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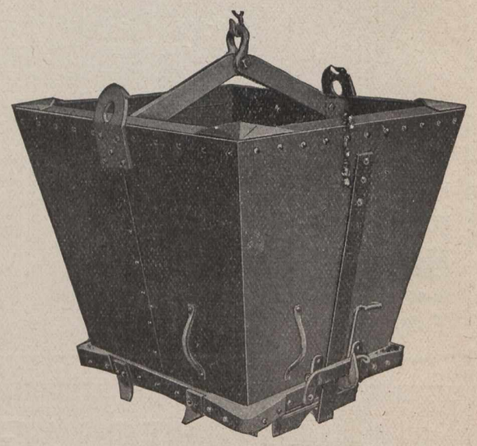

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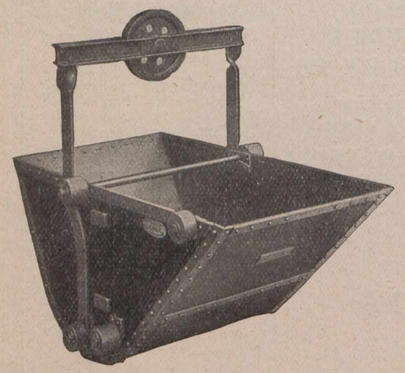

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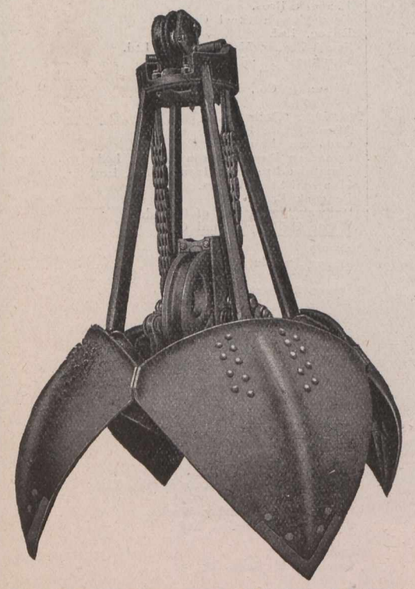

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Leonard & Sons, E.
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Structural Steel Co., Ltd.
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Hopkins & Co., F. H.
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THE CANADIAN ENGINEER

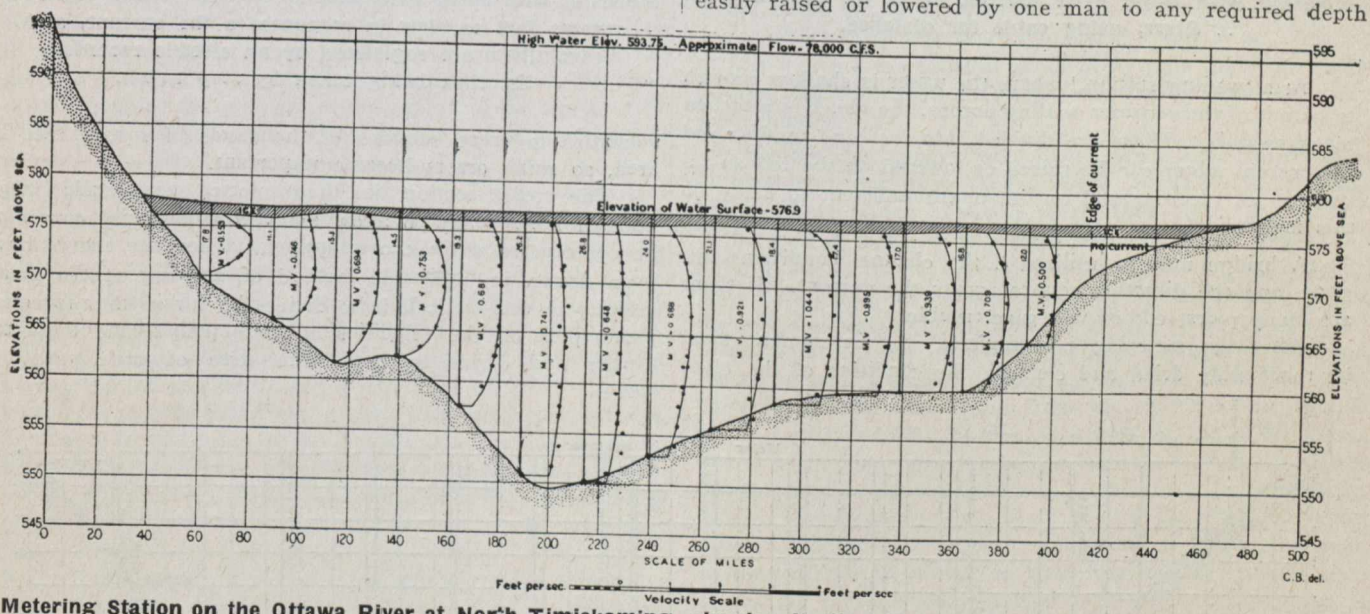
An Engineering Weekly.

STREAM METERING ON THE OTTAWA.

In connection with the conservation of waters on the Upper Ottawa the progress report for 1909-10 contains in addition to other information an interesting chapter on the stream metering.

With this article we also include two diagrams, one of which shows the variation and velocity when the ice is on the surface, and the other the velocity curve or free moving water.

Selecting a suitable stretch of river at which to carry on a series of meterings is the first and most important step to be taken in stream metering; and for this a thorough reconnaissance of the locality is necessary. The site selected should be uniform in width and free from bends for a distance equal to at least twice the width of the section finally decided upon. It should not have a rocky, uneven or shifting bottom, and its mean current should not be less than ¾ of a foot per second, nor greater than 4 feet per second. It should be as free as possible from eddies, cross currents and swirls.



Metering Station on the Ottawa River at North Timiskaming showing Vertical Velocity Curves Obtained by Measurement made Through Ice on the 5th of March, 1910. Area of Cross Section, 5,850 sq. ft., Mean Velocity, 0.771 ft. per. Sec. Flow, 4,510 C.F.S. Average Depth of Mean Velocity Below the Surface = 15% and 74.5%.

The line of current may be established by dropping in a number of boats at intervals across the stream, well above the point selected and watching their course from the shore as they float down. This operation should be repeated until the trend of the current is accurately determined, and the metering plane then set normal to the general direction. Permanent hubs should be placed well above high water on each shore in continuation of the line of cross section decided upon.

If the stream is not over 500 ft. wide, a ¾-in. hemp rope and steel cable are stretched across; the rope a little more than a boat's length up stream from the cable. The cable is tagged every 25 feet, and is used for distances only, the initial tag being placed directly over the hub on the shore from which the metering is started. The rope is used to hold the boat in position.

The large Price current meter, manufactured by W. & L. E. Gurley, is that most commonly used, but the small meter of the same pattern is more suitable for slow currents and small streams.

Before leaving shore, the meter is placed on the rod above the weight, and carefully wired. Usually a single insulated copper wire (No. 14) is run down from one pole of the batteries to the binding post on the meter. The return current is transmitted, through the cable, to a telephone receiver, held to the ear of the recorder, and thence to the other pole of the batteries. Thus, with the aid of a stop watch, the revolutions of the meter during a period of 50 or more seconds, are recorded.

If the stream to be metered is over 15 feet deep, the meter is attached to a cable and heavy weight, which is operated from near the stern of the boat by a winch. It is easily raised or lowered by one man to any required depth below the surface. Another man looks after the meter as it is being raised out of or lowered into the water. He also handles the sounding chain, calling out the depths to the recorder, who in turn gives him the depths at which the meter is to be held.

When a first metering is made on any stream, close soundings are taken in order to accurately determine the cross sectional area. Velocity observations are recorded in from 15 to 20 verticals across the stream, the meter being held at from 10 to 15 points below the surface at each vertical. In all cases when a first measurement is made, it is advisable to establish the depth at which the mean current occurs below the surface. It is then possible to determine the velocity by a single observation at each vertical

during all future measurements in open water; the presence of ice makes necessary special operations.

If the river is too wide or too swift, or if for any other reason, it is found impracticable to stretch a cable across, distances are fixed by triangulation. The length of the base should be at least ¾ the width of the stream. Range poles are set up on the shore, in line with the chosen metering section, and the boat is held in position on this range by anchors. A transit or box sextant is used for triangulating the distances. For this method of work, a party of from four to seven men is required to handle the oars, and the bow and stern anchors, the number depending on the swiftness of the current.

Metering with large Price current meter on the Montreal .. River, using cable for distance.

At a 'wading station,' where the water is shallow enough to permit of the recorder wading across, the meter is attached to brass rods. These are divided into feet and tenths, and the current meter can be raised or lowered on the rod as required. A recorder and one man are sufficient to carry on this metering.

A bridge may be utilized if the channel conditions are good, and the direction square across the current. If there are many piers, eddies will give trouble.

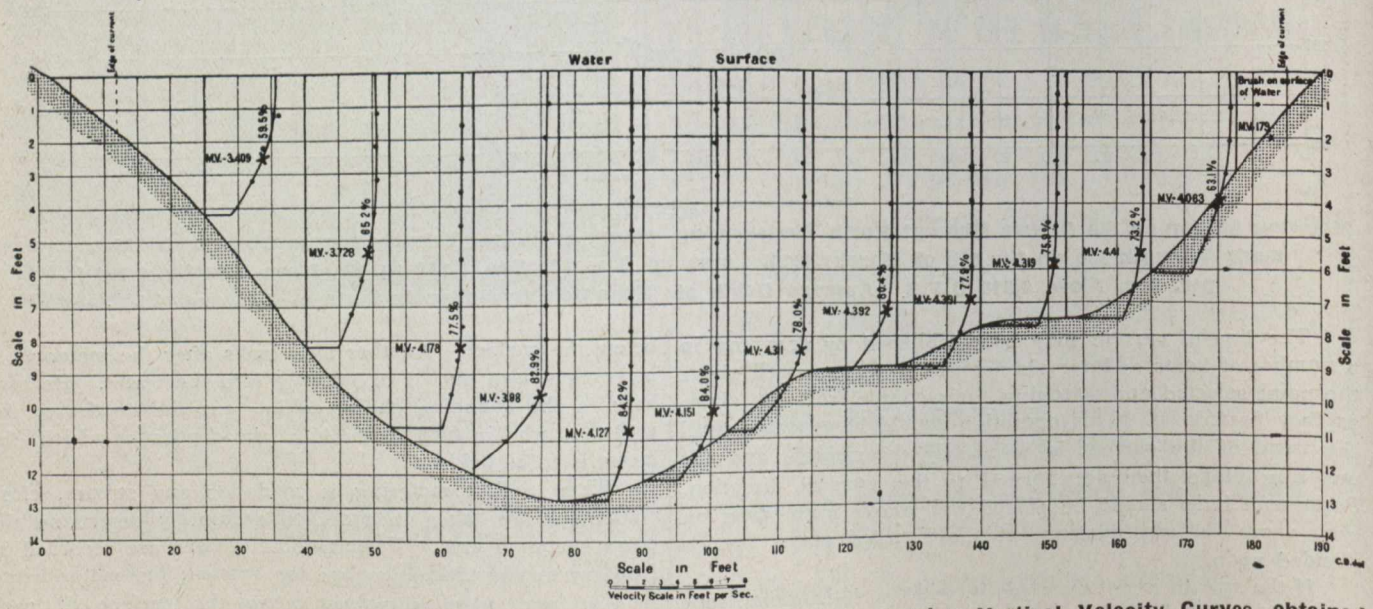
After the metering is completed, the instrument must be thoroughly dried and cleaned, the condition of the pivot bearing carefully noted and the point replaced by a new one if worn. The old point is put in an envelope and dated, to be rated at the first opportunity.

When the field notes have been copied into the office book, the recorded revolutions are reduced to revolutions per second, and the speeds are taken from the rating curve. This is a curve showing the absolute speed indicated by the revolutions of the instrument. Frequent trials of the instruments are required, because the pivot bearing wears constantly, and increasing the friction retards the revolutions. A rating station, where instruments can be quickly and accurately checked, is a sine qua non. The indicated speeds are multiplied by very large numbers, when applying the mean

Metering with small Price current meter. The conical cups revolve fast or slow in response to the current, and revolutions are registered by an electric recorder, the time being taken by stop watch.

velocities to cross sections of thousands of square feet in area, so small errors become important.

The cross section is then plotted to a scale large enough horizontally to allow the vertical velocity curves to be constructed without overlapping. When the curves have been drawn in, a simple method of arriving at the mean velocity in the vertical, is to divide the curves into 10 equal parts, pick off the velocities at these points, add them together and divide by ten. The area of each panel is



Metering Station on the Montreal River at 1½ Miles above Gillies' Depot showing Vertical Velocity Curves obtained by Measurement made on the 9th of June, 1910. Area of Cross-section 1,482.05 sq. ft. Mean Velocity, 3.94 ft. per Second. Flow, 6,000 C.F.S. Average Depth of Mean Velocity below the Surface = 75.1 per cent.

calculated separately and applied to the mean velocity, thus the total discharge is obtained.

Meterings should be made at every foot of surface fluctuation, or as often as possible. From these meterings, a discharge curve can be constructed, provided a gauge has been placed at some reach of the river. The vicinity should not be affected by back water from dams or from tributary streams flowing into the reach. The gauge should be tied into a permanent bench mark by levels and should extend at least 2 feet below the lowest known water, and the same distance above high water.

THE RELATION BETWEEN MODERN TRAFFIC AND THE ALIGNMENT AND PROFILE IN HIGHWAY DESIGN.*

During the past few years, highway engineers have endeavored to find some method of road construction that will economically resist the excessive wear produced by a heavy automobile traffic and at the same time eliminate the dust nuisance. Most of their endeavors have been confined either to incorporating a heavy bituminous binder with the road material or to using a light binder or dust palliative on the surface, and although in a great many instances the results obtained have been successful, they have not always been economical. There is no doubt that some such form of construction is absolutely necessary for a road which is subjected to a heavy motor car traffic and to use the one which will produce the result desired at the lowest cost is the most difficult part of the problem in the design of highways at the present day. Besides the particular method of construction, however, the relation between modern traffic and the alignment and profile of the road is a matter of great importance and a careful consideration of this point will tend to produce roads that will not only be safer to the travelling public but will also be more economical to maintain.

The design of roads suitable for a horse drawn vehicle traffic alone will first be considered. According to theory the maximum grade allowable is the one over which the greatest loads expected can be hauled at the least expense. In practice, however, the maximum grade is also governed by other factors than the loads to be hauled, and in most states a maximum rate of grade is established which is never exceeded except when surrounding conditions and the consideration of cost make it advisable to use a steeper grade. Although the determination of the grade is effected somewhat by the surface drainage, the latter is of much greater importance when taken into consideration with the crown or transverse slope of the road.

It is customary in the design of ordinary roads to make the transverse slope from ½ in. to ¾ in. per foot sloping in a straight line both ways from the centre to the sides or else to secure about an equivalent amount of slope by means of a parabolic or compound curve. On the steep grades a greater transverse slope is required than on the flat ones in order to guard against the danger of the water rushing down the grade and gullying out the road.

As far as the alignment of the road is concerned it is desirable of course to obtain the shortest distance between any two points, but in most instances the road to be improved has been laid out for many years and to abandon it for any great length for the sake of shortening the distance would be of little benefit, since usually the cost is increased by the heavy grading encountered and also whatever advantage there might be in having the old road bed serve as a foundation for the new road would be lost. Therefore the old road is generally followed very closely; only the worst of its irregularities in line are straightened out and sometimes short detours are made in order to improve the grade. With horse drawn traffic alone, neither sharp corners nor bad curves are considered detrimental to the road as the speed of the vehicles is not great enough to make it dangerous or to cause excessive wear at these points.

In thickly settled communities where roads varying from 20 to 40 ft. wide already exist the full width is generally improved. On the trunk lines connecting towns with each other and with the cities a width of from 12 to 16 ft. is found to be ample and to give sufficient clearance between passing teams. The width chosen in any particular case depends upon the amount of money it is advisable to spend on the road, as the cost of the surfacing varies almost directly as the width and only a heavy traffic would warrant the expenditure for a 16 ft. road.

In designing a road that takes either automobile traffic alone or a combination of automobile and horse drawn vehicle traffic, the safety of the travelling public as well as the construction of an efficient surface must be considered. If the speed of the motor vehicle could be limited in the sparsely settled districts a large part of the road builders' troubles would cease but, although ordinances regulating the speed are in effect in almost every state in the Union, as a matter of fact they are disregarded about every time the opportunity occurs with the result that the ordinarily constructed roads go to pieces.

Besides the danger of collision on roads subjected to automobile traffic where sharp curves occur, it is observed that at these points excessive wear takes place, particularly if the road is crowned both ways from the centre line. It is natural for all traffic to keep to the inside of the curve as closely as possible and in the case of the motor vehicles, if the speed is not brought down to about 10 or 15 miles an hour, there is a slew to the hind wheels as they pass around the curve which tends to grind out the road material. The half of the road that slopes from the centre to the outside of the curve receives hardly no travel at all either from machines or horse drawn vehicles and the writer has observed this fact in several instances, particularly on very sharp curves. Conditions are the same on slight curves except the damage is much less extensive. In order to lessen the wear on the road and to protect the travelling public, it would seem fit that all curves should be eliminated or made as slight as possible consistent with economy. As long as one-half of the road, when it is crowned both ways from the centre, is not used, it would be best to make a one way slope on the curve up from the inside edge and to increase the rate of this slope in proportion to the degree of curve. Practically the entire width of road is brought into use by doing this and hence the wear is much more evenly distributed. As far as the alignment of the rest of the road is concerned the straightest road is the best as it gives a clear view and therefore the tangents between curves should be as long as possible.

Perhaps a new location of the road would be of great advantage in some cases when both kinds of traffic have to be considered. Take for instance an old road with many sharp curves; it might be possible to improve such a road by a new layout so that many of the curves would be avoided and at the same time keep the new location near enough to the old so that the surrounding communities would be served just as satisfactorily. The advantage accruing from any

*Paper by Henry B. Drowne, Assistant Engineer, States Board of Public Roads of Rhode Island, presented before Section D of the American Association of Science at the Minneapolis meeting, Dec. 29, 1910.

such improvement would be a decreased cost of maintenance, a probable decrease in distance, a probable better grade and a safer road to travel. This last item cannot be figured in dollars and cents but its importance and worth should not be neglected in comparing the costs of construction between the old and new locations.

The crown of the road on the tangents should be as flat as the drainage of the road will allow because the flatter the road the more evenly is the traffic distributed over it. The writer believes that a transverse slope of ½ in. to the foot, or its equivalent, is amply sufficient in any case and that if the patrol system of maintenance is employed a slope of even less than ½ in. to the foot can be used.

The width out to out of the average touring car is about 6 ft. and a wider road is required than for the horse drawn vehicle traffic, in order to allow the machines to pass each other at a fair rate of speed with the proper clearance and still keep on the improved surface. Even on a 14 ft. road the writer has seen many places where the dirt shoulder has been displaced so that the edge of the road metal is left exposed. This exposed edge is soon broken down by the action of the traffic and sometimes the break is carried several inches into the road. On curves the same condition exists even to a larger extent and the writer knows of places where the curve has been widened as much as 10 ft. on the inside and still the traffic does not keep on the improved surface. Besides the damage done to the road on account of having too small a width, there is also the grave danger of the machines being ditched, due to driving them on the dirt shoulder. In view of the foregoing and in order to provide for the future it would seem advisable to use different widths depending upon the class of highway to be built. The writer will use the classification which has been recommended by Prof. A. H. Blanchard which is as follows: "the first class includes interstate trunk lines, interurban trunk lines and popular routes of travel; the second class includes intrastate trunk lines passing through towns, the highways connecting towns situated within a few miles of each other; the third class includes feeders leading to towns and highways of the first and second classes from sparsely populated parts of the country districts, highways connecting towns which are many miles apart, cross roads and transverse feeders in towns." For the first and second classes a width of improved surface of 20 ft. would probably be none too great, while a width of 12 to 16 ft. would be ample for those of the third class, the smaller width to be used in case of a very light traffic. On curves the road should be widened an amount depending upon the degree of curve and the inside edge should be protected by three or four rows of paving blocks or vitrified bricks laid on edge.

Fortunately the touring automobile is designed so that it is able to climb almost any grade encountered provided that the surface of the road is in good condition, hence the maximum allowable grade will be the same as for horse drawn vehicles. It is observed that on steep rising grades there is serious deterioration near the foot of the hill probably due to the increased speed of the automobile in order to gain impetus or to the changing of gears. Although a reduction in the rate of grade would help conditions, such a procedure would rarely ever be found to be either practical or economical.

There is little chance that the traction engine with its train loads of 30 or 40 tons will ever become as common in this country as it is abroad. There has been, however, a rapid development in the past few years in the use of the motor truck which carries loads of from 1 to 5 tons. Present indications show that this type of vehicle is becoming more popular every day and that before many years a greater part of the trucking of our large commercial houses will be accomplished by this method. Naturally this will effect the traffic on our highways, but there is no reason, as far as the writer can see, why the points already considered in regard to the relation of modern traffic with respect to the alignment and profile of the road will not fully cover the situation.

In coucluding, some of the resolutions pertinent to this paper will be given which were adopted by the International Road Congress at the meetings held in 1908 and 1909:

To have moderate gradients with as small a difference as possible between the maximum and minimum, it being understood that in exceptional cases gradients may be sacrificed if necessary to avoid sharp curves.

To have the least camber compatible with the easy running off of rain water.

The radii of curves should be as great as possible, 164 ft. at least, the curves being connected with the tangents by parabolic arcs. the outside of the curves should be slightly raised, but so as not to inconvenience ordinary vehicles, no obstructions to the view should be allowed at the curves. A narrow sidewalk, bounded by a curb, should be laid on the side of the shorter radius and the depositing of heaps of materials should be forbidden.

That vehicles propelled by mechanical power cannot cause extraordinary damage to the curved portions of roads provided that at these points a sufficient super-elevation is given and that the curved portion is not approached or traversed at an unreasonable speed.

SOME PRINCIPLES GOVERNING THE BLASTING OF ROCK.

By R. B. Brinsmade.*

It is only in recent years that engineers have had much to do with the details of underground excavation, as it was thought that all the schooling necessary for the successful miner could be gained by practice with a drill and shovel. It is evident, however, that where rock breaking forms such an important item of expense as it does in most mines, it will well repay study to ascertain if science cannot duplicate here the same success it has gained over empiricism in other departments.

After an explosion of powder in the bore hole, ab, Fig. 1, the sudden expansion of the resulting gases will exert its force equally in all directions on the bore hole, until either the enclosing rock or the tamping yields and the gases escape. The rock will yield along what is called the line of least resistance, which would be bc in the assumed homogeneous rock of Fig. 1. It is evident that the angle θ, which the hole ab makes with the exposed surface or the free face of the rock, can vary from nothing to 90°. At $\theta = 0°$, there would be no hole and at 90° the hole would be in the position bc, the line of least resistance, and would give a blown-out shot. The quantity of rock thrown out by the explosion would have the volume of a cone with an altitude bc or h, and a base with a radius ac, whose volume $v = \frac{1}{3}h\pi(ac)^2$ and where $\theta = 45°$ (the usual condition for the maximum volume) $ac = h$ and we have $v = \frac{\pi h^3}{3} = 1.05\ h^3$.

For a case with two free rock faces if the powder charge be placed at e, with the lines of least resistance eg and em, of equal length, the explosion will break out two cones

*Professor of mining engineering, State University, Morgantown, W. Va., in the Mining World.

def and fek, or nearly double the volume for one free face, so that $v=2h^3$. It is similar for three or more free faces, so that as a general equation we have, if n = the number of free faces, $v=nh^3$.

From this formula it can be seen that a system of mining should be adopted which utilizes as many free faces as possible in breaking. In development work for vertical, horizontal or inclined drives or passages, we start each round of holes with one free face and with our cut holes break out either a cone or a wedge whose surface forms another free face for the benefit of the other holes of the round. In stopping work, which must be started from a drive, we can always manage to maintain two and often three free faces in homogeneous rock, and in stratified formations, sometimes four faces, as a bedding plane is often nearly the equivalent of a free face.

In stratified formations the correct principles of breaking are especially important for economy's sake. The simplest case is that of beds 2 to 4 ft. thick. Here the holes should be drilled in a plane parallel to the beds because it is evident that we can more easily separate two wet coins on a table by sliding one sideways than by trying to lift it off vertically. Also these parallel holes do not weaken

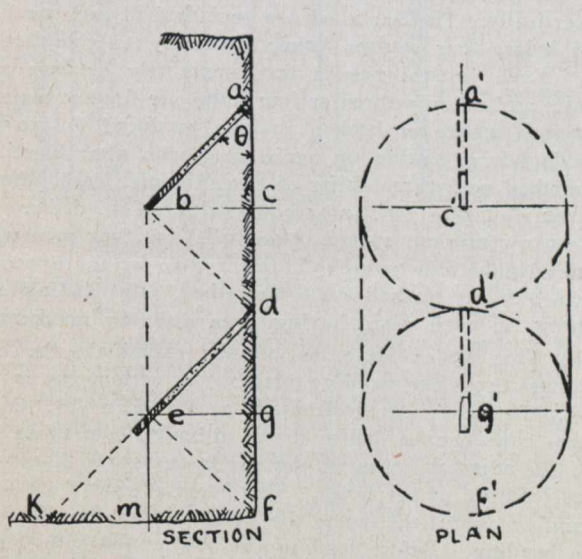


Fig. 1.

the blast by allowing the powder gases to escape through the bedding seam. Where the beds are thin, say under 8 ins., we encounter the possibility, with holes parallel to the bedding, of having only the small bed blown out that contains the hole. For this reason it is advisable to first make a cut by driving holes across the bedding planes and then break to the cut with the balance of the holes drilled parallel to the bedding plane, but which now exert their maximum force perpendicular instead of parallel to the beds.

The method of firing also affects the pointing and the necessary number of holes to drill for breaking. There is a great advantage in simultaneous electric firing wherever a weak roof or the greater danger from misfires with unskilled miners do not militate against it. In Fig. 1 it is evident that only the cone abd and the double cone dek would be broken out by the charges at b and e fired separately, but if b and e are not too far apart and are fired together the line of detachment will be along the lines abek instead of abdek and the extra volume bde will be broken with no extra powder or drilling. In any case of breaking, the pressure p produced by the explosive multiplied by the area of its section a (taken along the axis of the hole) must equal the ultimate tensile or shearing strength T of the rock multiplied by the area of its surface of fracture S or pa = TS.

If pa is greater than TS it means an excess of explosive over that required for detaching the burden. This excess causes a "windy" shot, resulting in a greater air blast, a louder report and a longer, hotter flame than from a normal shot. A normal charge leaves traces of the drill hole, but an insufficient charge leaves "candlesticks" in the rock and loose pieces of the burden have to be blasted off.

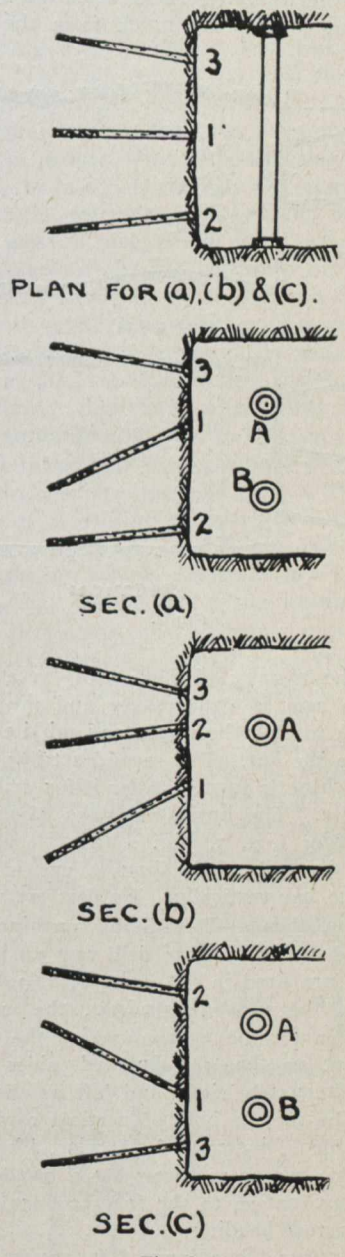


Fig. 2.

Underground Development.

In illustrating we will take the case of driving horizontal headings or drifts as the same principles of breaking apply equally well for inclined and vertical shafts and raises. The practical difference in the latter arises from the setting of the drills and the handling of the muck and the water, and the fact that the length of the section in shafts generally makes the central cut advisable. We will also assume, to simplify the illustrations, a heading small and soft enough to allow its breakage by rounds of nine holes in three rows of three holes each, although often nine holes

are more effective in four rows, one of three and the balance of two holes each. For longer headings with harder rock, the same principles would apply, but more holes must be added for breaking the round. On this basis we will now consider the following six cases of formation:—

Case I. Homogeneous Rock Free From Bedding Planes or Joints in the Face of the Heading.—Since this formation breaks equally well in any direction, the holes should be placed for the most convenient drilling and mucking. For setting the bar horizontally, as is usual where it is desired to begin drilling before the muck from the last round is

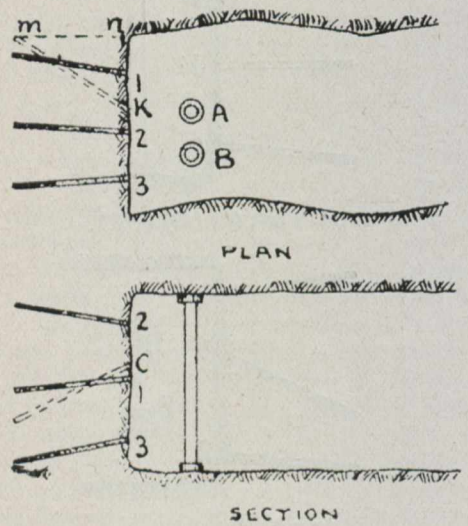


Fig 3.

cleaned up, the placing of Fig. 2 (a) is a favorite. Here the adjustable arm is unnecessary and the first setting of the bar is at A to drill the upper and middle rows with the machine above the bar. The second setting of the bar is at B and the machine is turned under it for drilling the bottom row 3 of lifters. The horizontal rows of holes are usually fired in the order 1, 2, 3, Fig. 2 (a).

The side instead of the bottom cut is handiest if we wish to set the bar vertically. We first set up at A, Fig. 3, and drill row 1, then at B with the machine on one side to drill row 2 and on the other to drill row 3. Here the vertical rows of holes are fired in the order 1, 2, 3, Fig. 3 plan. In order to keep the passage straight, the cut holes of row 1 will be put in for the next round on the opposite side to what is shown, so that the finished sides have a zig-zag appearance, alternately right and left as shown in the plan of Fig. 3. The middle hole of vertical row 1 points downwards, like hole c, instead of flat-wise, like the balance of horizontal row 1, so as to throw out a bottom cut and avoid a horizontal inclination to the face too acute for rapid progress in a narrow heading.

For large tunnel headings, 8 ft. square, in hard homogeneous rock, the cone or "Leyner" center-cut system has recently permitted of very fast driving in western metal mines. It is especially adapted to the water Leyner drill on account of the many upper holes used and the fact that this drill is short enough to allow the sharp pointing of the holes with two settings of the bar. For hard steel ore and jasper in a Michigan iron mine, this system was thus applied.

In Fig. 4, A is the bar in first position for two machines and from its top the four backholes, Nos. 9, 10, 11 and 12, are drilled. The machines are then tipped forward until the crank can just turn and clear the back or top of the drift for drilling the top center cut holes Nos. 1 and 2, while finally they are turned under the bar for side holes Nos. 5, 6, 7 and 8. The bar is then changed to position B, the machines are set up on top and side holes Nos. 13 and 14 are drilled. Then, after turning the machines under the bar, they are tipped up in front so the crank just clears the bottom of the drift and holes Nos. 3 and 4 are drilled about to meet Nos. 1 and 2 in the center of the heading. The four lifters, Nos. 15, 16, 17 and 18, are the final holes. In softer and better-breaking ground, cut-holes Nos. 5 and 6, one lifter and one back hole can be left out, but the four cut-holes, Nos. 1, 2, 3 and 4, are nearly always used and are pitched up and down and in, to meet about in the center.

The five remaining cases are given for regularly stratified rock, but the joints or cracks of massive rock may, like bedding planes, often be utilized for breaking.

Case II. Rock in Horizontal Beds; (a) Medium Thick Beds.—Here the best results from the powder can be got by two settings of the bar vertically and following the drilling and firing directions given above for the method illustrated by Fig. 3. In the disseminated lead mines of southeastern Missouri, this method is modified as follows:

For a drift 10 ft. wide by 6½ to 7 ft. high, 12 to 13 holes are needed, placed in three rows horizontally by four rows vertically. The bar is set up once to drill each vertical row of holes, four set-ups being necessary to complete a round. Each vertical row is fired separately by fuse and dynamite and as only three or four holes are fired at a time, not enough smoke or broken rock is produced to prevent the drillers from setting up again very soon after blasting. This method with three shifts of two drill men each, allows an advance of 5 to 7 ft. in 24 hours with 2¾-in. drills. By the former center-cut system, two drills and four men were able to advance only 10 to 15% faster than by the one drill and the side-cut method just described, all loading and tramming, in each case, having been done by muckers.

(b) Thin Beds: Here, as already explained, the cut-holes must cross the bedding planes. A bottom cut is advisable. The bar is set horizontally at A, Fig. 2 (b). Often all three rows can be drilled direct although sometimes the use of the adjustable arm on the bar is necessary to get the correct pointing of the holes. The holes of row 1 are fired first and break out the cut to the bedding plane on the floor of the heading. Before loading the row of cut-holes, it is often helpful to stop up their bedding planes, around the powder, with clay, but this precaution is unnecessary in the two upper rows where the holes are parallel to the beds.

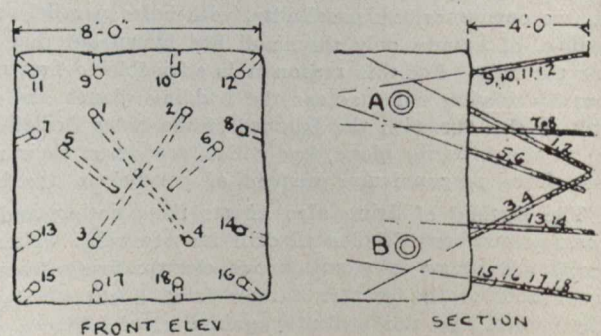


Fig 4.

Case III. Rocks in Vertical Beds Parallel to Heading; (a) Medium Thick Beds.—This case requires the bottom cut of Fig. 2 (a) which has already been described under Case I. The use of this method in the vertical copper veins of Butte, Mont., is as follows: The placing of holes is shown in Fig. 5 for the 12-hole system, although for most rock nine holes are ample, the center holes of rows 2, 3 and 4

being omitted. For this arrangement the drill bar (with adjustable arm) need only be set up once vertically, as shown. The round of holes is usually loaded and fired at one time and goes off in the order of 1, 2, 3, 4. Some of the miners regulate the explosions by cutting the fuse of different lengths and spitting them simultaneously while held together in the hand, and others by cutting all the fuse of the same length and spitting them separately in the required order.

