Rossland, B. C., reports that it has both compressors that were installed by the James Cooper Mfg. Co., Ltd., of 12-drill and 5-drill capacity respectively, now running, and development work will be proceeded with with great vigor. This company in the Great Western Nickel Plate, West Le Roi and Josie is operating 19 Ingersoll-Sergeant drills.

The Messrs. McGregor's attempt to work their property at Fifteen Mile Stream, N. S., open cast or quarry fashion, has had to be abandoned. The quartz which it was expected to strike was not met with, and that crushed bore so little gold that it would be a loss to work. This is a disappointment after the very heavy outlay of late. So complete are the arrangements at this mine, and so excellent the machinery, that quartz in larger leads yielding a dollar's worth of gold to the ton can be worked to advantage. But we are glad to learn that the disappointment of the owners soon gave place to satisfaction. A shaft was planned to be sunk a depth of a hundred and fifty feet, at a distance of fifty feet or so from the open cast. At that depth paying quartz was expected to be met with. The shaft, however, had not gone twenty feet when it was found the large lead showed gold all round. Besides the quartz from this shaft other quartz will be mined from what is known as the 'Orient' mine, which after being idle for a long time has been pumped out. From these two shafts it is expected sufficient material will be obtained to keep the fifty stamps fully employed. The cable road built for the open cast can be utilized in taking one from the new shaft.

Electric Flashes.

A company of American capitalists talk of utilizing the water power of the Jacques Cartier river for electrical purposes.

The promoters state that the necessary capital has all been subscribed for the power development at Fenelon Falls, Ont.

The Electric Co. of Windsor, N. S., has ordered a 100 horse power, Robb-Armstrong engine from the Robb Engineering Co.

Carmen O'Dell, of Annapolis, N. S., is increasing his electric lighting plant by the addition of a 50 k.w "S.K.C." Generator.

The Benallack Litho. & Printing Co., Montreal, has ordered from the Canadian General Electric Company, one of its latest type motors.

The Nelson, B. C., Electric Light Co. has sold out to the municipality for $35,400.

The Metropolitan Railway Company, Toronto, is now extending its line to Newmarket, Ont., which it is expected to reach by Nov. 1st.

The Hamilton smelting works will be fitted out with electric lights soon. The company will put in ten arc, and fifty incandescent lights.

The Canadian General Electric Co. has received an order from the corporation of New Westminster, B.C., for one of their 150 kilowatt monocyclic alternators.

The Hamilton Cotton Co., Hamilton, Ont., has decided to light its mills with electricity, and has placed an order with the Canadian General Electric Company for one of their 40-k.w. direct connected generators.

The West Kootenay Power & Light Company, Rossland, B.C., is rapidly extending its business, and for a recent extension has ordered from the Canadian General Electric Company three large feeder panels and two transformer panels.

The British Columbia Electric Railway Company of Vancouver, B. C., has found it necessary to increase its arc lighting plant, and has placed an order with the Canadian General Electric Company, for 1-125 light multiple brush arc dynamo.

R. H. Smith, Tilbury, Ont., whose plant was recently destroyed by fire, has placed an order with the Canadian General Electric Co., for an entirely new plant, consisting of two 15-k.w. standard Edison D. C. dynamos, and one 30-light arc machine. He expects to be running again in about two weeks.

The Kingston, Ont., Electrical Society has organized with these officers: C. Livingston, president; A. Chadwick, 1st vice-president; R. J. Dunlop, 2nd vice-president; R. H. Fair, Thomas Mills, D. E. Starr, John Carson, Joshua Knight, M. D. Curtis, G. McLean and Shibley, directors; Thomas Mills, treasurer, and J. P. Oram, secretary.

The Union Carbide Company, of Chicago, is arranging to greatly enlarge its plant at Sault Ste. Marie for the production of calcium carbide. The plant at Niagara Falls will be continued, but that at Appleton, Wis., will it is said, be discontinued. Twenty dynamos will be used in the new plant, and they have been purchased. These machines are single-phase, low-frequency alternators of 500 kilowatts each, delivering 2,500 amperes at 200 volts.

Herbert Webster, formerly of the firm of Webster and Hicks, Norwich, Ont., has secured a franchise for furnishing the town with electric light. The Canadian General Electric Company is supplying the entire electric equipment, which consists of a 700 light single phase alternator; marble panel switchboard, transformers, wiring. The corporation has contracted with Mr. Webster for the lighting of the streets by 40-32 c.p. incandescent lamps, operated in series.

