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MISSING

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The Canadian Engineer

ESTABLISHED 1893

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TORONTO, CANADA, AUGUST 2nd, 1907.

ANNOUNCEMENT.

Owing to the agreement between the Postal Departments of Canada and the United States, by which the rates on second-class matter have been advanced from one cent to four cents per pound on all publications going into the United States, we are obliged to announce that the subscription rate on The Canadian Engineer, when going into the United States will be advanced to $2.50 per year. Current subscriptions will be carried at the old rate.

CONTENTS OF THIS ISSUE.

CANADA'S OPPORTUNITY.

It is very desirable that Canada should be one of the principal overland routes on the world's highway. The proposal for a fast line of steamers between Great Britain and Canada, Canada and Australasian ports on the Pacific, and between Canada, Japan and China is a scheme in which every Canadian should be enthusiastic. It would make the Dominion a large part of the main artery of the world's commerce, and would benefit, to an extent that it is almost impossible to estimate Canada's commerce. The uppermost thought of the promoters is to bring the different parts of the Empire into closer touch with each other, and to do this by means of a world route that would be strictly British. For this reason it has been popularly termed the "All "Red" route.

Up to the present time sentiment has practically controlled the project. This is all very well in its way, Everyone living under the British flag would like to see the different parts of the Empire brought closer together by means of quick communication. Would the project be a success from a commercial standpoint? This appears to be the vital question. The lack of rapid transportation has been the great drawback to trade between Great Britain and Canada. At the present time it is impossible to get quick delivery of goods coming from the Old Country, and vice versa. Even the mails are too slow. It should not take twenty days to get an English reply to a Canadian letter. If better facilities were afforded the trade between Great Britain and this country would be doubled and trebled within a very short time.

The new mail service would be an excellent innovation. It calls for the establishment of a service between Halifax and Blacksod Bay, on the west coast of Ireland, of a line of first-class steamships capable of crossing the Atlantic in three and a half days at an average speed of 25 knots per hour. The establishment of ferries between the east coast of Ireland and the west coast of Scotland and England by means of steamships so constructed as to be capable of conveying passengers and goods trains entire from port to port without disturbing passengers or unloading trucks; and the construction of such railways in Ireland as may be necessary, in conjunction with existing lines, to provide for an express passenger service between Blacksod Bay and the east coast at a speed of not less than fifty miles per hour.

Vessels for this service would have to be similar to those now being built for the Cunard Line, the "Lusitania" and the "Mauritania." State aid would have to be given toward the building of such immense vessels, and the amount of passenger traffic to and from Canada for a long time to come will not be sufficient to support vessels of this type.

Some idea of what these leviathans are like may be gathered from an article in the Marine Journal by Egbert P. Watson, M.E. Referring to the speed, which is about 28 land miles per hour, nearly as fast as that of the average passenger train, he says:—

"To attain it the vessels are of enormous size and "adequate engine power. This last is of the turbine "type, and its aggregate far surpasses anything "hitherto put into a ship, comprising a total of 60,000 "horse-power in both engines and boilers. The screws

" are to make 200 revolutions per minute, and to supply " steam for them an enormous amount of coal has to be " burned hourly.

" On the basis of two pounds of coal per horse- " power hour, 120,000 pounds will be burned to develop " 60,000 horse-power to attain a speed of 25 knots " hourly; in 24 hours 1,440 short tons will be burned, " a quantity which cannot be understood by merely " reading of it. Thirty boilers of 2,000 horse-power " each will be needed to supply steam; with only three " square feet of grate surface per horse-power there " will be 180,000 square feet of grate surface, which is " comprised in a lot of ground 600 feet long by 300 feet " wide (a big baseball ground), and all the other details " of the steam department are in keeping."

Mr. Watson's opinion regarding the operating of these large steamers is rather a pessimistic one. He says: "Just what will happen when we undertake to " drive a vessel nearly 800 feet long, about 80 feet " beam, drawing upward of 35 feet of water, through " heavy weather every hour at 28 miles an hour for each " successive hour, there is no man living that can accu- " rately predict.

" Experience is cumulative, so to speak, and in- " creases with every departure from precedents. What " vessels of ordinary dimensions and speeds can do is " well known. We now have to learn what follows ex- " traordinary departures therefrom. The "Deutsch- " land," built to make 23 knots an hour continuously in " all weathers, is a very fast boat, but there have been " many voyages when she did not make anything like " it. Now, take 25 knots sea speed continuously, and " build a ship that will do it for day after day month " after month; there are many who will believe it when " the year is over, not before then."