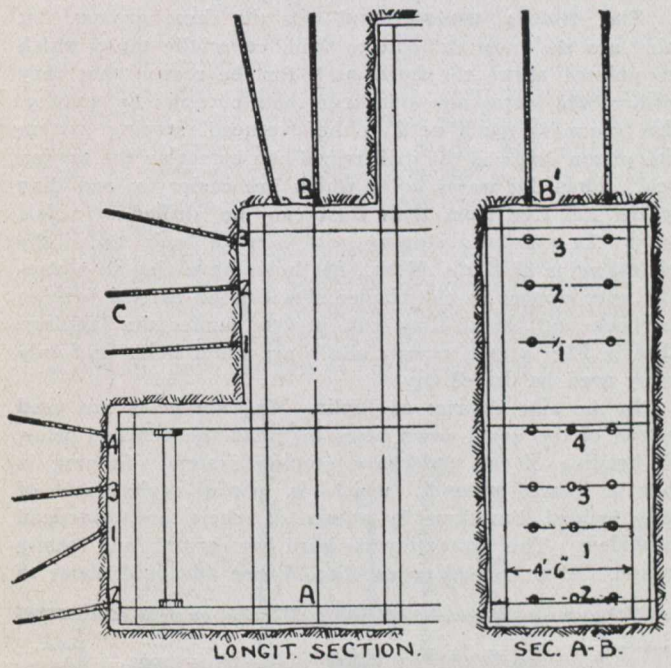


Fig. 5.

(b) Thin Beds: The solution of this case follows Fig. 3 and also resembles Case II (b) except that here the side instead of the bottom cut is used. With one setting of the bar, the three vertical rows K, 2 and 3 may be drilled and shot in the same order, row K breaking out the cut along a side bedding plane, mn, and rows 2 and 3 breaking to the cut. Here it is not necessary for alignment, as in Case II (a), to alternate the cut on each side of the heading, but it is often an advantage, especially where the vertical bedding planes are ill defined.

Case IV. Rocks in Vertical Beds Cutting the Heading at an Angle; (a) Medium Thick Beds.—If the cutting angle which the bedding plane makes with the side of the heading is 45° or less, the method of Fig. 2 (a) is usually preferable. If the cutting angle is more than 45°, the choice between the methods of Fig. 2 (a) and of Fig. 3 will often be merely a question of convenience in setting the bar horizontally or vertically, respectively.

(b) Thin Beds: With a cutting angle of 45° or less, the method of Fig. 3 is the best. Where the cutting angle is more than 45°, the choice between the methods of Fig. 2 (a) and Fig. 3 depends on setting the bar as in Case IV (a).

Case V. Rocks in Inclined Beds Dipping Towards the Floor of the Heading.—For either medium thick or thin beds the method of Fig 2 (a) is the best. Care must be taken, however, in the case of beds dipping over 45° to stop the holes of the horizontal row 1 at the last bedding plane which intersects the face of the heading above the floor.

Case VI Rocks in Inclined Beds Dipping Away from the Floor of the Heading.—For either medium thick or thin beds the method of Fig. 2 (c) should be used. The bar is set up at A for row 2 and at B for rows 1 and 3. The order of firing the horizontal rows of holes is 1, 2 and finally 3 The end of the holes in row 1 should be stopped beneath the last bedding plane intersecting the face of the tunnel under the roof in order to utilize this plane as a free face in breaking.

Surface Excavation and Underground Stoping.

In some kinds of deposits, especially the huge copper-bearing porphyry lenses and the Lake Superior iron mines, much time is often saved by drilling all the holes possible in the periphery of a heading in the ore from the same set-ups that are used in drilling the face. These peripheral holes can then be left untouched until the stoping of that section begins, when they can be easily loaded and fired.

Holes for stoping may be placed according to direction in three groups, (1) down holes, (2) flat holes, and (3) uppers. A dip of about 45° downwards and upwards can be assumed to make the limit between groups (1) and (2) and of (2) and (3) respectively, although the division between (2) and (3) is really marked by the angle of repose of the cuttings, that is, when the hole becomes self-cleaning, which may often mean a steeper dip than 45°. The speed of cutting with reciprocating drills depends on the removal of cuttings after each stroke to expose a fresh face. Therefore with these drills down holes drill easiest, then uppers, and lastly flats. Using the hammer drills with hollow bits cleaned by water or air-jets, there is less difference in drilling speed for different directions of pointing.

Down Holes; Underground.—Down holes are used underground in the underhand benches of tunnels or metal mines. To start this system, a heading ah, Fig. 6, is run at the top of the tunnel or stope and the down holes put in its floor for the first bench. The depth of this bench is limited by the length of the bit which can be inserted in the hole and that depends on the height of the heading which is usually around 7 ft. so that the ordinary railroad tunnel, 20 to 25 ft. high, requires two benches and two settings of the tripod at a and b, Fig. 6, to reach the bottom. These bench holes point downwards anyhow but often an advantage may be taken of the structure. Thus with horizontal beds, the holes of the first bench can be terminated at a bedding plane which the gases from the explosion will enter and thus exert a lifting action on the mass to be broken off.

Where there is a choice of plans, a heading can often be driven in a direction that will take the maximum advantage of the bedding and joint planes for breaking, both in driving and stoping. On this principle, the rooms of coal mines are usually laid out perpendicular to the line of the main joint planes of the coal seam or to the "face cleat."

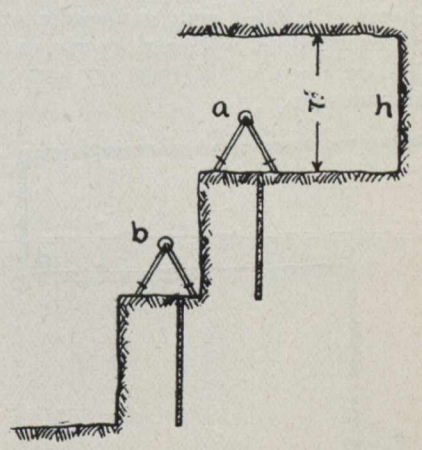


Fig. 6.

Down Holes; at Surface.—Above ground the only limit to the depth of the hole is the capacity of the drill. In considering breaking from deep holes we have a choice of two methods (a) multi-charging, (b) chambering.

In the drill hole ab of Fig. 7, it is evident that a charge of explosive at any point b will only break out a cone like cbd where eb is the line of least resistance. In order to break the whole length ab by multi-charging, other charges of explosives as f and g would be placed along the hole, with tamping between, and all be set off by simultaneous firing. In this way the whole mass abd would be detached.

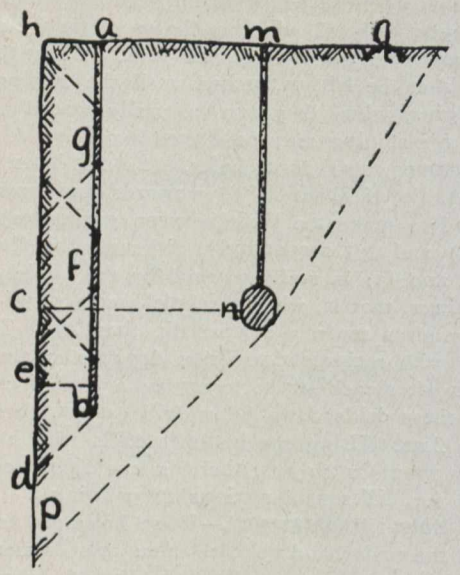


Fig. 7.

By chambering, the breaking from a long hole would be achieved differently. Instead of the hole being placed near the face hd of the bench as is the hole ab (because of its small section for developing explosive pressure), the hole mn would be placed back from the face so that nc, the line of least resistance in homogeneous rock, would be only a little shorter than the length of the hole above the chamber at n. The chambering is effected by shattering the bottom of the hole with high-power dynamite so that the final shape of the chamber approaches a sphere. In France this chambering, in limestone, is performed with hydrochloric acid, each dose of neutralized acid being washed out and a new one poured in until the chamber is of the required size. When the chamber is filled with gunpowder or low-power dynamite and exploded, it will exert nearly as much force upward as horizontally and will break out a mass along the surface of fracture qnp.

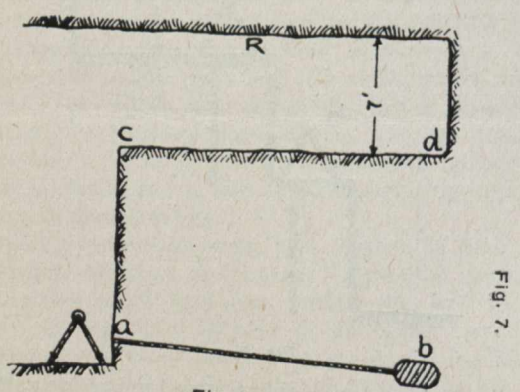


Fig. 8.

The choice between multi-charging and chambering depends on the varying conditions of formation, drilling and exploding. In a fissured formation, chambering has often an advantage because the explosive may be localized in a solid portion of the rock, although it often needs the use of two kinds of explosives, one for chambering and the other for breaking. Where it is desired to break off only a thin slice like hab, Fig. 2, from the cliff, it is evident that multi-charging should be resorted to. When an even topography will allow the handling of the portable steam or electric drop drill for a 3-in. hole (instead of the reciprocating drill for a 1½-in. hole), the multi-charging method will permit the drilling and breaking of a much longer hole than would be feasible by chambering.

Flat Holes; Underground.—Of the three groups, flat holes are the most difficult to drill, especially those which are pointed above the horizontal, for the reason that they neither hold water nor discharge their cuttings by gravity. This group is much used in the overhead stoping system with piston drills as the drill tripod can be set on the broken rock. Thus flat water holes which are easier to load than uppers and free from their dust can be drilled at a fair speed. In overhand stoping with a weak back, as in the vertical veins of Butte, Mont., flat holes have also an advantage over uppers as the timber sets can be carried next to the back and the drilling can proceed under the lagging. Thus in Fig. 5 at C rows 1 and 3 are water holes and only row 3 need be drilled dry.

In the zinc district of Joplin, Mo., flat holes are used instead of the usual down holes to break the benches below the heading of the underhand stoping system. Stoping is done in "sheet ground" which is partial replacement of flatly bedded limestone by seams of chert and zinc-lead sulphides. The formation is hard but brittle and easily broken. After a heading ah, Fig. 8, has advanced about 18

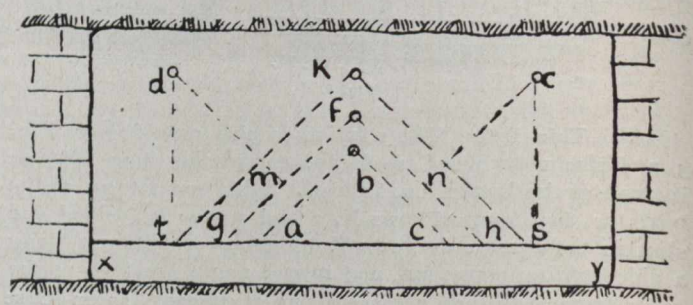


Fig. 9.

ft. under the roof of the stope R, a long water-hole ab is put in by a 3¼-in. piston drill on a tripod. The hole is then squibbed three or four times with 40% dynamite and finally the resulting chamber is filled with 50 to 100 sticks of the same explosive and fired by a fuse and cap. Only the most expert drillmen can put in these long holes but they have been found highly advantageous because they can follow one of the compact rock beds. On the contrary, vertical holes across the bedding planes would be difficult to drill on account of cracks and pockets. For the same reason they would be so porous as to render their exploding inefficient. It only takes three of these long horizontal holes to break off a bench 12 to 14 ft. high across a stope 40 ft. wide.

In driving coal headings or rooms by "blasting off the solid," flat holes bored by augers are generally used and are placed similarly to those shown for headings in flatly bedded rock in Fig. 3. In the location of the horizontal rows of holes, the character of the bedding planes between the coal seam and its roof and floor must be considered. If the roof is "tight," the shot must exert a strong shearing force to separate it. This is achieved by slanting the row of holes sharply upwards and terminating them at the tight plane. A similar remedy is applied to a tight floor. In many seams the coal is cut up into cubes by two sets of joint-planes perpendicular to the bedding planes, called the "face" and "end" cleats, which condition makes breaking easy.

The shearing of a coal face, before shooting, takes the place of the cut holes in blasting off the solid and the smaller charges allowable for the former method not only save explosive but prevent the shattering of the roof. With coal sheared vertically along one rib of a heading, the holes for breaking would be placed like vertical rows 2 and 3, Fig. 3. Where the shear is made horizontally as in the undercut xy, Fig. 9, it is customary in a thick seam of coal to place the first or "buster" shot at b in order to break out the triangular prism of coal abc. Then when the shattered strip gfh has been removed by the pick, we have dm and cn instead of dt and cs for the line of least resistance from the corner holes d and e, by which last the balance of the undercut coal can now be easily shot down. For a thin vein of coal, the "buster" shot would be located at K on a level with the corner holes and it would break out the triangular prism tKs as thick as the seam.

The undercut shown in Fig. 9 is that made by a hand or power pick. Being a height of 12 ins. or so in front with a downward slope to 4 in. in the back, its shape allows the "buster" shot to throw much of the coal out of the undercut, so that the strip gfh can be easily extracted by the pick to

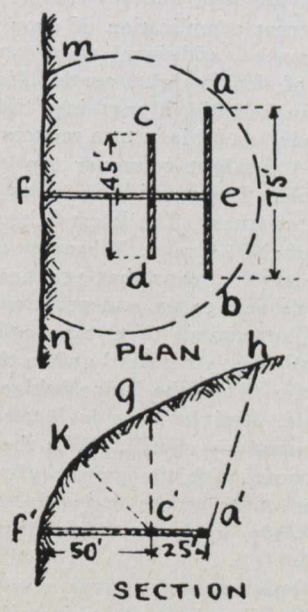


Fig. 10.

prepare for the corner shots. When the undercut, however, is made by a chain machine, it is of uniform height of only about 4 ins., and the "buster" shot may not throw the coal outwards. It is then often advisable to place an extra "snubbing" shot at f to flatten down the detached prism abc so that the shots d and c can be made effective without first cleaning out the broken coal underneath.

Flat Hole; Surface.—In loosening huge banks of placer gravel in California before hydraulicking, small adits have been used with crosscuts at their ends to hold the explosive. From a breaking standpoint, these adits correspond to flat drillholes with chambered ends. The same method has also been employed for breaking great masses of rock in quarries or excavations. Often a shaft has been sunk as an entrance to the explosive chamber instead of an adit. Sometimes two crosscuts from the adit may be made for explosive chambers, as shown in Fig. 10. There only the crosscuts cd and ab would be packed with gunpowder or low-power dynamite, while the adit itself would be blocked with timber or masonry bulkheads wherever it met the crosscuts. Elsewhere it would be packed with sand. For firing, electric fuses or caps would be placed in the explosive at intervals of about 10 ft. Finally they would all be connected by wiring in order that they might be fired simultaneously by electricity c^1k being the line of least resistance. The chamber cd would break out the cone gc^1f^1, and the chamber ab would break the prism ha^1c^1g, the plan of the line of fracture being mabn.

The same breaking equation, $pa = TS$, applies as in the case of drill holes, the factor a being the area of the cross section of the explosive taken along the axis of the crosscut.

Uppers.—Uppers are seldom used on the surface but are common in underground work not only in tunnel headings and raises, but also in overhand stoping. In excavating overhand stopes with square-set timbering, it is sometimes more efficient to drill the back with uppers as at B, Fig. 5, instead of the flats at C used in Butte practice. In the great stopes of the Portland mine, at Cripple Creek, Colo., where the pay shoot was in places 120 ft. wide and 400 ft. long, the ore hard and the back strong enough to stay up across the vein for several sets ahead of the timbermen, it was found that the fastest breaking was accomplished by drilling uppers from piston drills set on tripods, one drill being used in every set across the stope.

ÆSTHETICS IN BRIDGE DESIGN.

At the last meeting of the Toronto Branch of the Canadian Society of Civil Engineers, the instructive paper on "Aesthetics in Bridge Design" by Mr. C. R. Young, was delivered. This paper recently appeared in the published proceedings of the Society. Mr. Young had a large number of stereopticon views, each one of which seemed a splendid example of some particular feature he wished to bring before the meeting.

In the discussion of Mr. Young's paper which followed, the discussion by Mr. W. H. Breithaupt, which is here given, is of interest.

The question of aesthetics in bridge design is as old as civilization and yet is always in order.

The author is much to be commended for, in the main, so well setting forth the principles of proper bridge design. Inasmuch as right construction, the placing and correlating of material in the manner that will best do the required work, is the fundamental essential in all structures, and at the same time the fundamental aesthetic essential, the subject of aesthetics in design is one for engineers. Frippery ornamentation is too often considered as the sole province of aesthetics in design. Construction must be first, always. While ornamented construction is right, constructed ornament, particularly the elaborately constructed ornament too often seen, is an abomination.

All bridges are comprised in three types: the arch, the suspension bridge, and the beam. The truss is a modification of the beam as is also the cantilever which consists of two counter-weighted beams with their outward ends connected by a third one.

The stone arch is the accepted classical bridge design. The nature of the arch is to carry its load to the points of support wholly by compression. It is a visual demonstration of forces in compression and should therefore naturally carry its load superimposed. A stone, or any masonry, arch with suspended load at once antagonizes the sense of security and repose inherent in the properly loaded and proportioned arch. Even with iron or steel, materials well known as having great tensile strength, the best aesthetic effect is obtained when the load is carried above.

As the author speaks of, the suspension bridge for longer openings is one of the most ancient of bridge types. The grace and beauty of the suspension bridge are also accentuated by the author. In this type the visual demonstration

is that of material in tension and it is as little conceivable that a proper suspension bridge should carry its load mainly above as that an arch should have a suspended load.

The beam, of stone or wood at first, was primarily used for short spans only. With the modern development of the art of bridge building came the longer beam or girder, and more particularly with the use of iron and later of steel as material, the truss, or, as it may be called, the compound beam. This type of bridge may be considered as essentially utilitarian. It can nevertheless be dignified, dignity, and so aesthetic design, consisting of the most simple lines to satisfy the eye that the required purpose is served.

A further essential as to the arch bridge is that the supports should satisfy the eye as being ample to withstand the thrust. A piling of weight on the supports aids in this direction. Thus the massive pedestals placed over the skew-backs of the Alexander III. Bridge greatly enhance the appearance of security. As to the arch proper of this bridge the lines cannot be said to be wholly good. The break due to the central hinge is conspicuous. A full web spandrel arch without centre hinge could have been stiffer, with no straining of material to elastic limit; and with true parabola flow of arch curve it could have been materially better of appearance. In the Niagara Bridge, the thrust is taken at the foot of massive, almost vertical, cliffs. Lack of resistance is therefore not apparent. As the author well says, however, the ends of the superstructure are not satisfactory. The end bents, carrying the shore span ends, though of greater section are not enough so in appearance, and the shore spans in themselves engender a lack of harmony. In striking contrast to the main arch the semi-lenticular truss form of these spans gives the impression of suspenders loaded from above. They should have been parallel chord trusses.

A fine example of dignity of design is the Grand Trunk Railway bridge at Niagara. The massive, rigid, two hinged spandrel braced arch of parabolic curve admirably combines strength with repose. There may be said in passing that while the absence of centre hinge in a braced arch entails indeterminate stresses to some extent this is well offset by the gain in rigidity.

A succession of uniform masonry arches is in itself beautiful and the more so if the design is good. The Pennsylvania Railroad bridge over the Susquehanna River near Harrisburg, Pa., consisting of forty-eight uniform stone, concrete backed, arches, making up a total length of 3820 ft., is a good example of this class as is also the Raritan bridge on the New York division of the same railway.

The Rhine bridges at Bonn and Duesseldorf may be cited as good examples of aesthetic design notwithstanding the fact that the main spans have their loading suspended. These spans, essentially alike in both bridges, are massive, and yet graceful and light appearing, double ribbed arches, flanked on both sides by one or more smaller arches with superimposed loading. The main arches are of such conspicuous outline that the bridge roadway hung from them little interferes with their impression as of great portals, appropriate gateways of commerce in a busy traffic way, as is the river.

Of suspension bridges it cannot always be said that construction and aesthetics go together. A large versed sine may not be as graceful as a more moderate one, in a given location, but be better both for strength and rigidity. The three Brooklyn suspension bridges well illustrate this. The most graceful one in appearance is undoubtedly the first one with its stone towers, its comparatively flat catenary, and its loaded and therefore curved backstays. Against it the Williamsburg bridge as it is called, the second one built, with its great versed sine, its steel towers and straight backstays, though an excellent engineering structure, looks almost ungainly.

Magnitude alone constitutes dignity, and a kind of beauty, as witness the Great Pyramids; as witness also the Eiffel Tower with its great height but simple unadorned lines, so manifestly lines of strength.

In beams, girders, trusses, simple lines are best. The notion that a curve is per se preferable to a straight line in any case is not tenable. Plate girders in general look best with parallel chords, though rounded corners of single girders, or of the end ones of a series, are of good appearance. In long viaducts of plate girders, with naturally varying depths of the short spans over the towers and the long ones between the towers, proper construction agrees with best appearance. That in long truss spans there is saving in weight of material with increase of truss depth toward the centre and varying inclination of top chords is easily demonstrable. That long span trusses with curved top chords are therefore preferable does not follow. There are many objections: irregularity of stresses particularly change of web stresses with moving load and reversal of stresses in posts toward centre, great complication of shop work, &c. With varying panel lengths, additional shop complication accompanies increase of floor weight, as the floor beams for the shorter panels can be little, if anything, lighter owing to the concentrated loads, and this in turn reduces or offsets gain in truss weights. A straight columnar top chord is in many respects preferable. Design of long spans is largely returning to this form of truss. The latest Missouri River bridge, the new bridge of the Chicago, Milwaukee and St Paul Railroad, with three 425 ft. spans, has practically parallel chord trusses, the panels next to the end posts only being inclined. As to dignity of appearance there can be little question that the parallel chord truss, particularly when there are a number of spans, is better. Thus the Rhine bridge at Cologne, with its rigidly simple, straight lines is better than the one at Mayence with curved top chords. With the curved top chord there is furthermore, with the generally occurring break in continuity of the curve at the main hip, the impression of an arch out of place, up in air, with insufficient end resistance.

The good appearance of a truss may be largely due to the bracing. The triangle is the universally recognized stiff frame unit. Hence we can have a symmetrical grouping of regular, almost equilateral, triangles, forming a compound frame of good outline. Otherwise one cannot well maintain, under the requirements of proper design in general so well given by the author, that what is in appearance a bowstring truss of stone, with stone string at bottom and stone diagonals, is right. If waterway requirement precludes arch design why not a simple, dignified, full web girder, in reinforced concrete?

The cantilever bridge is of limited proper application. It is inferior in stiffness to both the truss and the arch, and up to their respective limits of practicability of span length or of erection, the cantilever superstructure requires more material than either the truss or the arch for a given opening. A familiar example of comparison between arch and cantilever, to credit of the arch design, is afforded by the two Niagara railway bridges, side by side, one of them the arch already spoken of. For very long spans, again, with great fixed load as compared to moving load, the suspension bridge with stiffening truss has features of preference.

The acceptable design of cantilever bridges is a difficult undertaking. The best in dignity and general satisfactory appearance that has been done as yet is the Forth Bridge, which is also the largest. An early published design for the Quebec Bridge, a combination of more or less meaningless

festoons and up curves, showed how weak, aesthetically, such a design can be. Of the "late lamented" Quebec Bridge there is to be said that the design was essentially on good lines with one small, but conspicuous marring feature. The end main panels, subdivided into two panels, of the shore arms of the cantilevers had, in addition to the inclined member connecting the top chord with the point of anchorage directly in the line of stress, a superfluous squaring out of this panel by continuation of the top chord and erection of a vertical frame, ostensibly as portal, over the anchorage pier. This useless addition gave an awkward sawed-off appearance in side elevation.

GRAND TRUNK PACIFIC PROGRESS.

The Grand Trunk Pacific has put down 1,622 miles of steel to date. This does not include passing tracks, sidings, etc., but does include the 252 mile stretch from Graham to Winnipeg in the eastern section. The Lake Superior branch, 195 miles, from Port Arthur to Graham, has been finished for two or three years, and west of Winnipeg to Edmonton the road is completed, ballasted and in first-class condition. Nearly 100 miles of the line building north and south from Melville to Kenora and to Regina is in operation. A daily, except Sunday, train service has been put on between Edmonton and Edson, Alta., 129 miles, making a total of 929 miles west of Winnipeg now under operation, and steel has been laid 57 miles beyond Edson.

It is expected that grading for branches from the main line will be completed into Regina, Calgary and Brandon by the end of the present year, thirty miles having already been completed south of Regina towards the international boundary. The grading from Regina towards Moose Jaw and Lethbridge will be resumed as soon as the frost is out of the ground. At Young, second station west of Watrous, Saskatchewan, a branch takes off for Prince Albert; seventy per cent. of the grade on this line is finished and the steel laid for twenty-five miles. Another important branch is the one building southwest from Edson to tap the big Alberta coal fields. About sixty per cent. of the grade is finished on the Biggar-Battleford branch, and it is expected that this line will be in operation before the close of 1911.

STATISTICS OF ONTARIO TOWNS.

The engineer frequently is interested in the relation between population, area and assessment of municipalities, and that he may have this information convenient for his use we are preparing a series of tables dealing with the towns of the provinces.

This table takes the Ontario towns with a population of three thousand and over, and gives the population per acre and the assessment per acre.

Name of Town.	Population.	Area in Acres.	Population per Acre.	Total Assessment in Dollars.	Assessment per Acre.
Windsor, Ont.	16,142	2,020	7.9	8,879,539	4395.8
Stratford, Ont.	14,779	2,835	5.2	6,635,950	234.0
St. Catharines, Ont.	12,307	2,400	5.1	6,422,143	2675.8
Owen Sound, Ont.	12,091	3,680	3.2	5,211,191	1416.0
Chatham, Ont.	10,317	1,650	6.2	5,099,020	3090.6
Sarnia, Ont.	9,810	1,450	6.7	4,803,088	3312.4
Woodstock, Ont.	9,243	1,525	6.0	4,183,683	2743.4
Lindsay, Ont.	7,725	1,550	4.1	2,594,575	1673.9
Collingwood, Ont.	7,610	4,440	1.7	2,769,416	623.7
Cornwall, Ont.	6,242	680	9.1	2,072,033	3046.8
Oshawa, Ont.	6,218	2,400	2.5	1,992,847	830.3
North Bay, Ont.	6,166	500	1.2	2,397,729	4795.4
Smith's Falls, Ont.	6,003	1,030	5.8	1,719,507	1669.4
Orillia, Ont.	5,703	1,600	3.5	2,200,200	1375.1
Pembroke, Ont.	5,500	625	8.8	2,534,235	4054.7
Kenora, Ont.	5,246	7,140	.73	3,556,463	498.1
Cobourg, Ont.	5,155	2,417	2.1	1,742,044	720.7
Ingersoll, Ont.	5,059	2,200	2.2	1,963,226	892.3
Cobalt, Ont.	4,871	417	11.6	1,484,376	3559.6
Goderich, Ont.	4,630	1,000	4.6	1,963,608	1963.6
Waterloo, Ont.	4,514	2,350	1.9	2,117,006	900.7
Arnprior, Ont.	4,317	1,121	2.0	1,188,370	106.9
Hawkesbury, Ont.	4,294	1,704	2.5	676,961	397.2
Dundas, Ont.	3,953	550	7.1	1,317,895	2396.1
Haileybury, Ont.	3,818	768	4.9	1,416,359	1844.2
Petrolea, Ont.	3,696	2,700	1.3	1,241,990	459.9
Renfrew, Ont.	3,689	2,400	1.4	1,407,955	586.6
Picton, Ont.	3,532	552	6.3	1,737,715	3148.0
St. Mary's, Ont.	3,412	2,683	1.2	1,506,953	561.6
Perth, Ont.	3,359	1,400	2.3	1,332,720	951.9
Preston, Ont.	3,243	1,300	2.4	1,311,335	1008.7
Newmarket, Ont.	3,200	743	4.2	946,032	127.3
Strathroy, Ont.	3,116	2,000	1.5	1,116,826	558.4
Walkerton, Ont.	3,090	1,350	2.2	805,845	596.9

SIDE LIGHTS ON THE ELECTRIC LIGHTING BUSINESS.*

W. H. Coles.

I wish to discuss three side lights which bear upon isolated electric lighting business, each of which should require from 10 to 24 hours each for a comprehensive discussion.

First, let us look hurriedly at the general trend and development on the agricultural industry which have brought about the desire on the part of the farmer for the luxuries of city life, and these present some peculiar and distinctive features worth consideration.

Second, I will only touch on the recent development of the electric lighting equipment, rendering them available and practical for farm use.

Finally, I can not pass over two or three conditions which have come within the range of my experience in observing the average engine man in his effort to secure his share of the electric lighting business.

In looking over the history of the agricultural community the uninitiated is surprised to find conditions somewhat different from what he had previously supposed.

We have all come to recognize that the farmer stands for prosperity.

Just now we are beginning to feel the effect of another influence, viz., that the larger prosperity, the greater intelligence and the increased opportunity have led the farmer to secure, or his children, larger opportunities than he himself enjoyed, and they in turn bring back to the farmer the refinements and pleasures experienced as the result of their broadened horizon, this being exhausted because of an increased understanding that with modern labor-saving machinery, quicker means of transportation and closer accessibility through telephones and rural delivery, the independence of country life offers inducements not obtainable in the city.

We may now profitably turn our attention briefly to some of the pitfalls which have stood between the average gas engine dealer and success in his effort to develop a permanent and profitable business in this electric lighting field.

The first thing which is noticeable in a gas engine man, as he becomes immersed in the electric lighting business, is a sense of awe and mystery with which he regards his new enterprise. After a few uninspiring and disastrous experiences he becomes convinced that not only is electricity an entirely new realm abounding in torments and controlled by an unsponsible and fickle master. He comes to consider electricity as possessing all the vagaries of a flash of lightning. His attitude often voiced by the statement which we so often hear, namely, that no one knows what electricity is, with the apparent conclusion that it is a peculiar juice subject to unstable law.

One can simply call attention to the fact that while electriciy is mysterious, it is no more so than thousands of other evidences of force with which we deal constantly. If we were to ask you what heat is, we would be met with the same reply that we give you when you ask us about electricity; for, as a matter of fact, electricity is a new creation, but simply the transformation is a more convenient form of of the energy which is generated either from the combustion of coal, the explosion of gasoline, or some kindred energy.

The methods pursued by the average mechanical mind are the same methods which we must employ in considering electrical machinery. It has been frequently advised that engine manufacturers recognize this fact and put their best mechanical erectors in the hands of some one competent to give them common sense, instruction about electrical equipment, and after a brief experience they will be entirely able to take care of the electrical end of an installation without further assistance. This policy has resulted in a security and satisfaction in the pursuit of lighting business which believes the impressions of a first experience.

In fact, the generating outfit, consisting of dynamo, engine and storage battery, constitute a unit, easily handled by an engine erector, the logical dividing lines coming beyond the engine room. The wiring or construction end of an installation has never appeared practical for engine mechanics. If it is necessary to do this work, it is frequently advisable to associate with you, either directly or indirectly, some wire man who employs cheap labor for this class of work and turn over to him such construction work as can not be avoided. This practice seems to have been almost universally adopted by those concerns who have undertaken the electric lighting business. Disabused of doubts and with the limited information needed, a foreboding outlook loses its menace.

The next phase of the proposition to which we would call your attention is the wide variety of electrical equipment possible, with the suggestion that much trouble has been experienced through failure to use care in selecting the type of installation and the character of equipment best suited to the conditions encountered.

As you know, dynamos are now made in voltages of 13, 32, 60, 110 and 220. Each of these voltages meets a specific condition far better than any other possible equipment. For instance, the 13-volt equipment is limited in capacity and restricted as to the distance through which its current can be carried, but it has the advantage of a low price, absolute safety, easy maintenance. Experience has indicated that nothing has been found which so opens up the field which has formely been occupied by acetylene as these 13-volt outfits. Within their limitations they provide an entirely satisfactory equipment and at a price approximately the same as the cost of an acetylene outfit.

The 30-volt equipment has similar advantages, except that of requiring a larger number of cells in the storage battery, with a correspondingly higher price. This seems to be the equipment most practicable for the average farm installation, although one is constantly surprised at the number of installations that can be successfully handled with 13-volt outfits.

The 60 and 110-volt installations cover other and different conditions, which are broadly distributed, and the advantages of these equipments for their intended service are universally recognized.

But assuming, for instance, that there has been selected a 32-volt storage battery outfit, there are still large opportunities for choosing as to the detail of the equipment.

The simplest form is an equipment whereby a standard shunt wound generator is used solely to charge the storage battery, the storage battery being of practically equivalent capacity to the generator. When the lights are used the current is taken from the battery, there being no connection between the dynamo and the lights. In this installation, which is simplest in form and cheapest in price, the current available for lights is limited by the capacity of the storage battery.

With a slight modification in the switchboard the above installation can be so arranged that the current from the generator is used either to operate the lights or to charge the storage battery, the arrangement permitting of connecting the lights to either the generator or the storage battery, thus

*Paper read before the National Gas and Gasoline Engine Trades Association, Racine, Wis., December 12 to 15, 1910.

being floated in the line. With this installation the battery takes surplus current from the dynamo or reinforces the dynamo as the lights require. Thus a change in the switchboard practically doubles the capacity of the equipment at small cost. This outfit permits the use of the standard type generator.

Then there is still a third type of installation, in which the storage battery is much less than the current capacity of the generator. Such an installation requires a different type of switchboard entirely, and can be so arranged as to permit of operating lights from the dynamo and of charging the storage battery at the same time. It is usual in such installations to split up the battery into two halves—charging through resistance. This is done as a matter of convenience, although it sacrifices some of the economy of the installation; yet, inasmuch as the storage battery is a comparatively small factor in the equipment, this feature is not seriously detrimental.

The above installation can be so arranged that the battery can be discharged at the same time the generator is furnishing current to the lights, thus adding its capacity to the capacity of the generator. But in ordinary practice it is entirely satisfactory to depend upon the generator for the entire number of lights when the dynamo is running, and to rely on the storage battery simply for lights after the use of the generator is discontinued.

Still further refinements can be made in such an installation, but the above three types will indicate the possible variety and the extreme care necessary in the selection of an equipment.

Each of the above combinations demands a specific construction of each part; for instance, some installations, such as floating a battery equipment, with the battery equal to the capacity of the generator, are satisfactorily served by the use of the standard type, two-bearing, shunt wound dynamo.

In installations of a different type, where the dynamo is depended on primarily for the main amount of light, compound wound generators are preferable, and, if the regulation in the speed is not secured effectively in the engine, it is advisable as far as possible to select the dynamo of a type which will minimize the impulsive fluctuation of the motive power, as the storage battery is not of sufficient capacity to compensate for this variation.

You can see, therefore, the extreme care required in selecting equipments, all parts of which are designed to operate harmoniously, and also to select the type of equipment best suited to the conditions encountered.

Possibly no one condition has caused so much confusion or trouble as this failure of the different parts to operate harmoniously. You can see, therefore, why I am a believer in and am endeavoring to promote in the average engine man the practice of securing his electrical requirements through a single channel, or, at least, in such a manner as would assure harmonious operation of all related individual parts.

The third and last factor on which we will touch, and which has appeared as worthy of consideration, explains in some considerable degree the failure on the part of some engine men to secure electric lighting business.

This failure lies in the line of a sales policy and is controlled by the fact that the selling of luxuries, such as electric light, must be handled through channels of influence and by methods which differ somewhat from those which are pursued in selling equipment for which the customer parts with his money solely in order that it may come back to him in larger measure.

You are undoubtedly familiar with the crabbed retail merchant in a small town, who bent his effort in securing a position in the public schools for an exceedingly attractive and tactful young lady out-of-town candidate. A travelling man in questioning him as to his interest, discovered the fact that his sole motive lay in the effect which the presence of this young woman might have on the rural swains of his community, and the consequent increase in wearing apparel and articles of personal adornment which would pass over his own counter.

Something of this spirit of salesmanship enters into the sale of electric lighting equipment. It is a class of apparatus which can not be sold from pictures or by persuasion, and it is almost impossible to attempt to develop a trade in this class of equipment without having at your disposal an equipment in operation.