The Montreal Cotton Co., of Valleyfield, P. Q., has placed a large increase order with the Canadian General Electric Company for induction motors, consisting of two 50-h.p., one 75-h.p., five 100-h.p. and one 200-h.p. When these are completed the cotton company will have one of the largest isolated electric power plants in America, the Canadian General Electric Company having already installed for this company, in generators and motors, a total of between 3,000 and 4,000 h.p.

The Canadian General Company has just closed a contract with the Lunenburg Gas Company, of Mahone Bay, N. S., for a 100 kilowatt three phase revolving field type alternating generator. This installation is to be used for the transmission of electric current, from a water power, situated about 9 miles from the town of Lunenburg, and will be operated without transformers at a potential of 4,000 volts. The company have also received an order for the wire to be used in the erection of the transmission line.

The amalgamation of the District Railway and Q. M. & C. Railway Companies is to be followed shortly, we understand, by the absorption into the joint concern of the Montmorency Electric Power Company. The shareholders of the Q. M. & C. Electric Railway Company will meet on the 13th inst. to ratify the bargain, and those of the Montmorency Electric Company a few days later. The trains of the Q. M. & C. will be run by electricity next year, and there will probably be an electric line along the Beauport road as far as Montmorency Falls.

L. E. Whitehead has resigned his position as superintendent of the Sherbrooke Street Railway.

The Peterboro Electric Light Co. is about to erect a modern power house at a cost of about $35,000.

The ratepayers of Barrie, Ont., have carried a by-law to raise $35,000 to build a municipal electric lighting plant.

An electric light system, arc and incandescent lights, has been installed by the C. P. R. at McAdam Junction, N. B.

Percy Domville has accepted the position of electrical expert for the city of Hamilton, Ont., in connection with the municipal lighting project.

A contract has been signed by the Canadian Niagara Power Company to supply light, heat and power to the Hospice of the Carmelite Fathers at Falls View.

A rumor is current that the Ottawa Street Railway Company has bought the Ottawa and Gatineau Valley Railway, and will convert it into an electric road.

As the people of Perth, Ont., defeated the Lanark County Electric Railway bonus by-law, there is now a scheme on hand to connect Lanark with Carleton Place.

S. C. Drummond, representing the British Electric Traction Co., of London, Eng., has applied to the Nelson, B. C., town council for a charter for an electric street railway.

There is talk of connecting the Niagara Central Railway with an electric road and extending it from St. Catharines to Port Dalhousie, Ont., and perhaps Beamsville, Ont.

L. E. Whitehead has resigned his position as superintendent of the Sherbrooke Street Railway. R. R. Smith, recently of Worcester, Mass., will assume the duties of superintendent.

A generator at the London, Ont., Electric Company's power house was burned out by the storm, Aug. 16th, and as a result power could not be supplied to a number of factories for a short time.

The ratepayers of Campbellford, Ont., have voted a by-law to raise $8,000 for the construction of a new incandescent light system over the entire village, to replace the one in use at present.

The Fisher Equipment Company of Chicago, manufactures electrically driven auto-cars, of which one known as a coach delivery wagon is now the property of the Robert Simpson Co., Toronto.

The Rat Portage Lumber Co. has fitted a motor to the car which supplies the planing mill and sash and door factory with lumber from the yards, and now has the first electric railway in Rat Portage, Ont.

The Jacques Cartier Pulp and Paper mill, Point Rouge, Que., has arranged to light the new pulp and paper mills by electricity. The order for the plant has been placed with the Royal Electric Co. and is to be installed immediately.

The Shawenegan Water and Power Company has advanced sufficiently with its plans for the installation of a plant capable of developing 100,000-h.p. to be enabled to call for tenders for the construction of the headrace, excavation for the wheel pits, etc.

The municipal ownership idea has apparently not swept Hamilton. A proposal to purchase the street railway has been rejected by the ratepayers by a vote of 264 to 2,043. Hamilton has at present an arrangement with its street railway that yields the city $16,000 a year. This coupled with the fact that only part of the voters were allowed to vote may account for the result.