In view of an opinion like this, before going too far, perhaps it would be just as well to await the results given by the new Cunarders, which will be ready for service in a short time. It is just possible that they will be a success. In any case it will be well to watch their operation.

In an explanatory letter from Sir Thomas Troubridge, Bart., the following time-table is given, which, he says, can be adhered to without difficulty, excepting under very exceptional circumstances:—

Atlantic Ocean..... 25 knots.
Pacific Ocean..... 18 and 21 knots.

Leave London, June 1st, Friday, 7 p.m.
Arrive Blacksod, June 2nd, 9 a.m., leave 10 a.m.
Arrive Halifax, June 5th, 6 to 9 p.m., leave 10 p.m.
Arrive Vancouver, June 9th, 10 p.m., leave midnight.

18 knots.

Arrive Honolulu, June 15th, 10 a.m., leave 4 p.m.
Arrive Suva, June 21st, midnight, leave 6 a.m., 22nd.
Arrive Auckland, June 24th, 10 p.m., leave 2 a.m., 25th.
Arrive Sydney, June 27th, midnight.

London to Sydney, 26 days 5 hours.
London to Auckland, 23 days 3 hours.

21 knots.

Arrive Honolulu, June 14th, 4 p.m., leave 10 p.m.
Arrive Suva, June 20th, 9 a.m., leave 3 p.m.
Arrive Auckland, June 22nd, 10 p.m., leave 2 a.m., 23rd.
Arrive Sydney, June 25th, 2 p.m.

London to Sydney, 23 days 19 hours.
London to Auckland, 21 days 3 hours.

The service on the Pacific would not be quite so speedy, and it is possible that vessels running from 20 to 21 knots per hour would be placed on this route. This service is more complicated than that on the Atlantic, due to the geographical position of New Zealand and Australia. Either one of these plans must have the first port of call after leaving Fiji. If it is in New Zealand, Australians will have to travel a day and a half longer to get to Sydney, and if at Sydney, the people of New Zealand will be at a greater disadvantage. Reports show that it is advisable to make Auckland, N.Z., the first port of call, and if this were done Sydney would have the advantage of being the terminus of the line.

Fast steamers such as projected could not be used for heavy freight, as the unloading of steamers, loading of trains, etc., would be too costly. These high-speed vessels would be express steamers for passengers, mails, and express freight.

Cost in this, as in every other undertaking, is an important item. Canada has been offering $750,000 per annum to secure a 20-knot service to and from Great Britain without avail. The "All Red" route would give a 25-knot service at about the same cost, although the cost of operating the service would be much greater.

This is a project that, while benefiting the whole of the Empire, would particularly benefit Canada. It is an opportunity that Canadians cannot afford to miss, placing the Dominion, as it would, on the direct highway of the greater part of the world's commerce.

EDITORIAL NOTES.

The day of the individual gold miner is fast departing. The gold dredge, operated by syndicates, is taking his place, and many old mining districts, long ago thought to be worked out, have been resuscitated from a dormant state to one of activity. At the present time there are some nine large dredges being operated in the Klondyke on rivers and creeks that it was almost impossible to work with success in any other way. Dredging and hydraulic sluicing can be carried on over large areas where the ore is low grade and too poor to be worked by ordinary methods. Until the advent of the dredge it was not possible to follow gold-bearing gravels under rivers, but now it is a simple matter to bring the gravel at the bed of the river to the surface. In Victoria, Australia, there are ninety bucket dredges and hydraulic pump sluices being operated.

* * * *

Much difficulty is encountered by the city of Toronto on account of the clause in its contracts calling for the payment to union workmen of the prevailing rate of wages. On this account not one Canadian firm put in a tender for the steel work on the Lansdowne Avenue subway. Three English firms sent in tenders, and the contract was awarded to one of them. This means that work which should be done by Canadian contractors will be done by outside firms, and simply because the unions are being catered to. Are Canadian contractors and manufacturers to be left behind in the race because municipalities practically wish to dictate the rate of wages they shall pay their employees? Not only has the contractor to suffer, but it is quite likely that the municipality will pay a much higher price for the work done than would be the case if this clause were omitted.