Many engine men have attempted to drift into the lighting business; and they have never been successful. A logical sales policy must be pursued, and nothing is more effective than a little plant itself, doing its work quietly, surely and attractively.

Originally it was my intention to discuss this more at length, but time forbids.

Reviewing the facts I have given, you can see that I have tried to leave only a few general impressions in your mind. First, the logical and inevitable trend in the agricultural communities by which they have reached a point and have attained a stage of development such that he who aspires to profit from this class of business must recognize and cater to the increasing intelligence and rapidly growing refinement of the farmer.

The recent developments in the electric lighting field have brought the convenience of electric light within the reach of the average farmer, and with these conditions in mind it has been my endeavor to point out to you two or three stumbling blocks with which those who undertake to handle electric lighting installations so often meet. The terrifying awe and mystery of the proposition, the inability to select and determine upon a harmonious equipment suited to the specific conditions encountered, and the failure to pursue logical sales processes in catering to this trade have appeared to stand between the average engine man and a much desired success. It is my hope that the seed which I have sown may prove to be measurably good seed, and I know from looking into your faces that the soil is not a stony ground.

YORK COUNTY ROADS COMMISSION.

The Good Roads' Commission formed for the purpose of spending $300,000.00 on the roads in the county of York contiguous to Toronto, will consist of Robert Bull, Weston, Ont., Geo. Henry, Oriole, Ont., W. H. Pugsley, Richmond Hill, Ont. Lionel Clark and J. J. Ward from the city of Toronto, and W. J. Trethewey, representing the Ontario Government.

In this scheme the city of Toronto are appropriating $100,000.00 to be spent on the roads of the County, it being felt that the traffic on the roads near the city are of such a character that the Rural Municipalities should not be expected to bear all expenses of construction and maintenance.

The production of gold in Nova Scotia during the year ended September 30th, 1910, was 10,675 ounces recovered from 49,557 tons of ore mined and crushed, being an average yield of $4.09 a ton. This production shows a decrease of 9,501 tons crushed, 1,822 ounces of gold recovered, and an increase of $0.04 in the average yield a ton.

CONCRETE ROAD CONSTRUCTION.

By Fred. R. Charles.

The city of Richmond, Ind., cannot claim to have a large amount of concrete roadways, but it laid some of the earliest street pavements of this construction. Our first roadway was laid in 1896, and now has nearly fourteen years of life and usefulness to its credit, and is still continuing its service without having cost one cent for repairs. In truth this was a small beginning, and owing to the excellent character of its macadam streets, our city has been backward in constructing permanent pavements, but nevertheless, this first concrete roadway has abundantly justified its existence, so that for the last eight or ten years the amount has been added to by a small amount annually. There was nothing especially remarkable about the construction of this first pavement, except that extreme care was used in all the processes. The natural soil under this first pavement is gravel, so that no sub-base was required. The concrete was proportioned 1-2-5, deposited 5 inches thick after running, with a top surface 1 inch thick, proportioned 1 to 2. It was cut into blocks about 5 feet square and the surface pitted with an ordinary lug roller.

In the subsequent work various plans have been used. The principal variations consist in the material for aggregate thickness of concrete, with and without a top surface, thickness of the latter, size of blocks, thickness of joints and material used therefor. One roadway was cut in blocks 8 to 10 feet square; another 30 to 40 feet square; all joints between the blocks, both cross and longitudinally, are 1 inch wide and filled with paving pitch. The defect of this method consists in the chipping of the concrete edges of these joints, principally the longitudinal ones. Our experience seems to show the blocks should be as large as possible in order to reduce the number of joints, and that the joints should be as thin as can be made. On the other hand, we find that blocks 10 to 50 feet square are about as large as can be made without developing temperature cracks in our climate. These latter, however, apparently do not injure the pavement, beyond detracting from its appearance, as cracks that have existed for years show no enlarging, and the pavement up to and over the cracks is as solid as elsewhere. Possibly there have been such experiments, but I have no knowledge of them to ascertain what size of blocks are safe in different climates, or places with different range of temperature. Corrugating or grooving the surface is also objectionable for the same reasons as are the joints; the edges of the grooves afford an opportunity for the concrete to chip and sprawl off by the action of horses' hoofs, etc. Also the grooves catch and collect the dirt, interfering with the cleanliness of the pavement and rendering it more difficult to sweep. Possibly the corrugations afford slightly better foothold for horses, but I think even here the advantage is exaggerated. We obtain a very good surface by using one part cement to two parts hard-grained, coarse sand, screened through a No. 4 screen; trowel down to remove all holes, air space, etc., and "raise" with a cork or wood float, giving a rough, gritty surface, on which horses can maintain their footing as securely as on a cement-filled brick, an asphalt or wooden block pavement when damp. For ordinary traffic pavement we find excellent results are secured by the use of 5 inches of 1-2-5 concrete, and a top surface 1½inches thick, mixed 1 to 2. For automobile travel nothing could be more satisfactory.

Of course, it is trite and unnecessary to say that care must be used in selecting good aggregate material, proportioning properly to reduce voids to a minimum, and securing good workmanship in all the operations of mixing, placing and finishing the work. I am a firm believer in "wet mix" for this, as well as for most other concrete work. Place this concrete on a well-prepared foundation, using suitable straight-edges and templates cut to the required crown of the street; tamp or jostle to make a compact mass, leaving the surface rough to provide attachment for the top layer; cut joints through the concrete every 10 to 15 feet and fill with sand. Before the concrete begins to set, place thereon the top surface, composed of one part cement to two parts hard, coarse sand; trowel and float, cutting joints directly over those in the concrete, using a small radius "jointer" to leave as thin a joint as possible, and finally finish by means of a "float," leaving the surface as rough as possible. This gives a roadway very suitable for our use. For heavier traffic, use 6 inches of concrete, making the pavement homogeneous, that is without the top surface. Make the concrete somewhat richer in cement, and quite wet. Tamp until free mortar flushes to the top, then finish with trowel and float. For this purpose the concrete should be free from large stones, as with a large stone at the surface, if one end becomes worn or loose, a large leverage is afforded to tear the remainder of the stone from the concrete. As remarked before, the disadvantage of concrete is its lack of toughness, whereby exposed edges of joints and corrugation are prone to chip and wear off. For this reason joints ought to be reduced to a minimum, and especially longitudinal joints should be eliminated wherever possible. Another defect urged against concrete is its lack of elasticity. This contention does not seem to be well founded, as concrete is not the only non-elastic pavement. Brick on a concrete foundation and with a cement filler seems to be about as unyielding and non-elastic as any roadway could be. Of course, for horses some elasticity is desirable, but in view of the increasing number of motor vehicles, this quality is not so essential to so many users as formerly.

The present laws of the state of Indiana, while passed avowedly in the interest of the asphalt paving industry, ought to bring about the increased use of concrete roadways. For example, plans must be made for a foundation suitable for any kind of "a modern city pavement," which foundation will naturally be concrete. Then the specifications must include, and bids will be received for four different paving materials to go on top of this concrete foundation. After receipt of bids the property owners have the right to determine which one of the four shall be adopted, and since cheapness usually appeals to the average property owner, asphalt often wins the day, because with the same foundation specified for each pavement the top surface of asphalt can be put on at less cost than brick. Here is the chance for concrete paving. Put down a suitable foundation for any kind of pavement, viz., 5 or 6 inches in depth of concrete, sized, placed and jointed as above suggested; then before this concrete begins to set, place thereon "paving material," consisting of the wearing surface 1½ or 2 inches thick, mix one part cement and two parts sand, as before stated, and you will have a pavement that can compete with any other in price, and will cost less in maintenance, and will give a cleanly sanitary effect, and will come as near to satisfying the "public" as you can ever hope to satisfy that exacting personage.

*Delivered at the Sixth Annual Convention of the National Association of Cement Users.

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CONTENTS OF THIS ISSUE.

THE UPPER ST. LAWRENCE RIVER: ITS INTERNATIONAL HISTORY, ITS DEVELOPMENTS OF NAVIGATION, ITS FUTURE POSSIBILITIES.

Before the Canadian Society of Civil Engineers at Montreal, on March 16th, Mr. Henry Holgate, M. Can. Soc. C.E., delivered a most interesting address, in which he dealt with the history of the St. Lawrence River, historically as a boundary line, and from an engineering point of view as a transportation route, and its possibilities as a hydraulic power development.

The first part of the address presented some very interesting facts in connection with the early treaties in which mention of the St. Lawrence as a boundary line was made, and points clearly of the difficulties that were experienced in the early days, and the necessity of and the advantage attained by the appointing of the International Waterways Commission, on which Canadian and United States Governments have representatives.

The concluding sections of the address were taken up with references to the canals already built, and the money already expended in making the St. Lawrence a modern transportation route, some reference being made to the possibilities of the power developments along this great waterway; and Mr. Holgate estimated that the minimum amount of power developable on the St. Lawrence from Lake Ontario to Montreal as 3,500,000 horse-power.

THE CITY OF TORONTO AND ITS PURE WATER PROBLEM.

For some years the most serious engineering problem which the city of Toronto has had to face is the question of the pure water supply. Several solutions have been suggested, but so far the reports have been more in the nature of suggestions from construction engineers than the careful analysis of the situation and the formulating of conclusions and recommendations upon which the city staff might act.

In the past it has been too much a matter of consulting the shoemaker as to whether you should buy shoes or an overcoat, with the result that the city have received that which the one consulted had to dispose of.

Early in this month the City Council decided to appoint a commission to investigate the question of the pure water supply for the city of Toronto, and it is expected that this commission, in addition to reporting upon the conditions as they find them, will outline what they conceive to be the policy best suited to the future requirements of a city which already has a population very near the half million mark.

The commission consists of Mr. John G. Sing, Dominion Government Resident Engineer in Toronto, who has had considerable experience with public works along the shores of Lakes Ontario and Erie. Mr. Sing is chairman of the commission.

Mr. Willis Chipman, who has carried on in Canada one of the most extensive practices as a consulting engineer in connection with sewerage and water supplies. Mr. Chipman is secretary of the commission.

Mr. T. Aird Murray, who is a consulting engineer, specializing in pure water supplies and sewage disposal works, and who has been for some years consulting engineer of the Department of Public Health, Saskatoon. Mr. Murray, as are the two commissioners already mentioned, is a resident of Toronto and a member of the Canadian Society of Civil Engineers.

The fourth commissioner is Mr. Isham Randolph, of Chicago. Mr. Randolph is the engineer who had charge of the Chicago Drainage Canal, and was one of the engineers appointed by the President of the United States on the last commission to report upon the progress of affairs at the Panama Canal.

MANITOBA PUBLIC HEALTH ACT.

The present session of the Legislature of Manitoba had among other things to consider a new Public Health Act.

The measure is complete and comprehensive, and represents on the part of the Secretary of the Provincial Board of Health, Mr. E. M. Wood, much labor and careful consideration. This Act embodies the latest ideas available from the experiences gained under the old Act and from similar legislation now in force in other provinces.

According to the proposed enactment, the regulation of the situation, sanitary management and maintenance of slaughter houses, canneries, creameries, dairies, shops, stores, and manufactories of every kind is placed under the control of the Provincial Board of Health, and provision is made for the proper enforcement, by that body, of the statute. No offensive trade, industry or manufacture may be established without the consent of the municipal council of the locality in question. Regulations are set out for the sanitary condition of places for the manufacture of food supplies, or the disposal thereof, and for the destruction of unwholesome food. There are also clauses with respect to the construction, ventilation and sanitation of dairy and storage buildings of all kinds, to the handling of milk and food supplies, and to the erection, ventilation, sanitation and conduct of restaurants, pantries, cellars, etc.

The newer and more important regulations are those dealing with waterworks, sewerage and sewage disposal works, and the prevention and control of epidemics and similar matters relating to the welfare of the public.

The bill, as a whole, was a measure marking distinct advances in sanitary legislation.

METHOD OF RATING FOR ELECTRIC HOUSE LIGHTING.

The electric lighting of houses, shops and outbuildings will always be a popular method of illumination because of its convenience and cleanliness and the whiteness of the light which they are now able to produce.

The method of payment for electric illumination is a much debated question, and if one were allowed to consider from the consumer's viewpoint only, or from the producer's viewpoint only, there would be little difficulty in arriving at a suitable system of rating, but usually the engineer who has to assist and recommend on matters of this kind has to find a common meeting-ground for the producer and the consumer, and to so adjust rates and conditions as to make each feel they are receiving a square deal.

A straight meter rate, where the consumer pays for just what he consumes and no more, would appear at first glance to be an equitable arrangement, but when one considers the large plant and equipment they are necessary to always have at the command of the consumer sufficient energy for him to draw upon, it is not a fair arrangement, because he is not paying for the placing at his disposal the convenience.

Whether the consumer draws on this plant or not, some one must pay for its maintenance, and it is to arrive at some fair basis of charge for the maintaining of the plant when not in use that is difficult.

In some municipalities there is a flat rate charge of so much per room plus the charge per kilowatt hour. This charge per room secures a regular income for the system, and the charge per kilowatt hour, although small, prevents the unnecessary and wasteful use of light. The customer, knowing he has a flat rate to pay and but a small meter rate for the additional electricity used, will be more likely to consume larger quantities, and thus keep the load more uniform.

Using the room as a basis to charge has the disadvantage that rooms are not the same size, and that after the house has been rated additional rooms may be used, or some rooms may be shut off entirely, and the question of rating continues to be a source of great annoyance.

Other municipalities have made a charge per square foot of house area. This, perhaps, comes a little nearer being uniform than the room rate, but it entails much delay work and bookkeeping.

A third system that is receiving some attention now is the per cent. on the assessment of the buildings plus a charge per kilowatt hour. This has the advantage of being quick to compile, as the assessor's roll already contains the information, and saves the people the additional worry of another official bothering them in their homes. It is likely to be a fair system for charging, as the more expensive the house or building, the more likely they are to require electric energy to be kept on demand for their convenience, and they are likely to be large consumers, so that, although they pay a heavy fixed charge, they will secure remarkably low rating by the kilowatt hour.

It is not expected that any system will be absolutely perfect, but where no meter rent is charged, we think the last system is preferable to the other two.

These systems are only a few of many variations which may be thought out, but they are suggestions of what may be worked out more in detail.

EDITORIAL NOTES.

The second issue of Vol. No. 1 of The Pilot, a magazine classifying the titles of the important magazine articles of the English-speaking world, has reached us, and not only is the publication useful, but its methods are unusual. It has made arrangements with the large journals to receive before publication a table of contents of the issue, so that the readers of The Pilot will know in advance what articles may be expected in the current journals. This issue devotes considerable space to engineering and allied subjects, and as a matter of reference will be found very useful to the engineer.

* * * *

Five Thousand Facts About Canada is the name of a booklet compiled by Frank Yeigh, Toronto. In this booklet Mr. Yeigh has stated briefly the main facts in connection with the agricultural and industrial life of the nine provinces, and has included many facts in connection with the principal centres throughout the Dominion.

The Canada Hydro-Electric Power Commission have for weeks been lighting a number of the cities of the Province, but this week the first electric railway to be operated by power distributed by the commission received some 800 horse-power. This was the Galt, Prescott, Hespeler, Berlin Interurban Railway. Not only is this a passenger line, but it does a heavy freight service, handling with their fifty thousand ton electric locomotives as many as twelve cars.

THE GARBAGE CREMATORY AT HOUSTON, TEXAS.*

BY DAVID M. DULLER, C.E., HOUSTON, TEXAS.

Of all the methods of destroying garbage and refuse, that by fire is by far the most effective, as thus all accompanying bacteria are killed and the organic matter is completely oxodized into gases and only ashes are left behind. The destruction of garbage, or, what is more correct, its reduction to ashes, in crematories especially built for this purpose, is therefore now in almost universal use.

The design of a furnace for the burning of garbage, street sweepings, rubbish, etc., is, however, by far more difficult than it appears to one unacquainted with the problem. This is due to the ever-changing composition of the materials to be destroyed and to the difficulty of securing complete combustion. Garbage, street sweepings, etc., contain a great amount of moisture, often from 30 to 72 per cent., which must be evaporated either in the process of burning or by preliminary drying, and a very high temperature and an excess of air must be maintained in the furnace at all times, as otherwise the chimney gases will be extremely offensive.

There have been put into service a number of different furnaces or garbage crematories, but most of them have only been successful in larger cities, where the different kinds of refuse are collected separately and where continuous operation can be maintained. Most of these large crematories need auxiliary fuel, and with some of them a special apparatus for preliminary drying of the refuse had to be connected. Both cost of construction and cost of operation have been very high, and even for larger cities of 100,000 inhabitants and over, a garbage crematory plant up to this time has been a heavy burden. There was no furnace which met the demands of smaller cities, and, although the necessity of a crematory has been felt everywhere, even in the smallest country towns, the city authorities were unable to install such a plant on account of its excessive cost.

Even a great number of larger cities have, after careful investigation, decided not to utilize the crematory heat for steam production on account of the following reasons:—

1. If the refuse is not collected separately, its fuel value is very low, and, as these plants have to use a large percentage of auxiliary fuel with the garbage, the cost of steam production is often greater than if good fuel were burned alone.

2. The boilers must be about twice as large per horse-power generated as would be required in an ordinary plant. If fuel is reasonably cheap in the locality where the plant is to be built, the economy effected by using the waste heat from the crematory will not pay interest on the increased investment.

3. The temperature and the volume of gases from the crematory vary so much that the generation of steam is very unsteady. It is, therefore, always necessary to employ an additional boiler, fired separately, to generate enough steam to make the power steady. This again increases the cost on construction and operation, and, therefore, even at its best, the utilization of the waste heat is a doubtful economy.

4. There is, as a rule, a great increase in cost of the cost of the hauling of the refuse to the power plant. In order to use the steam to the best advantage, the location of the plant can not be decided upon from the standpoint of economical transportation alone, and very often the increased cost of hauling dissipates all the savings which possibly could be effected by steam generation.

There are, however, conditions in certain localities where, on account of some manufacturing concerns, large public institutions, homes, trades, or the like, a great amount of combustible refuse is produced, and where in connection therewith, for the reason of high prices of fuel in such locality, the generation of steam by burning this refuse will be economical. These, however, are very rare instances, and even then very careful investigation by experts should be made before any decision is reached to install such steam plants.

The Thompson crematory for the city of Houston is not designated to utilize the waste heat for steam generation. The crematory is, however, designed so that a water-tube-grate, in which sufficient steam can be produced for driving a blower to increase the draft, if such should become necessary for certain purposes, may be installed. In all ordinary cases, however, where mixer refuse is burned, natural draft alone is used, no blower or other machinery is attached, and therefore the Thompson crematory is a model of simplicity and economy, and is by far the most economical furnace ever designed for this purpose.

A careful study of the subject and investigation of the local conditions and the results of garbage disposal plants in a great number of other cities, and a series of very exhaustive experiments, resulted in the design and installation of a crematory plant for the city of Houston which has now been in successful operation for over three years.

There has hardly ever been any other crematory plant used as hard and for so many different purposes as this one, but it stood all the tests to the fullest satisfaction, and the results of the most severe tests have been excellent in every instance.

In one test there were twenty-three dead dogs cremated in one day without the slightest trouble, no auxiliary fuel, except the regular trash and garbage was used, and no offensive odors of any kind were noticeable.

This crematory is located in the centre of a well-built section of the city, and has done its work without any objectionable effect. For over three years this crematory was the only method that the city of Houston used for destroying its garbage, refuse, the smaller dead animals, etc.

In the Mayor's annual message and department report the following statement is made:

"The operation of the garbage crematory has been satisfactory. This plant has a capacity of sixty-five cubic yards, and is sufficiently large to care for all the garbage removed from the business centre of the city. Not only is it a benefit from a sanitary standpoint, but by reason of the fact that the haul is shortened, it is possible to clean the business centre of the city earlier, with less equipment, than would otherwise be required. No fuel is necessary for the furnace, as the lighter material is made to serve as fuel to consume the heavier substances. The smaller animals dying in the city limits are cremated here, and last summer the 563 dogs destroyed by the dog catcher were disposed of in this manner."

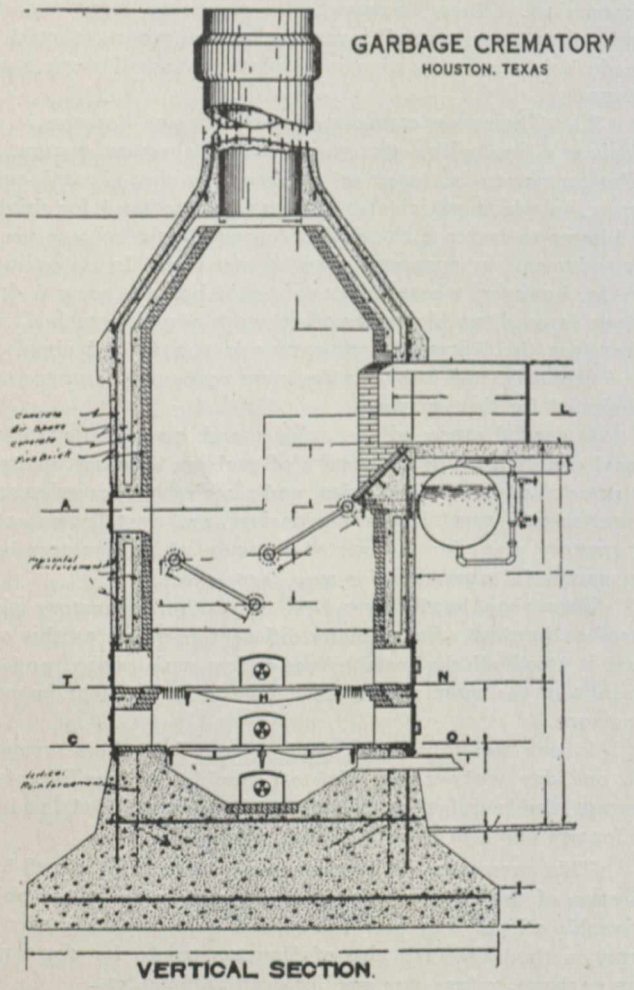
*A paper before a convention of Health Officers of Texas.

As a consequence of the excellent results obtained, the city of Houston has now replaced this plant by a new Thompson crematory of a larger capacity.

In reply to our inquiry we received a letter from the city engineer of Austin, Texas, commenting on the satisfactory working of their Thompson crematory, which had been in use for several months.

The construction of the Thompson crematory is very simple, and therefore the cost of its maintenance and operation is reduced to a minimum.

The furnace consists in the main of a vertical cylindrical combustion chamber, which by a series of grates is horizontally divided into four different compartments. The lower compartment is the ash-pit, which is provided with a clean-out door through which the ashes are removed and by which also air can be admitted. For this purpose special air regulators are also provided.



VERTICAL SECTION.

The second compartment is the room between the secondary and main grate. Here the cinders and ashes which have passed the fires above and have dropped through the main grate are reburned before they finally pass into the ash-pit, and therefore absolute combustion must take place. This chamber is also provided with all the necessary regulators.

The third compartment is the room above the main grate, and, as the name implies, the hottest fire is maintained here on this grate. Stoke holes, air inlets and clean-outs are also provided here.

The fourth compartment is the room above the water tube grate, and this compartment is connected with the chimney, which is built directly over it, thus securing the best possible draft conditions.

The furnace is charged through the feeding chute, which empties above the water tube grate. This grate is so arranged that it holds the garbage like a basket, and allows it to drop on the main grate only after a preliminary drying has taken place and after the more bulky materials have been partly reduced. In this manner any clogging of the main fire is most effectively prevented, and odorless combustion is possible at all times.

The water tube grate is connected with a water tank, which is located under the charging floor, and a free circulation of the water through the tube grates is accomplished. All the steam generated in the tubes accumulates in this tank, and if necessary sufficient steam can be drawn from it to drive a fan or blower. If no use is made of the steam it will either escape through a steam pipe connected with the chimney, or it can be condensed by a small condenser and the water can thus be saved. The water grates are so constructed that they can easily be cleaned in all parts, all main connections of same being located at the outside of the furnace.

The Thompson crematories are built of two strongly reinforced concrete walls with an air space between, and heavily lined with fire brick. The chimney is of reinforced concrete, built according to the Weber system, which to-day, without any doubt, represents the most advanced type of chimney construction and has proved its superiority by long years of hard use in almost all civilized countries. The figure herewith shows the details of construction, the location of the reinforcement and the arrangement of air isolation chambers, which are provided to protect the outer concrete walls against excessive heat from the furnace within. All manholes, stokeholes, air regulators, charging chute, grates, dampers, water tanks, etc., are made of cast or wrought iron, as best adapted for their purpose, and only first-class materials are used in every instance, together with best possible workmanship.

The operation of the crematory is very simple. After a small fire has been started on the main grate with easily combustible materials, selected from the refuse, the plant is charged through the chute. Care must be taken to have the water tank filled before starting the fire, in order to prevent burning of the tube grates.

On the water tubes the garbage, etc., is suspended until it is dried and sufficiently charred to fall through them directly upon and into the main fire, where it is fully consumed. The cinders falling through the main grate are retained on the secondary grate below, and only after they are completely incinerated they can pass into the ash-pit.

Tin cans, bottles, wire, iron, flower pots and similar materials are taken from the garbage by the man on the charging floor and thrown directly into the ash pile.

There are only three men necessary for operating a twenty to thirty-ton crematory. One of these men, who acts as a foreman, should have some intelligence and must understand the operation of the plant in every detail. The two others can be common laborers, as their work consists only of feeding the furnace, removing the ashes, stoking etc. There is no other expense connected with the operation of this furnace, and therefore the Thompson crematory is the most economical in operation.

The Thompson crematory has the following advantages over any other type of furnace known for the reduction of solid wastes:

1. The cost of construction is very low; in fact, it costs less than one-tenth of some plants built heretofore by several other crematory builders. For this reason even the smallest town can afford to own such a plant and to secure for its citizens all the benefits derived from its operation.

2. The Thompson crematory requires no auxiliary fuel for its operation. On account of its ingenious construction and the arrangement of the grates, one directly above the other, drying and burning of the trash takes place in the same furnace.

3. On account of the excellent natural draft obtained by placing the chimney directly over the furnace, without any horizontal flues, absolutely perfect combustion takes place, and a high temperature is maintained in the furnace at all times.

4. There are no objectionable odors of any kind connected with the operation of the plant. The Thompson crematory can be located within any part of the city. By this arrangement the cost of collecting and hauling of the refuse is greatly reduced, and this reduction alone more than pays the cost for the operation in most instances.

5. No continuous operation is necessary to obtain best results. The crematory can be used for several hours per week only if so desired. This is of highest importance for smaller towns, where only one collection per week is all that is required. This is also an important point in large cities, where, in order to reduce the cost of collecting and hauling, a small furnace is built for each district. When there is not enough garbage in each district to keep a crematory in continuous operation, the same men can be used to operate the different furnaces alternately.

6. On account of its compact construction and the arrangement of building the furnace and chimney on the same foundation, a minimum of space is occupied by the Thompson crematory. The whole plant can be erected on a small lot, and in fact, no other garbage crematory can be compared with this type in that respect.

This crematory is designed in different sizes, in accordance with the requirements, from the smallest type for large private residences, hospitals, hotels, and other institutions, to the largest sizes for large municipalities, military camps, etc.

The smaller types can easily be built within a basement, and if they can be connected to an existing chimney of sufficient size, the cost will be greatly reduced.

The larger sizes are capable of consuming from twenty to one hundred tons and more of garbage per ten-hour shift, in accordance to the grate areas and composition of the waste to be burned.

The cost of construction depends largely upon local conditions, prices of building materials, subsoil for foundation, etc.

GRAND TRUNK WESTERN.

The State Railroad Commission at Lansing, Michigan, this week granted the Grand Trunk Western Railway Company permission to issue a $30,000,000 mortgage on its property, the money to be used in making improvements on the company's lines.

Among the improvements will be the expenditure of $850,000 in installing a block signal system. It is the intention of the Western Division to purchase the property of the Pontiac, Oxford and Northern Railway, which, it is intimated, is now owned by the Canadian division of the Grand Trunk.

At present there is a suit pending in the Supreme Court of Michigan State, instituted by the State Railroad Commission, to determine who owns the Pontiac, Oxford and Northern, in order to compel the road to charge a two-cent passenger fare, instead of three, as is now being charged. The Grand Trunk is paying the taxes on the road, but denies its ownership.

The Railroad Commission also authorized the Minneapolis, St. Paul and Sault Ste. Marie Railway to issue $6,562,000 in stock for the purpose of making additions and betterments.

PROPOSED STANDARD METHODS OF TESTING DRAIN TILE.

BY C. M. POWELL*.

The subject, "Proposed Standard Methods of Testing Drain Tile," takes for granted two things: First, that drain tile should be tested; second, there should be but one general accepted method of making such tests. It can hardly be assumed that, everyone recognizes the importance of the former or realizes what the latter would mean to the cement drain tile industry. All kinds of steel, cast iron, wrought iron, cement, lumber, paving brick and all structural materials are purchased on specifications. The interest shown at present on the subject of tests for drain tile indicates that in the course of a short time this product can also be included in the above list.

According to the best available information there were made last year in this country some 124,000,000 cement tile, 12-inch and less in size, valued at approximately $4,000,000. Certainly the expenditure of this sum annually justifies the user in insisting upon some guarantee of a satisfactory quality.

The general practice of purchasing cement drain tile on a specification would benefit the manufacturer who turns out a first-class product and free him from the ujust reflection which the inferior product of the unscrupulous or unqualified manufacturer throws upon his business. It would relieve the drainage engineer of a lot of responsibility, because the quality of the tile would not be left to his judgment, but would be a matter of satisfying certain definite requirements. A set standard of quality for cement drain tile would reduce the failures to a minimum and leave nothing upon which the other tile interests could base their claim that cement tile is not adapted for drainage purposes.

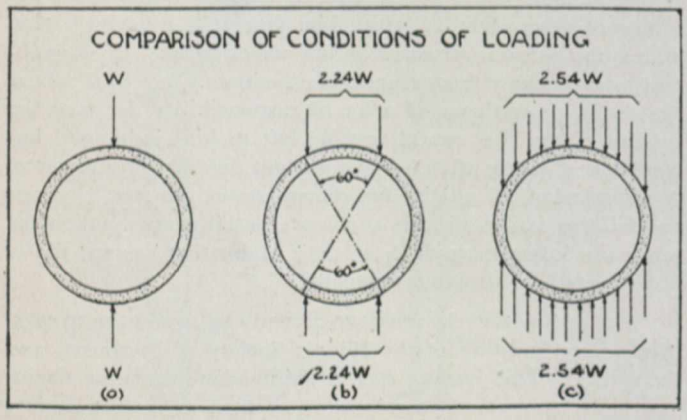
It was the writer's privilege recently to attend the twenty-fifth annual meeting of the Illinois Society of Engineers and Surveyors. This society has probably done more on drainage in its tweny-five years' existence than any other society in the country. Cement tile was a live topic at this meeting. One drainage engineer present, who had at that time twenty-nine drainage districts under his direct supervision, expressed the consensus of opinion when he said he was not using cement tile in any of his work because he could not be assured that the tile had been well made with sufficient cement, suitable aggregate and properly cured. Until the engineers have this assurance cement tile will not receive their entire confidence or enjoy the reputation to which the merits of a good quality entitle the product. This assurance can be guaranteed not only to the engineer, but to everyone concerned, if you, as manufacturers, sell your product on a specification. When this is done the drainage engineers will be boosters, the claims of other tile interests will be discredited, all will recognize the merits of cement drain tile, your product will continue to be used and its further introduction made possible.

A specification for drain tile which will bring about these things must necessarily be one which represents a harmonization of the views of manufacturers, engineers, societies, engineering colleges and experiment stations regarding what requirements will give the desired quality of product. This is the means whereby the non-essentials will be rejected and only the fundamentals retained. Such a specification can be

*Assistant Inspecting Engineer Universal Portland Cement Company. This paper was given before the convention of the Inter-State Tile Manufacturers, Association.

prepared only after the most painstaking investigation, thorough study and serious consideration. All this work will be justified by the result, which could be accepted by all concerned as meeting every possible contingency, a true standard in every sense of the word and the best that could be drawn up. The process of manufacture and the conditions in most, if not in all, factories are such that tile cannot be manufactured to comply with more than one specification except at an increased cost of production. On the other hand, making all tile according to requirements, worked out as suggested, would make for a standardization with a tendency to reduce the cost or increase the output, which amounts to the same thing.

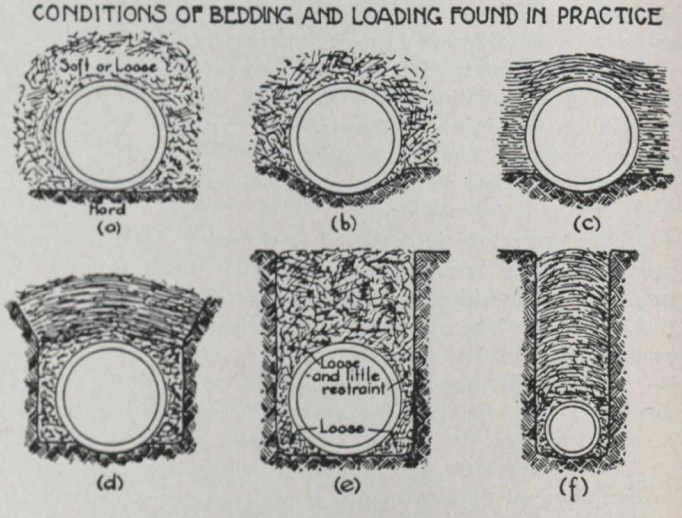
The American Society for Testing Materials, as you know, has prepared specifications for structural materials in general that are the accepted standards throughout the country. Last summer Mr. C. W. Boynton, inspection engineer, Universal Portland Cement Co., brought to the attention of this city the need of standard tests and specifications for drain tile, and their executive committee has recently authorized the creation of a special committee to study thoroughly the drain tile question and report standard tests and specifications at its earliest convenience. This committee is now being appointed and as soon as completed the matter will



receive its immediate attention. As is the practice of the American Society for Testing Materials, the co-operation of other societies and associations will be sought. The Illinois Society of Engineers and Surveyors at its last meeting in East St. Louis, January 25-27, 1911, authorized the appointment of a committee on standard tests and specifications for drain tile to co-operate with the committee of the American Society. In due time no doubt the committee appointed by the American Society will invite the co-operation of the Interstate Cement Tile Manufacturers' Association in this matter. What the American Society for Testing Materials recommend in this matter will have a great weight, and a uniform specification will result by the adoption of these recommendations by all other societies. If each local society and college or experiment station makes tests and issues recommendations regarding proper requirements for drain tile, there would be no uniformity and this would lead to endless confusion and dispute between manufacturers, engineers and purchasers. For instance, if such specifications are adopted in Iowa the drain tile you furnish for use in that state would have to meet these requirements, while those which you furnish for use in Minnesota would probably have to meet some other requirements.