A meeting of the shareholders of the Eastern Townships Light, Power and Carbide Co., was held at North Hatley, Que., a short time ago. The new company has been formed for supplying the electric light system to the villages of Waterville, Compton, Eustis, and North Hatley, and also to manufacture calcium carbide. The capital stock of the company is $50,000. At a subsequent meeting of the directors the following officers were elected: President, J. A. Gordon, North Hatley; vice-president, N. N. Walley, Sherbrooke; general manager, Dr. C. J. Edgar, Sherbrooke; secretary-treasurer, O. Roy, Montreal; assistant secretary-treasurer, Joseph Goodwin, North Hatley; solicitor, Mr. M. F. Hackett. The company has purchased the electric plant formerly owned by Edgar & Roy, and propose extending the business.

A charter for a railway to be operated by steam or electricity from Sault Ste. Marie to Michipicoten has been applied for.

The Stevens Mnfg. Co., London, Ont., has closed the electrical department of its business and will confine itself in future to agricultural machinery, etc.

The Royal Electric Co. is installing in the sub-station of the Cataract Power Co., on Victoria street, Hamilton, a 30-h.p. S. K. C. induction motor, which is to be used in driving the fans for the air blast transformers.

Electric light and gas fixtures are beautifully illustrated in catalogue No. 20 issued by Munderloh & Co., Montreal, wholesale electrical supplies and dealers in incandescent and arc light plants and electrical goods generally.

The Waterous Engine Works Co., Ltd., Brantford, Ont., is adding to its shop capacity, and requiring more power, is installing a 30-h.p. induction motor from the Royal Electric Co., which is to be operated from the alternating current lines of the Brantford Electric & Operating Co. This makes over a 100-h.p. in S. K. C. motors now operating in Brantford.

The Windsor Electric Light & Power Co., Windsor, N. S., is enlarging the recently installed electric lighting plant. It is adding one 100-k.w. and one 40-k.w. S. K. C. generator, with an additional complement of transformers and material. The S. K. C. apparatus and transformers are from the Royal Electric Co.

J. T. Ayers, of Lachute, has secured a franchise from that town to furnish incandescent electric lights. For this purpose he has placed his order with the Royal Electric Co., for a 100-k.w. S. K. C. generator, and the necessary transformers and material for the construction of the entire plant. The new plant will be driven by a water power situated about two miles from the center of the town.

The Ontario Telephone and Switchboard Construction Company, Ltd., has received an Ontario charter to manufacture telephones and other electrical appliances; capital $75,000. The incorporators are: R. Fox, T. H. Smallman, F. B. Leys, T. H. Purdom, R. A. Bayly, J. Labatt, M. Masuret, J. Milne, J. D. Wilson, M.D., and J. R. Minhinnick, London, Ont.; and R. H. Evans, H. C. Walters, Detroit, U. S.

The fourth of the 2,200-k.w. S. K. C. generators was set up in the Chambly Electric Manufacturing Co.'s power house at Richelieu, Que., a few days ago, and there are now ready for operation over 10,000-h.p. These are the largest electrical motors ever built in Canada, and the largest excepting Niagara Falls, that has ever been built. Electricity is no longer in its infancy, neither is Canada behind in the development of the science.

The Dundas Electric Light Co. has received a franchise from the town of Dundas, Ont., to furnish incandescent lights throughout the town, and also a contract for the street lighting. Both systems must be in operation by the first of November, 1898. The entire electrical equipment, consisting of a 50-k.w. S. K. C. two phase generator, with 500 lights capacity in transformers, and all the necessary wire and material, is to be supplied by the Royal Electric Co., and the plant is to be installed at once. Geo. H. Harper, Dundas, will be manager of the new company.

Friday, the 26th August, 1898, will be memorable in the annals of electricity in Canada, being the day on which the Cataract Power Co., Hamilton, Ont., turned the first current on to the long distance transmission line between Decew Falls and Hamilton. The water was let into the fore bays and pipe line at about 3 p. m., and at 3.30 p. m. the hydraulic plant, consisting of two 1,500-h.p. waterwheels, and the electrical plant of two 1,000-k.w. S. K. C. generators, were turned over, the switch closed and the power sent to Hamilton, a distance of 35 miles, where it was utilized for lighting arc and incandescent lamps, and also for driving a 40-h. p. S. K. C. induction motor. The incandescent lamps in the sub-station, in Hamilton, were very artistically arranged in the form of a large star and maple leaf, and were kept lighted until far into the night. The plant will be started up permanently in a few days.