* * * *

If the efforts of the Toronto Exhibition directors meet with success the Brennan mono-rail will be exhibited this year. Mr. Louis Brennan, of London, England, has been asked to give an exhibition of his invention, and it is said that if possible a cable will be run from the Exhibition grounds to Hanlan's Point, a distance of about a mile and a half. Railway Engineers in Canada do not seriously regard Mr. Brennan's wonderful invention. None of them say that the results, which it is claimed the invention will accomplish, are impossible, having in view the achievements of scientists in almost every subject during the last half century. It is regarded, however, as a wonderfully ingenious and strikingly novel toy. The model which was exhibited before the Royal Society and a train of loaded freight cars, each carrying about 60,000 pounds, have some distance between them. Before railroad

engineers will consider this invention seriously there will have to be further developments. Should the directors of the Toronto Exhibition be successful, the exhibit will undoubtedly prove one of, if not the most, interesting displays at the fair grounds, not only to laymen and children, but to engineers, particularly those dealing with the problem of overland transportation. It will most likely be looked at from the same view point as are the "Midway" shows"—"something novel, something "new," and not because of its possibilities in revolutionizing transportation. It is well that this invention has only reached the model stage, and that the model only will come to Toronto, if it comes at all. If this were not the case it is quite likely that a number of the more venturesome people would take the proposed trip across the Bay, and a few more names would be added to the season's drowning list.

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What should prove a valuable addition to technical literature is a journal, entitled "Waterproofing." The first number was published last month, and if the ensuing numbers are as good as this one the subscription price, which is $1 per year, will be well spent. The programme of the editor, Mr. Myron H. Lewis, C.E., shows that the paper will deal with waterproofing of buildings, foundations, tunnels; in fact, all engineering works where it is necessary. Many well-known names appear on the list of contributors. The publication office is at 8 and 10 Burlington Slip, New York.

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A tribute has been paid to the Canadian Pacific Railway by a British officer. Lieut.-Colonel Burnby Campbell has completed a trip around the world in forty days, nineteen and a half hours. The trip was made via Quebec, Vancouver, Yokohama, Vladivostock, and Moscow. The officer left Liverpool at 7.20 p.m. on May 3rd, the actual time table for the trip, as given in the Canadian Gazette, being as follows:—

May 10th (3 p.m.), arrived Quebec.
May 10th (5 p.m.), left Quebec.
May 14th (5 a.m.), arrived Vancouver.
May 14th (12.30 p.m.), left Vancouver.
May 26th (5 a.m.), arrived Yokohama.
May 27th (7 p.m.), left Yokohama.
May 28th (9.30 a.m.), arrived Tsaruga.
May 28th (6 p.m.), left Tsaruga.
May 30th (2.15 p.m.), arrived Vladivostock.
May 30th (7 p.m.), left Vladivostock.
May 31st, arrived Harbin.
June 4th, arrived Irkutsk.
June 10th (2.38 p.m.), arrived Moscow.
June 10th (6 p.m.), left Moscow.
June 11th, left Warsaw.
June 12th, left Berlin.
June 13th (11 a.m.), left Ostend.
June 13th (2.50 p.m.), arrived Dover.

The traveller found that the part of the journey on the Canadian Pacific system, on the Atlantic, across the continent, and on the Pacific, was by far the best. The colonel is reported to have expressed the opinion that the "magnificent steamers of the Canadian Pacific" were especially to his liking. The worst part of the journey was the fourteen days and nights on the trans-Siberian Railway. The Canadian Pacific is to be congratulated.

The town of Bracebridge, Ont., owns a water-power, operating its own water and electric systems, and disposes of its surplus power for manufacturing purposes at a rate below that charged by power corporations at the big power stations on the Niagara and St. Lawrence. It is the water-power that has been the attraction to Bracebridge for manufacturers. Within the town limits and adjacent to them are thousands of horse-power for the most part running to waste.

MARKET CONDITIONS.

Montreal, Aug. 1, 1907.

There has been considerable fluctuation in prices in the English market during the past few weeks, and the level is again fairly low. These fluctuations, being speculative, have not in any way affected the general market. Shipments of iron are still going on actively, and a number of furnaces, as usual at this season of the year, are out of blast. There is much scarcity in Scotch brands, particularly for No. 1, which is almost unobtainable at the moment. Prices on such grades are as high and are being held as firmly as at any time in the past year. While English markets have been fluctuating, good Scotch brands have been sold up to the limit, so that prices have been fully maintained.

The American market shows a slightly better tone. Inquiries are coming in more readily for both foundry and Bessemer irons, and there promises to be another buying period, even though it be only of moderate extent. As a result of the increase in inquiry, prices are being well maintained. It is said that the United States Steel Corporation is in the market for a considerable tonnage of Bessemer steel, and this has a tendency to keep prices of this class of metal at a higher level.