Considering what a standard specification for drain tile should embody, the first attention must necessarily be given to a specification governing the tests of tile. Since this material is used under conditions which subject it to external earth pressure that sometimes causes failure, a breaking tests by the application of an external load suggests itself. The pressure may be applied in a variety of ways. The load which a tile or pipe will stand without breaking depends upon the conditions of loading. The comparison of the stresses produed by the assumed loadings illustrated in the drawing shows that under the concentrated loading, Fig. (a). the pipe will sustain the smallest load. Under the loading in Fig. (b) a load two and one-quarter times as great as if it were concentrated at one point top and bottom will be required to cause failure. If the load is uniformly distributed across the horizontal projection, as shown in Fig. (c), over two and one-half times the concentrated load will be required to break the pipe. It is therefore evident that tests of tile to be comparable must necessarily be made under the same conditions of loading, and this is why first attention must be given to the methods of making the tests

Before taking up which method is best adapted for the purpose, let us look into the conditions of loading which may be found in practice. The amount of the load and its distribution, and therefore the stress in the tile, depends upon a number of conditions; the nature of the earth used in the



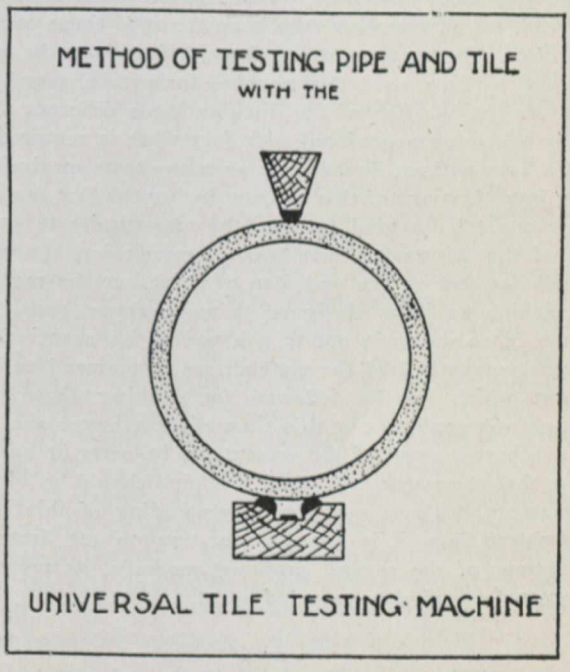
filling, the method of bedding the pipe, the way of tamping the earth at the sides, the amount of lateral restraint or pressure of the earth horizontally, the method of filling and packing the earth above, the conditions of moisture in the earth, ets., all have an effect upon the amount of external pressure on the tile. Professor Talbot, in University of Illinois Engineering Experiment Station Bulletin No. 22, calls attention to the following ditch conditions: If the layer of earth immediately under the pipe is hard or uneven, or if the bedding of the pipe at either side with soft material is not well tamped, as indicated in Fig. (a), the main bearing of the pipe may be along an element at the bottom and the result is in effect concentrated loading, hence the tendency of the pipe to fail is greatly increased. In bedding the pipe in hard ground it is much better to form a trench so that the pipe will surely be free along the bottom element even after settlement occurs, and so that the bearing pressures may tend to concentrate at points, say, under the third points of the horizontal diameter (or even the outer ¼ points). This will reduce the tendency of the pipe to fail, as shon in Fig. (b) on the last slide.

In case the pipe is bedded in loose material the effect of the settlement will be to compress the earth immediately under the bottom of the pipe more completely than will be

the effect at one side, as indicated in Fig. (b), with the result that the pressure will not be uniformly distributed horizontally. Similarly in a trench if loose material is left at the sides and the material at the extremities of the horizontal diameter is loose, and there is little restraint, as indicated in Fig. (e), the pressure on the earth will not be distributed horizontally and the amount of stress in the pipe will be materially different from that where careful bedding and tamping give an even distribution of bearing pressure over the bottom of the tile. In case of a small tile in a deep trench the load upon it will be materially less than the weight of the earth above, as shown in Fig. (f), where the earth forms a hard, compact mass and is held by pressure and friction against the sides of the trench. If the large tile is held in a trench with sloping sides, as shown in Fig. (d), the load which comes upon the pipe will be materially less than the earth immediately above it. Should the sides of a deep trench cave, the pressure against the pipe will differ occasionally from that which obtains in the case of an earth filling as shown in Fig. (c). Your own experiience will probably suggest other conditions of loading which might occur in the ditch. The ones described are sufficient, I think, to indicate that a wide variation exists in the amount of pressure which will come upon a tile in actual practice. It is not practical to attempt to select any one of these conditions as being representative. If one were to be on the safe side a condition which produces in effect that of a concentrated loading must necessarily be selected. However, from experience in the field, at the tile plants and in the laboratory, we have found that the conditions of loading found in the ditch are not as important to consider in selecting a method of loading for making the tests as are the conditions under which the tests must be made. The latter govern the selection of the method best adapted for these tests. For instance, take the standard strength test for cement: This test is made in tension, not because it approximates in the least degree the conditions under which the material is used, but because it is a simple test and one which gives the engineer and cement manufacturer a fair knowledge of the material and guides him in the use of it.

Let us consider for a moment the purpose of the breaking test, where it will be made and by whom it will be made, in order that we may get a clear idea of the requirements of a practical tile testing machine that can come into general use. The purpose of the tests is to determine under what load a tile will break and in this way to furnish a basis for comparing the quality of a tile from one plant with tile from another plant. The tests will be made at the plant where conditions are seldom favorable for doing such work scientifically, and out along the line of the ditch where the engineer will haul the testing outfit onto the job, set up and make a few tests and under the least favorable conditions. The operators will not as a rule be familiar with such work and cannot appreciate the necessity of numerous details, or may be careless and neglect them should such details of operation be required. These conditions demand of the testing machine, first, that it must be accurate to give comparable results; second, it must be capable of rapid operation to save the superintendent's time and the engineer's time, and therefore the user money; third, it must be simple and, for lack of a better expression, absolutely "foolproof." The operations required to make a test must be reduced to the fewest possible number. Can a machine be devised which will meet these essential requirements and duplicate ditch conditions.

At the start the various methods which had been used up to that time were considered. The method of loading, shown in the figure, is the one used at present in the Universal machine and one which we have found can be safely used on 1,000-pound capacity platform scale for tile up to 30-inch. The distance between the lower supports is fixed at 2-inch, and while the bending moment developed is not exactly the same for the different sizes there is practically no difference above the 6-inch size between it and the one point of support. The amount of load required for each size to sustain under this condition of loading will take care of the little variation in the stress developed in different sized tile by this loading. Analysis of this loading shows that theoretically there is but 5 per cent. difference on a 4-inch tile, 2½ per cent. on the 6-inch size, less than one-third of one per cent. on the 12-inch size and no difference on 24-inch tile. As in testing, the results will be reported in, say, pounds of load per foot of length for a given diameter and not as a breaking load of so many pounds per square inch of wall section; that is, modulus of rupture, the small difference in this load for the smaller sizes will not be at all objectionable. For the 12-inch



size it is only three pounds in one thousand; for the larger sizes it is too small to figure. This loading is scientific because it can be accurately calculated and the results agree closely with the tests. It is also practical. What more could be required? Comparisons will not be made between a certain make of 4-inch tile and some other makes of, say, 12-inch tile. What is required is a method so accurate, simple, and absolutely controllable in any operator's hands that the results of tests on, say, 8-inch tile made along the ditch by the engineer or his assistant are comparable with the results that you or one of your men will get at your plant on tile of the same size, other things, such as age, mixture, etc., being the same. If a tile testing machine is so constructed that the results obtained may be juggled by the operator, intentionally or not, imagine the field for dispute which is immediately in store for the manufacturer and inspector who passes on the product.

A specification for tests of tile should not be such as to required any computations or calculations on the part of the man making the test, because it can be put in a form so that this is not necessary. Calculations are all right for research work, but the average tile manufacturer or drainage engineer will not stand for any unnecessary work in this respect and a good specification will not burden him with it. It should not be compulsory to figure the breaking load per square

inch of wall section: that is section modulus. The breaking load can be such as will require a good quality of concrete and this will take care of the section modulus.

There is one other important detail closely connected with a method of testing which must be considered and that is the application of the load to the specimen. This is one of the fundamental principles of testing which has been long recognized and always specified in making such tests as the one in question. As a case in point I quote from "Uniform Methods of Testing Portland Cement" regarding the strength test as follows:

'The load should not be applied too suddenly, as it may produce vibration, the shock from which often breaks the briquette before the ultimate strength is reached. * * * The load should be applied at the rate of 600 pounds per minute."

In the design of this machine simplicity, speed, ease of operation and accuracy of results have been kept constantly in mind. The machine will cost as little to build as is consistent with these essentials. The machine itself is the best proof that we have realized the importance of these essential requirements better than others have. This is to be expected since we have used the machine for over a year in tile plants and on the line of the ditch in three different states, thereby becoming acquainted with just what is required.

We have without doubt made as many tests on drain tile in our investigations of this subject during the last few years as any one. I am glad to have the opportunity to present some of the things we have learned concerning the proper methods for testing tile and also to point out the merits of the machine we have designed to make these tests. The purpose in so doing is not to ask you as an association to adopt as your standard the methods we recommend as being the best which can be followed for making these tests, although you could not at this time adopt a better one. But with the best interest of the cement tile industry at heart we believe that at present nothing of this kind should be adopted. Furthermore, without a better understanding of this important subject than it is possible for you to get from the descriptions of the several proposed methods, as presented, you are not qualified to pass judgment.

WATER REQUIRED TO REDUCE QUICKLIME TO PASTE AND TO CREAM.

In considering the matter of coating surfaces in various ways, the committee on Treatment of Concrete Surfaces of the National Association of Cement Users, Mr. L. C. Wason of the Aberthaw Construction Co., chairman, had conducted a series of experiments in order to determine the relation between hydrated lime and quicklime in Portland cement mortars and concrete; a series of experiments were conducted upon samples of quicklime obtained from local dealers in lime. These experiments consisted of adding sufficient water to weighted quantities of quicklime to produce a paste. In another series of experiments sufficient water was added to slake the lime and reduce it to the consistency of cream, or to such a consistency that when a stick is immersed in the lime, then withdrawn, the cream will drip from the end of the stick. This seems to be a very definite consistency. It is easily determined and seems to be a good consistency for the purpose.

It was found that the amount of water required to make a paste varied from 54 to 84 gallons of water per barrel of quicklime of 300 pounds. The following represent the variations on eight samples of lime tested, the individual figures running: 54, 59, 69, 71, 73, 73, 75 and 84 gallons of water per barrel of lime. It is apparent from the above that five samples out of the eight require between 69 and 75 gallons per barrel, and that 72 gallons per barrel would be a very fair average for these five samples.

To reduce these same samples to cream required a total of from 100 to 234 gallons of water per barrel of lime, the individual figures being as follows: 100, 138, 149, 159, 161, 230 and 234. It is interesting to note that the lime which required the least water to make a paste, namely 54 gallons, required the most water to reduce the lime to cream, namely 234 gallons.

These great variations in quantities of water required to reduce quicklime to a paste or cream, render it difficult to draw a specification that would apply to any lime. It would seem, therefore, that such a specification can only state that where quicklime is used in place of hydrated lime ¾ of the quantity of quicklime shall be used. This is on the basis that 100 pounds of quicklime will produce 135 pounds of hydrated lime.

DIAMOND INDICATIONS IN BRITISH COLUMBIA.

The director of the Geological Survey announces that diamonds have been discovered by the survey in British Columbia rock, the first recorded discovery of diamonds in Canada.

The rock carrying the crystals is a peridotite of the variety known as Dunite, consisting of olivine and chromite. The rock specimens in which the diamonds were found were collected by Mr. Chas. Camsell on Olivine Mountain, near the Tulameen River, where Mr. Camsell has been making a geological examination on behalf of the survey. Samples of the rock were submitted to Mr. R. A. A. Johnston, mineralogist of the survey, to ascertain the nature of the chromium minerals. In the course of his examinations Mr. Johnston secured some insoluble fragments of crystals, which appeared to be diamonds. More of this material was separated out, and a series of tests conducted by Mr. Johnston which establish beyond doubt the nature of the material. The individuals so far extracted, from a number of samples, are small, none of them being larger than an ordinary pinhead, but many appear under the microscope to be clear and bright and of good quality, though some are yellowish or brownish.

The diamonds found occur in the chromite, and not in the olivine of the rock. The chromite occurs as short, irregular, veinlike segregations an inch or more in width, in irregular masses and as small disseminated grains through the rock. Gold and platinum also occur in the chromite.

On account of the small size of the diamonds and the distribution of the chromite the discovery is of scientific rather than of commercial importance. It is possible that the placer deposits in the stream draining peridotite rock mass may contain stones of greater size, although the fact that placer mining for gold and platinum has been carried on for a number of years without such a discovery having been made tends to lessen the possibility, as stones of commercial size in the sluice-boxes would be apt to attract the attention of the miners.

The peridotite in which the diamonds occur is often weathered to serpentine. It is interesting to note that it is closely related to the rocks which form the matrix for the Arkansas diamonds and for the South African.

The discovery of diamonds in British Columbia was not altogether unexpected by the survey, officials working there

having for some time been on the lookout for them. Some years ago the present director obtained some microscopic crystals which were believed to be diamonds, and which gave positive results in all tests to which they could be submitted, as a result of which prospectors were notified to be on the lookout for diamonds in British Columbia. The present discovery, however, is the first in Canada which can be definitely announced.

Commercial stones have been found in the glacial drift across the international border, in Illinois, Ohio, etc., that have no doubt come from Canada, but the original locality has not yet been found.

DISINTEGRATION OF CONCRETE IN SEWAGE DISPOSAL TANKS.

Upon the completion of the work, it will appear as a Bulletin from this Station.

Attention was first called to the disintegration of cement mortar in concrete, resulting from sewer gases, by Frank H. Olmsted, City Engineer, of Los Angeles, and his deputy, Homer Hamlin, in 1899. The case observed by them occurred in the outfall sewer for Los Angeles, built in 1895. This resulted from the holding back of the sewage in the inverted siphons in this outfall sewer, forming in principle, a septic tank. Beyond this point the neat cement mortar was badly disintegrated and it became necessary to consider the reconstruction of the walls and roof of this portion of the sewer. It was observed that this disintegration resulted from the formation of sulphuric acid upon the walls and roofs, which attacked the cement, giving calcium sulphate or gypsum as the final product. It was also observed that the amount of sulphuric acid formed appeared to be too large to be produced by the organic sulphur compounds in normal sewage. Mr. Hamlin suggests that the only possible sources for this excessive amount of sulphur were acids from manufacturing plants, the sulphates in water, sulphuretted water from oil wells and the sulphur which is always present in small quantities in the normal sewage. The reports do not indicate that the source of these sulphur products was located. The work done in this laboratory would point to the water supply itself as furnishing the necessary sulphates.

The disintegration of concrete in sewage disposal plants was called to our attention about two years ago, when such a condition was observed in the dosing chamber of the septic tank at the State Hospital for Inebriates at Knoxville, Iowa. In addition to this disintegration large quantities of hydrogen sulphide were given off whenever the dosing chamber discharged, producing extremely disagreeable odors in the surrounding atmosphere and causing complaint from dwellers in that vicinity. The disintegration in this plant, as in other cases observed, occurred above the water line in the dosing chamber. At a later date, the writer observed that the sewage disposal plant at Grinnell, Iowa, showed a condition similar to, if not identical, with that at the Knoxville Institution.

In a recent paper read before a Cement Association in London, by Mr. William Dunn, he reports a similar case, though he does not attempt to show any relation between this condition and the character of the water supply. One or two other cases in this country have come to our notice, but the trouble was less pronounced and owing to distance, have not been carefully investigated. In the two cases investigated (Grinnell and the State Inebriate Hospital) it was observed that the water supply carried high mineral content and that the sulphates were high in both, as the following analyses will show:

Water supply.	Solids on evaporation.	Solids on ignition.	Sulphates SO_4
Hospital for Inebriates....	2690	2670	1645 Pts per
Grinnell	1066	1018	476 Million

Seven other sewage disposal plants, built along similar lines, have been observed by the writer and in all there is neither excess of hydrogen sulphide nor any disintegration of concrete and the highest sulphate content in the water supplies is 51 parts per million. These observations seem to point to a relation between the mineral sulphates of the water supply and the excessive hydrogen sulphide evolved in the process. Analyses of the raw sewage and the effluent were made to determine the sulphates in solution, together with the total sulphur in the raw sewage. These results indicate first, that the organic matter in normal sewage does not contain enough sulphur to produce the hydrogen sulphide observed in this case, second, that where the sulphates in the original water supply are high, there is a reduction in the amount of mineral sulphates found in the effluent, showing that a portion of these mineral sulphates must have been reduced and assisted in producing the hydrogen sulphide observed. The moisture upon the walls of the dosing chambers where disintegration occurs, contains a considerable amount of sulphur and all of the lime content of the cement near the surface, is converted to calcium sulphate. It is evident then, that the agent producing the disintegration is sulphuric acid and that this sulphuric acid comes from the hydrogen sulphide. It is well known that the oxygen of the air will convert hydrogen sulphide to sulphuric acid, but it seemed improbable that the amount of acid here formed could result from this simple chemical action. This belief was emphasized by the fact that the roof and walls of the dosing chambers were coated with what appeared to be yellow sulphur, evidently deposited from the hydrogen sulphide.

At this point Dr. R. E. Buchanan of the State College took up the bacteriological study of the problem. He found that normal sewage contains bacteria which have the power of reducing mineral sulphates with the liberation of hydrogen sulphide. He identified these bacteria in the sewage taken from the tanks mentioned and proved by experiment, that they would reduce the mineral sulphates occurring in water. This then accounts for the formation of the large quantities of hydrogen sulphide found in sewage disposal plants where highly sulphated waters are used. His attention was then turned to the walls where the disintegration occurred, where he found on examining what appeared to be a sulphur deposit under the microscope, that it really consisted of sulphur granules mingled with a mass of living organisms. Many of these were evidently feeding upon this sulphur, as the sulphur granules were identified within their bodies. Among these bacteria was identified at least one form (and there were probably others) which is known to convert hydrogen sulphide and sulphur to sulphuric acid. This then, supplies another important factor in the production of the sulphuric acid which is the direct cause of the disintegration. These facts, I believe, establish the relation between the formation of the excessive hydrogen sulphide and consequent disintegration of the concrete and the character of the original water supply.

*A paper read before the Iowa Association of Cement Users.

We hope in our more complete report, to add further evidence to this case by investigating similar situations if they may be discovered. It will then remain to suggest a method for the disposal of sewage where heavily sulphated water is used, without producing a nuisance from the foul odors arising, or injury to the plant from the breaking down of sound concrete.

FACTORY ACCIDENTS IN GREAT BRITAIN.

Accident Risk Has Tendency to Decrease—Conclusions of Committee.

In November, 1908, a committee was appointed by Mr. Herbert Gladstone, then Home Secretary, to enquire into the increasing number of reported accidents in Great Britain in places under the Factory and Workshops Act.

The committee's report shows that the total of reported accidents rose from 79,020 in 1900 to 100,609 in 1905, while between 1905 and 1907 there was a further striking increase, the figures being:

	Total	Fatal
1905	100,609	1,063
1906	111,904	1,116
1907	124,325	1,179

The increase in 1905 to 1907 was especially noticeable in certain trades. Thus, in the textile trade the non-fatal accidents increased by 44.62 per cent., in metal founding by 46.07 per cent., in engineering, etc., by 35 per cent.; whilst generally in non-textile factories the increase was 35.83 per cent.

PREVENTION OF CORROSION IN METAL LATH.*

C. W. Noble, Consulting Engineer, Toronto, Ont.

For the past year the writer has been investigating corrosion in steel and the methods of preventing it. The object of the investigation was to determine what improvement, if any, could be made in the protective coating used on Herringbone Metal Lath. The investigation brought to light much interesting technical information.

The nature and cause of corrosion was first studied. A very exhaustive investigation of the corrosion of iron and steel exposed to the atmosphere has been recently made by Dr. A. S. Cushman, of the United States Department of Agriculture. While his studies were confined primarily to the corrosion of fence wire, the results are of general value. He states that corrosion is primarily due to the presence in the air of minute quantities of carbonic acid and sulphurous gases. These acid gases are dissolved in falling rain and thus brought into contact with the iron. Their action then depends on the condition of the metal. If it is absolutely uniform in quality the attack is exceedingly slow and impotent. If, owing to the localized presence of impurities, different portions of the metal vary in electrical conductivity, then the acids and the varying portions of the metal form a miniature electric battery. A current is set up and that portion of the steel which is electro positive as compared with the surrounding metal will be corroded. This explains why certain fence wires will corrode while others with the same exposure will last for many years. The local presence of impurities also explains why steam boilers will pit instead of corroding uniformly.

The action of wet plaster on metal lath depends on the nature of the plaster. Portland Cement and lime plasters are strongly alkaline and will not allow the formation of acids in their presence. They therefore prevent the rusting of metal lath. The protection given by Portland Cement is a permanent one. Lime plaster, however, has a greater attraction for moisture than Portland Cement, and while lime protection may be permanent, still need is felt for further investigation before making a definite statement. Such investigation was not made as the matter is a diversion from the subject in hand.

Plaster of Paris, which is the base of the many brands of patent and hard wall plasters, is actively corrosive. During the setting up process it has in a marked degree the tendency to start electric currents, and these currents cause the oxygen molicules which are momentarily free by the chemical changes, to attack the steel. The corrosion is much more rapid than that due to atmospheric exposure. Iron rust, once started, works progressively, and the rusting in this case continues long after the chemical changes in the plaster, with their resulting electric currents, have ceased. It only requires the presence of a normal amount of atmospheric moisture to keep the action going.

The different types of protective coatings which were studied fall naturally into three separate classifications: paints, electrical insulators, and galvanizing coatings. Each of these works on a different theory: 1. The painted coating is merely an attempt to shield the steel from the plaster. If well done with an undiluted oil paint it has some value. Linseed oil is subject to attack by lime and Plaster of Paris becoming what is known among painters as "dead." It is then porous and will not prevent corrosion. The first attack of the plaster is, however, expended on the paint instead of the steel, and for this reason the paint coating is of assistance. If the paint holds until the electric currents cease it has served a useful purpose, if not, it has at least delayed matters.

Metal lath should be coated with an exceptionally tenacious material. It is shipped in bundles and roughly handled during erection and the coating is severely tested by scratches. In this respect even the best paint leaves much to be desired; of course, rust will immediately start at each scratch. If in the effort to reduce cost, the manufacturer dilutes his paint with gasoline, the resulting coating is valueless, although it can be made very cheap. Unfortunately, most paint used for lath protection is thus diluted. Everything considered, the paint coating has the least to recommend it of any of the three types of protection considered.

The coating with electrical insulators proceeds on an entirely different theory. The attempt is here made to prevent the electric currents from reaching the lath. The cold japan coating used on Herringbone Lath is of this class. It consists of an asphaltum varnish which is oxidized by the addition of a chemical dryer instead of by baking. It is proof against the action of all types of plaster and is a perfect insulator as long as the coating itself is perfect. The objection to it is that it is impossible to make it proof against the wear and tear of handling. If it is sufficiently elastic to prevent chipping, then it will scratch. There seems to be no neutral territory between these two difficulties. Its cost, 5/8 of a cent per square, is in its favor. While rust will start at the open scratches the attack can never, as in the case with paint, be made through a "dead" coating. It will probably be long before it will be replaced for medium priced work.

*Read before the Canadian Cement Association.

Galvanizing coatings work on still a different theory. The electric currents are here allowed to circulate at will while their mischief is prevented. It has been previously stated that the currents flow only between metals which differ in electric potential and that the attack is on that metal which is most strongly electro positive. Now all zinc is more electro positive than any commercial steel regardless of its impurities. A coating of zinc therefore will cause the currents to run between the steel and the zinc instead of between the different portions of the steel, and the attack will be invariably taken by the zinc. Freedom from scratches in this method of protection is unessential. It is only detrimental when the steel is so far exposed as to disclose a localized impurity (a potential rust spot) entirely surrounded by exposed steel. In this case the rust spot would develop. So true is this that metal lath cut from galvanized sheets with all the raw edges exposed will show most excellent results.

In the search for a perfect protective coating only one type of paint, Marine Tocholith, was tried. This is not a mixture of oil and pigment, and is therefore, strictly speaking, not a paint at all, but as its action is similar to paint it will be discussed here. It is a modified Portland Cement. Its advantage is due to the fact that it has the property common to all types of Portland Cement of preventing rust and absorbing a small amount of rust already started. It grows harder with age and in time adheres very tenaciously to the steel, It was found that it would not attain sufficient hardness to stand bundling and shipping for several weeks. The manufacturers submitted a special sample designed to harden with unusual speed, but even this was not commercially feasible. It was rejected on account of its liability to scratching. Two insulating coatings were considered, a baked and a cold japan coating. The cold japan is merely an improvement in the coating which has been used on Herringbone Lath for several years. It was adopted to replace the old cold japan coating, but on account of the liability to scratching is not considered absolutely perfect coating. The baked enamel coating is used to a certain extent in the United States. It requires considerable exposure for plant and only partially overcomes the scratching difficulty. When the lath is bent in forming cornice work the enamel is very apt to break. It is very expensive and is not regarded as sufficiently satisfactory to justify the cost.

A new metal called ingot iron was also considered. This is being used for the manufacture of Herringbone Lath in the United States. The impurity which causes variation in electric potential in steel is manganese. A very slight variation in the percentage of manganese makes a wide variation in electric potential. As it seems to be impossible to secure an absolutely uniform distribution of manganese the manufacturers of ingot iron have made a product in which this and practically all other impurities are omitted altogether. Electric currents are, therefore, not set up in ingot iron as the result of an acid bath and corrosion is much slower. Acid tests with ingot iron show remarkable results. Tests with plaster were not sufficient to give a satisfactory verdict.

The metal was rejected for an entirely different reason. Lath cut from ingot iron looks exactly like lath cut from ordinary steel sheets. An architect or contractor purchasing lath for an important contract and paying an additional price for the best material wants something more than the assurance of the manufacturer that he is getting the quality he is paying for. He wants the assurance of his own senses. The lack of this cannot be overcome with ingot iron.

Four types of galvanized lath were considered, hot galvanized, electro-galvanized, Sherardized and lath cut from a galvanized sheet. None of these require description except the Sherardized coating.

This process was invented in England by Mr. Sherard Cooper-Cole, a noted Metallingist, some seven years ago, The metal to be treated is packed in zinc dust and baked for several hours at a temperature just below the melting point of zinc. The process and the result is very similar to case hardening. Just as the casting while being case hardened absorbs part of the carbon in which it is packed, so the metal lath while being Sherardized absorbs zinc. The process differs from case hardening in the formation also of a pure zinc coating on the outside of the steel, while no corresponding coating of carbon is formed on a casting.

As galvanizing offers a perfect solution to the difficulty regarding scratches, the investigation now began to narrow down to a choice between these four types. Tests, however, which will be described later, were being made at this time which showed the probability of considerable damage to the zinc by plaster. It was therefore suggested that the coating should be lead instead of zinc, as the formation of lead oxide would protect the lead coating from further destruction. Mr. G. Frank Allen, a noted metallingist, was consulted. He reported that the suggestion was of no value because lead is electro negative as compared with iron, and the iron would, therefore, be rusted at the expense of the lead. He proposed an alloy of lead and zinc mixed in such proportion as to be neutral toward iron. This was rejected as again opening up the difficulty regarding scratches.

The simplest manner of making galvanized lath is to cut it from a galvanized sheet. With Herringbone Lath the results are very satisfactory, although the coating is frequently cracked at the bends. Whether it would prove so in the diamond mesh type, where the bends in the metal are much more frequent, remains a question. The process was rejected on account of its commercial impracticability. To a technical man who understands how galvanizing protects, there is no difficulty apparent from the raw edges of the strands. It would, however, require considerable explanation to sell such lath to the average layman. Plato once said that a man's reputation is more injured by telling an improbable truth than a plausible lie, and the statement is as true to-day as in Plato's time. If nothing better had been found the process would have been adopted but was finally rejected.

Hot galvanizing was rejected on account of the cost. The result is not better than that obtained by Sherardizing while the cost is about eight times as great.

Electro galvanizing was rejected on similar grounds. This process is really zinc electro-plating. In order to be efficient there must be sufficient zinc deposited to supply the wasting, while the electric currents due to hardening of the plaster are in progress, and still leave an ample residue for further protection. Perfect color is obtained with a quantity of zinc entirely insufficient to provide perfect protection. It is also much cheaper to provide color than protection, and unfortunately, mere color satisfies the manufacturer for this reason; many American architects in specifying galvanized lath, are now stating that it must not be electro-galvanized. By continuing the process, any desired quantity of zinc can be deposited, but if sufficient is provided to give a coating equal to the Sherardized coating the cost would be many times as great.

The Sherardized coating, which was finally adopted, differs from other types of galvanizing by reason of the zinc-iron alloy coming between the pure zinc and the steel. Immediately beneath the surface will be found a thin coating of alloy which is almost entirely of zinc. Going further the percentage of zinc decreases, while the iron increases until

pure iron is reached. There is, therefore, no contact between two metals of appreciable variation in electric potential. The coating can be considered as made up of a large number of layers, each varying slightly in electric potential from those immediately above and below it. While electric currents doubtless exist in these layers they seem to be very weak and very minute and their effect is quite insignificant. A given quantity of zinc is far more efficient in the Sherardized coating than when applied in any other manner. Prof. Burgess, of the chair of metallingy of the University of Wisconsin, reports that a given quantity of filings from the Sherardizing alloy takes fifteen times as long to dissolve in acid as a like quantity of zinc filings from a hot galvanizing bath.

Another reason for choosing Sherardizing is that the process cannot be scamped and is practically proof against mistakes in the shop. The zinc dust in which the lath is baked is a very poor conductor of heat. The process starts at the outside of the drums long before it starts at the centre, yet heat must be kept up until the centre is being Sherardized. Conversely, the process is still going on at the centre for some time after the drums are removed from the oven. The real protective is the alloy, which is deposited before the pure zinc. If, therefore, pure zinc appears at the centre of the sheet one can be sure that the process is perfect.

In order to assist in the selection of a proper coating an attempt was made to devise an accelerated test applicable to the case in hand. The commonly used acid tests do not represent anything like working conditions. Patent plasters are not acids.

A number of specimens were coated with pure plaster of Paris and kept for two weeks in a bath of exhaust steam. It was supposed that they would thus receive in a short time the effect of as much moisture and warmth as would ordinarily act on them in a long period of years.

The result was a disappointment. The temperature was above the melting point of asphaltum, and the cold japan coating had consequently been absorbed into the plaster. Plain uncoated lath ingot iron and cold japanned lath all looked equally rusted. All types of galvanizing lath showed rust spots, although the electro-galvanized was much the worse of the lot. The samples were submitted to Thomas Heyes & Sons, consulting chemists, for further examination. They reported that the only reason the galvanized coatings looked better than the bare lath is that iron oxide is red while zinc oxide is white. Actually there was more loss through oxidization of the zinc than of the iron.

They stated further that the application of steam started an entirely new set of chemical reactions and brought about conditions which never existed at normal temperatures. They reported after further consideration that they could devise no accelerated test which would fairly represent the action of plaster through a series of years and offered as an alternative a series of very careful quantitive analyses lasting for several months.

By this time evidence obtained from other sources had shown the superiority of the Sherardized process. It remained, however, to see whether the plaster test would develop any unknown weakness. The chemists were instructed to conduct a series of tests on cold japanned and Sherardized samples. These were coated with pure Plaster of Paris and carefully watched for five months. From time to time bits of the plaster were chipped off. The plaster film remaining in contact with the lath would then be scraped off and carefully analyzed. From the first these samples showed minute quantities of zinc oxide and metallic zinc dust. This is doubtless loose dust left on the coating from the manufacturing process. The first test showed 0.18 per cent. of such dust, but no later tests showed as much as this. No trace of zinc sulphate or iron oxide was formed in any sample, although they were watched for carefully.

The cold japanned sample showed iron oxide at the exposed edges while the edges of the Sherardized sample were clear. Otherwise the results from the cold japanned sample were as good as the other.

The chemists stated that "forever" is too long a time to be considered in a careful scientific statement. His tests showed, however, no reason to suppose that Sherardized metal lath in a gypsum plaster would not last for a number of generations.

In comparing galvanizing the quantity of protecting zinc must always be considered. Prof. Burgess found that chemically pure zinc from an electro-galvanized coating from a hot process bath and that the Sherardized alloy was fifteen times as efficient as the hot galvanizing zinc. This was for equal quantities of metal. The excess zinc or hot galvanized material is wiped off wherever this is possible. Average tests show the commercial Sherardized coating to be two to three times as efficient as a wiped hot galvanized coating but the latter requires much more zinc. Such a hot galvanized coating is also superior to the electro-galvanized coating as commercially applied, yet if the same amount of zinc were used in both processes the electro-galvanized coating would be much the superior.

Metal lath, when hot galvanized, cannot be wiped off and a very heavy coating of zinc is the consequence. Our tests would indicate the probable superiority of Sherardizing over even this very heavy coat, although the cost is only about one-eighth as great. A conclusive test of this point was made by Mr. J. H. Burn-Murdock in England. He had one half a chain hot galvanized without wiping and the other half Sherardized. Both chains were hung in sea water. When they were finally removed, the hot galvanized chain had lost all of its coating and was so badly rusted that some of the links could be broken in the fingers. The Sherardized chains had turned blue. There were occasional yellow patches which were rubbed off without showing pits or roughness below and all the links were evidently as strong as when originally immersed.

A METHOD OF SPECIFYING.

The following table, the new standard evolved by Steel and Radiation, Limited, for expanded metal, is interesting from the standpoint of expediency and convenience. The use of these tables is intended to eliminate confusion in specifying and ordering material. By stating the plate number the engineer or architect will convey the necessary data for the material desired as tabulated. For instance, if one wishes to order or specify a certain gauge material of certain cross-section and certain mesh, he can do so by using the plate number, which distinctly specifies what he requires. For example, referring to the table, if a ten-gauge material .2 sq. in. per foot width is required, the plate number, 31020, states clearly and at once what is wanted. In this instance the left-hand digit in the plate number, specifies the mesh, the next two the gauge, and the two right-hand digits designate the area per foot width. Therefore, plate number 31020 would mean a material of 3-in. mesh, of number 10 gauge with sectional area of .2 square inches per foot width.

By the old method there arose a certain amount of confusion through the architect specifying 3-in. 10-gauge + 50 per cent., or whatever percentage was required, and the con-

tractor in ordering 3-in., 10-gauge material, failing to state the percentage, the result being that he received a 3-in., 10-gauge standard material instead of what the engineer or architect specified. It was for the purpose of eliminating any such confusion that these standards were adopted. It will be readily seen that the standards are comprehensive and take in areas all the way from .05 square inches per foot width, to .6 square inches per foot width, increasing in area by .05 square inches.

#4 Gauge

Plate Number	Weight per Square Foot	Area per Foot Width	Mesh	Width of Sheet	Length of Sheet
6420	.68	.20□"	6"	8'-3"	16'-0"
6425	.85	.25□"	6"	6'-6"	16'-0"
6430	1.02	.30□"	6"	5'-6"	16'-0"
6435	1.20	.35□"	6"	5'-0"	16'-0"
6440	1.36	.40□"	6"	4'-3"	16'-0"

#6 Gauge

3630	1.02	.30□"	3	4'-9"	16'-0"
3635	1.20	.35□"	3	4'-1½"	16'-0"
* 3640	1.36	.40□"	3	7'-1½"	16'-0"
3645	1.53	.45□"	3	6'-3"	16'-0"
* 3650	1.70	.50□"	3	5'-9"	16'-0"
3655	1.87	.55□"	3	5'-3"	16'-0"
* 3660	2.04	.60□"	3	4'-9"	16'-0"

#10 Gauge

* 31015	.51	.15□"	3"	6'-6"	8'-0" to 16'-0"
* 31020	.68	.20□"	3"	5'-3"	8'-0" - 16'-0"
* 31025	.85	.25□"	3"	4'-3"	8'-0" - 16'-0"
* 31030	1.02	.30□"	3"	6'-10½"	8'-0" - 16'-0"
* 31035	1.20	.35□"	3"	5'-10½"	8'-0" - 16'-0"

#14 Gauge

31405	.17	.05□"	3"	These numbers can be cut in any widths from 6" up to 12'-0" to order.	8'-0"
31410	.34	.10□"	3"		8'-0"
31415	.51	.15□"	3"		8'-0"
21405	.17	.05□"	2"		8'-0"
21410	.34	.10□"	2"		8'-0"
21415	.51	.15□"	2"		8'-0"
21420	.68	.20□"	2"		8'-0"
21425	.85	.25□"	2"		8'-0"
21430	1.02	.30□"	2"		8'-0"
21435	1.20	.35□"	2"		8'-0"
11410	.34	.10□"	1"		8'-0"
11415	.51	.15□"	1"		8'-0"
11420	.68	.20□"	1"		8'-0"
11425	.85	.25□"	1"		8'-0"
11430	1.02	.30□"	1"		8'-0"
11435	1.20	.35□"	1"		8'-0"

#16 Gauge

31605	.17	.05□"	3"	6" to 12'-0"	8'-0" to 16'-0"
* 31610	.34	.10□"	3"	6" to 12'-0"	8'-0" - 16'-0"
21605	.17	.05□"	2"	6" to 12'-0"	8'-0" - 16'-0"
21610	.34	.10□"	2"	6" to 12'-0"	8'-0" - 16'-0"

Sizes Marked * are Standard Stock Sheets shown to have length from 8 feet to 16 feet, vary every two feet.