At the Royal Electric Company's fourteenth annual meeting the reports presented were considered to be satisfactory The gross revenue was shown to have been $955,826; expenditure $636,057; interest and fixed charges, $42,609; net profit, $277,160. Four quarterly dividends have been declared, of two per cent each, equalling $120,000. Ninety thousand dollars was charged to profit and loss for reduction of assets in patents, $25,000 for depreciation of plant, and $31,992 for other reasons. It was shown that the company last year made eighteen and one-half per cent. on invested capital, as compared with sixteen and one-half per cent the preceding year. A dividend of eight per cent has been paid yearly since 1891. The company now employs 600 hands, and its wage bill exceeds a thousand dollars a day. There was expended in material last year $400,000. Business in new customers has increased fourteen per cent., and for lights, sixteen per cent. The addition of a new plant has resulted in an economy of coal consumption of 5,300 tons of coal; as compared with the figures of two years ago. The old board of directors were re-elected, namely: The Hon. J. R. Thibaudeau, president; D. Morrice, vice-president; F. L. Beique, Allan R. Macdonell, H. S. Holt, J. A. L. Strathy, A. Brunet, Edwin Hanson, Robert Cowans and W. H. Browne, general manager.

Personal

James Quigley, Kingston, has been appointed chief engineer of the Deaf and Dumb Institute, Belleville, Ont.

George Bottomly, aged 25, was killed recently by an emory wheel bursting in his father's mill, Halifax.

John White, for nearly a quarter of a century foreman in MacGregor, Gourlay Company's foundry, died in Galt, Ont., a short time ago.

James D. Banks, Toronto, formerly engineer on the steamer Ada Alice, committed suicide a short time ago by inhaling gas, and thus causing asphyxiation.

Louis Simpson, Belleville, Ont., an engineer on the Grand Trunk, was struck by the pilot engine in the Brockville yard, August 2nd, and instantly killed.

C. W. Taylor, vice-president and general manager of the Canada Carriage Co., Brockville, died last month, much to the regret of a large circle of friends.

F. R. F. Brown, late mechanical superintendent of the I. C. R., is said to have fallen heir to $50,000 through the death of a relative in England.

George Kelly was caught in a belt in the George Gillies Company belt factory at Gananoque, Ont., and was thrown over the shaft and instantly killed.

Dan. McAnnany, contractor, of St. Boniface, Manitoba, is dead from the result of an accident on the Crow's Nest railway construction, where he had a contract.

Frank Travers, a steam-fitter, was accidentally killed a short time ago at the Mimico asylum while engaged in repairing the heating apparatus A radiator fell upon him.

A. P. Coleman, geologist for the Ontario Government, has gone to England to attend the British association at Bristol. He will read a paper upon the inter-glacial period.

Hector McLean, president of the International Brick and Tile Company, died at Bridgetown, N.S., a short time ago. He was one of the best known men in Annapolis county.

W. Griffith, engineer at the electric light station, Carleton Place, Ont., has resigned his position to go firing on the Parry Sound Railway. J. Bennett succeeds Mr. Griffith, and Geo. Fife takes Mr. Bennett's place.

William Madden, Westville, N. S., who has held the position of deputy inspector of mines in Nova Scotia for many years, has been appointed, by the Dominion Government, one of the mining inspectors in the Yukon.

A H Harris, the late traffic manager of the Intercolonial Railway, has been appointed general traffic agent of the Fitchburg Railway Company, in charge of all traffic affairs in the Dominion, with headquarters at Montreal.

Percy Girouard, son of Hon. Mr. Justice Girouard, of the Supreme Court of Canada, has been appointed chief in the Egyptian railway system at a yearly salary of £2,000 sterling, by the Imperial Government.

James Hutcheon, city engineer, Guelph, Ont., was up some 50 feet in the old rolling mills to superintend the fixing of a block and tackle to take down railroad rails, when he caught hold of a loose board and fell to the floor below, but fortunately escaped serious injuries.

George Coates, son of John Coates, president of the Ottawa Gas Co., blew off his arm by the accidental discharge of a gun and died in a few hours. The accident happened at Shaganaga Lake, near Hunter's Island, Algoma. Mr. Coates was 21 years of age, and a student in the Kingston, Ont., School of Mines.