The local market shows very little change, although there is a distinctly better inquiry. Prices are not materially altered, but it would seem as if consumers no longer anticipate a material reduction in prices, and some of them have at last decided to place their orders for late summer and fall deliveries. Some importers and makers report having booked more orders during the past week than for the previous month. This, however, is only to be expected, as purchases for fall requirements cannot much longer be delayed.

Antimony.—The decline in antimony continues, quotations being now 14½ to 15c. The market has been exceptionally weak for some time past, and prices have declined fully 60 per cent. The general expectation is that they will decline still further, as present prices are nearly double those of a few years ago.

Bar Iron and Steel.—Dealers report trade brisk and prices steady. Quotations are: Bar iron, $2.20 per 100 pounds; best refined horseshoe iron, $2.60, and forged iron, $2.45; mild steel, $2.25 per 100 pounds; sleigh shoe steel, $2.25 for 1 x ⅜-base; tire steel, $2.40 for 1 x ⅜-base; toe calk steel, $3.05; machine steel, iron finish, $2.40; base and reeled, $2.85.

Boiler Tubes.—Trade is active and prices are steady. Quotations are: Two-inch, 8 to 8½c.; 2½-inch, 10¼ to 10¾c.; 3-inch, 12c.; 3½-inch, 15 to 15¼c.; 4-inch, 19¼ to 19½c.

Cement—Canadian and American.—Supplies are exceptionally light and demand is active. Canadian prices are steady at $1.90 to $2 per bbl., in cotton bags, and $2.20 to $2.30 in wood, weights in both cases, 350 lbs. There are four bags of 87½ pounds each, net, to a barrel, and 10 cents must be added to the above prices for each bag. Bags in good condition are purchased at 10c. each. Where paper bags are wanted instead of cotton, the charge is 2½ cents for each, or 10 cents per barrel weight. American cement is steady at $1.10 per 350 pounds, basis Lehigh mills, conditions being the same as in the case of Canadian mills, save that when the cotton bags are returned in good condition, only 7½ cents is allowed for them.

Cement.—English and European.—English cement is unchanged at $1.80 to $1.90 per barrel in jute sacks of 82½ pounds each (including price of sacks), and $2.10 to $2.20 in wood, per 350 pounds, gross. Belgian cement is quoted at $1.75 to $1.90 per barrel, in wood. German is $2.52 to $2.55 per barrel of 400 pounds for Dyckerhoff.

Copper.—As indicated a week ago, the market for copper has been firm, and is at the present time, perhaps, ½c. higher at 23 to 23½c. per pound. Demand throughout the market continues very encouraging, and there is no immediate likelihood of a decline.

Iron.—Inquiry has increased to such an extent that any tendency the market may have had to decline has been

checked, and at the moment there is every evidence that prices will remain steady. Last week's figures are accordingly repeated. Londonderry is only offering for future shipment, and is quoted at $24, f.o.b. Montreal, for No. 1. Toronto prices are about $1.25 more. Summerlee iron is arriving, and is quoted at $23.50 to $24, f.o.b. on cars, Montreal, for No. 2 selected, and $25 for No. 1. No. 1 Cleveland is quoted at $21 on cars, Montreal and Clarence at $19.50 to $20.

Lead.—Notwithstanding the firmness reported a week ago, the market for lead has declined materially, being now quoted at $5.25 to $5.35 per 100 pounds. There is considerable uncertainty about prices at present, the fluctuations being frequent.

Nails.—Demand is active and prices steady. Quotations are $2.50 for cut and $2.55 for wire, base prices.

Pipe.—Cast Iron.—The market is very firm and active. Water pipe is quoted as selling at $37 to $38 per ton net at the foundry, and at about $38 to $39, Montreal, gas pipe being about $1 more.

Pipe, Wrought.—Demand is good and prices steady. Quotations and discounts for small lots, screwed and coupled, are as follows: ¼-inch to ⅜-inch, $5.50, with 57 per cent. off for black and 42 per cent. off for galvanized The discount on the following is 66 per cent. off for black and 56 per cent. off for galvanized: ½-inch, $8.50; 1-inch, $16.50; 1¼-inch, $22.50; 1½-inch, $27; 2-inch, $36; and 3-inch, $75.50.