QUEBEC UTILITIES COMMISSION.

The path of the Quebec Utilities Commission has not been smooth. Whenever an appeal has been made thereto, prominent lawyers jump in where the small fry fear to tread and question its powers and jurisdiction. The progress of Lieut.-Col. Hibbard, K.C., the commission's president, and his colleagues, has been beset with such challenges. Some corporations have, apparently, regarded the commission as a judicial joke. The trouble seems to have been that the powers of the commission have not been properly defined, or if they have, that the jurisdiction had not been enforced. Recently the commission has been more active, and, therefore, its labors have not met with appreciation in some quarters.

There is fear that if the commissioners chanced to feel dull one morning, for instance, that their decision would wreck provincial or municipal credit. Leading business men, bankers, and brokers have decided to petition the Quebec Legislature, asking that some modifications be made in the powers granted to the Public Utilities Commission in its dealings with corporations and other interests throughout this province.

The argument is advanced that the scope of the commission in dealing with matters corporate and otherwise is too sweeping, and that it places in the hands of a small commission powers that are likely to have a more or less retractive effect on the future financial standing and credit of the Province of Quebec.

Those who are asking the government to revise the powers of the commission claim that unless this is done foreign capital will not feel secure if invested in this province. The statement is made that in order to induce capital to Canada, and particularly to this province, some guarantee must be given to outside capitalists and banking institutions that money invested here is safely guarded, not by the good wishes of two or three men, but by the laws of the country and the unanimous approval of the people, who support corporations and permit them to carry out their obligations in the usual course of business.

To some extent those contentions are weak, for the Public Utilities Commission is a creation of the Quebec Government. One might just as well advance the same arguments respecting the Dominion Railway Commission, for great consequences hinge upon the decision of the able commissioners who constitute that Commission.

In addressing the Toronto Empire Club the other week, Lieut.-Col. Hibbard, president of the Quebec Utilities Commission, stated that the function of a commission was not to be confused with that of a court of law. The operations of a commission should be effected with the minimum of law and maximum of despatch, and at the same time the commission should be invested with great power. The members of a commission should be chosen with much care, and should be men of common sense, conscience and backbone.

Having described the field and character of a commission in a general way, Col. Hibbard referred particularly to the Ontario Municipal Board. "Unlike any other commission, this board has been given a certain amount of control over municipalities," said the speaker. "How far it will work out it will be interesting to observe," said Col. Hibbard. "I have this to say, however, that the field of the commission is limited by one emphatic fact"—it should only have power to deal with the monopoly or usurpation of public property or rights, and not be called upon to interfere with private rights or contracts or representative governments of any kind.

The most welcome document just now would be a statement of the duties, jurisdiction and powers of the Quebec Commission, written in plain English.

COAL, COKE, SALT, CEMENT.

Notes of Mineral Production—Large Output of Coal—Natural Gas in Ontario.

The total coal production in Canada in 1910, comprising sales and shipments, colliery consumption and coal used in making coke, is estimated at 12,796,512 short tons, valued at $29,811,750. This is an increase of 2,295,037 tons, or nearly 22 per cent. over the production of 1909, and is the largest production of coal yet recorded for Canada.

There has been an increased production from practically all the larger collieries, while in the province of Alberta many new mines are being opened up and developed. The largest increases have been in the west—Alberta showing an increase of nearly 42 per cent. and British Columbia over 27 per cent., while Nova Scotia shows an increase of a little over 13 per cent. The total production is almost equally divided this year between the eastern and western coal fields, while Alberta contributes about 22 per cent. of the whole as compared with 10 per cent. in 1905 and 5 per cent. in 1900.

The production by provinces was approximately as follows, the figures for 1908 and 1909 being also given. With respect to Alberta, while the table below shows a production in 1910 of 2,824,929 tons, the Provincial Mine Inspector estimates the output at over 3,000,000 tons.

Province	1909.		1910.	
	Tons	Value $	Tons	Value $
Nova Scotia	5,652,089	11,354,643	6,407,091	12,871,388
British Columbia ...	2,606,127	8,144,147	3,319,368	10,373,024
Alberta	1,994,741	4,838,109	2,824,929	6,161,055
Saskatchewan	192,125	296,339	190,484	293,488
New Brunswick	49,029	98,496	53,455	106,910
Yukon Territory ...	7,364	49,502	1,185	5,925
Totals 10,501,475		24,781,236	12,796,512	29,811,750

Imports and Exports of Coal.

The exports of coal are reported by the Customs department as 2,377,049 tons, valued at $6,077,350, as compared with exports of 1,588,099 tons in 1909, valued at $4,456,342.

Imports of coal during the year include bituminous 5,966,466 tons, valued at $11,919,341; slack 1,365,281 tons, valued at $1,795,598, and anthracite 3,266,235 tons, valued at $14,735,062, or a total of 10,597,982 tons, valued at $28,450,001.

There was a greater importation of each class of coal than in 1909, when the total imports were 9,872,924 tons.

The total production of oven coke in 1910 was about 897,273 short tons, as compared with a production of 862,011 tons in 1909. The total quantity of coal charged to ovens was 1,373,793 short tons. By provinces the production was, Nova Scotia, 507,996 tons; Ontario, 25,959 tons; Alberta 121,578 tons, and British Columbia, 241,740 tons. The coke is all made from Canadian coal with the exception of that made by the Atikokan Iron Company at Port Arthur, Ontario. All of the coke produced was used in Canada with the exception of 50,922 tons sold for export to the United States, chiefly from Alberta. The quantity sold for export in 1909 was 77,407 tons.

The quantity of coke imported during the calendar year was 737,088 tons, valued at $1,908,725, as compared with imports of 661,425 tons, valued at $1,508,627 in 1909.

No returns of production of chromite have been received but 619 tons are reported as having been shipped by rail from Coleraine and Black Lake. An export of 15 tons valued at $150 is also reported by the Customs Department.

Petroleum and Natural Gas.

The production of crude petroleum shows another large falling off in 1910, the production being only 315,895 barrels, or 11,056,337 gallons, valued at $388,550, as compared with 420,755 barrels, or 14,726,433 gallons, valued at $559,604 in 1909. The average price per barrel was also less, being about $1.23 in 1910, as compared with $1.33 in 1909.

The above statistics of production have been kindly furnished by the Trade and Commerce Department, and represent the quantities of oil on which bounty was paid, the total bounty being $165,845.06 in 1910 and $220,896.50 in 1909.

The production in Ontario by districts as furnished by the Supervisor of Petroleum Bounties, was, in 1910, as follows, in barrels: Lambton, 205,456; Tilbury and Romney, 63,058; Bothwell, 36,998; Leamington, 141; Dutton, 7,752, and Onondaga (Brant County) 1,005.

The production in New Brunswick was 1,485 barrels.

In 1909 the production by districts was as follows, in barrels: Lambton, 243,123; Tilbury and Romney, 124,003; Bothwell, 38,092; Leamington, 5,929, and Dutton, 9,513. New Brunswick produced 95 barrels.

Petroleum Oils Imports.

While the production has been decreasing, the imports as might be expected have been increasing. The total imports of petroleum oils, crude and refined, in 1910 were 67,949,643 gallons, valued at $3,133,449, in addition to 1,362,235 pounds of wax and candles, valued at $80,106. The oil imports included, crude oil, 53,604,053 gallons; refined and illuminating oils, 7,656,727 gallons; lubricating oils, 3,071,257 gallons; other petroleum products, 2,607,606 gallons.

The production of natural gas was valued at $1,312,614, being $68,568 for the province of Alberta and $1,244,046 for Ontario. These values represent as closely as can be ascertained the value received by the owners of the wells for gas produced and sold or used and do not necessarily represent what the consumers have to pay for the gas, since in a number of instances the gas is re-sold once or twice by pipe line companies before reaching the consumer. In Alberta also some gas is being used by brick manufacturers for which no estimate has been obtained as to quantity or value. The total quantity of gas used in Ontario exceeded 7,036 million feet, and in Alberta over 450 million feet. A considerable flow of gas is reported from the new wells of the Maritime Oil Co., Ltd., in Albert County, New Brunswick, which it is proposed to pipe to Moncton.

Complete returns of salt production show total sales of 84,092 tons, valued at $409,624 for the salt alone. Packages used were valued at $173,446. Stock on hand at the end of the year was reported as 2,474 tons. Two hundred and eight men were employed and $112,909 paid in wages. The production was about the same as in 1909.

Imports of salt during the calendar year were: Salt in bulk and bags dutiable, 20,174 tons, valued at $97,326, and salt free of duty 108,794 tons, valued at $364,735.

Details of Production.

Complete statistics have been received from the manufacturers of cement, covering their production and shipments during the year 1910. These returns show that the total quantity of cement made during the year, including both Portland and slag cement, was 4,396,282 barrels, as compared with 4,146,708 barrels in 1909, an increase of 249,574 barrels, or 6 per cent.

The total quantity of Canadian Portland cement sold during the year was 4,753,975 barrels as compared with 4,067,709 barrels in 1909, an increase of 686,266 barrels, or 16.87 per cent. The total consumption of Portland cement in 1910, including Canadian and imported cement, and neglecting an export of Canadian cement valued at $12,914, was 5,103,285 barrels, as compared with 4,209,903 barrels in 1909, or an increase of 893,382 barrels, or 21.22 per cent.

Detailed statistics of production during the past four years are shown as follows:

	1908	1909	1910
	Barrels	Barrels	Barrels
Portland cement sold	2,665,289	4,067,709	4,753,975
Portland cement manufactured	3,495,961	4,146,708	4,396,282
Stock on hand January 1	383,349	1,098,239	1,180,231
Stock on hand December 31 ...	1,214,021	1,177,238	822,538
Value of cement sold $3,709,063		$5,345,802	$6,414,315
Wages paid $1,275,638		$1,266,128	$1,323,264
Men employed	3,029	2,498	2,085

Average Price Per Barrel.

The average price per barrel at the works in 1910 was $1.34, as compared with an average price of $1.31 reported for 1909, and $1.39 in 1908.

The imports of Portland cement into Canada during the twelve months ending December 31, 1910, were 1,222,586 cwt., valued at $468,046. This is equivalent to 349,310 barrels of 350 pounds at an average price per barrel of $1.34. The imports in 1909 were 142,194 barrels, valued at $166,669, or an average price per barrel of $1.17.

The imports from Great Britain during 1910 were 123,880 barrels valued at $130,951; from the United States 168,972 barrels valued at $253,463; from Belgium 19,027 barrels, valued at $20,618; and from other countries 37,431 barrels, valued at $63,014.

Following is an estimate of the Canadian consumption of Portland cement for the past six years:

Calendar Years	Canadian		Imported		Total
	Barrels	Per cent.	Barrels	Per cent.	Barrels
1905	1,346,548	59	918,701	41	2,285,249
1906	2,119,764	76	665,845	24	2,785,609
1907	2,436,093	78	672,630	22	3,108,723
1908	2,665,289	85	469,049	15	3,134,338
1909	4,067,709	97	142,194	3	4,209,903
1910	4,753,975	93	349,310	7	5,103,285

ORDERS OF THE RAILWAY COMMISSIONERS OF CANADA.

Copies of these orders may be secured from the Canadian Engineer for small fee.

13106—February 24—Approving location of Toronto Eastern Railway Co. through Townships of Pickering, Whitby East, Whitby and Darlington, Counties of Durham and Ontario, Ontario.

13107—February 24—Authorizing Toronto & Eastern Railway Co. to construct along Wellington, and across Scugog, Temperance, George, Liberty and Division Sts., in town of Bowmanville, Ont.

13108—February 25—Refusing application of council of municipality of Etobicoke, for the protection of Mimico Ave. crossing by G.T.R.

13109—February 25—Requiring Great Northern Railway before 1st. September, 1911, under penalty of $25 per day to construct ditch to prevent flooding of lands of Geo. Gordon, Port Kells, B.C.

13110-11—February 24—Authorizing Toronto & Eastern Railway to construct its railway along Brant St. and across Mechanic, Church, Prince, Simcoe, Mary and Division Sts., Oshawa, Ontario; also along Mary St., and across public road at station 195.59, Grand Trunk Railway Street, Ash, Perry, Brock, Byron, Centre, Kent and Euclid Sts., and public road at station 227.02 in town of Whitby, Ontario.

13112—February 24—Rescinding Order No. 9611, of February 17th, 1910.

13113—February 27—Authorizing G.T.R. to construct siding from a point on Pacific Ave., north of Liberty St., Toronto, to lands owned by Hinde & Dauch Paper Co. of Canada, Ltd., within six months from date of Order. Compensation to be paid for properties injured on Pacific Ave. to be fixed by Mr. P. H. Drayton, if any.

13114—February 24—Authorizing T. H. & B. Ry. to construct spur in city of Hamilton across Trolley St. and Stipe's Road, etc.

13115—March 1—Dismissing application of J. Ba...on Yourex, of Toronto, re tax charge for Bell Telephone at 187 College St.

13116—February 27—Approving location of new station, C.P.R., near northern corner of Weston Road and Royce Ave., town of West Toronto.

13117—February 27—Authorizing C.P.R. to construct seven tracks across Weston Road, and construct trans-ship platform, C.P.R., to pay city of Toronto $8,052 towards cost of reconstruction of bridge now being carried on by city.

13118—March 3—Authorizing C.N.Q.R. to reconstruct bridge over St. Esprit River, near St. Julienne Station, Que.

13119—February 4—Rescinding Order No. 12551, of December 17th, 1910.

13120—February 27—Authorizing city of Toronto to cross with its wires track of C.P.R. at Hanna Ave. and Liberty St.

13121—February 27—Refusing application of Powell Lumber & Door Co. for an Order rescinding Order dated October 12th, 1903, which authorized G.T.R. to construct spur across Front and John Streets, in city of Toronto, or to vary or amend said Order by directing G.T.R. only to use said spur at noon or night, or that means of free egress or ingress be provided. Applicants may speak to question of alleged damages should it desire to do so.

13122—March 7—Approving location of Kettle River Valley Railway, west and north of Midway, between Rock Creek and Westbridge, mileage 10.43 to 20.91. British Columbia Province.

13123—March 6—Authorizing city of Winnipeg to lay sewer under C.P.R. where Pembina Branch intersects Godfrey Ave.

13124—March 6—Authorizing Hydro-Electric Commission to cross with its wires wires and track of C.P.R. at Hurontario St., Cooksville, (Brampton Line), County of Peel.

13125—March 6—Authorizing city of Toronto to cross with its wires track of G.T.R. and wires of G.N.W. Tel. Co. at Wallace Ave.

13126 to 13130 Inc.—March 6—Authorizing Board of Light & Heat Commissioners of Guelph, Ont., to cross with its wires wires of Bell Telephone Company, at certain streets in city of Guelph.

13131—March 6—Authorizing South River Electric Co. to cross with wires wires and track of G.T.R. and Bell Telephone Co. at Main Street, Sundridge, Ont.

13132—March 6—Authorizing town of Swift Current, Sask., to maintain wires under C.P.R.

13133-34—March 6—Authorizing Canadian Niagara Power Co. to cross with its wires wires of Bell Telephone Co. at Oak St. and Victoria Ave., and Second Ave. and Oak St., Niagara Falls, Ont.

13135—March 6—Extending Order No. 12747, January 12th, 1911, until May 18th, 1911.

13136—March 6—Authorizing C.P.R. to reconstruct and alter location of bridge leading from premises of Peterboro Lumber Co. to highway known as George St., Peterboro, Ont.

13137—March 6—Authorizing C.P.R. to construct spur to premises of D. Ackland & Son, Ltd., in D.G.S., 14 St. John, Winnipeg, Man.

13138—March 7—Authorizing C.P.R. to reconstruct bridge at Forty-Mile Creek, No. 82.1, Laggan Subdivision, Alberta Div.

13139—March 6—Authorizing C.P.R. to construct industrial spur for city of Calgary, in Lots 31 and 32, Block 50, fronting on 9th Avenue.

13140—March 6—Approving plan of M.C.R. of interlocking appliances for protection of drawbridge over Chippewa Creek, near Montrose, Ontario.

13141—March 7—Approving revised location of C.N.O.R. in unsurveyed territory, Sudbury Mining Division, District of Algoma, mileage 65.9 to mileage 68.5 from Sudbury Jct.

13142—March 7—Authorizing C.P.R. to construct additional tracks across 15th Street East, 9th Avenue and 17th Avenue East, in city of Calgary, Alta.

13143—March 6—Approving plan for twenty-foot arch over Jones Creek, of C.N.O.R., Township of Sidney, Ontario.

13144—February 28—Authorizing G.T.P.R. to construct industrial spur to premises of J. D. Clark & Co., in Block 41, D.G.S. 28 and 29, Parish of St. Boniface, city of Winnipeg, Man.

13145—March 6—Authorizing G.T.P. Branch Lines Co. to cross highway on its Prince Albert Branch in south-west ¼ 32, Township 40, Range 26, west 2nd, Sask.

13146—February 27—Approving Standard Passenger Tariff C.R.C. No. 162, of Quebec, Montreal & Southern Railway for a maximum fare of 3c. per mile or fraction thereof.

13147—March 3—Extending time until June 1st, 1911, for completion of work authorized in Order No. 11804, of September 27th, 1910.

13148—February 27—Authorizing G.T.R. to construct spur to premises of Hagersville Contracting Co., Ltd., Township of Walpole, Ontario.

13149—March 6—Authorizing C.P.R. to divert highway on its Moose Jaw Northwesterly Branch at mileage 103.3 and 110.6, Saskatchewan.

13150—February 27—Directing G.T.R. to file new plans for subway at Brock Ave., Toronto, within 1 month, question of division of cost of work to be deferred until filing of said plans.

13151—February 22—Directing Atlantic, Quebec & Western Ry. under penalty of $25 per day after May 1st, 1911, to provide a suitable farm crossing for James Collin, of Cap d'Espoir, Gaspe, P.Q.

13152—February 27—Rescinding Order 12849, of January 30th, 1911, and authorizing C.P.R. to operate three railway sidings along and across Pardee Ave. and Liberty St., but not to connect with siding belonging to G.T.R. at Lot 30, Toronto, Ont.

13153—February 28—Refusing application of William Kerley, of St. Thomas, for an Order allowing him to sue the London & Lake Erie Railway & Trans. Co. for $1,200 for running its railway on Sundays.

13154 to 13157 Inc.—March 7—Authorizing G.T.P. Branch Lines Co. to cross certain highways on its Calgary Branch, consent granted by Province of Alberta.

13158—March 1—Dismissing application of Township of York for an Order directing G.T.R. to provide a level crossing for a new road to be opened over Old Belt Line Railway.

13159—February 18—Authorizing Cobourg Water & Electric Co. to lay water main under G.T.R. at George St., Cobourg, Ontario.

13160—March 8—Authorizing G.T.P. to divert road in north-west ¼ Section 22, Township 44, Range 6, west 4th Meridian, Alberta.

13161—March 8—Rescinding Order No. 12188, November 7th, 1910.

13162—March 7—Directing C.P.R. to remove warehouse and grant a lease at a nominal rental of $12 per year with renewal rights, and building to be carefully moved, etc. Application of Matthias Meagher, of Debec Jct., in Province of New Brunswick.

13163—March 8—Authorizing City of Fort William to maintain culvert under C.P.R. at Sprague Street.

13164—February 21—Re Order No. 12520, of December 10th, 1910, Regina Rates Granting C.N.R. and C.P.R. leave to appeal to the Supreme Court of Canada upon and subject to certain terms and conditions.

13165—March 9—Authorizing G.T.R. and N. St. C. & T. to operate trains over interlocking plant order by Order No. 9646, February 17th, 1910.

13166—March 9—Extending until June 1st, 1911, time for completion of work required by Orders 10613 and 11117, 12 and 13 May, 1910.

13167—March 7—Authorizing G.T.R. to construct spur to premises of National Acme Mfg. Co., St. Henri, city of Montreal.

13168—February 24—Confirming agreement between city of Guelph and C.P.R. in regard to protection of certain crossings, etc.

13169—February 25—Authorizing G.T.R. to construct subway at Salisbury Ave., village of Mimico., Ont., plans to be filed by April 1st, 1911.

13170—March 8—Authorizing payment of $3,000 to G.T.R. deposited by provisions of Order No. 7613, dated July 22nd, 1909.

13171—February 24—Approving plans of G.T.R. station at Guelph, Ont., with proviso that satisfactory lavatory accommodation be provided, and floor to be modern, of material other than wood.

13172 to 13184 Inc.—March 9—Authorizing city of Toronto to cross with its wires wires of Bell Telephone Company at various streets and avenues in the city.

13185—February 27—Application J. & J. Taylor, Safe Works, Toronto, Board Orders that note to item 35, page 47, Canadian Classification No. 15, be struck out, and that words "Safes of 1,000 pounds each or over" be struck from the list of exceptions to the tariffs of cartage charges of railway companies.

13186—March 7—Approving plans of proposed platforms and train shed for Central Union Passenger Station at Ottawa.

13187-88—March 9—Authorizing G.T.P. Branch Lines Co. to cross highways in Province of Saskatchewan, approved by Saskatchewan Government.

13189—March 10—Approving C.N.O.R. location through County of Lanark, Ont., from mileage 29 to 37.8.

13190—March 10—Approving plans of C.N.O.R., Shannonville Station, Ont.

13191—February 27—Authorizing G.T.R. to take certain lands in neighborhood of Jamieson Ave. and Empress Crescent, Toronto, Ont., to enable G.T.R. to comply with terms of Orders 8487, and 10196, dated 15th October and 8th December, 1909.

13192—March 10—Authorizing city of Winnipeg to lay water main under C.P.R. at Portage Avenue, at crossing of Pembina Branch.

13193—March 9—Authorizing C.N.R. to cross certain highways shown on location plan approved by Order 8050, dated 9th September, 1909, highways being situated in the Province of Saskatchewan, and approved by Government of that Province.

13194—March 10—Authorizing Hydro-Electric Commission to cross with its Port Credit-Brampton lines wires of Bell Telephone Co.

13195—March 10—Extending until August 1st, 1911, time for completion of installation of interlocking plant at Dana, Sask., by G.T.P. to cross C.N.R., authorized by Order No. 11307, of July 26th, 1910.

13196—March 9—Directing that work authorized by Order 12066, of October 22nd, 1910, being deviation of highway by G.T.P., be completed by 1st May, 1911, under penalty of $25 per day. Complaint of Local Improvement District, 23-C-4, Greenshields, Sask.

13197—March 7—Authorizing C.N.Q.R. to cross Notre Dame St. and over Montreal Street Railway by overhead structure, and join tracks of Montreal Harbor Commission in city of Montreal.

13198—March 13—Authorizing C.N.R. to cross certain highways shown on location plan approved by Order No. 8590, dated November 5th, 1909 highways being situated in the Province of Saskatchewan, and approved by Government of that Province.

13199—March 11—Authorizing Province of British Columbia to cross with highway C.P.R. called the B.C. Southern Railway, being 616 feet in a northerly direction from iron post No. 28, near Hosmer Station, B.C.

13200—March 11—Authorizing Georgian Bay & Seaboard (C.P.R.) to cross Trespass Road in Lot No. 6, Concession 11, Township of Thorah, Ont., by means of a subway.

13201—March 13—Authorizing G.T.P. Branch Lines Co. to cross highway on its Prince Albert Branch in north-west ¼ of 29-37-26, west 2nd Meridian, Saskatchewan.

13202-03-04—March 11—Authorizing C.N.O.R. to cross public roads in Township of Nepean, County of Carleton, Ontario.

13205—March 10—Authorizing C.P.R. to construct spur to premises of Virden Brick & Tile Co., near Virden, Manitoba.

13206—March 10—Authorizing the Dominion Natural Gas Co., Ltd., to lay gas main under C.P.R. (Tillsonburg & Port Burwell Branch), on Lot 17, 3rd Concession Township of Bayham, County of Elgin, Ontario.

13207—March 10—Authorizing city of Toronto to cross with its wires wires of Bell Telephone Company at Wolfrey and Bowden Streets.

13208—February 24—Authorizing T. H. & B. Railway to construct spur to premises of Canadian Westinghouse Co., Ltd., and across certain streets and lanes in city of Hamilton, Ont.

13209—March 13—Authorizing C.N.R. to cross highways in Province of Alberta with consent of Provincial Government.

13210—February 25—Directing G.T.R. to file plans for subway at Church St., Mimico, Ont., by 1st April, 1911.

13211—March 13—Authorizing C.N.Q.R. and N.T.R. to operate trains over crossing authorized by Order 1945, November 12th, 1906, without being brought to a stop.

13212—March 13—Approving revised location of C.P.R., Regina, Saskatoon and North Saskatchewan Branch from mileage 77.95 (from Regina) to a point on the north boundary of Section 33, Township 26, Range 25, west 2nd Meridian, to mileage 95.8, and from mileage 95.8 to mileage 132.69, a point on the Pheasant Hills Branch, in Section 1, Township 35, Range 28, west 2nd Meridian.

13213—March 13—Authorizing C.P.R. to use and operate bridge No. 57.8, Teeswater Branch, and bridge 84.1, Toronto Section.

13214—March 13—Approving location of C.N.O.R. through unsurveyed territory, District of Algoma, mileage 240 to 560, from Sudbury Junction.

13215—February 27—Directing G.T.R. to restore rates on gas-house coke from Buffalo, (River Street), Black Rock and Suspension Bridge, New York, to the Ontario points shown in its special tariff C.R.C., No. E. 2195, which were in effect the 11th of December, 1910, not later than 24th April, 1911, application, Thos. Miles Sons, Ltd., Hamilton, Ont.

13216—March 13—Dismissing application of Kelly & Close, Port Arthur, Ont., re minimum rates on carloads of logs and piling alleged to be excessive as compared with the minimum rates charged on carloads of lumber.

13217—March 13—Authorizing village of North Hatley, P.Q., to construct highway crossing over B. & M. Ry.; question of cost of protection reserved for further consideration.

13218—March 14—Authorizing G.T.P. Branch Lines Co. to cross highways on its Calgary Branch between mileage 50 and 99, Alberta.

13219—March 14—Authorizing G.T.P. revised location of its line from Section 8, Township 45, Range 2, to Section 21, Township 45, Range 3, west 6th, mileage 119.53 to mileage 124.94, Alberta.

13220—March 13—Authorizing Province of British Columbia to cross C.P.R. with a highway about four miles from Michael Station, B.C.

13221—March 11—Authorizing C.P.R. to construct industrial spur to premises of R. D. Lindsey, across Hawks Ave., and Lots 21 to 32, Block 44, D. L., 141, city of Vancouver, B.C.

13222—March 13—Authorizing C.P.R. to open for carriage of traffic without limitation as to speed its Moose Jaw Branch from mileage 14.5 to 118.75.

13223—March 13—Authorizing Trenton Electric & Water Co. Ltd., to maintain its wires across G.T.R. near city of Belleville, County of Hastings, Ontario.

13224—March 14—Dismissing application of Canadian Piano and Organ Manufacturers' Association respecting classification of musical instruments.

13225—March 13—Dismissing application of H. E. Ledoux Co., Winnipeg, for carload classification on shipments of cigars.

13226—March 14—Authorizing city of Lethbridge, Alta., to construct overhead bridge on line of Coutts St., produced north of Baroness Road, across yards of C.P.R.

13227—March 14—Authorizing G.T.P. Railway to divert road in northeast ¼ of Section 8, Township 15, Range 3, west 3rd Meridian, District of East Saskatchewan, Province of Saskatchewan.

13228—January 17—Directing that Canadian Classification No. 15 be amended to provide a minimum carload weight of not more than 24,000 pounds for flaked or cooked cereals. Application of Battle Creek Toasted Corn Flake Co., London, Ont.

ENGINEERING SOCIETIES.

CANADIAN SOCIETY OF CIVIL ENGINEERS.—413 Dorchester Street West, Montreal. President, C. H. Rust; Secretary, Professor C. H. McLeod.

QUEBEC BRANCH—
Chairman, P. E. Parent; Secretary, S. S. Oliver. Meetings held twice a month at Room 40, City Hall.

TORONTO BRANCH—
96 King Street West, Toronto. Chairman, H. E. T. Haultain; Secretary, A. C. D. Blanchard, Engineering Building, Toronto University, Toronto. Meets last Thursday of the month.

MANITOBA BRANCH—
Secretary, E. Brydone Jack. Meets first and third Fridays of each month, October to April, in University of Manitoba, Winnipeg.

VANCOUVER BRANCH—
Chairman, Geo. H. Webster; Secretary, H. K. Dutcher, 40-41 Flack Block, Vancouver. Meets in Engineering Department, University

OTTAWA BRANCH—
Chairman, A. A. Dion, Ottawa; Secretary, H. Victor Brayley, N. T. Ry., Cory Bldg.

MUNICIPAL ASSOCIATIONS.

ONTARIO MUNICIPAL ASSOCIATION.—President, Mr. George Geddes, Mayor, St. Thomas, Ont.; Secretary-Treasurer, Mr. K. W. McKay, County Clerk, St. Thomas, Ontario.

UNION OF ALBERTA MUNICIPALITIES.—President, H. H. Gaetz, Red Deer, Alta.; Secretary-Treasurer, John T. Hall, Medicine Hat, Alta.

THE UNION OF CANADIAN MUNICIPALITIES.—President, W. Sanford Evans, Mayor of Winnipeg; Hon. Secretary-Treasurer, W. D. Lighthall, K.C., ex-Mayor of Westmount.

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UNION OF NOVA SCOTIA MUNICIPALITIES.—President, Mr. A. E. McMahon, Warden, King's Co., Kentville, N.S.; Secretary, A. Roberts, Bridgewater, N.S.

UNION OF SASKATCHEWAN MUNICIPALITIES.—President, Mayor Hopkins, Saskatoon; Secretary, Mr. J. Kelso Hunter, City Clerk, Regina, Sask.

CANADIAN TECHNICAL SOCIETIES.

ALBERTA ASSOCIATION OF ARCHITECTS.—President, G. M. Lang; Secretary, L. M. Gotch, Calgary, Alta.

ASSOCIATION OF SASKATCHEWAN LAND SURVEYORS.—President, J. L. R. Parsons, Regina; Secretary-Treasurer, M. B. Weeks, Regina

ASTRONOMICAL SOCIETY OF SASKATCHEWAN.—President, N. McMurchy; Secretary, Mr. McClung, Regina.

BRITISH COLUMBIA LAND SURVEYORS' ASSOCIATION.—President, W. S. Drewry, Nelson, B.C.; Secretary-Treasurer, S. A. Roberts, Victoria, B.C.

BUILDERS, CANADIAN NATIONAL ASSOCIATION.—President, E. T. Nesbitt; Secretary-Treasurer, J. H. Lauer, Montreal, Que.

CANADIAN ASSOCIATION OF STATIONARY ENGINEERS.—President, Charles Kelly, Chatham, Ont.; Secretary, W. A. Crockett, Mount Hamilton, Ont.

CANADIAN CEMENT AND CONCRETE ASSOCIATION.—President, Peter Gillespie, Toronto, Ont.; Secretary-Treasurer, Wm. Snaith, 57 Adelaide Street, Toronto, Ont.

CANADIAN CLAY PRODUCTS' MANUFACTURERS' ASSOCIATION.—President, W. McCredie; Secretary-Treasurer, D. O. McKinnon, Toronto.

CANADIAN ELECTRICAL ASSOCIATION.—President, N. W. Ryerson, Niagara Falls; Secretary, T. S. Young, Canadian Electrical News, Toronto

CANADIAN FORESTRY ASSOCIATION.—President, Thomas Southworth, Toronto; Secretary, James Lawler, 11 Queen's Park, Toronto.

CANADIAN GAS ASSOCIATION.—President, Arthur Hewitt, General Manager Consumers' Gas Company, Toronto; J. Keillor, Secretary-Treasurer, Hamilton, Ont.

CANADIAN GAS EXHIBITORS' ASSOCIATION.—Secretary-Treasurer, A. W. Smith, 52 Adelaide Street East, Toronto.

CANADIAN INDEPENDENT TELEPHONE ASSOCIATION.—President, W. Doan, M.D., Harrietsville, Ont.; Secretary-Treasurer, Francis Dagger, 11 Richmond Street West, Toronto.

CANADIAN MINING INSTITUTE.—Windsor Hotel, Montreal. President, Dr. Frank D. Adams, McGill University, Montreal; Secretary, H. Mortimer-Lamb, Montreal.

CANADIAN RAILWAY CLUB.—President, H. H. Vaughan; Secretary, James Powell, P.O. Box 7, St Lambert, near Montreal, P.Q.

CANADIAN STREET RAILWAY ASSOCIATION.—President, D. McDonald, Manager, Montreal Street Railway; Secretary, Acton Burrows, 157 Bay Street, Toronto.

CANADIAN SOCIETY OF FOREST ENGINEERS.—President, Dr. Fernow, Toronto; Secretary, J. W. H. Jacombe, Ottawa.

CENTRAL RAILWAY AND ENGINEERING CLUB.—Toronto, President, J. Duguid; Secretary, C. L. Worth, 409 Union Station. Meets third Tuesday each month except June, July, August.

DOMINION LAND SURVEYORS.—President, Thos. Fawcett, Niagara Falls; Secretary-Treasurer, A. W. Ashton, Ottawa.

EDMONTON ENGINEERING SOCIETY.—President, J. Chalmers; Secretary, B. F. Mitchell, City Engineer's Office, Edmonton, Alberta.

ENGINEERING SOCIETY, TORONTO UNIVERSITY.—President, A. D. Campbell; Corresponding Secretary, A. H. Munroe.

ENGINEER'S CLUB OF TORONTO.—96 King Street West. President, Killaly Gamble; Secretary, R. B. Wolsey. Meeting every Thursday evening during the fall and winter months.

INSTITUTION OF ELECTRICAL ENGINEERS.—President, Dr. G. Kapp; Secretary, P. F. Rowell, Victoria Embankment, London, W.C.; Hon. Secretary-Treasurer for Canada, Lawford Grant, Power Building, Montreal, Que.

INSTITUTION OF MINING AND METALLURGY.—President, Edgar Taylor; Secretary, C. McDermid, London, England. Canadian Members of Council:—Prof. F. D. Adams, J. B. Porter, H. E. T. Haultain, and W. H. Miller, and Messrs. W. H. Trewartha-James and J. B. Tyrrell.

MANITOBA LAND SURVEYORS.—President, George McPhillips; Secretary-Treasurer, C. G. Chataway, Winnipeg, Man.

NOVA SCOTIA MINING SOCIETY.—President, T. J. Brown, Sydney Mines, C.B.; Secretary, A. A. Hayward

NOVA SCOTIA SOCIETY OF ENGINEERS, HALIFAX.—President, S. Fenn; Secretary, J. Lorne Allan, 14 Victoria Road, Halifax, N.S.