William Cooper, contractor of Clinton, Ont., fell about thirty feet from a scaffold on Aug. 17th, and died in about 20 minutes. Mr. Cooper was one of the best known men in the county of Huron and very highly respected. He leaves a widow and family, one of whom is John A. Cooper, editor of The Canadian Magazine and secretary of the Canadian Press Association.

Wm. Fraser, engine driver on the Springhill and Parrsboro Railway, was instantly killed at Springhill station, recently. He went under the locomotive to do some work and while under accidentally struck the brake with his hammer. The throttle of the engine had been left open, and the striking of the brake released the wheels of the engine, which gave a jump and went about eight feet along the track.

W. F. Robertson, the new provincial mineralogist of British Columbia, graduated in 1880 with honors in natural science from McGill. His first practical work was at the Capleton copper mines in Quebec province. He afterwards went to Pennsylvania as superintendent for the Chemical Copper Company, and next assistant in New Jersey to H. M. Howe at the Orford Copper Company. Mr. Robertson after this became superintendent to James Douglas' copper works at Phoenixville, Pennsylvania, and after some time there went back to the Orford Copper Company as engineer and put up their large works for that company, which, it may be mentioned, smelts the Sudbury nickel ore. Mr. Robertson later on was engaged as engineer of the Spring Hill collieries in Nova Scotia. He then went to Spain in the employ of the Minas Sotiel Coronada, and after returning to this continent put up a large smelter for the Osceola Smelting Company in the Lake Superior district, and had also charge of the smelting works at Great Falls for the B. & M. Co. Having gone back to the Orford Company as superintendent, he finally settled down in New York in private practice as a consulting mining engineer and has given reports on mines in various parts of the continent.

FIRE-PROOF BUILDINGS.

BY FRANCIS C. MOORE.

(Continued from last issue).

All buildings over 125 feet high should be provided with 4 inch, or, better still, 6 inch vertical pipes, with Siamese connections at the street, for the use of the fire department, extending to the roof, with hydrants at each story and on the roof. This would save the time of carrying hose to upper floors—a difficult task in the case of high buildings. Ample tanks of water should be provided on the roof, supported by protected iron beams resting on iron templates on the brick walls, to supply the building's inside pipe system for fire extinction, and secure pressure by gravity or by some other method constantly operative, especially on holidays and at night. Stone templates should not be used, and care should be taken to secure strong supports, so that, in the event of fire below, the tanks will not come crashing through the building to destroy it and endanger the lives of firemen. Two such disasters in "fire-proof" buildings within a year show how true is this proposition. Tanks in the basement, under air pressure are also a great advantage, and recent invention has perfected them to the point of reliability. Fire Marshal Swenie, of Chicago, urges that standpipes should not be less than 6 inches internal diameter, and that a check valve should be provided, so that when steamers are attached, their force will be added to that of the local pumps. Each floor should have hose connections with the standpipes, and sufficient hose to reach to the most remote point of the floor above, and this hose should be frequently inspected to see that it is in order. He recommends that a code of signals, by which communication can be established between the firemen and the engineer of the building, is essential.

All high buildings should have constantly present, night and day, some competent person understanding the elevator machinery, fire appliances, etc., so as to aid the firemen in reaching the upper levels; and there should be sufficient steam in the boilers, at all times, to run one elevator.

Marble, slate, and other stones are certain to disintegrate or crumble when subjected to the joint action of heat and water. For this reason 90 per cent. of the staircases in modern "fire-proof" buildings would be found utterly unreliable in the event of fire, either for the escape of the inmates or for the use of firemen—a serious consideration. Stone treads are usually let into iron rabbet frames, and as these stone treads would give way in case of fire, it would be impossible for a person to find a footing on the stairways; 2 inch oak treads might actually last longer; but a safer staircase would be one the framework of which is of iron, the tread having an iron web or gridiron pattern, the interstices or openings of which should be small enough to prevent the passage of a foot, underlying the stone or slate, so that if the stone tread should disintegrate, the staircase still remains passable. It is possible to have the supporting tread of open work cast iron in an ornamental pattern, which, in relief against the white marble tread resting on it, would present a tasteful appearance from the underside or soffit of the staircase, with this great advantage, that in the event the action of fire and water should pulverize the marble or slate tread, it would still afford a safe support for the foot. It is generally supposed that it is not necessary to be careful as to stone treads in buildings occupied solely for offices separated in "fire-proof" hallways in which, it is claimed, there is nothing to burn; but in the case of one large "fire-proof" building of this kind in New York, I found the space under the staircase in the basement story was used to store the waste paper rubbish of the building—material particularly likely to cause a fire by concealed matches, oily waste, cigar or cigarette stumps, etc., and to make a lively and quick fire, quite sufficient to destroy stone staircase treads. Even where there is no combustible material in the hallway, if the staircase is near windows, stone treads may be destroyed by exposure to burning buildings and by the combustion of window frames, dadoes, and other wooden trim.