Steel Shafting.—Prices hold steady at 30 per cent. off the price list. Demand is evidently in excess of supply in some quarters as some borrowing has lately been done.

Steel Plates.—Demand is good and deliveries are hard to make. Prices for small lots are $2.75 for 3-16 and ⅛, and $2.50 for ¼ and thicker.

Spikes.—There is no let-up to the activity of demand. Railway spikes are quoted at $2.75 per 100 pounds, base of 5½ by 9-16. Ship spikes are also in good demand, and prices are $3.15 per 100 pounds, base ⅝ x 10-inch and ⅝ x 12-inch.

Tin.—After declining further, a few days since, prices took an upward turn and now rest at last week's quotations, 44 to 44½c. per pound. The market is very speculative and price changes are frequent, the general tone being apparently downwards.

Tool Steel.—The situation is fairly active and firm. Base prices are as follows: Jessop's best unannealed, 14½c. per pound, annealed being 15½c.; second grade, 8½c., and high speed, "Ark," 60c., and "Novo," 65c.; "Conqueror," 55 to 60c.; Sanderson Bros. and Newbould's "Saben," high speed, 60c.; extra cast tool steel, 14c., and "Colorado" cast tool steel, $8c., base prices.

Zinc.—There is no change in the market, prices being still 7 to 7½c.

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Toronto, 2nd Aug., 1907.

Although the present time of the year is usually a slack season in building, it is yet a time of great activity just now. According to the building permits issued, the aggregate value of buildings in Toronto this year will exceed by $5,000,000 any previous year in her history. Other cities report great building activity also, Hamilton and Ottawa being noteworthy in this respect. A degree of briskness characterizes the merchants, therefore, who deal in building materials that they scarcely expect at the end of July.

Cement is in steady demand, and the accounts heard from the various factories point to this industry as one of the most promising in Canada, financially as well as industrially. Bricks are in steady request also, and we learn from the Don Valley works at Toronto that the pressed bricks of that establishment, both red and white, are in such demand that they are hard pushed to keep up with orders.

The metal markets show no marked alteration during the week. Lead, we are told, can be laid down here to-day as cheaply from England as it can from the Canadian Kootenay, and, indeed, cheaper, which is unpleasant news for Canadian producers. Copper continues weak; it is down to 22 or 23c. in New York for electrolytic, which was not long ago 25c. Antimony is less weak. Tin steady here, with a slightly downward aspect abroad. Zinc steady as before reported.

As per Glasgow advices July 19th: Iron warrants were very quiet, Cleveland closing 56s. 7d.; the stock is 230,259 tons as against 602,930 in 1906. Cumberland stock in public stores, 19,012 tons, compared with 73,589 a year ago; Scotch, 2,657 tons as against 19,396 in July, 1906.

No change in iron or steel prices in Toronto, and unlikely to be much change during this slack season, contracts not being let in any number at present. Our remarks of last week may be repeated to-day with respect to steam and water pipe; there is a hope that more 3-inch tubes may arrive next week and relieve the scarcity.

We quote prices in Toronto as under:—

Antimony.—A little steadier. Cookson's, $19.

American-Bessemer Sheet Steel.—14 gauge, $2.70; 17, 18, and 20 gauge, $2.80; 22 and 24 gauge, $2.90; 26 gauge, $3; 28 gauge, $3.25.

Bar Iron.—$2.30, base, from stock to the wholesale dealer.

Boiler Heads.—25c. per 100 pounds advance on boiler plate.

Boiler Plates.—¼-inch and heavier, $2.50.

Boiler Tubes.—Lap-welded steel, 2-inch, $9.10; 2¼-inch, $10.85; 2½-in., $12; 3-in., $13.50; 3½-in., $16.75; 4-in., $21 per 100 ft. Demand steady, prices unaltered.

Bricks.—Common structural $10 per thousand. In steady demand. Red and buff pressed, at Don Valley works, $18 per 1,000, and in constant request.

Cement.—Star brand, $1.95 per barrel, f.o.b., Kingston. National, $1.95 per barrel, Toronto, in car lots; retail price, $2.15; English, Anchor, $3 per bbl. in wood.

Ingot Copper.—Quiet and with a downward tendency. Toronto price: Lake, 24c.; casting, 22 to 23c.

Lead.—Strong and in active demand; scarce for immediate delivery; $5.50 for pig.

Nails.—Wire, $2.55 base; cut, $2.75; spikes, $2.75. See Montreal.