ONTARIO PROVINCIAL GOOD ROADS ASSOCIATION.—President, W. H. Pugsley, Richmond Hill, Ont.; Secretary, J. E. Farewell, Whitby.

ONTARIO LAND SURVEYORS' ASSOCIATION.—President, J. Whitson; Secretary, Killaly Gamble, 703 Temple Building, Toronto.

ROYAL ARCHITECTURAL INSTITUTE OF CANADA.—President, F. S. Baker, F.R.I.B.A., Toronto, Ont.; Hon. Secretary, Alcide Chausse, No. 5 Beaver Hall Square, Montreal, Que.

ROYAL ASTRONOMICAL SOCIETY.—President, Prof. Alfred T. de Lury, Toronto; Secretary, J. R. Collins, Toronto.

UNDERGRADUATE SOCIETY OF APPLIED SCIENCE, McGILL UNIVERSITY.—President, H. P. Ray; Secretary, J. P. McRae.

WESTERN CANADA IRRIGATION ASSOCIATION.—President, Wm. Pierce, Calgary; Secretary-Treasurer, John T. Hall, Brandon, Man.

WESTERN CANADA RAILWAY CLUB.—President, Grant Hall; Secretary, W. H. Rosevear, 109 Chestnut Street, Winnipeg, Man. Second Monday, except June, July and August, at Winnipeg.

CONSTRUCTION NEWS SECTION

Readers will confer a great favor by sending in news items from time to time. We are particularly eager to get notes regarding engineering work in hand and projected, contracts awarded, changes in staffs, etc. Printed forms for the purpose will be furnished upon application.

TENDERS PENDING.

In addition to those in this issue.

Further information may be had from the issues of The Canadian Engineer referred to.

Place of Work.	Tenders Close.	Issue of.	Page
Brantford, Ont., pavement	Mar. 30.	Mar. 16.	66
Brantford, Ont., four bridges	Apr. 3.	Mar. 16.	449
Calgary, Alta., chalets	Apr. 1.	Mar. 16.	450
Guelph, Ont., pavement	Mar. 30.	Mar. 9.	66
Kingston, Ont., steel bridge	Apr. 5.	Mar. 16.	66
Leeville, Sask., schoolhouse	Apr. 15.	Mar. 9.	420
Minnitonas P.O., Man., bridge and piers	Apr. 15.	Feb. 23.	70
Moose Jaw, Sask., sewer and water extensions	Apr. 10.	Mar. 2.	70
Moose Jaw, Sask., main drainage works	Apr. 10.	Feb. 23.	66
Oak River, Man., debentures for hall	Mar. 29.	Feb. 23.	54
Ottawa, Ont., concrete bridge	Mar. 31.	Mar. 2.	390
Ottawa, Ont., hot water heating apparatus	Apr. 4.	Mar. 16.	449
Ottawa, Ont., public building at Portage la Prairie	Apr. 3.	Mar. 16.	449
Ottawa, Ont., armoury	Apr. 5.	Mar. 16.	449
Ottawa, Ont., wharf	Apr. 4.	Mar. 9.	419
Prince Albert, Sask., intercepting sewer	Apr. 15.	Mar. 16.	66
Rouleau, Sask., mains, valves, etc.	Apr. 4.	Mar. 9.	64
Saskatoon, Sask., intercepting sewer	Apr. 14.	Mar. 9.	66
Brampton, Ont., pavement	Apr. 17.	Mar. 23.	66
Calgary, Alta., pipe line	Apr. 8.	Mar. 23.	482
Calgary, Alta., wells	Mar. 31.	Mar. 23.	482
Goderich, Ont., municipal bldg.	Apr. 15.	Mar. 23.	482
Kingston, Ont., work on chemistry building	Apr. 1.	Mar. 23.	482
Montreal, Que., ferry wharf and approaches	Mar. 29.	Mar. 23.	481
Moose Jaw, Sask., car barns and power house	Apr. 1.	Mar. 23.	482
North Toronto, Ont., cross arms, etc.	Mar. 30.	Mar. 23.	73
Ottawa, Ont., old Custom Bldgs.	Apr. 8.	Mar. 23.	481
Ottawa, Ont., sale of fire engine and hose wagon	Apr. 10.	Mar. 23.	481
Ottawa, Ont., meters, etc.	Apr. 6.	Mar. 23.	481
Ottawa, Ont., plaza	Apr. 3.	Mar. 23.	482
Ottawa, Ont., public building	Apr. 10.	Mar. 23.	482
Saskatoon, Sask., cement sidewalks	Apr. 7.	Mar. 23.	73
Saskatoon, Sask., water filtration plant	Mar. 31.	Mar. 9.	66
Saskatoon, Sask., franchise for street railway	Apr. 3.	Mar. 2.	70
Swan River, Man., steel bridge	Apr. 15.	Feb. 16.	66
St. John, N.B., excavation, etc.	Mar. 29.	Mar. 23.	481
Saskatoon, Sask., store	Mar. 31.	Mar. 23.	482
Toronto, Ont., right to cut pulpwood	Apr. 10.	Jan. 19.	203
Toronto, Ont., rails and ti s	Apr. 4.	Mar. 2.	64
Toronto, Ont., integrating Wattmeters	Mar. 28.	Mar. 23.	73
Toronto, Ont., copper wire	Mar. 28.	Mar. 23.	66
Toronto, Ont., club house	Apr. 1.	Mar. 23.	482
Toronto, Ont., sewers	Mar. 28.	Mar. 23.	482
Victoria, B.C., school building	Mar. 29.	Mar. 16.	450
Victoria, B.C., court house	Apr. 3.	Mar. 23.	482
Winnipeg, Man., cast iron pipe	Mar. 29	Mar. 9.	420
Welland, Ont., waterworks pumps	Apr. 3.	Mar. 16.	66
Winnipeg, Man., frames and covers	Apr. 4.	Mar. 16.	450
Winnipeg, Man., pumping machinery	Apr. 5.	Mar. 23.	66
Westmount, Que., road supplies.	Mar. 30.	Mar. 23.	481
Winnipeg, Man., laying of water pipe	Mar. 29.	Mar. 23.	482
Winnipeg, Man., ornamental lighting standards	May 1.	Mar. 23.	482
Winnipeg, Man., conduit	Apr. 19.	Mar. 23.	482
Winnipeg, Man., school bldg.	Mar. 30.	Mar. 23.	482

TENDERS.

Montreal, Que.—Tenders will be received until April 4th, 1911, for the following: Ballast stone, concrete stone, Portland cement, rails, sand, steel bars, yellow pine timber. Specifications and forms of tender may be had upon application to Mr. F. W. Cowie, Chief Engineer. David Seath, Secretary, Montreal.

Brockville, Ont.—Tenders will be received until April 17th, 1911, for the construction of a concrete floor on the South Lake Bridge across the Gananoque River in the Township of Leeds. E. R. Blackwell, County Engineer, Court House, Brockville, Ont.

Ottawa, Ont.—Tenders will be received until April 12th, 1911, for the construction of a public building at Wolfville, N.S. Plans and specifications and form of contract can be seen and forms of tender obtained on application at the office of Mr. C. E. W. Dodwell, District Engineer, Custom House, Halifax, N.S., at the post office, Wolfville, N.S., at the office of R. C. Desrochers, Secretary, Department of Public Works, Ottawa.

Burnaby, Ont.—Tenders will be called for up to May 31st, 1911, by the Municipality of Burnaby, for the delivery of 66,500 feet of water main pipe, ranging from 18 inches to 34 inches in diameter.

Toronto, Ont.—Tenders will be received addressed to the Chairman of the Board of Control, up to noon Tuesday, April 4th, 1911:

(A) Asphalt pavement on five streets.
(B) Bitulithic pavements on two streets.
(C) Asphalt block track allowance on one street.
(D) Granite block track allowance, two streets.
(E) Scoria block track allowance, two streets.
(F) Treated wood block track allowance, one street.
(G) Concrete curb, six streets.
(H) Concrete walk, twenty streets.

G. R. Geary, Mayor; C. H. Rust, City Engineer, Toronto.

Toronto, Ont.—Tenders will be received until April 5th, 1911, for the various trades required in the erection of the West End Building, corner of College St. and Dovercourt Road. Burke, Horwood & White, Architects, 28 Toronto St., Toronto

Toronto, Ont.—Tenders will be received until April 1st, 1911, for the erection of the North Broadview Presbyterian Church. Symons & Rae, Architects, 25 Toronto St., Toronto.

Toronto, Ont.—Tenders will be received until March 31st, 1911, for the several trades required in the erection of new school on Caledonia Road. Plans and specifications may be seen at the office of the Board, City Hall. W. C. Wilkinson, Sec.-Treas.; W. W. Hodgson, Chairman of Committee, Board of Education, Toronto.

Toronto, Ont.—Tenders will be received until April 17th, 1911, for concrete paving, etc., hardware, and stable fit-

tings required in connection with the East Toronto fire hall. Plans and specifications may be seen at the office of the city architect, City Hall, Toronto. G. R. Geary, Mayor, Chairman Board of Control, City Hall, Toronto.

Toronto, Ont.—The time for receiving tenders for wiring exhibition buildings is extended until noon, Tuesday, April 11th, 1911. G. R. Geary (Mayor), Chairman, Board of Control, City Hall, Toronto.

Oakville, Ont.—Tenders will be received until April 5th, 1911, for the following works:—A, labor for pipe-laying; D, furnishing cast-iron pipes and specials; E, furnish fire hydrants, valves, etc. Plans and specifications may be seen at the office of the Engineers', 204 Mail Building, Toronto. C. G. Marlott, Chairman; Geo. Hilmer, Mayor; P. A. Bath, Commissioner, Board of Water and Light Commissioners, Oakville. Chipman & Power, Engineers, Toronto.

Welland, Ont.—Tenders will be received until the 6th of April, 1911, for the supply and delivery of various articles of timber, hardware, castings, oils, etc., for use on the Welland Canal and its branches, for the year 1911-1912. L. K. Jones, Sec. Dept. of Railways and Canals, Ottawa.

Guelph, Ont.—Tenders will be received until March 30th, 1911, for the construction of the cement sidewalks required to be laid by the city during the current year. Also for the supply of sewer pipe and Portland cement required this season. Further information to be had at City Engineer's Office. Jas. Hutcheon, City Engineer, Guelph.

London, Ont.—Tenders will be received until April 3rd, 1911, for new watering carts and repairs to the old carts. Specifications and information regarding same may be obtained at the office of the city engineer. Hubert Asphlant, Chairman No. 3 Committee, Geo. W. Wright, Acting City Engineer, London, Ont.

Odessa, Ont.—Tenders will be received until April 15th, 1911, for any or all parts in the erection of a brick Methodist Church in the village of Odessa, Ont. Plans and specifications may be seen at the office of J. C. Fraser, Odessa. J. C. Bell, Chairman, J. S. Fraser, Secretary of building committee.

Fort William, Ont.—Tenders will be received until April 5th, 1911, for all labor and certain material necessary, in connection with the laying of 18-in., 14-in., 12-in., 8-in. water mains and making and installing the necessary connections, valves, hydrants and manholes. John Wilson, City Engineer.

Winnipeg, Man.—Tenders will be received until April 10th, 1911, for the construction of boiler shops, Winnipeg, and transfer table, Winnipeg shops. Plans and specifications can be seen at the office of Frank Lee, Division Engineer, Winnipeg.

Winnipeg, Man.—Tenders will be received until April 5th, 1911, for supply of 50 h.p. gasoline or steam traction engine. Specification and form of tender may be obtained at the office of the city engineer, 223 James Avenue. M. Peterson, Secretary, Board of Control Office, Winnipeg.

Winnipeg, Man.—Tenders will be received until April 4th, 1911, for the supply of from 25,000 to 30,000 barrels of cement, to be delivered f.o.b. cars city yards. Specifications and form of tender may be obtained at the office of the City Engineer, 223 James Avenue. M. Peterson, Secretary, Board of Control Office, Winnipeg.

Winnipeg, Man.—Tenders will be received until April 7th, 1911, for the erection and completion (except plumbing, heating and lighting) of a sanitorium building for the Manitou Sanitorium Company, on Lakeview Beach, Little Manitou Lake, Sask. Herbert B. Rugh, Architect, Union Bank Building, Winnipeg.

Winnipeg, Man.—Tenders will be received until April 5th, 1911, for the construction of freight office, Fort William. Plans and specifications can be seen at the office of Frank Lee, Division Engineer, Winnipeg.

Winnipeg, Man.—Tenders will be received at the office of the Winnipeg Public School Board, up to 5 p.m., on Tuesday, April 11th, for the erection of a twelve class room addition to the Strathcona School, on McGregor and Burrows Streets. For plans and specifications apply to J. B. Mitchell, Comm. of Buildings, School Board Office. R. H. Smith, Secretary-treasurer, W.P.S.B., Winnipeg.

Winnipeg, Man.—Tenders will be received until April 3rd, 1911, for the supply of labor and materials required for the erection of two (2) patrol houses and stables, near Tyndall, Man., and Lac du Bonnet, Man., according to specifications, which may be obtained at the office of Smith, Kerry & Chace, Power Engineers, Carnegie Library Building, Winnipeg. M. Peterson, Secretary, Board of Control Office, Winnipeg.

Saskatoon, Sask.—Tenders are being called for a six-storey departmental store, which will be erected on 21st street on the west side of the C.N.R., at a cost of $200,000. It will be known as the Taylor department store and the project is being backed by eastern promoters. The property will be 125 feet square and the two lower stores will be practically glass.

Regina, Sask.—Tenders will be received by the City Commissioners until April 15th, 1911, for the construction of approximately seven miles of street railway track laying, consisting of ordinary construction and track laying in pavement. L. A. Thornton, City Engineer, Regina.

Regina, Sask.—Tenders will be received until April 17th, 1911, for the supply of 46,000 square feet of galvanized iron sheeting for the sewage disposal works. A. J. McPherson, city commissioner, Regina.

Regina, Sask.—Tenders will be received until April 8th, 1911, for the erection of a large college building in Regina, Sask. Plans and specifications can be seen at the office of J. H. Oliver, 406 Darke Block, Regina, Sask., also the Builders' Exchange, Winnipeg, and office of Brown & Vallance, Architects, Canada Life Building, Montreal. J. H. Oliver, Acting Bursar.

Coleman, Alta.—Tenders will be received until April 1st, for the erection of one concrete bridge across McGillivray Creek, West Coleman, also one concrete culvert across Nez Perce and Fourth Street, Coleman. Robt. Holmes, Chairman of Works Committee, Coleman.

Edmonton, Alta.—Separate sealed tenders registered and endorsed "Tenders for Court House (a), (b), or (c)," will be received until April 8th, 1911, for the supply and construction of: (a) Plumbing, sheet metal, roofing and heating. (b) Electric conduit wiring. (c) Tile and marble, required in connection with the completion of the Court House, Edmonton. Plans and specifications can be had at the engineer's office, new Parliament buildings, Edmonton, or at the branch office of the Department of Public Works, Calgary. John Stocks, Deputy-Minister of Public Works, Edmonton.

Vancouver, B.C.—Tenders will be received until April 20th, 1911, for one 85-foot ladder truck, and one chemical engine for the Vancouver Fire Department. Specifications may be seen at the Fire Chief's Office, No. 2 Fire Hall, Seymour St. Wm. McQueen, City Clerk, City Hall, Vancouver.

Victoria, B.C.—Tenders will be received until the 10th day of April, 1911, for the erection and completion of a large one-room school building at Hammond in the Dewdney Electoral District. Plans and specifications may be seen on and after the 17th of March, 1911, at the offices of E. W. Beckett, Secretary of School Board, Haney, B.C., the Government Agent, New Westminster, and F. C. Gamble, Public Works Engineer, Dept. of Public Works. Victoria.

CONTRACTS AWARDED.

Sydney, N.S.—The wreck of the Quebec Bridge will be brought to Sydney and will be manufactured into various forms by the Dominion Iron and Steel Corporation. The Steel Company has purchased from the Koenig wrecking firm which bought contorted mass from the Government, the entire right to the ownership and removal of the bridge wreckage. When the bridge collapsed 12,000 tons of steel had been put up. Some of this cannot be secured because it is lying beneath water.

Montreal, Que.—The contract for the building of the first section of the Quebec and Saguenay Railway extending from just below Ste. Anne de Beaupre to Murray, a distance of 56 miles, has been awarded to Mr. M. J. O'Brien, railroad contractor. The contract will involve the expenditure of nearly two million dollars.

Smith's Falls, Ont.—The contract for double tracking the C.P.R. between Smith's Falls and Bathurst has been awarded to Messrs. Jones and Girouard, of Ottawa.

Brantford, Ont.—Messrs. Schultz Bros., of Brantford, were the successful tenderers for the new post office in Tillsonburg.

Toronto, Ont.—The Grand Trunk Railway has awarded the Sydney, C.B., Mills contract for 40,000 tons of steel rails, to replace 260 miles of tracks in Western Ontario. The contract amounts to more than one million dollars.

Burnaby, Ont.—The Municipality of Burnaby has awarded the contract for the supply of eighty Ludlow hydrants at a total price of $3,333.67, to Messrs. Crane & Company. Evans, Coleman & Evans secured the contract for eighty tons of pig lead at $3.70 per 100 lbs.

Welland, Ont.—The Board of directors of the Page-Hersey Iron Tube and Lead Company, have awarded the contract for their new plant at Welland to Messrs. David Dick & Sons, Limited, of Welland. The price of contract is about $150,000.

Welland, Ont.—Messrs. David Dick & Sons, Ltd., Welland, have been awarded the contract for a $25,000 building for the Canadian Automatic Transportation Company, Ltd.

Welland, Ont.—The contract for the new building for the Welland Club has been awarded to Mr. McKissock, of Toronto. Work has begun on the contract and the building is to be done by June 1st. The building, work on grounds, etc., will cost about $20,000.

Winnipeg, Man.—Messrs. James McDonald & Company have been awarded the contract for 100 miles of railway grading and ballasting of the Alberta Central Railway, 64 miles west of Red Deer and 36 east. The price is $25,000 a mile, a total of $2,500,000.

Winnipeg, Man.—The Grand Trunk Pacific awarded contracts for $17,000,000 worth of work in the West. There will be 265 miles of main line track laid, as well as 200 miles further grading on branch lines.

Winnipeg, Man.—In connection with the Souris waterworks, the contract for building the power house was let to Messrs. Kitchen Bros., of Souris, at $3,200. Mr. M. S. Holmes, of Portage la Prairie, was awarded the contract for all work in connection with the laying of the water and sewer pipes, at a price amounting to about $39,000.

Winnipeg, Man.—The board of control decided to accept the tender of the Canadian Mineral Rubber Company, of Toronto, for the supply of from 1,000 to 1,500 tons of asphalt, as required, during 1911, at $25 per ton. The same company had the asphalt contract last year. Shipments are to commence as soon as navigation opens. Dunn Bros. are local agents for the company. The question of duty was raised for the first time this year. Asphalt is now on the free list, but it has been hinted that a different reading of the tariff schedule may be enforced, putting a duty on asphalt into Canada. The contractors, however, have undertaken the responsibility on this score, so that the price will be $25 net per ton of 2,000 pounds, delivered in Winnipeg.

Edmonton, Alta.—The contract for the sixty miles grading on C.N.R. main line, west from Entwistle to Wolf Creek, has been awarded to D. F. McArthur.

Edmonton, Alta.—The different contracts that have been let by Messrs. Phelan & Shirley who were awarded the contract for the building of the Grand Trunk branch line southwest from Biggar are as follows: James Fitzgerald, one mile to the 21st mile, inclusive. Biggs & Clement, 22nd mile to the 33rd mile, inclusive. James A. Foy, 36th mile to the 39th mile inclusive.

Strathcona, Alta.—The tenders for the supply of electrical machinery to be installed in the municipal power plant that were accepted are: 600 k.w. generator, 80 per cent. power factor, 150 r.p.m., to Chapman and Walker, Toronto, for $10,160,.00. Burnham regulator for generator, to Gorman, Glancey & Grindley, Edmonton, for $750.00. Engine to run generator, 80 per cent., Goldie & McCulloch, Galt, $12,900.00. Smoke stacks, fans, connections, etc., 2 feed pumps, to Canada Foundry Company, $1,167.00.

Vancouver, B.C.—The contracts for the building of the new pavilion for Stanley Park and also for the new bandstand, were let to W. G. Patterson, of Cedar Cottage. The contract for the building of the pavilion was let for the sum of $12,250.00 and the bandstand was for $1,485.

Victoria, B.C.—The contract for the paving with asphalt of View Street and Fort Street, between Douglas Street and Cook Street, has been awarded to the Worswick Paving Company.

Howe Sound B.C.—The Rainy River Gravel Co., of Howe Sound, B.C., has awarded contracts for erection of bunkers, 2,000 cubic yards capacity, to Egdell & Dixon, Vancouver, and for gravel washing plant, rock crushers, etc., to the Jenckes Machine Company, Sherbrooke, P.Q. Cartwright, Matheson & Company are the consulting engineers.

RAILWAYS—STEAM AND ELECTRIC.

Montreal, Que.—The dates for the opening of the Canadian Pacific Railway's summer hotels are as follows: Algonquin Hotel, June 20th; the Inn, July 1st; Banff Springs Hotel, May 15th; Chateau Lake Louise, June 10th; Emerald Lake Chalet, June 15th; Glacier House, May 1st.

Montreal, Que.—The Canadian Pacific Railway will shortly call for tenders for a concrete bridge about 500 feet long at Graham's Station, Ont.

Welland, Ont.—Messrs. Laughlin who have just secured a charter for an electric railway through Welland town are arranging to go to work at once, and expect to have the line completed in about four months.

Toronto, Ont.—The Grand Trunk Railway has ordered 40,000 tons of steel rails from the Sydney, C.B., mills, to replace 260 miles of its tracks in western Ontario. The order amounts to more than $1,000,000. The company will ship 209 miles of displaced track to the west for yards and sidings on the Grand Trunk Pacific. Some of these rails have been in use since 1869, but are still good, having been imported from England. Being only 56 pound and 65 pound rails, they are too light for heavy through traffic. Another order may be placed with the Soo corporation this summer.

Toronto, Ont.—The work on the series of subways which are being constructed by the Grand Trunk Railway over all the level crossings between Queen Street and Mimico, the bridge over the Humber River, and the elevation of the tracks is progressing. Men are at work digging the foundations for the concrete subways. These will be fourteen feet clear above the roadway. The new bridge at the Humber will be perfectly level, with no superstructures, and it will be four tracks wide. It will be about 200 feet long. The company will employ a large staff of men, and after about April 1st work will be rushed.

Toronto, Ont.—The plans of the Grand Trunk Railway for its proposed new bridge over the Humber River have been approved by the Minister of Public Works, subject to certain conditions, which will effectually, it is said, safeguard the public interest. It is stipulated that the company must agree to leave a sufficient opening for the flow of water, and the department will determine the requirements in this respect. At the time of construction the company must, according to the order, if so directed by the resident engineer of the department, excavate a sufficient amount from the bed of the river at the bridge to ensure diminution in the present area of flow, and if at any time navigation interests demand that this area be increased the company must bear all the expense of carrying out the department's order for further deepening of the channel. It is further stipulated that the company shall assume all liability for damages to lands above the bridge through flooding either because of ice jams or other causes that might be due to the erection of the bridge.

Winnipeg, Man.—Over 5,000 miles of wire will be used by the Canadian Pacific this year in building new fences along their lines in the prairie provinces. This quantity of wire will build 700 miles of fence, which is the amount suggested for the work of the year. The fences are seven strands high, the wire used being the class without barbs. Some of the old fences will be replaced, but for the most part the wire will be used in the construction of fences where there are none at the present time. The work of building is to be done by contract; the company supply the posts, the contractors supplying the wire and doing the work. This latter will be done by one of the local companies.

Swan River, Man.—Superintendent Fisher, of the C.N.R., was in town recently and announced that the railway company would build a new steel bridge over the river here, the estimated cost being over $20,000. The company will also co-operate with the town council in making a park on the east.

Edmonton, Alta.—The C.N.R. will commence construction this summer of the quarter million dollar bridge on the main line west over the Pembina and Macleod rivers.

Pincher Creek, Alta.—Word has been received here from the promoters of the Alberta Pacific Railway in New York that good progress is being made in the matter of securing the necessary capital for the construction of at least one hundred miles of the road this year. The survey of the line has been completed and the final location made from the international boundary line, so that no time will be lost in preliminary work. Under the terms of the charter granted by the provincial legislature, at least thirty miles of the road from Pincher Creek must be built this year, or the charter will lapse. That the company means business and will push the work ahead this summer there is no doubt.

Vancouver, B.C.—It is understood that Mr. Edward Bath, one of the highest engineering authorities in England, will be in Vancouver in the course of a week on his way to Quatsino Sound to investigate conditions as to its complete suitability as a port for the C.P.R. In addition to the harbor possibility, Mr. Bath is concerned on behalf of other undertakings having interests in the district of Quatsino Sound.

LIGHT, HEAT AND POWER.

Peterboro, Ont.—The F. R. J. MacPherson Co., contractors for electrical work and plumbing, have secured a large contract at North Bay for the installation of the heating and plumbing of the new convent which is being built. It is expected that about two months will be required for the completion of the work.

Toronto, Ont.—The Hydro-Electric Power Commission will at once call for tenders for material for some eight or ten miles of transmission lines from a point on the Severn River to the towns of Midland and Penetanguishene. The tenders will also include material for necessary transformer stations. The object is to supply both the municipalities mentioned with hydro-electric power. Actual work of construction both on the lines and the transformer stations, will be carried out by the commission. It is hoped to be able to supply both towns with power by June 1st.

Edmonton, Alta.—City Engineer Latornel has prepared the subjoined estimate of the cost of establishing a gas plant in Edmonton, and after going over the figures City Commissioner Bouillon is of the opinion that the estimate is well founded. The city engineer's figures are as follows:

4,500 lin. ft. of 18-inch pipe.
21,000 lin. ft. of 12-inch pipe.
21,000 lin. ft. of 8-inch pipe.
198,000 lin. ft. of 4-inch pipe.
24,000 lin. ft. of 4-inch pipe.
3,000 lin. ft. of 2-inch pipe.
3,000 services laid including meters.

Estimate of Cost.

Material—	
Cast iron pipe, valves, drips and other specials	$199,535.60
Labor—	
Excavating, pipe laying, etc	73,790.00
3,000 services laid with meters, connections, average length of service taken as 50 ft..	109,500.00
Engineering, 5 per cent.	19,141.28
Total	$401,966.78

Using steel or wrought iron for piping, this estimate will be reduced by $10,274.50.

SEWAGE AND WATER.

Hamilton, Ont.—The city has eight miles of sewers, principally in east Hamilton, waiting to be built and almost as great a length of water mains to be laid. Three sewer gangs are at work and the Main Street sewer and another large sewer in the Flatt survey were recently begun.

Point Grey, B.C.—The decision of the council to co-operate with the other municipalities in the preparation of a large scheme of sewerage disposal for the district, is given in the following resolution, unanimously passed: "That Point Grey Municipality co-operate with the City of Vancouver and the Municipality of Burnaby and South Vancouver, in the preparation of a comprehensive scheme of sewerage disposal for the whole district, and that acting Reeve Churchill and Councillor Adams be representatives on the general committee; and that this council recommend that the various municipalities proceed at once to have their engineers prepare contour maps of their respective districts."

CURRENT NEWS.

St. John, N.B.—The work the dredge Fielding has been doing in deepening the harbor entrance, will be completed before the steamers come again in the fall. Then it will be possible for a steamer drawing up to thirty feet of water to enter and dock even at dead low tide, so no matter how the tide is when the harbor mouth is reached, the steamers will be able to come up and dock. The new channel will be four hundred feet wide. It is understood the work is now pretty well advanced. In fact most of the mud digging has been completed. Unfortunately, some big boulders have been uncovered right in the channel and until these are removed the other work done is of little practical advantage. To get the boulders and ledges down to grade will be a big summer's job for the dredging crew, but divers and dynamite will be used and it is expected the last vestige of the rocks will be out of the way and a straight channel, thirty feet deep and four hundred feet wide, available before next winter.

Montreal, Que.—The Canadian Pacific Railway will open 50 towns this year on branch lines completed last fall. Last year 40 were placed on the map and nearly all of them are developing into centres of commercial activity. Many of the new towns are in Southern Saskatchewan and Southern Alberta, a few miles north of the boundary line. American settlers have largely developed these sections of Western Canada in the past and it is said that feeders will be run from the Minneapolis, St. Paul & Sault Ste. Marie line to half a dozen American points to carry out the company's plan for commercial expansion.

Montreal, Que.—According to a report submitted to the board of control by the road department, it is shown that last year there was expended on macadamizing streets in the various wards, over one million dollars.

Ottawa, Ont.—At least six firms are expected to tender for the construction of the ships of the Canadian navy. Proposals are to be received up till May 1st, and the correspondence indicates considerable competition. Ten ships are to be constructed, and at Canadian yards.

Ottawa, Ont.—The Dominion government is to establish a testing station for explosives in the city. For this purpose it has secured a piece of land on Division Street, at the head of Young Street, and the board of control has approved of the location. The communication from the government stated that the testing station would be along the lines suggested recently by Capt. Desborough. The maximum amount of explosives at any one time would be 300 pounds, and it would be kept in special mounds, so as to be perfectly safe. In making tests only a pound and a half would be used at a time.

Kingston, Ont.—The civic committee met recently and examined the plans and specifications for the eighty-foot span to be put in Cataraqui bridge, if the ratepayers pass the debenture by-law on April 4th. Tenders are to be called for the work of construction at once, as the committee anticipates the passing of the by-law. Members of the Ontario Exploration Syndicate do not like the delay by the city in proceeding with the work, but the city council can take no other course than it is taking. The question of purchasing the bridge and improving it must be voted upon by the people. The Ontario statutes require this. The work on the syndicate's pier is proceeding.

Toronto, Ont.—The city engineer was recently authorized by the Board of Control to purchase a 4-cylinder automobile.

Toronto, Ont.—Through an oversight, the management of the Cement Show at Toronto omitted to include in the list of exhibitors in the official programme of the Show, the name of The Ideal Concrete Machinery Co., Ltd., of London, Ont. There was a very good exhibit of Ideal machinery

at the Show, and it attracted considerable attention. Despite the omission from the official programme everyone who attended the Show knew that The Ideal Concrete Machinery Co. was exhibiting, as the name was included in the list of exhibitors printed in the Daily Bulletin, issued by The Canadian Engineer.

Toronto, Ont.—The $10,000,000 plant of the American Car and Foundry Company will be built at Port Mann. A charter has been granted by the government at Ottawa, incorporating the British Columbia Steel Corporation, with a capital of $10,000,000. The plant will be erected at Port Mann, near New Westminster, British Columbia. This was the announcement of Mr. W. P. Gibbs, who was recently at the King Edward Hotel, Toronto. In speaking of the proposed big plant, Mr. Gibbs said that French, Belgian, Holland, and American capital was interested in the undertaking. The plant will turn out structural steel, rails and other articles from its merchant bar, rail and tube mills. Its capacity from seven furnaces will be 850 tons a day. Five thousand men will be employed. Mr. Gibbs said that 16c. to 22c. a ton had been paid for the delivery of rails from Pittsburg to the Pacific coast.

Welland, Ont.—The plant of the Electro Metals, located in the factory district of Welland, will be doubled in size this spring. The company have been exceedingly prosperous, and have found it necessary to have increased accommodation. United Motors, manufacturers of automobiles, will erect their factory building the coming summer. It is understood that additions amounting to over two million dollars will be made to the plant of the Canada Car & Foundry Company.

Porcupine City, Ont.—Cutting of trees for a road through the woods from the railway station on Lakeview Townsite to the Dome and Foster mines will start this week, and a large crew of men will be set to work at once. With a road cut through from the railway west to the mines, a long route around through South Porcupine, up the Tisdale Road, and then back two miles to the mines, will be cut off.

South Porcupine, Ont.—The Preston East Dome is receiving a large amount of freight at present, including boilers and engines and other equipment for the spring work. While no mining is yet being done, the camps are being put into shape and plans are being made for the installation in a few months of a two-stamp test mill. These stamps have already been ordered, but will not be set up for some time.

Port Arthur, Ont.—The capacity of storage reservoir on Current River will be increased 24,000,000 cu. ft. by increasing height of present concrete dam 6 feet and replacing old timber section with concrete. The additional storage capacity will be sufficient to run the power plant at a capacity of 1,000 continuous horse power for two days. Estimated cost is $25,000. The street railway will be extended on Red River Road from High Street to Algonquin, a distance of about 4,000 ft. Estimated cost $8,000. Work will be started as soon as material is received.

Winnipeg, Man.—The Perfection Concrete Company are increasing their paid-up capital to $100,000 for the purpose of extending their business in concrete blocks, ornamental stone and adding concrete structure, fireproofing, tile and concrete sewer pipe to their output. The concrete tile are to be made by the Pauly System, while the concrete sewer pipe are made by the Thomas glazed concrete sewer pipe machine. Pipe made by this process is now in use in Vancouver, B.C., and Portland, Oregon. The company will build a large factory in Winnipeg to take care of this work.

Winnipeg, Man.—It was learned at the G.T.P. offices that reports have been received from prospectors that vast quantities of rich minerals have been discovered along the main line of the company, which runs through the Yellow Head Pass on the western slope of the Rockies. Silver, iron and copper have been found about fifty miles beyond Tete Juan Ache, and it may be expected that great mining developments may take place in this district.

Edmonton, Alta.—For the purpose of running the 22nd base line from the fifth meridian to the Peace River, a distance of 129 miles, A. H. Hawkins, in charge of a party of 20 men will leave for the north within the next few days. The work will take Mr. Hawkins and his party a distance of sixty miles northeast of Lesser Slave Lake. From this point they will survey the 22nd base line, which forms the northern boundary of township 85, directly west until they strike the Peace River, twelve miles north of Peace River Crossing. It will be late in the fall before the work is completed.

Edmonton, Alta.—Steps are being taken by the Dominion government to lay out in townships all the coal land in the Brazeau district that has not been surveyed hitherto and J. Francis, a Dominion government surveyor, will leave Edmonton for the west within the next three weeks, to carry on this work. He has been here for the past month and is now engaged in outfitting his party so that he will be ready to start as soon as the spring has opened sufficiently to make it possible to carry on survey work in the mountains.

Edmonton, Alta.—Forty surveyors will leave the city within the next week or two to subdivide several million acres of homestead lands in the north. Several have already left for Peace River, block 12, the townships of which are to be divided this year.

Edmonton, Alta.—It is stated here that a number of local men are forming a big cement company, capitalized at $1,000,000 with a plant about twelve miles west of the city on the G.T.P. The place where the plant is to be placed consists of three hundred acres. The committee at work on the matter now consists of Lieut.-Governor Bulyea, Dr. Ferris, A. Driscoll, A. C. Friday and S. H. Smith. It is said that a number of Winnipeg men are interested in the scheme.

Dewdney Dyke, Dewdney, B.C.—The dyking commissioners have awarded contract to Bayfield and Archibald, Vancouver, for pumping plant. The work on the dyke is progressing favorably, Geo. H. Webster being the contractor for grading and sluiceway. Cartwright, Matheson & Company, of 503 Cotton Building, Vancouver, are the consulting engineers.

Vancouver, B.C.—The superstructure of the new Cambie Street bridge is under way. This portion of the bridge is being erected by the Canadian Bridge Company. It is asserted by the bridge company that delays on other portions of the work and the failure of the equipment to arrive on time kept them behind. The substructure of the Cambie Street bridge is being constructed by Palmer Brothers & Henning. The Cambie Street structure is expected to see completion about July. It is costing in the neighborhood of $600,000. Apart from the gigantic swing span itself there will be 6,400,000 pounds of steel in the superstructure.