No building should exceed in height the width of the street on which it is located, from the view point of light and health; nor, in any case, in excess of 95 feet for mercantile occupancy, nor a height in excess of 200 feet for office occupancy.

It should be remembered that merchandise, furniture, etc., are combustible, no matter whether located in 'fire-proof" buildings or in ordinary buildings. This obvious fact seems generally to be ignored. In fact, combustible material will sometimes be more effectually and thoroughly destroyed in a "fire-proof" building than in an ordinary building, since the early collapse of the latter may smother the fire and effect salvage, whereas "fire-proof" floors support the contents of the former, and distribute them so that they are more certain to be destroyed.

Enclosing walls should be of brick, the brickwork of the lower stories especially, if not of all, being laid in cement mortar. In fact, the specifications for a building in the compact part of the mercantile section of a city, ought to be drawn in contemplation of the possible cremation of its contents, and the generation of heat considerably greater than 2,000 degs. Fahr. The heat of a wood fire is from 800 to 1,140 degs.; charcoal, about 2,200 degs.; coal, about 2,400 degs. Cast iron will melt at between 1,900 and 2,800 degs.; wrought iron, 3,000 to 3,500 degs.; steel, 2,400 to 2,600 degs.; and if an architect should be required to draw specifications for a building adjoining others, with the knowledge beforehand that its entire contents, from cellar to roof, were to be totally consumed, and he were under a bond to pay damages to surrounding property, he would not be more severe in his exactions than should a building law protecting neighborhood rights in the enjoyment of property; for a mercantile or manufacturing building sometimes generates a greater heat in combustion than a smelting furnace. It is hardly necesary to deal with the foundations of buildings. The question is an engineering problem which hardly requires suggestions from a fire standpoint, and I shall not deal with it here, other than to touch again upon the im-

portant point of not having wrought-iron or steel columns in the cellar or basement, where moisture and gas conditions would increase the danger of rust. These, as already stated, should be of brick, the lower stories laid in cement mortar, not less than 16 inches thick at the top of the building and increasing 4 inches in thickness for every 25 feet in height to the bottom. This would require a 44 inch wall at the grade for a 200 foot building. The thicknesses here recommended are for buildings not exceeding 100 feet in depth. If they exceed this depth without curtain or cross walls, or proper piers or buttresses, the walls should be increased in thickness 4 inches for every additional 100 feet in length.

Brick is the best known resistant of fire. Stone yields readily to the combined effect of heat and water, and even terra-cotta or burned clay tile cannot be regarded as a perfect substitute for hard-burned brick. Under no circumstances should the iron framework of a skeleton building be incorporated in thin enclosing walls. No wall that has not a cross section sufficient to support itself without the ironwork should be allowed, aside from the importance of having it thick enough to prevent the passage of hot air from an adjoining building. Curtain walls for enclosing walls supported by the longitudinal members of skeleton construction are objectionable; they are liable to be buckled out by the expansion of the framework. The great trouble with modern "fire-proof" structures is, that while the separating "fire-proof" floors tend to prevent the passage of flame from one story to another, the enclosing walls are often insufficient to prevent heat from igniting the contents of an adjoining building, so that what is gained by preventing the spread of fire vertically is lost laterally. It should be borne in mind that the thickness of walls herein recommended is not for carrying capacity as bearing walls. Thinner walls would answer for that purpose. It is intended to confine the heat generated by a fire, and should be required in the compact portions of cities, where every man should be compelled to build with reference to the safety of his neighbor.

Architects and builders generally seem to have in mind only the carrying capacity of walls, and to lose sight of this important fact. As the contents of a mercantile building and its floors burn, they sink to the bottom, where enormously high temperatures are reached, and it is for this reason recommended that walls should increase in thickness as they approach the bottom, on the same principle that the walls of smelting furnaces are thicker at the bottom than at the top. It is the generally accepted opinion that a 12 inch brick wall will prevent the passage of fire, but a much thicker wall will fail to confine the heat of a burning building on the first floor particularly, sufficiently to prevent the ignition of combustible merchandise or other material in an adjoining building. In a fire which occurred in Boston, several years ago, combustible material was ignited through a 3 foot wall, which became so hot as to thus conduct the heat into the adjoining building.