Pig Iron.—Summerlee No. 1, to arrive, nominally, $27; No. 2, 26; Cleveland, No. 1, $23.50, $24; Clarence, No. 3, $24.

Steel Rails.—80-lb., $35 to $38 per ton. Steel beams, channels and angles, 2¾ to 3c. per lb.

Sheet Steel.—Firm, 10 gauge, $2.70; 12 gauge, $2.80; both scarce.

Tank Plate.—3-16-in., $2.65; Tees, $2.90 to $3 per 100 pounds; angles, 1¼ by 3-16 and larger, $2.75 to $3.

Tin.—Visible supply reduced, goods scarce and strongly held. Here unchanged in price, 45c. for pig, and firm.

Tool Steel.—Jowitt's special pink label, 10½c. per pound; Capital, 12c.; Conqueror, highspeed, 65c. base.

Wrought Steam and Water Pipe.—Trade prices per 100 pounds are: Black, ¼ and ⅜-in., $2.37; ½-in., $2.89; ¾-in., $3.90; 1-in., $5.60; 1¼-in., $7.65; 1½-in., $9.18; 2-in., $12.24; 2½-in., $20.10; 3-in., $26.40. Galvanized, ¼ and ⅜-in., $3.19; ½-in., $3.74; ¾-in., $5.06; 1-in., $7.26; 1¼-in., $9.90; 1½-in., $11.88; 2-in., $15.84; 3½-in., black, $34.20; 4-in., $38.85. Supplies are meantime short, and the future unpromising.

Zinc.—Sheet zinc, a moderate business doing at steady prices. Toronto, slab, $7; sheet, $8.

In the case of stationary engineers and firemen, some thoughtful employers have carried the pipes for forced ventilation above the furnace doors to prevent the fireman from baking their faces when "hauling the fires." Others have contributed greatly to their comfort by exhausting the foul, hot air and throwing fresh air into the furnace and boiler rooms. In many places this is seriously needed, because the rooms are located in the sub-cellars or interiors of structures.

BRITISH UNIVERSITIES STUDENTS VISIT TO CANADA, 1908.

It has been proposed that a party of Engineering and Science Students from the various British Universities should visit Canada during the summer of 1908, and a committee has been appointed to carry the suggestion into execution. Sir Wilfrid Laurier has kindly consented to act as honorary

Mr. Nugent M. Clougher (late of Toronto), Honorary Organizing Secretary of the British Universities Engineering and Science Students Canadian Visit, 1908, who is now in Canada making preliminary arrangements.

patron, and Lord Strathcona has consented to be honorary president. In a matter of this kind much preliminary work is necessary, so that even at this early date efforts are being put forward to get the co-operation of the institutions of learning that are specially interested in the engineering and science side. It is proposed to visit all the leading manufacturing and mining districts throughout Eastern Canada, and it is hoped that arrangements may yet be made for the party to proceed to British Columbia. The honorary organizing secretary, Mr. Nugent M. Clougher, sailed for Canada by the "Empress of Britain," July 12th, to make preliminary arrangements, and and intends to proceed west as far as Victoria.

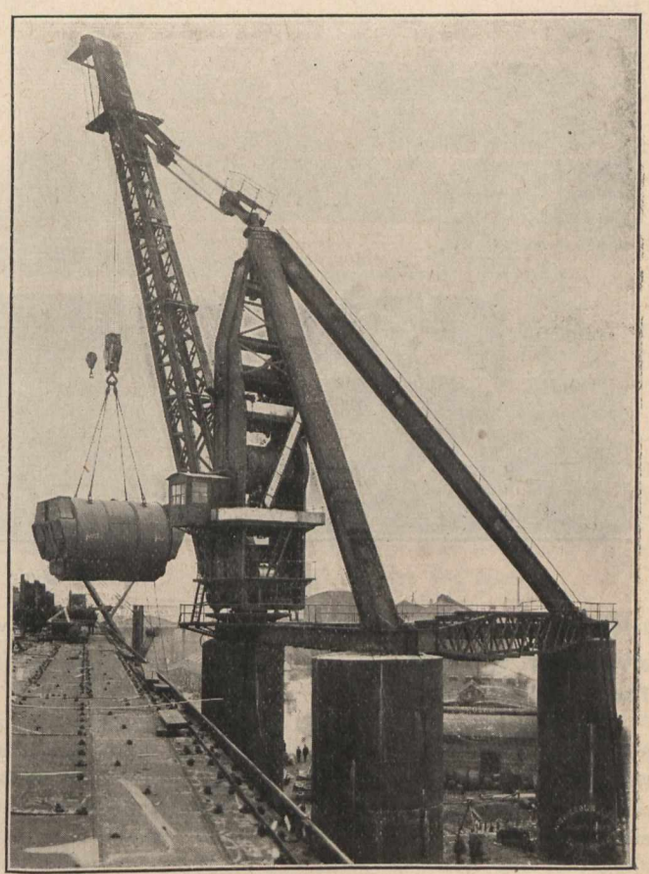
ENGINEERING NEWS FROM GREAT BRITAIN

(From our own Correspondent.)