PERSONAL.

Mr. A. C. Sangster, electrician and mechanical engineer of Vancouver, has been appointed as electrical superintendent of Saskatoon. It is expected that he will be able to greatly assist in solving the city's power problem, the outlook being that this year alone will see a doubling of the demand.

Prof. W. F. Schaphorst, of the Mechanical Engineering Department of the New Mexico College of Mechanic Arts, has resigned his position there to become a technical writer on the staff of A. Eugene Michel, Advertising Engineer, New York City.

Mr. R. S. Stockton, project engineer of the United States reclamation service in charge of the lower Yellowstone irrigation project, Montana, has resigned from the government service to take a position as engineer in charge of operation and maintenance of the Canadian Pacific Railway's irrigation operations in Alberta. Mr. Stockton is a native of Illinois, and a graduate of the Colorado School of Mines. He has had a varied experience working on government surveys and for power and mining companies. From 1895 to 1903 he was professor of mathematics and surveying in the Colorado School of Mines.

Mr. Phillip W. Ellis who was a member of the original Ontario Power Commission, which first inquired into the possibilities of utilizing Niagara power, has been selected by the Board of Control of Toronto, as the city's nominee to the commission to manage the Hydro-electric system of Toronto. The Ontario government through the Hydro-electric Power Commission appoints one member and the third member for the time being will be the mayor. Mr. Ellis is to hold office for two years.

Mr. J. K. McNeillie, who has been C.P.R. superintendent of division 2 for the last two years, goes to Farnham, district 1 of the east division, including all lines from Megantic and Newport to Montreal, and branch lines.

Mr. A. L. Smith, formerly C.P.R. superintendent of district 3, Ontario division, now in charge of district 1, east division, will be transferred to division 3.

Mr. Geo. Hodge, C.P.R. superintendent of district 3, east division, lines from Ottawa to Quebec, has been transferred to London.

SOCIETY NOTES.

Electrician's Club.—At a meeting held for the organization of a club for furthering the interests of electricians, inspectors, contractors, and those allied with the electrical trade in Winnipeg and St. Boniface, the following officers were elected: Honorary presidents, Mayor Evans, Mayor Bleau, Aldermen Cusson and Lachance, of St. Boniface, and Controllers Waugh and Cockburn, of Winnipeg; president Fred A. Cambridge; vice-president, Mr. Swain; secretary-treasurer, Mr. Schumacher; executive committee, Mr. McKittrick, Mr. McKenzie, Mr. Douglas and Mr. Langley.

MARKET CONDITIONS.

Halifax, March 27th, 1911.

Generally the markets are very steady. The demand in the hardware business being particularly strong, continued advances in the price of the linseed oil and turpentine has necessarily effected the prices of paints. The purchases for the spring work have hardly commenced yet, and, therefore, the trade is not particularly brisk, although the outlook is good.

Axes.—Ordinary chopping axes, single bit, $6.50 per dozen, double bit, $11. Special brands, prices on application to jobbers.

Bar Iron.—The market for bar iron is open, but the situation is firm, and prices range as high as $2.25 base.

Black Sheet Iron.—This commodity is in good demand. We quote 24-gauge, $2.40.

Cast Steel.—The market is steady at 10 to 15c., according to makers.

Cement.—Stocks are low and market is steady, $2 per bbl.

Coil Chain.—The jobbing prices of English proof chain in Halifax are as follows: 3-16 x 4, $7.15; 3-16 x 3, $6.25; ¼, $5.35; 5-16, $4.30; ⅜, $3.90; 7-16, $3.85; ½, $3.60; ⅝, $3.60; ¾, $3.50; ⅞, $3.50; 1, $3.50; 1⅛, $3.50.

Fencing Wire.—We quote: Plain, twisted and galvanized at $3.25 per 100 lbs.; barb at $2.75 per 100 lbs.; bright staples in 100-lb. kegs at $3, and in 50-lb lots, $3.25. Galvanized staples are 25c. extra.

Galvanized Sheet Iron.—The wholesale prices are as follows: 16 to 20-gauge, $3.45; 22 to 24, $3.80; 26, $4.30; 28, $4.55. These prices are for less than case lots.

Ingot Tin.—The tin market as usual is a fluctuating one, and the present price is about 38c. net cash.

Lead Pipe.—Quotations here are open, and the price quoted to-day is about $4.75 for ordinary jobbing quantities.

Linseed Oil.—Raw is fully worth $1.20, and boiled, $1.25 per gallon. Orders are small, stocks low, and the outlook firm.

Nails.—Nails are firm. Wire nails, $2.45, and cut nails, $2.60. Business in this line is reported fairly active.

Peavies.—There is a better enquiry than last year. Prices are unchanged at $11 to $13 per dozen, according to make, but we are advised that there will be an advance.

Pig Lead.—We quote $4.25 for English and $4 for Canadian. The outlook is for higher prices.

Pipe.—Wrought iron, 1-in., $5.25.

Roofing Paper.—The demand is good. Tarred paper, $1.70 per 100 lbs.; three-ply roofing 90c. per 100 lbs.; two-ply roofing, 65c.; sheathing paper, 30 cents per roll; tarred sheathing, 40 cents per roll.

Rope.—The price of cordage for next spring's supplies is unchanged. For large lots dealers should write jobbers for quotations. Small lots are as follows: Sisal, 9½c. base; lobster rope, 9¾c.; British manilla, 9½c.; base, best manilla, 10½c. base.

Sheet Lead.—The price of sheet lead is also very firm, 3 lbs. and heavier, $4.75 per cwt., in rolls, and $5.75 in smaller quantities.

Steel.—Tire, $2.50; spring, $2.70; machine, $3.25; toe caulk, $3.50; sleigh shoe steel, $2.50; the above are all base prices.

Tin Plates.—I. C. coke, $3.95 to $4.10; I. C. charcoal, $4.75; I. X. charcoal, $5.50.

Turpentine.—Prices now quoted are as high as $1 to $1.10 in bbls., and $1.05 to $1.15 in smaller quantities. The market is open.

White Lead.—For Canadian pure, in 50 and 25-lb. irons, $6.25 is being asked. Brandram's B.B. genuine in 25, 50, and 100-lb. irons, $7.35, and B.B. No. 1, $6.10. The trade expect prices to be much higher before long.

Zinc.—This commodity is very firm, $7.50 for casks and $8 for smaller quantities. Spelter is $2.75 per cwt.

Montreal, March 28th, 1911.

The iron and steel makers of the Pittsburg district are paying little attention to the coming extra session of Congress, but are bending their energies towards the establishment of better prices for their products in that district, and with the trade in general.

There seems little cause for alarm with regard to the effect the probable tariff changes will have on the business of the district, but, nevertheless, the makers are not leaving any stones unturned that might be a check later on to possible orders from the jobbers and big consumers of the country.

The pig-iron market changed little, and it is thought there will not be much of an increase in orders in this line for some time to come unless a number which have been hanging fire are put into the market and the material demanded on short time.

Pig-iron makers, however, are protecting themselves at every turn, and are not taking the chances of overstocking the market in the various grades of crude iron and steel. As a result better prices are being maintained than has been the case during other slow-downs in orders.

Southern iron producers seem to have adopted a policy of disposing of iron at any price. During the last several days drastic concessions have been made in order to stimulate buying. This is due to the fact that many producers have large surplus tonnages of iron on hand, and are willing to shade quoted prices in order to clean up their yards.

The Sloss-Sheffield Steel & Iron Co. has sold 25,000 tons of pig-iron, deliveries to be made over the next five months. The price obtained for this iron was $11 a ton, which is considered a concession. Heretofore, Sloss would not dispose of any iron at $11 a ton, except for immediate delivery. The fact that a portion of the above contract will not be delivered before August is evidence that producers are willing to make concessions.

Sloss is one of the iron producers in the South, with a large tonnage on hand. Before the company disposed of the above-mentioned 25,000 tons it had approximately 98,000 tons stacked in its yards. The management deems it more advisable to make small concessions in prices rather than increase its present surplus.

Reports from the English market are not very encouraging. Home demands would seem to be pretty slow, and although the export demand is always pretty fair, it is not sufficient to absorb the production. It is stated that the stocks in store amount to 570,000 tons. As for Scotch iron it is in a better situation, and the feeling is stronger. Purchases have been made in England for delivery here on the opening of navigation at pretty low figures.

Local importers report very good buying for the opening of navigation. Although the iron which is arriving has been purchased in England at a fairly low cost, it is still too far above the American iron to be put into Ontario in competition with it. American iron is selling in Toronto, Hamilton, Brantford, and other western points at about $18 per ton, which figure has to be met by Canadian producers in Ontario. As against them, quotations on dock in Montreal are as stated in the following list:—

Bar Iron and Steel.—Trade is reported first-class. Bar iron, $1.90 per 100 pounds; best refined horseshoe, $2.15; forged iron, $2.05; mild steel, $1.95; sleigh shoe steel, $1.95 for 1 x ⅜ base; tire steel, $2.05 for 1 x ⅜-base; toe calk steel, $2.75; machine steel, iron finish, $2.00; imported, $2.05.

Antimony.—The market is steady at 8¼c.

Building Paper.—Tar paper, 7, 10, or 16 ounces, $1.80 per 100 pounds; carpet felt, $2.50 per 100 pounds; tar sheathing, 36c. per roll of 400 square feet; dry sheathing, No. 1, 28c. per roll of 400 square feet; tarred fibre, 55c. per roll; dry fibre, 45c. (See Roofing; also Tar and Pitch).

Cement.—Canadian cement is quotable, as follows, in car lots, f.o.b., Montreal:—$1.35 to $1.40 per 350-lb bbl., in 4 cotton bags, adding 10c. for each bag. Good bags re-purchased at 10c. each. Paper bags cost 2½ cents extra, or 10c. per bbl. weight.

Chain.—The market is unchanged, being now per 100 lbs., as follows:—¼-in., $5.30; 5-16-in., $4.70; ⅜-in., $3.90; 7-16-in., $3.65; ½-in., $3.55; 9-16-in., $3.45; ⅝-in., $3.40; ¾-in., $3.35; ⅞-in., $3.35; 1-in., $3.35.

Coal and Coke.—Anthracite, egg, stove or chestnut coal, $7 per ton, net; furnace coal, $6.75, net. Bituminous or soft coal: Run of mine, Nova Scotia coal, carload lots, basis, Montreal, $3.85 to $4 per ton; cannel coal, $9 per ton; coke, single ton, $5; large lots, special rates, approximately $4 f.o.b., cars, Montreal

Copper.—Prices are easy at 13¾c

Explosives and Accessories.—Dynamite, 50-lb. cases, 40 per cent. proof, 15c. in single case lots, Montreal. Blasting powder, 25-lb. kegs, $2.25 per keg. Special quotations on large lots of dynamite and powder. Detonator caps, case lots, containing 5,000, 75c. per 100; broken lots, $1; electric blasting apparatus:—Batteries, 1 to 10 holes, $15; 1 to 20 holes, $25; 1 to 50 holes, $35; 1 to 40 holes, $50. Wire, leading, 1c. per foot; connecting, 50c. per lb. Fuses, platinum, single strength, per 100 fuses:—4-ft. wires, $3; 6-ft. wires, $3.54; 8-ft. wires, $4.08; 10-ft. wires, $5.

Galvanized Iron.—The market is steady. Prices, basis, 28-gauge, are:—Queen's Head, $4.10; Colborne Crown, $3.85; Apollo, 10¾ oz., $4.05. Add 25c. to above figures for less than case lots; 26-gauge is 25c. less than 28-gauge, American 28-gauge and English 26 are equivalents, as are American 10¾ oz., and English 28-gauge.

Galvanized Pipe.—(See Pipe, Wrought and Galvanized).

Iron.—The following quotations are now given, basis of dock, Montreal, on opening of navigation:—No. 1 Summerlee, $20 per ton; selected Summerlee, $19.50; soft Summerlee, $19; Carron, No. 1, $20; Carron special, $19.50; Carron soft, $19; Clarence, or Cleveland No. 3, $16.75 to $17.

Laths.—See Lumber, etc

Lead.—Prices are firm at $3.65.

Lead Wool.—$10.50 per hundred, $200 per ton, f.o.b., factory.

Lumber, Etc.—Prices on lumber are for car lots, to contractors, at mill points, carrying a freight of $1.50. Red pine, mill culls out, $17 to $21 per 1,000 feet; white pine, mill culls, $16 to $17. Spruce, 1-in. by 4-in. and up, $15 to $17 per 1,000 ft.; mill culls, $12 to $14. Hemlock, log run, culls out, $12 to $15. Railway Ties; Standard Railway Ties, hemlock or cedar, 35 to 45c. each, on a 5c. rate to Montreal. Telegraph Poles: Seven-inch top, cedar poles, 25-ft. poles, $1.35 to $1.50 each; 30-ft., $1.75 to $2; 35-ft., $2.75 to $3.25 each, at manufacturers' points, with 5c. freight rate to Montreal. Laths: Quotations per 1,000 laths, at points carrying $1.50 freight rate to Montreal, $2 to $3. Shingles: Cedar shingles, same conditions as laths, X. $1.50; XX, 2.50; XXX, $3.

Nails.—Demand for nails is steady and prices are: $2.40 per keg for cut, and $2.30 for wire, base prices. Wire roofing nails, 5c. lb.

Paints.—Roof, barn and fence paint, $1.25 to $1.45 per gallon; girder, bridge, and structural paint for steel or iron—shop or field— $1.45 to $1.55 per gallon, in barrels; liquid red lead in gallon cans, $2 per gallon.

Pipe.—Cast Iron.—The market shows a firm tone and trade is said to have been most satisfactory Prices are firm, and approximately as follows:—$33 for 6 and 8-inch pipe and larger; $34 for 3-inch and 4-inch

at the foundry. Pipe, specials, $3 per 100 pounds. Gas pipe is quoted at about $1 more than the above

Pipe.—Wrought and Galvanized.—Demand is about the same, and the tone is firm, though prices are steady, moderate-sized lots being: ¼-inch, $5.50, with 63 per cent. off for black, and 48 per cent. off for galvanized; ⅜-inch, $5.50, with 63 per cent. off for black, and 48 per cent. off for galvanized; ½-inch, $8.50, with 69 per cent. off for black, and 59 per cent. off for galvanized. The discount on the following is 72½ per cent. off for black, and 62½ per cent. off for galvanized; ¾-inch, $11.50; 1-inch, $16.50; 1¼-inch, $22.50; 1½-inch, $27. On the following the discount is 73½ per cent. for black, and 63½ per cent. for galvanized: 2-inch, $36; 2½-inch, $57.50; 3-inch, $75.50. Discount on the following is 71½ per cent. off on black, and 61½ per cent. off for galvanized: 3½-inch, $95; 4-inch, $1.08.

Plates and Sheets.—Steel.—The market is steady. Quotations are: $2.20 for 3-16; $2.30 for ⅛, and $2.10 for ¼ and thicker; 12-gauge being $2.30; 14-gauge, $2.15; and 16-gauge, $2.10.

Rails.—Quotations on steel rails are necessarily only approximate and depend upon specification, quantity and delivery required. A range of rails, per gross ton of 2,240 lbs., f.o.b. mill. Re-laying rails are quoted at $27 to $29 per ton, according to condition of rail and location.

Railway Ties.—See lumber, etc.

Roofing.—Ready roofing, two-ply, 70c. per roll; three-ply, 95c. per roll of 100 square feet. Roofing tin caps, 6c. lb.; wire roofing nails, 5c. lb. Roofing cement in bbls., of 40 gallons, 15c.; in 5-gallon tins, 20c. per gallon. (See Building Paper; Tar and Pitch; Nails, Roofing).

Rope.—Prices are steady, at 9c. per lb. for sisal, and 10½c. for Manila. Wire rope, crucible steel, six-strands, nineteen wires; ¼-in., $2.75; 5-16, $3.78; ⅜, $4.75; ½, $5.25; ⅝, $6.25; ¾, $7; ⅞, $10; 1-in., $12 per 100 feet.

Spikes.—Railway spikes are steady, at $2.45 per 100 pounds, base of 5/16 x 9-16. Ship spikes are steady at $2.85 per 100 pounds, base of ⅝ x 10-inch, and ⅝ x 12-inch.

Steel Shafting.—Prices are steady at the list, less 25 per cent. Demand is on the dull side.

Telegraph Poles.—See lumber, etc.

Tar and Pitch.—Coal tar, $4 per barrel of 40 gallons, weighing about 500 pounds; roofing pitch, No. 1, 75c. per 100 pounds; No. 2, 55c. per 100 pounds; pine tar, $9.50 per barrel of 40 gallons; refined coal tar, $4.50 per barrel, pine pitch, 3c. per lb.; rosin, 3½c. (See building paper, also roofing).

Tin.—Prices are firm at $44.

Zinc.—The tone is easy, at 6¼c.

CAMP SUPPLIES.

Beans.—Prime beans, $1.85 to $1.90.

Butter.—Held creamery, 24 to 26c.

Canned Goods.—Per Dozen.—Corn, $1.00; peas, $1.20 to $2.00; beans, $1.00; tomatoes, $1.45; peaches, 2s, $1.90; and 3s, $2.90; pears, 2s, $1.80; and 3s, $2.40; salmon best brands, 1-lb. talls, $2.07, and flats, $2.25; other grades, $1.40 to $2.10.

Cheese.—The market ranges from 12 to 13c., covering all Canadian makes.

Coffee.—Mocha, 22 to 30c.; Santos, 18 to 21c.; Rio, 15 to 18c.

Dried Fruits.—Currants, Filiatras, 6¾ to 9½c.; dates, 5½c.; raisins, Valentias, 7¾ to 8¼c.; prunes, 8½ to 12c.

Eggs.—New laid eggs, 23 to 25c.

Flour.—Manitoba, 1st patents, $5.60 per barrel; and patents, $5.10, strong bakers', $4.90.

Molasses and Syrup.—Molasses, New Orleans, 27 to 28c.; Barbados, 34 to 36c.; Porto Rico, 40 to 43c; syrup, barrels, 3c.; 2-lb. tins, 2 dozen to case, $2.25 per case.

Potatoes.—Per 90 lbs., good quality, 90c. to $1.

Rice and Tapioca.—Rice, grade B, in 100-lb. bags, 3¾ to 3½; Tapioca, medium pearl, 5½ to 8c.

Rolled Oats.—Oatmeal $2.45 per bag; rolled oats, $2.20, bags.

Sugar.—Granulated, bags, $4.60; yellow, $4.20 to $4.45; Barrels 5c above bag prices.

Tea.—Japans, 20 to 38c.; Ceylons, 20 to 40c.; Ceylon, greens, 19 to 25c., China, green, 14 to 50c.

Fish.—Salt fish.—No. 1 green cod, $8 to $9 per bbl.; herring, $4.50 per bbl.; salmon, $8.50 per half barrel. Smoked fish.—Bloaters, $1.25 per large box; haddies, 8c. per lb.; kippered herring, per box, $1.20 to $1.40.

Provisions.—Salt Pork.—$24 to $31 per bbl.; beef, $18 per bbl., smoked hams, 14 to 19c per lb.; lard, 14 to 15c. for pure, and 11½ to 12c. per lb. for compound; bacon, 13 to 18c.

Toronto, March 30th, 1911.

The following are the wholesale prices for Toronto, where not otherwise explained, although for broken quantities higher prices are quoted:—

Antimony.—The market is controlled by a syndicate, and the price is advanced to $9.

Axes.—Standard makes, double bitted, $8 to $10; single bitted, per dozen, $7 to $9.

Bar Iron.—$2.05 to $2.15, base, per 100 lbs., from stock to wholesale dealer. Free movement.

Bar Mild Steel.—Per 100 lbs., $2.15 to $2.25. Sleigh shoe and other take same relative advance.

Boiler Plates.—¼-inch and heavier $2.20. Boiler heads 25c. per 100 pounds advance on plate. Tank plate, 3-16-inch, $2.40 per 100 pounds.

Boiler Tubes.—Orders continue active. Lap-welded, steel, 1¼-inch, 10c.; 1½-inch, 9c. per 10 foot; 2-inch, $8.50 to $9; 2¼-inch, $10; 2½-inch, $10.50; 3-inch, $12.10; 3½-inch, $15; 4-inch, $19.

Building Paper.—Plain, 27c. per roll; tarred, 35c. Nothing doing.

Bricks.—In active movement, with very firm tone. The price is $10.50 to $11.00 for half-and-half. Don Valley pressed brick are in request. Red and buff pressed are worth $18 delivered and $17 at works per 1,000.

Broken Stone.—Lime stone, good hard, for roadways or concrete, f.o.b., Schaw station, C.P.R., 70 to 75c. per ton of 2,000 lbs., either 1-inch, 2-inch, or larger, price all the same. Rubble stone, 55c. per ton, Schaw station, and a good deal moving. Broken granite is selling at $3 per ton for good Oshawa, or Quebec Province. At Washago, $2.50 per ton for small and $1.15 for large; freight to Toronto, 60c.

Cement.—Car lots, $1.65 to $1.70 per barrel, without bags. In 1,000 barrel lots, $1.55. In smaller parcels $1.90 is asked by city dealers. Bags, 40c. extra.

Coal.—Anthracite egg and stove, $7.25 per ton; chestnut, scarce, $7.50; pea coal $6.00 per ton. In the United States there is an open market for bituminous coal and a great number of qualities exist. We quote: Youghiogheny lump coal on cars here, $3.75 to $3.80; mine run, $3.65 to $3.70; slack, $2.75 to $2.85; lump coal from other districts, $3.55 to $3.70; mine run 10c. less; slack, $2.60 to $2.70; cannel coal plentiful at $7.50 per ton; coke, Solvey foundry, which is largely used here, quotes at from $5.75 to $6.00; Reynoldsville, $4.90 to $5.10; Connelsville, 72-hour coke, $5.00 to $5.25. Shipments falling off on account of season drawing to a close. Dealers are buying only such quantities as are actually required so as to facilitate stock taking on April 1st. Nut coal still continues scarce, being held at a premium by miners. The soft coal market is unchanged and prices are expected to remain firm. Contracts for better grades being written up in some cases at a higher figure than last season, subject to any change which may be made in duty.

Copper Ingot.—The market has reached a firm basis, and holders are quite stiff at $13.50 per 100 lbs. Demand is active, and a large quantity moving.

Detonator Caps.—75c. to $1 per 100; case ots; 75c. per 100; broken quantities, $1.

Dynamite.—The price is determined by the point at which it is to be delivered. Here we quote 21 to 25c. as to quantity.

Felt Roofing.—Not much moving, price continues as before, $1.80 per 100 lbs.

Fire Bricks.—English and Scotch, $30 to $35; American, $25 to $35 per 1,000. Fire clay, American, $8; Scotch, $12.

Fuses.—Electric Blasting.—Double strength 4 feet, $4.50; 6 feet, $5; 8 feet, $5.50; 10 feet, $6. Single strength, 4 feet, $3.50; 6 feet, $4; 8 feet, $4.50; 10 feet, $5, per 100 count. Bennett's double tape fuse, $6 per 1,000 feet.

Iron Chain.—¼-inch, $5.75; 5-16-inch, $5.15; ⅜-inch, $4.15; 7-16-inch, $3.95; ½-inch, $3.75; 9-16-inch, $3.70; ⅝-inch, $3.55; ¾-inch, $3.45; ⅞-inch, $3.40; 1-inch, $3.40, per 100 lbs.

Iron Pipe.—At present quotations are lower, thus:—Black Pipe, ¼-inch, $2.03; ⅜-inch, $2.25; ½-inch, $2.63; ¾-inch, $3.16; 1-inch, $4.54; 1¼-inch, $6.19; 1½-inch, $7.43; 2-inch, $9.54; 2½-inch, $15.24; 3-inch, $20.01; 3½-inch, $27.08; 4-inch, $30.78; 4½-inch, $35.75; 5-inch, $40.75; 6-inch, $52.85. Galvanized Pipe, ¼-inch, $2.86; ⅜-inch, $2.86; ½-inch, $3.48; ¾-inch, $4.31; 1-inch, $6.19; 1¼-inch, $8.44; 1½-inch, $10.13; 2-inch, $13.14, per 100 feet.

Lead.—A fair business is doing at prices unaltered from $3.75 to $4, and there is more demand.

Lime.—Retail price in city 35c. per 100 lbs., f.o.b., car; in large lots at kilns outside city 23c. per 100 lbs. f.o.b. car without freight. Demand is beginning.

Lumber.—Demand less brisk, because of the late season of the year, but prices are not materially altered. Pine is good value at $32 to $40 per M. for dressing, according to width required; common stock boards, $28 to $33; cull stocks, $20; cull sidings, $17.50. Southern pine dimension timber from $30 to $45, according to size and grade; finished Southern pine, according to thickness and width, $32 to $42.50; hemlock is in demand and held quite firmly, we quote $17.50 to $18.00; spruce flooring in car lots, $22 to $24; shingles, British Columbia, are steady, we quote $3.30; lath, No. 1, $4.60; white pine, 48-inch, No. 2, $3.75; for 32-inch, $1.85 is asked. The factories are all busy; the yard trade necessarily more slack, because of the season of the year.

Nails.—Wire, $2.35; cut, $2.60; spikes, $2.85 per keg of 100 lbs., base.

Pig Iron.—We quote Clarence at $20.50, for No. 3; Cleveland, $20.50; Summerlee, $22; Hamilton quotes a little irregular, between $19 and $20. Midland, No. 1, $19; No. 2, $18.50. Any change must be upward.

Pitch and Tar.—Pitch, unchanged at 70c. per 100 lbs. Coal tar, $3.50 per barrel. Season is over.

Plaster of Paris.—Calcined, New Brunswick, hammer brand, car lots, $1.95 to $2, f.o.b. cars, Toronto; retail, $2.15 per barrel of 300 lbs., delivered in 5 barrel lots; $2.10 at warehouse.

Putty.—In bladders, strictly pure, per 100 lbs., $2.60; in barrel lots, $2.10. Plasterer's, $2.15 per barrel of three bushels, at warehouse.

Ready Roofing.—Prices are as per catalogue.

Roofing Slate.—Most of the slate used in Canada comes now from Pennsylvania or Maine, the Canadian supply being slender and mostly from the Rockland quarries of the Eastern Townships in Quebec. There is a great variety of sizes and qualities, so that it is difficult to indicate prices. But No. 1 Bangor slate 10 x 16 may be quoted at $7.75 per square of 100 square feet, f.o.b. cars, Toronto; seconds, 50c. less. Mottled, $7.50; green, $7.75, with a prospect of advance. Dealers are fairly busy.

Rope.—Sisal, 9½c. per lb.; pure Manila, 10½c. per lb., Base.

Sand.—Sharp, for cement or brick work, $1.15 per ton f.o.b., cars, Toronto siding.

Sewer Pipe.—

	4-in.	6-in.	9-in.	12-in.	24-in.
Straight pipe, per foot	$0.25	$0.40	$0.65	$1.00	$3.25
Single junction, 1 or 2 ft. long.....	1.00	1.60	2.60	4.00	13.00
Double junctions	1.25	2.00	3.25	5.00	16.25
Increasers and reducers	....	1.60	2.60	4.00	13.00
P. & H. H. traps	2.00	3.20	6.50	15.00	.....
Bends	0.75	1.20	1.95	3.00	9.75

Above is the October list, as changed. The retail price is less 65 per cent. off these figures on all sizes, 9 inches and under, or less 60 per cent. off these figures on anything over 9 inches. For car-load lots a greater discount.

Steel Beams and Channels.—Active.—We quote:—$2.75 per 100 lbs., according to size and quantity; if cut, $3 per 100 lbs.; angles, 1¼ by 3-16 and larger, $2.50; tees, $2.80 to $3 per 100 pounds. Extra for smaller sizes of angles and tees.

Sheet Steel.—American Bessemer, 10-gauge, $2.40; 12-gauge, $2.45; 14-gauge, $2.30; 17, 18, and 20-gauge, $2.45; 22 and 24-gauge, $2.55; 26-gauge, $2.65; 28-gauge, $2.80. A very active movement is reported at unchanged prices, and an advance is not unlikely.

Sheets Galvanized.—Apollo Brand.—Sheets 6 or 8 feet long, 30 or 36 inches wide; 10-gauge, $3.00; 12-14-gauge, $3.00; 16, 18, 20, $3.20; 22-24, $3.35; 26, $3.50; 28, $3.95; 29, $4.25; 10¾, $4.25 per 100 lbs. Fleur de Lis—28-gauge, $4.10; 26, $3.80 per 100 lbs. Active and firm at these prices.

Tank Plate.—3-16-inch, $2.40 per 100 lbs.

Tool Steel.—Jowett's special pink label, 10½c. Cammel-Laird, 16c. "H.R.D." high speed tool steel, 65c.

Tin.—The market is lower; we quote 43c.

Wheelbarrows.—Navvy, steel wheel, Jewel pattern, knocked down, $21.60 per dozen; set up, $22.60. Pan Canadian, navvy, steel tray, steel wheel, $3.30 each; Pan American, steel tray, steel wheel, $4.25 each.

Zinc Spelter.—Demand not so brisk, and the market easier at $6.

CAMP SUPPLIES.

Beef.—by carcases, $8.50 to $9.50.

Butter.—Dairy prints are 20 to 24c.; creamery prints, 26 to 28c.; do. fresh made, 29 to 30c. Splendid demand for fresh made.

Canned Goods.—Peas, $1.35 to $1.75; tomatoes, 3s, $1.45 to $1.50; pumpkins, 3s, 97½c.; corn, 95c. to $1.00; peaches, 2s, $1.87½; yellow, $1.82½ to $1.87½; strawberries, 2s, heavy syrup, $1.80; raspberries 2s, $1.80 to $1.97½.

Cheese.—Moderately firm, large, 13¾ to 14c.; twins, 14 to 14¼c.

Coffee.—Rio, Green, 15½ to 16c.; Mocha, 23 to 25c.; Java, 25 to 31c.; Santos, 16 to 17c.

Dried Fruits.—Raisins, new, Valencia, 8 to 8½c.; seeded, 1-lb. packets, fancy, 8c.; 16-oz. packets, choice, 7½c.; Sultanas, good, 8½c.; fine, 9½c.; choice, 10 to 11c.; fancy, 12c.; Filiatras currants, cleaned, 7½ to 8c.; Vostizzas, 9 to 10c.; uncleaned currants, 7 to 7¼c.

Eggs.—Strictly new-laid, 21 to 22c.

Flour.—Prices unchanged thus far; thus, Manitoba flour, first patents, $5.20; second, $4.70; strong bakers', $4.60; Ontario flour winter wheat patents, $3.90; $4 per barrel.

Feed.—Bran, $22 to $23 per ton; shorts, $23 to $24 per ton.

Lard.—Tierces, we quote 11¾c. here; tubs, 11¾c.; pails, 11¾c.

Molasses.—Barbados, barrels, 37 to 45c.; West Indian, 27 to 30c.; New Orleans, 30 to 33c. for medium.

Pork.—Not much doing, short cut, $26 to $26.50 per barrel; mess, $1 off, heavy, $22 to $22.50.

Rice.—B. grade, 3½c. per lb.; Patna, 5 to 5¾c.; Japan, 5 to 6c.

Salmon.—As before stated. We quote Fraser River, talls, $2.05; flats $2.20; River Inlet, $1.90; cohoes, $1.75.

Tenders Called For

CITY OF WINNIPEG—ELECTRICAL DISTRIBUTION SYSTEM.

TENDERS FOR SWITCHING EQUIPMENT FOR SUB-STATION NO. 1.

Tenders will be received by the undersigned up to 11 a.m., of Thursday, April 27th, 1911, for the supply and installation in sub-station No. 1, on King Street, Winnipeg, of electrical switching equipment for this station. Plans and specifications may be obtained at the office of the Power Engineers, Smith, Kerry & Chace, Carnegie Library Building, Winnipeg.

Each tender must be accompanied by marked cheque for five (5%) per cent. of the amount of tender. The Board reserves the right to reject any or all tenders, or to accept any bid which may appear to the city's advantage.

M. PETERSON,
Secretary.

Board of Control Office, Winnipeg, March 27th, 1911.

DEPARTMENT OF RAILWAYS AND CANALS, CANADA.

ONTARIO—ST. LAWRENCE CANALS.

CORNWALL CANAL.

Sealed tenders addressed to the undersigned and endorsed "Tender for improving Upper Entrance to Lock No. 19," will be received at this office until 16 o'clock on Saturday, April 15th.

Plans, Specification, and Form of Contract to be entered into can be seen on and after March 18th, at the office of the Chief Engineer of the Department of Railways and Canals, Ottawa, and at the office of the Resident Engineer of the Ontario—St. Lawrence Canals, Cornwall, at which places form of tender may be obtained.

Parties tendering will be required to accept the fair wages Schedule prepared or to be prepared by the Department of Labour, which schedule will form part of the contract.

Contractors are requested to bear in mind that tenders will not be considered, unless made strictly in accordance with the printed forms, and in the case of firms, unless there are attached the actual signature, the nature of the occupation, and place of residence of each member of the firm.

An accepted Bank cheque for the sum of $1,500.00 made payable to the order of the Minister of Railways and Canals must accompany each tender, which sum will be forfeited if the party tendering declines entering into contract for the work, at the rates stated in the offer submitted.

The Cheque thus sent in will be returned to the respective contractors whose tenders are not accepted.

The cheque of the successful tenderer will be held as security, or part security, for the due fulfilment of the contract to be entered into.

The lowest or any tender not necessarily accepted.

By order,
L. K. JONES,
Secretary.

Department of Railways and Canals,
Ottawa, March 21st, 1911.

Newspapers inserting this advertisement without authority from the Department will not be paid for it.

TOWN OF BRAMPTON, ONTARIO.

Pavement Construction.

Sealed tenders addressed to the Town Clerk will be received up to 6 p.m. on Monday, April 17th, 1911, for the construction of approximately 8,000 square yards of pavement and 3,500 lineal feet of concrete curb and gutter. The different classes of pavement to be considered are:—

1. Asphalt Block.
2. Vitrified Brick.
3. Bitulithic.
4. Bituminous Macadam.

Plans and specifications may be seen at the office of the Town Engineer or the Town Clerk, also at the office of The Canadian Engineer, 62 Church Street, Toronto. Marked cheque for $500.00 or 5% of the tenders submitted must accompany each tender. Lowest or any tender not necessarily accepted.

W. C. YOUNG, Town Clerk.
W. M. TREADGOLD, Town Engineer.

Brampton, Ont., March 21st, 1911.

(Tenders continued on pages 66, 68, 70.)

POSITIONS WANTED

TECHNICAL GRADUATE, M.M.E, Member A.S.M.E., C.S., and C.S.C.E., of wide experience in both United States and Canada in hydro-electric work, power generation and electric transmission and electric railway work, desires business association for consulting and contracting practice, or to become associated with an electrical industry as engineer or manager. Box 180, Canadian Engineer.

TECHNICAL CHEMIST seeks position—preferably in Cement Works. Thoroughly experienced in works process and analyses. Also in examination of metals, minerals, fuels, oils, gas, etc. Robinson, 112 Sherbourne St., Toronto.

POSITIONS VACANT

WANTED.—Draughtsman or Engineer thoroughly experienced in the design of Hydro-Electric Power Plants and Transmission Lines. Apply, stating education, experience, present occupation and salary expected to the General Manager, the Lake Superior Power Company, Sault Ste. Marie, Ont.

PATENT NOTICE.

Anyone desiring to obtain the compound covered by Canadian patent No. 104546, granted on April 9th, 1907, to Jacob Buss, Munich; and Carl Fohr, Schloss Wallenburg near Miesbach, both in Bavaria, Germany, for Briquette Manufacture, may do so upon application to the undersigned, from whom all information can be obtained, and who are prepared to supply all reasonable demands on the part of the public for the invention. Fetherstonhaugh & Co., 5 Elgin St., Ottawa, Canada; Russel S. Smart, resident.