I do not believe "skeleton construction" so-called should be permitted for stores, warehouses, or manufactories in cities, as the walls are not thick enough to confine the heat of burning merchandise. In some of our Western cities, Detroit, Chicago, etc., the practice is growing of using hollow tiling, bonded like ordinary brickwork, 12 inches thick, for enclosing walls, instead of brick, the exposed steel frame being protected by terra-cotta slabs about an inch thick. The Leonard building, in Detroit, destroyed by fire October 7, 1897, was an example of the great danger of this style of construction. It was ten stories high, and as fast as the columns or wall girders were warped by the heat the tiling dropped out like loose bricks, leaving the entire structure after the fire a ragged cage-work of iron with very little of the tiling on the enclosing walls and none of the floors intact. The contents were, of course, totally destroyed.

Bond stones should not be allowed in piers, especially in the cellar or basement, or in piers vital to the building or carrying great weights. Stone yields readily and quickly to the combined effects of water and heat and, disintegrating at its edges, gradually releases the bricks above it, so as in time to destroy the integrity of the pier. Bond stones are employed by the mason to steady his work. A green brick pier while being laid is frequently unsteady, and a bond stone enables him to progress with his work by steadying all below it so as to receive new courses of brick. In all cases the bond should be a cast-iron plate. If the plate should be cast with holes through it about 1½ inches in diameter, so that the mortar and cement can thoroughly incorporate the plate with the masonry above and below, it would be an improvement. Wrought iron is liable to rust and should not be used. Where bond stones are used in the outer walls of buildings they are less objectionable, but for inside piers they are so dangerous that they ought to be prohibited by law. It not infrequently happens that a building of otherwise admirable construction has its weakest point in the cellar, where a stone pillar forms the basis of support of the entire line of columns through the building. In case of fire and the application of water these stone pillars, no matter how substantial, whether single monoliths or stone blocks, will rapidly disintegrate and bring down the entire structure; and inspectors should carefully examine, especially in the cellars, for such construction. After the great Boston fire, granite piers were shovelled up and carted away like so much sand. It is quite a common practice, but a most dangerous one, to employ single stone columns, often of polished granite, to support the centre of a long stone lintel carrying the wall over the ornamental entrance of a building. Such a column would surely yield to the effect of fire and water and perhaps let down the entire front. The vertical supports, columns, pillars, etc., as already stated, should be of cast iron, cylindrical in form, of liberal thickness, especially in the lower stories, thoroughly tested as to sand holes, thin places, etc. Cast iron columns should be round, and not square. In the former shape there is less likelihood of defects in casting, sand holes, etc, resulting in uniform sound thickness of the shell. The columns should be planed to smooth bearings, so that the entire system of columns, from the foundation to the roof, may be securely bolted together and form a continuous line with joints for expansion and without any inequalities of bearings. Under no circumstances should wedges or "shims"* be allowed. This most important matter is often neglected. The flanges and corbel brackets for supporting beams should be cast in one piece with the column and not depend upon rivets or bolts. Rivets, aside from the danger of shearing strains, are almost certain to rust to the point of danger. The beams should be riveted or bolted to lugs on the columns, however, as a tie between the side walls, holding the entire structure firmly and consistently together as one rigid whole and yet with play for expansion. Col. George B. Post, of New York, has devised a form of cast-iron cage construction consisting of pillars and floor beams, the members of which lock into each other without the use of bolts or rivets, forming a very rigid construction, and saving the cost of mechanics for bolt and rivet work.

(*Continued in next issue*)

—Gaseous fuel as a substitute for the direct consumption of coal continues to extend in England, state Matheson & Grant in a recent circular to the engineering trades. Not only are the waste gases of blast furnaces being more skilfully utilized than heretofore, but improvements and economies in the making of producer-gas from cheap waste coal at the collieries, encourages its use as power for gas engines, and in some cases as fuel for steam boilers. This change, if it continues to extend, will go far to solve the question of smoke prevention in iron manufacturing towns.

*Shims are pieces of slate or iron inserted to secure a true vertical, where the two surfaces have not been properly levelled or planed.