London, July 28, 1907.

Electric Power in London.

Although a solution of the problem of who shall be the authority for supplying electric power in London and the surrounding district seems as far off as ever, yet one feels thankful that at last the County Council, which has been largely responsible for the delay hitherto, has now clearly defined its position in the matter. We know now that the present London County Council is opposed to the principle of municipal trading in so far as this necessitates the actual working of an electric supply undertaking, but it is not averse to assuming the responsibility of control. This much having been said, it follows that in continuing with the Bil deposited in Parliament by the late Progressive Council, the present Moderate London County Council proposes merely to secure the necessary Parliamentary powers and then to lease them. As an abstract theory this sounds reasonable and feasible enough, but the practical possibilities are by no means so simple. It has been truly said that there is only one London, and in no connection is this so obvious, and at the same time embarrassing, when one has to consider the electric supply question. London is divided into some 27 boroughs, each administered locally by a borough council. About half of the burgh areas are supplied with electric power by the local authority, and in the remaining districts companies perform this service. Between the companies there is a certain amount of competition, and in at least one instance there is competition between a company and a local authority. No other large city in the world is so dealt with and, incidentally, it emphasises the grave error in passing the London Government Act of 1900, which created the borough councils. Above these involved interests—for be it remembered any borough council has the statutory right to purchase the undertaking of a company within its borders in 1926—it is proposed to create an electric supply authority with supreme powers of supply in an area limited only by what may be termed agricultural borders of the greater Metropolitan area. It will at once be realised what a task lies before any Parliamentary Committee which attempts to grapple with such a problem if anything like justice is to be done to existing interests. The great drawback to the expan-