TENDERS CALLED FOR

DEPARTMENT OF RAILWAYS AND CANALS.

ONTARIO—ST. LAWRENCE CANALS.

CALOPS CANAL.

SEALED TENDERS addressed to the undersigned and endorsed "Tender for improving Upper Entrance to Lock No. 28," will be received at this office until 16 o'clock on Saturday, April 15th.

Plans, Specification, and Form of Contract to be entered into can be seen on and after March 18th, at the office of the Chief Engineer of the Department of Railways, and Canals, Ottawa, and at the office of the Resident Engineer of the Ontario—St. Lawrence Canals, Cornwall, at which places Form of Tender may be obtained.

Parties tendering will be required to accept the fair wages Schedule prepared or to be prepared by the Department of Labor, which schedule will form part of the contract.

Contractors are requested to bear in mind that tenders will not be considered, unless made strictly in accordance with the printed forms, and in the case of firms, unless there are attached the actual signature, the nature of the occupation, and place of residence of each member of the firm.

An accepted bank cheque for the sum of $6,000.00 made payable to the order of the Minister of Railways and Canals must accompany each tender, which sum will be forfeited if the party tendering declines entering into contract for the work at the rates stated in the offer submitted.

The cheque thus sent in will be returned to the respective contractors whose tenders are not accepted.

The cheque of the successful tenderer will be held as security, or part security, for the due fulfilment of the contract to be entered into.

The lowest or any tender not necessarily accepted.

By order,

L. K. JONES,
Secretary.

Department of Railways and Canals,
Ottawa, March 21st, 1911.

Newspapers inserting this advertisement without authority from the Department will not be paid for it.

CITY OF MOOSE JAW, SASKATCHEWAN.

SEWER AND WATER EXTENSIONS.

Sealed tenders endorsed "Tender 28," "Tender 29," "Tender 30," and "Tender 31," will be received by the undersigned City Clerk until 8.30 o'clock p.m., on Monday, April 10th, 1911.

Any tender received after the above stated time will be declared informal.

CONTRACT 28—

The laying of approximately 30,700 lineal feet of tile pipe sewer, building manholes, etc.

The laying of approximately 29,700 lineal feet of cast iron water main, placing valves, valve boxes, hydrants, etc.

CONTRACT 29—

The supplying of approximately:

29,600	lineal feet of 6-in. C.I. Water Pipe.
112	" " of 4-in. " " "
132	6-in. cast iron reverse curves.
34	6-in. cast iron crosses.
72	6-in. cast iron tees.
29	4-in. off 6-in. cast iron tees.
28	4-in. cast iron tees.
95	6-in. cast iron plugs.

CONTRACT 30—

The supply of approximately:

28,000	lineal feet of 6-in. Vitrified Tile Sewer Pipe.
26,600	" " of 8-in. " " " "
5,225	" " of 10-in. " " " "
1,100	" " of 12-in. " " " "
25	8-in. Tees.
75	6-in. Tees.
25	8-in. ¼ Bends.
100	6-in. ⅛ Bends.
25	8-in. Stops.
25	10-in. Stops.
400	4-in. to 6-in. Increasers.

CONTRACT 31—

The supply of approximately:

65	6-in. 3-way Hydrants.
147	6-in. Gate Valves.
29	4-in. Gate Valves.
150	6-in. Valve Boxes.
29	4-in. Valve Boxes.
88	Manholes, Frames and Covers.

Plans and specifications for Contract 28 may be seen at the office of the City Engineer, Moose Jaw, Sask., and at the offices of the Canadian Engineer at Toronto and Winnipeg.

Plans and specifications for Contracts 29, 30, and 31. will be sent upon request.

The lowest or any tender not necessarily accepted.

J. M. WILSON,
City Engineer.

W. F. HEAL,
City Clerk.

Moose Jaw, 24th February, 1911.

NOTICE TO CONTRACTORS.

TENDERS will be received by registered post only, addressed to the Chairman of the Board of Control, City Hall, up to noon on

TUESDAY, APRIL 11th, 1911,

for the supply of **EIGHTEEN COPPER SCREENS FOR THE MAIN PUMPING STATION, TUNNEL SHAFT NO. ONE.**

Envelopes containing tenders must be plainly marked on the outside as to contents.

Specifications and forms of tender may be obtained at the office of the City Engineer, Toronto.

The tenderers shall submit with their tender the names of two personal sureties (approved of by the City Treasurer), not members of the City Council, or officers of the Corporation of the City of Toronto, or in lieu of said sureties, the bond of a guarantee company, approved as aforesaid.

The usual conditions relating to tendering as prescribed by City By-law must be strictly complied with, or the tenders will not be entertained.

The lowest or any tender not necessarily accepted.

G. R. GEARY (Mayor),
Chairman, Board of Control.

City Hall, Toronto, March 28th, 1911.

(Tenders continued on pages 68, 70.)

Books for Municipal Engineers

British Sewage Works.—By M. N. Baker. Cloth, 6 x 9 ins., 150 pages, $2.00.

Sewage Disposal Works.—By H. P. Raikes. Cloth, 6 x 9 ins., 414 + xv. pages, 72 illustrations, $4.00.

Clarification of Sewage.—By Dr. Ing. Rudolf Schmeitzner. Translated from the German by A. Elliott Kimberly, C.E. Cloth, 5 x 7½ ins., xiv. + 113 pages, 47 illustrations and 2 plates, $1.50.

Municipal Franchises (Vol. I.)—By Delos F. Wilcox, Ph.D. Cloth, crown octavo, 710 + xx. pages, $5.00.

The Art of Road-making.—By Harwood Frost. Cloth, 6 x 9 ins., 544 + xvii. pages, 260 illustrations, $3.00.

An explanation of the problems involved in the building of roads and streets, the various road-making materials, qualities of roads suited for various purposes, and other information written in a non-technical style suitable for the general reader. Contains a Digest of the State-aid Road Laws of the Various States, and a Bibliography of Road-making Covering a Period from 1600 to date.

Economics of Road Construction.—By H. P. Gillette. Cloth, 6 x 9 ins., 40 pages, illustrated; second edition, enlarged, $1.00.

City Roads and Pavements.—By Wm. Pierson Judson. Cloth, 6 x 9 ins., 197 pages, 69 illustrations; Fourth edition, revised (1909), $2.00.

Road Preservation and Dust Prevention.—By Wm. Pierson Judson. Cloth, 6 x 9 ins., 144 pages, 16 illustrations, $1.50.

Specifications for Street Roadway Pavements.—By F. Whinery. Paper, 6 x 9 ins., 56 pages, 50 cents.

Bridge and Structural Design.—By W. Chase Thomson. Second edition. Entirely rewritten and drawings redrawn. Cloth, 6 x 9 ins., 192 + vi. pages, 82 illustrations (including 5 folding plates), $2.00.

Design of Typical Steel Railway Bridges.—By W. C. Thomson. Cloth, 6 x 9 ins., 178 + vii. pages, 21 diagrams and detail drawings (including 5 folding plates), $2.00.

Design of Steel Highway Bridges.—By M. S. Ketchum. Cloth, 6 x 9 ins., 550 + xiv. pages, 300 figures, 77 tables, 8 folding plates, $4.00.

Analysis of Elastic Arches.—By J. M. Balet. Cloth, 6 x 9 ins., 320 pages, 184 diagrams, 6 folding plates, 19 tables, $3.00.

Inspectors' Handbook of Reinforced Concrete.—By Ballinger and Perrot. Flexible cloth, 4½ x 6½ ins., 64 pages, 6 folding diagrams, $1.00.

Concrete-Steel Construction (Der Eisenbetonbau).—By Prof. Emil Mörsch. Translated from (1908) German edition by E. P. Goodrich. Buckram; 6½ x 9½ ins., x. + 368 pages, 350 illustrations (including 2 folding plates), $5.00.

Reinforced Concrete.—By A. W. Buel and Chas. S. Hill. Second edition, entirely rewritten. Cloth, 6 x 9 ins., 500 pages, tables, diagrams and 357 illustrations, $5.00.

Concrete System.—By Frank B. Gilbreth. Flex. morocco, 8½ x 11 ins., 200 pages, 220 illustrations and 10 folding plates, printed on finest coated paper, $5.00.

Concrete Blocks: Their Manufacture and Use in Building Construction.—Cloth, 6 x 9 ins., 125 pages, illustrated, $1.50.

Practical Hints for Concrete Constructors.—By W. J. Douglas. Paper, 4½ x 7 ins., 60 pages, 3 illustrations, 25 cents.

The regular price of the CANADIAN ENGINEER is $3.00 a year. By adding $2.00 to the price of any book ordered from our Book Department, we will send the paper to you for one year if you are not already on our subscription list.

CANADIAN ENGINEER

BOOK DEPARTMENT

62 Church Street, - - - - TORONTO, CANADA

Tenders Called For

(Continued from page 66.)

CITY OF MOOSE JAW, SASKATCHEWAN.

Main Drainage Works.

Sealed tenders endorsed "Tender A" and "Tender B," will be received by the undersigned City Clerk until 8.30 o'clock p.m. on Monday, April 10th, 1911. Any tender received after the above stated time be declared informal.

Contract "A."

Supplying materials for and constructing a Sewage Disposal Plant complete, including a Pump House, Sedimentation Tanks and Percolating Filters, also the supplying of materials for and the laying of a Trunk Sewer and Water Main.

Contract "B."

Supplying two Electrically-driven Centrifugal Pumps and Auto Starters complete with all piping, connections, etc.

Plans and specifications for contract "A" may be obtained from the City Engineer, Moose Jaw, upon receipt of a marked cheque for the sum of $25, to be held until return of plans and specifications; and for contract "B" plans and specifications will be sent upon request.

The lowest or any tender not necessarily accepted.

J. M. WILSON, City Engineer.
W. F. HEAL, City Clerk.

Moose Jaw, February 18th, 1911.

CIVIC CAR LINES.

TENDERS FOR RAILS AND TIES.

Tenders will be received by registered post only, addressed to the Chairman of the Board of Control, City Hall, Toronto, Canada, up to noon on Tuesday, April 4th, 1911, for delivery of thirteen hundred and forty (1,340) tons of open hearth steel rail, 80-lb. section, also thirty thousand (30,000) untreated wood ties, white cedar preferred, although other woods will be considered.

Envelopes containing tender must be plainly marked on the outside as to contents.

Specifications and forms of tender may be obtained upon application to the office of the City Engineer, Toronto.

The lowest or any tender not necessarily accepted.

G. R. GEARY (Mayor),
Chairman Board of Control.

City Hall, Toronto, February 28th, 1911.

TENDERS FOR A STEEL BRIDGE.

THE RURAL MUNICIPALITY OF SWAN RIVER, in Manitoba, invite tenders for one ninety-four (94) foot centre to centre of end bearings Steel-riveted Pratt Truss Bridge and two Concrete Piers with (Steel) Stringers, and three (3) inch Tamarac Plank Floor. To be erected over the Woody River, east side of Section 36, Township 37, Range 27, west of the Principal Meridian in Manitoba, in accordance with Specifications, which can be obtained from the Provincial Department of Public Works, Parliament Buildings, Winnipeg, Manitoba.

The bridge site is within one mile of Bowsman Station on the Canadian Northern Railway.

Sealed Tenders to be delivered to the undersigned on or before the 15th day of April, A.D., 1911.

JOSEPH ARMSTRONG,
Secretary-Treasurer, Municipal Council,
Swan River, Manitoba.

CITY OF SASKATOON.

TENDERS WANTED.

CONSTRUCTION OF CEMENT SIDEWALKS.

Sealed tenders, addressed to the City Commissioners, Saskatoon, Sask., and endorsed "Tender for Cement Sidewalks," will be received up to 12 o'clock noon on Friday, 7th April, 1911.

Plans, specifications, instructions to bidders, general conditions, forms of tender and forms of agreement, may be seen at the office of the City Engineer, Saskatoon, and also at the following places:

Office of "The Canadian Engineer," 62 Church St., Toronto.
" " " " Board of Trade Bldg., Montreal.
" " " " 315 Nanton Building, Winnipeg.

Copies of instructions to bidders, and forms of tender will be furnished on application to the City Engineer, but not plans or specifications.

The lowest or any tender not necessarily accepted.

JAS. CLINKSKILL,
W. B. NEIL,
City Commissioners.

Saskatoon, Sask., March 15th, 1911.

CITY OF SASKATOON.

INTERCEPTING SEWER.

Sealed tenders addressed to the undersigned city commissioners and marked as to contents, will be received until 12 o'clock noon on Friday, April 14th, 1911, for the following work:—

Contract No. 78—Pipelaying.
" " 79—Furnishing concrete sewer pipe.
" " 80—Furnishing cast-iron sewer pipe and specials.

Plans, specifications, etc., may be seen at the office of the City Engineer, Saskatoon, also at the following places:

The Canadian Engineer—62 Church St., Toronto.
" " " —315 Nanton Bldg., Winnipeg.
" " " —Board of Trade Bldg., Montreal.
Engineering News. —220 Broadway, New York City.

The lowest or any tender not necessarily accepted.

JAS. CLINKSKILL (Mayor),
W. B. NEIL,
City Commissioners.

Saskatoon, Saskatchewan, Canada,
March 1st, 1911.

TENDERS FOR A STEEL BRIDGE.

The Municipal Council of THE RURAL MUNICIPALITY OF MINNITONAS invite TENDERS for the supply and erection of a Steel Warren Truss Bridge, and Two Concrete Piers. Bridge to be 60 feet centre to centre, of end bearings with Steel Stringers and Three-inch Plank Floor in accordance with Plan (No. F 10), and specifications on file at this Office, and also at the Office of the Chief Engineer, Department of Public Works, Parliament Buildings, Winnipeg, Manitoba.

Tenders under Seal to be delivered to the undersigned on or before the 15th Day of April, A.D. 1911.

The lowest or any Tender not necessarily accepted.

E. WIDMEYER,
Secretary-Treasurer, Municipal Council,
Minnitonas, P.O., Manitoba.

(Tenders continued on page 70.)

Tenders Called For

(Continued from pages 66 and 68.)

Sealed tenders addressed to the undersigned, and endorsed "Tender for Plaza between Dufferin and Sapper's Bridges, Ottawa," will be received at this office until 4.00 P.M., on Monday, April 3, 1911, for the construction of a Plaza between Dufferin and Sapper's bridges, alterations to Dufferin bridge, and demolition and reconstruction of Sapper's bridge.

Plans, specification and form of contract can be seen and forms of tender obtained at this Department.

Persons tendering are notified that tenders will not be considered unless made on the printed forms supplied and signed with their actual signatures, stating their occupations and places of residence. In the case of firms, the actual signature, the nature of the occupation and place of residence of each member of the firm must be given.

Each tender must be accompanied by an accepted cheque on a chartered bank, made payable to the order of the Honourable the Minister of Public Works, equal to ten per cent. 10 p.c. of the amount of the tender which will be forfeited if the person tendering decline to enter into contract when called upon to do so, or fail to complete the work contracted for. If the tender be not accepted the cheque will be returned.

The Department does not bind itself to accept the lowest or any tender.

By order,
R. C. DESROCHERS,
Secretary.

Department of Public Works,
Ottawa, March 16, 1911.

Newspapers will not be paid for this advertisement if they insert it without authority from the Department.

CITY OF TORONTO.

Tenders Wanted for Construction Equipment.

Separate or bulk tenders, on prescribed forms, will be received by registered post only, addressed to the Chairman of the Board of Control, City Hall, Toronto, Canada, up to noon on Tuesday, April 11th, for the delivery of the following:—

(1) Two (2) full circle swing traction steam shovels, one and a quarter (1¼) yard dipper.
(2) Six (6) saddle tank locomotives, 36-in. gauge.
(3) Forty (40) four yard (4 yd.) dump cars, or fifty-four (54) three yard (3 yd.) dump cars, 36-in. gauge.
(4) Four (4) double truck flat cars, 36-in. gauge.
(a)
(5) Two hundred (200) tons 30-lb., steel rail.
(b)
Twenty-four (24) No. 5 switch leads.
(c)
Seventy-five (75) kegs of spikes.
(d)
Eighteen hundred (1800) pair of fish plates.
(e)
Twenty (20) kegs bolts and nuts.

Envelopes containing tenders must be plainly marked on the outside as to contents.

Specification and form of tender may be obtained upon application from Department of Railways, Bridges and Docks, City Engineer's Office, Toronto.

The lowest or any tender not necessarily accepted.

G. R. GEARY (Mayor),
Chairman, Board of Control

City Hall, Toronto, March 27th, 1911.

CITY OF PRINCE ALBERT.

Tenders for Intercepting Sewer.

Sealed tenders addressed to the Commissioners of the City of Prince Albert and marked "Tender for Sewer," will be received until noon on Saturday, the 15th day of April, 1911, for the construction of a main intercepting sewer, as follows:—

5,749	lin.	ft.	4′ 6″ x 3′ 0″	concrete	sewer.
4,640	"	"	4′ 3″ x 2′ 10″	"	"
2,798	"	"	4′ 0″ x 2′ 8″	"	"
19 manholes.					

Alternate bids for reinforced concrete pipe will be considered.

Plans and specifications may be obtained at the office of the City Engineer, also at office of Canadian Engineer, Winnipeg, after April 1st.

A marked cheque for $2,500, in favor of the treasurer of the City of Prince Albert must accompany each tender submitted.

Andrew Holmes,
C. O. Davidson,
F. A. Creighton,
Commissioners.

Prince Albert, Sask.,
March 7th, 1911.

WELLAND, ONTARIO.

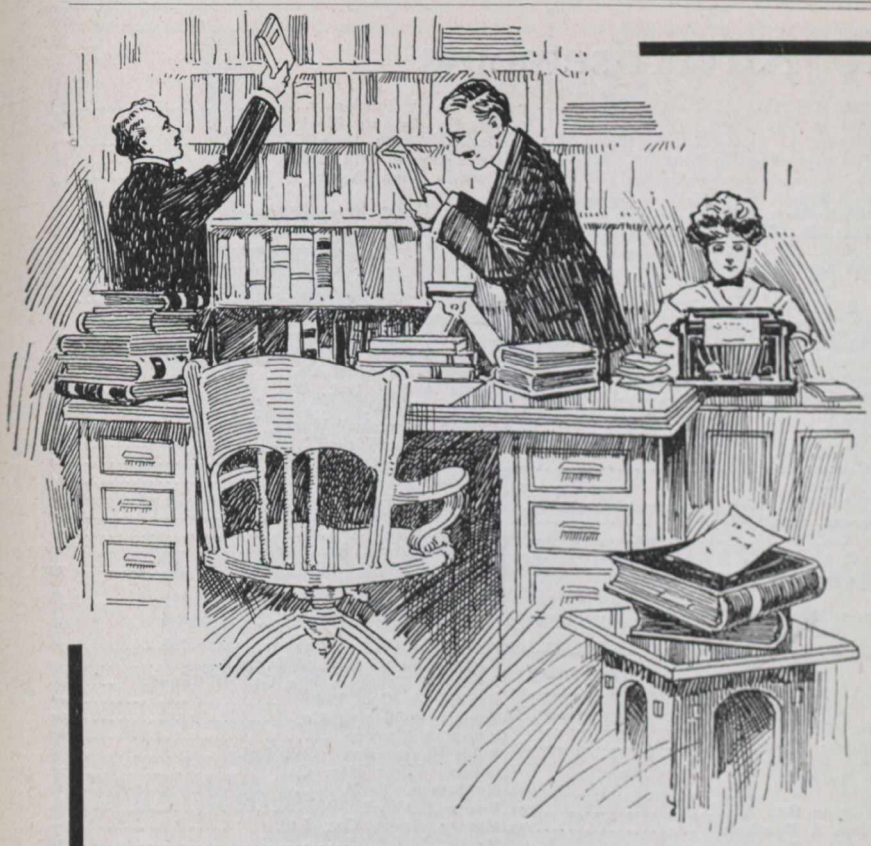
Sealed tenders will be received until Monday noon, April 3rd, for the construction, delivery and erection in place in Welland, Ontario, of one unit of waterpower driven waterworks pumps, three millions imperial gallons daily capacity, including turbine, pipes, valves, etc.

Specifications, prepared by Mr. Wm. Kennedy, Jr., Engineer, Montreal, may be obtained from the undersigned.

Envelopes to be marked "Tenders for pumps."

R. COOPER,
Chairman Water Commissioners,

Welland, Ont.



It is perhaps not generally known

that we have an Information Department consisting of trained and practical men, whose time is employed solely in answering enquiries from people interested in cement.

Now it will be readily understood

that out of the mass of enquiries that come to us, there are a number that include questions as to what might be termed Allied Industries. These we now answer to the best of our ability, but we could answer them still more satisfactorily, if manufacturers of materials used in conjunction with cement would co-operate to the extent of sending copies of their catalogues and other literature, to be placed on file in our office for reference.

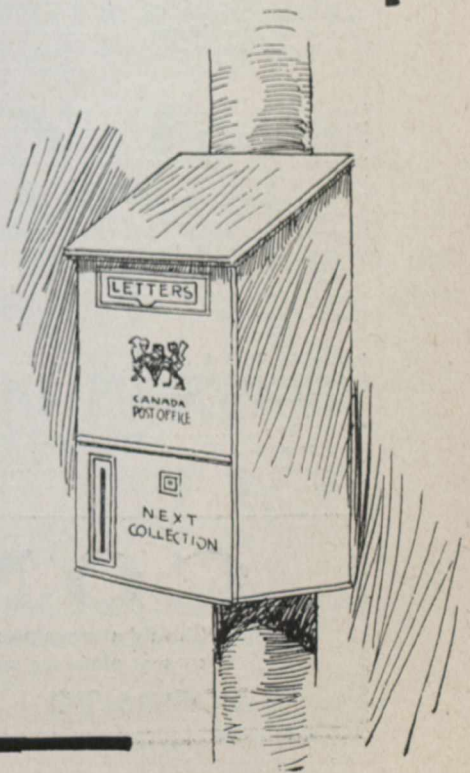
We should like to obtain

the names and addresses, together with catalogues, and any other obtainable information of manufacturers of and dealers in:—

1. Concrete Machinery
2. Building Blocks
3. Cement Bricks
4. Tile Molds
5. Fence Posts
6. Reinforcing Material
7. Waterproofing Compounds

It is not alone for our own convenience that we make this suggestion: Firms who manufacture or deal in such articles, will find it to their own advantage to have this information in the hands of our Information Department, thereby enabling us to hand on to them, from time to time, enquiries for such materials as they severally make.

In sending catalogues, literature or information, please address same to "Sales Department."



The

Canada Cement Co., Limited

Banque National Bldg. - MONTREAL

Index to Advertisements

AMONG THE MANUFACTURERS

A department for the benefit of all readers to contain news from the manufacturer and inventor to the profession.

NEW OFFICE.

To meet the constantly increasing business around the Pittsburg District, The Richardson-Phenix Company, of Milwaukee, Wis., have recently opened a branch office in the Keystone Building, 324 Fourth Avenue, Pittsburg, Pa. This office will be under the management of Mr. H. H. Laughlin, who has been with The Richardson-Phenix Company for several years. Any question concerning the economical lubrication of any kind of machinery can be taken up with Mr. Laughlin and will have his personal attention. He is familiar with all systems of lubrications, and is willing to give advice on "everything for lubrication but the lubricants."

PATENTS.

The following is a list of Canadian patents recently issued through the agency of Messrs. Ridout & Maybee, Manning Chambers, Toronto, from whom further particulars may be obtained:

J. F. & V. Durbin, Railway Car Coupling; J. F. & V. Durbin, Car Couplers (inclined bearing); J. F. & V. Durbin, Lock Sets for car couplings; A. H. Edwards & M. D. Rucker Aeroplane; Charles O. Bastian, Method and means for transforming electric energy; T. J. Hoover, Apparatus for ore concentration (Case 1); Apparatus for ore concentration (Case 2); David Anderson, Controlling devices for lighting systems; Dunlop Tire & Rubber Goods Co., Ltd. Tread for pneumatic tires; Edward Unverricht, Automatic railway safety devices; R. B. Porter, Semaphores for railway signalling; A. J. Rossi, Producing alloys of titanium; The Berlin Suspender Co., Suspenders; W. J. Hesseln, Two-fluid galvanic cells; George Evans, Detachable heels; A. H. Darker, Secondary batteries; Julius Haltenberger, Bearings for automobile transmission gear.

NEW INCORPORATIONS.

Medicine Hat, Alta.—Burnside Development Co., $50,000.

Walkerville, Ont.—Beaver Asbestos Co., $500,000. H. A. Walker, P. Dugal.

Canboro, Ont.—Canboro Co-operative Store Co., $40,000. M. Shave, W. Melick, R. Johnson.

Sault Ste. Marie, Ont.—Lake Superior Paper Co., $8,000,000. T. Gibson, A. Taylor, E. P. Seon, N. D Bayly.

Aurora, Ont.—Collis Leather Co., $150,000. J. F. Lennox, C. W. Plaxton.

Campbellton, N.B.—Richards Manufacturing Co., $300,000. D. Richards, D. E. Richards, W. S. Richards.

Bathurst, N.B.—Eastern Transportation Co., $20,000. A. E. Loosen, O. Page, C. M. Mersereau.

Gananoque, Ont.—Gananoque Harness Works, $40,000 W. R. Acton, T. W. Suddaby, J. Acton.

Chatham, Ont.—Wm. Gray-Sons-Campbell, $2,000,000. R. Gray, M. Campbell, W. R. Landon.

Cargill, Ont.—Dominion Well Supply Co., $40,000. W. D. Cargill, C. W. Keeling, C. Kyle.

St. Ours, Que.—St. Ours Telephone Co., $3,500. J. E. Taschereau, N. Courtemanche, J. H. Larose.

Niagara Falls, Ont.—Medina Natural Gas Co., $500,000. D. A. Coste, Niagara Falls; W. G. Ryan, R. L. Pattison, Chatham.

Windsor, Ont.—Hoover Suction Sweeper Company of Canada, $10,000. W. H. Hoover, H. W. Hoover, F. G. Hoover.

Milton, Ont.—Brandons' Pressed Brick and Tile Company, of Milton, $100,000. R. C. Brandon, Cannington; S. E. Brandon, Milton.

Walkerville, Ont.—Ideal Packless Valve Co., $40,000. F. Leadbeater, Detroit; F. W. Stodgell, C. J. Stodgell, Walkerville.

Hamilton, Ont.—Hamilton Lock and Hardware Manufacturing Co., $100,000. S. Aikins, J. T. Anderson, W. M. Findlay.

Oromocto, N.B.—Imperial Dredging and Construction Co., $40,000. W. J. McMulkin, Upper Gagetown; R. E. Smith, Oromocto; H. B. Bridges, Gagetown.

Calgary, Alta.—Calgary Crushed Rock & Gravel Co., $100,000. Grant Brothers, $10,000. Mount Royal Garage Co., $50,000.

Sherbrooke, Que.—Compagnie Industrielle Transcontinentale, $45,000. D. O. E. Denault, C. S. Milette, O. C. Morissette.

British Columbia.—Blue Mountain Refractories Co., $1,500,000. British Pacific Coal Co., $1,500,000. Fernie Garage Co., $10,000. Royal Canadian Oil Co., $250,000. Scandia Trading Co., $25,000. Vancouver Pressed Brick and Stone, $100,000. Witcombe, Conray & Brettell, $25,000. Woods, Limited, $50,000.

Montreal, Que.—Frasers, Limited, $1,000,000. A. D. Fraser, G. A. Fraser, W. F. Fraser. Wilfrid Clermont, $40,000. W. Clermont, A. Pichette, P. Clermont. Goss Brothers, $10,000. A. H. Goss, Flint; H. W. Bailey, C. W. Hockett, Detroit, Mich. Merchants Realty Co., $100,000. W. G. Scott, Outremont; L. A. Dubrule, M. Marchand, Montreal.

Toronto.—Moffat-Irving Electric Smelters, $40,000. J. W. Moffat, W. H. Garvey, J. A. Rowland Bell Filtration Company of Canada, $40,000. C. E. Richardson, R. W. Houser, W. A. Henderson. Victoria Manufacturing Co., $40,000. S. Rosenberg, W. J. McLarty, F. C. Gullen. Perfect Ventilator Co., $40,000. W. Phillips, W. E. Ireland, R. C. Vaughan. Northern Ontario Light and Power Company, $7,500,000. G. H. Sedgewick, A. G. Ross, L. Davis. Madeleine River Timber Co., $45,000. F. Denton, P. A. Lynch. Mines Products, $40,000. D. Henderson, W. H. McGuire, C. H. Sheriff. Kitsumkalum Timber Co., $1,500,000. W. J. Rooney, G. F. Morrison, R. F. Pack

CATALOGUE INDEX

Some of the most valuable information on engineering and contracting subjects is to be found in the trade literature of the large supply houses.

The Canadian Engineer maintains a card index upon which is kept an up-to-date list of manufacturers of contractors supplies and engineering equipment. If you want the catalogues of any of these firms all you need do is to send us a postal giving your address and the list numbers (as printed below) of the catalogues you wish sent. This will save you time and labor and insure prompt service. This department can put you in direct communication with the principal manufacturers of and dealers in engineering equipment of all kinds.

1 Air compressors.
2 Air lift pumping machinery.
3 Alloys.
4 Aluminum.
5 Angles (see structural steel).
6 Architects' supplies.
7 Asbestos and Asbestos Products.
8 Asphalt.
9 Asphalt plants and tools.

10 Bars (steel)
11 Bearing Metals.
12 Bearings, ball and roller.
13 Belt dressing.
14 Belt tighteners.
15 Belting, chain, link, canvas, etc.
16 Benders (rail).
17 Blacksmiths' tools.
18 Blast furnaces and fittings.
19 Blasting powder.
20 Blocks and tackle.
21 Blowers.
22 Boiler fittings, mountings and tubes.
23 Boiler tubes.
24 Boilers (tubular).
25 Boilers (water-tube).
26 Bolts.
27 Bolts (machine).
27A Bonding for Concrete.
28 Bonds (Contractors').
29 Books (engineering and technical).
30 Boots.
31 Brackets and cross-arms
32 Brick and tile.
33 Brick (paving).
34 Bridge builders.
35 Bridge engineers.
36 Bridges (concrete).
37 Buckets.
38 Buckets (clam shell).
39 Buckets (concrete).
40 Buckets (dredging and excavating).

41 Cables (manila).
42 Cableways.
43 Caisson Foundations.
44 Car replacers.
45 Carbolineum.
46 Cars (ballast).
47 Cars (concrete).
48 Cars (dumping).
49 Cars (industrial).
50 Cars (inspection).
51 Carts and wagons (ash and dump).
52 Carts (concrete).
53 Castings (malleable iron).
54 Castings (steel).
55 Cement.
56 Cement block and brick machines.
57 Cement-making machinery.
58 Cement testing machines.
59 Cement waterproofing.
60 Centers.
61 Chemists.
62 Chimneys (concrete).
63 Chimneys (steel).
64 Clutches (friction).
65 Coal and ore-handling machinery.
66 Cofferdams.
67 Compressed-air tools.
68 Concrete block machines
69 Concrete reinforcement.
70 Conduits (steel)
71 Conduits (vitrified clay).
72 Contractors' (general).
73 Conveying machinery.
74 Conveyers (belt).
75 Conveyers (cable).
76 Cordage.
77 Cranes and hoists.
78 Cranes (derrick).
79 Cranes (electric).
80 Cranes (hand-power).
81 Cranes (locomotive).
82 Cranes (travelling).
83 Crusher castings (rock).
84 Crushing rolls.
85 Culverts.
86 Curb (steel).

87 Dams (concrete).
88 Derails.
89 Derricks (pile driving).
90 Derricks (steam).
91 Drafting Instruments and supplies (see engineers' and surveyors' instruments and supplies).
92 Dredging machinery.
93 Drills (pneumatic).
94 Drills (rock).
95 Drums (hoisting).
96 Dryers (cement, asphalt and sand).
97 Dynamite.

98 Elevators (bucket).
99 Engineers and contractors.
100 Engineers' and surveyors' instruments and supplies.
101 Engines (compressed air).
102 Engines (gas, gasoline, oil).
103 Engines (high duty—pumping).
104 Engines (hoisting).
105 Engines (oil).
106 Engines (steam).
107 Engines (traction).
108 Excavating machinery.
109 Explosives.
110 Fans.
111 Fence, railing and posts
112 Filters (feed water).
113 Filters (water).
114 Fire brick and fire clay.
115 Forgings (steel).
116 Foundations.
117 Foundry equipment and supplies.
118 Frogs and switches (ry.).

119 Garbage crematories.
120 Gas producers.
121 Gates and valves.
122 Gauges (steam), (see steam specialties).
123 Generators (electric).
124 Governors (water-wheel).
125 Grain elevators and storage tanks.
126 Grinding & Mixing Machinery.

127 Hand cars.
128 Heating and ventilating machinery.
129 Hoists (chain and rope).
130 Hoists (pneumatic).
131 Hoists (steam).
132 Hydrants.

133 Ice and refrigerating machinery.
134 Incline cableway engines.
135 Inspection of materials.
136 Irrigation supplies.

137 Jacks (screw and lever)
138 Jacks (hydraulic).
139 Jacks (pneumatic).
140 Jacks (track).

141 Kilns (cement).

142 Lamp posts.
143 Levels.
143A Lights (Contractors' & Municipal).
144 Locomotives (industrial and light).
145 Locomotives (steam)
146 Locomotives (traction).

147 Manganese steel.
148 Manhole covers.
149 Meters (water, oil and gas).
150 Mixers (asphalt).

151 Oakum.

152 Paints and metal coatings.
153 Paving joint filler.
154 Penstocks.
155 Pile driving machinery.
156 Pile protection.
157 Piling (interlocking steel).
158 Pipe (galvanized iron).
159 Pipe (reinforced concrete).
160 Pipe (riveted steel).
161 Pipe (wood).
162 Portland cement.
163 Pulverizers.
164 Pumps (pneumatic).
165 Pumps (centrifugal).
166 Pumps (diaphragm).
167 Pumps (waterworks).

168 Rail joints, fastenings and specialties.
169 Railroad track supplies.
170 Rails and track.
171 Rails, second-hand.
172 Railways, industrial and narrow gauge.
173 Reinforcement steel for concrete structures.
174 Riveting hammers.
175 Riveting machines.
176 Road machinery.
177 Road oils.
178 Road rollers.
179 Roofing.
180 Rope (wire).
181 Rubber boots.

182 Sand-blast machines.
183 Scarifiers.
184 Schools and colleges.
185 Scrapers, road.
186 Second-hand machinery and supplies.
187 Sewage disposal.
188 Sewer braces.
189 Sewer buckets.
190 Sewer flushers (automatic).
191 Sewer pipe.
192 Shovels (steam).
193 Shovels and picks (hand).
194 Sluice gates.
195 Steam specialties.
196 Steel substructures for tanks
197 Street-cleaning implements, machinery and snow plows
198 Street sprinklers.
199 Structural materials
200 Structural steel.

201 Testing laboratories (chemists, etc.).
202 Ties (steel and wood).
203 Tile.
204 Track tools.
205 Traction ditching machines.
206 Transits.
207 Trench excavating machi
208 Turbine pumps.
209 Turntables (overhead).

210 Valves (sluice).

211 Wagons (contracto
212 Wagons (garbage).
213 Wagons (oil).
214 Well-drilling machin
215 Wheelbarrows.
216 Winches.

CONTRACTORS

Should always phone the nearest office of The Canadian Engineer before going out of town to see plans or specifications of work. The plans, etc., may be on file at our offices.

TORONTO - WINNIPEG - MONTREAL