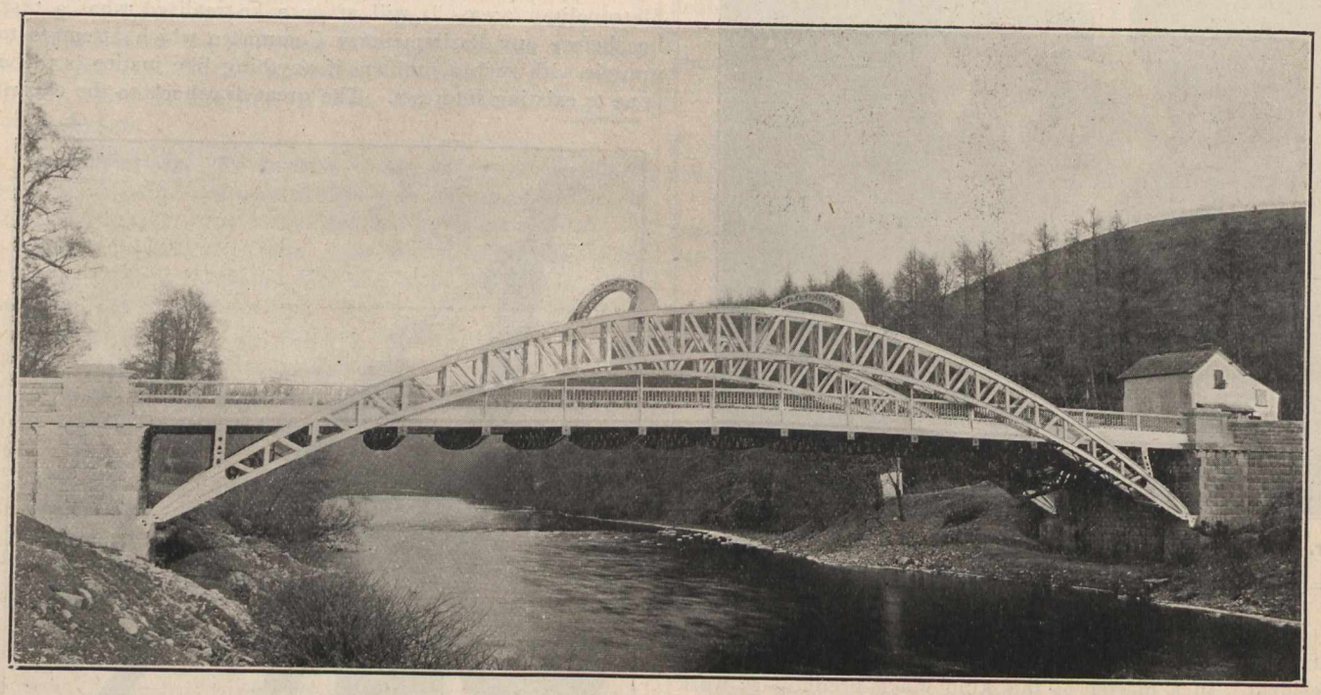


150 Ton Electrically-Driven Derrick Crane.

sion of the existing local business is the limited area within which they may supply, and this has resulted in the erection of a large number of generating stations supplying upon various systems and voltages. The companies have a proposition for a general linking up and so to form a bulk supply authority, and likewise, the local authorities think the same. As matters now stand, the London County Council Bill will shortly be under consideration by a Committee of the House of Commons, to the exclusion, for the present, at anyrate, of all other proposals. Many competent people are gradually coming to enquire whether any further excessive capital outlay is really necessary, and that everything that is required could be achieved by consolidating and co-ordinating existing sources of supply.

British Trade with Canada.

Somewhat bearing upon the above, is the present position of the electrical industry in England, for it has been urged that several millions would have been expended in electrical plant had not the bill promoted by a company in 1905 been so obstructed as to be prevented from passing into law. The past year or two has witnessed great activity on the part of electrical engineering firms to foster trade with the colonies, and latterly, more especially with Canada, although the fact has to be admitted that the greater attention thus bestowed upon oversea countries is the result of over-competition for orders at home. Almost every large firm is devoting a large portion of its attention in this direction, and the wealthier ones are sending out representatives direct from home. So acute has the position at home been, that several firms refuse to tender for a certain class of work, having quite made up their minds beforehand that even if they secured the order the margin of profit would be so small that no benefit would ensue. Thus Messrs. Callender's Cable and Construction Company have recently personally visited Canada, in order to stimulate business, whilst I could name half a dozen others who have been sending out agents in the same manner. It might be said that Canada and India are regarded by the electrical industry as the most promising fields for avoiding a position at home which appears to show few signs of recovery.



Bridge Over River Usk, South Wales.

The Road Dust Nuisance.

With the phenomenal increase during the past four or five years of the number of motor vehicles on the roads of Great Britain, the inconvenience of dust upon macadamized roads has been largely accentuated, and many kinds of treatment have been devised for minimizing, if not removing altogether the nuisance. As regards the proper material, opinions seem to have pretty well standardized. viz., that materials of a viscous nature, such as coal tar, etc., are the most efficacious. Consequently, much ingenuity is being displayed in the methods of application, and a recent demonstration, near London, of various systems revealed an activity in this direction unknown to many. In all cases the tar spreading machine takes the form of a tank, and usually it forms part of a motor tractor. I give a brief account of some of the machines. The " Tarmaciser " Company use a steam tractor to which is attached a large tank. Steam coils are fitted in the tar tank and connected to the steam tractor to heat the tar. By means of rotary brooms and suckers the road is thoroughly cleansed from surface detritus, after which the surface binding of the road is disturbed. The tar is then spread on, and brushed in, which is followed by a distribution of the dust, over the tar, taking from the road before applying the hot tar. The tarspray apparatus distributes the material upon the road by means of a double acting pump driven from the road wheels through gearing, and is claimed to penetrate two inches. The Emulsifix system has two tanks, one of which contains tar oil, and the other water. The tar and water meet in a common tank at the back of the cart, in which there are rapidly revolving blades that emulsify the tar and the water and force the emulsified tar oil through a sprayer on to the road. In another apparatus by Messrs. Thwaite & Thorpe, of London, a certain proportion of water is added, the mixture being applied hot after first rolling the surface of the road with a hot roller. The tar is afterwards sprinkled with sand at 300° F. In yet another apparatus the hot tar principle is embodied. These various systems are being largely taken up by local authorities and road authorities generally, but as they are all more or less efficient the question of cheapness of working appears to be the determining factor. The results of the tests mentioned above, which were carried out on behalf of the Royal Automobile Club and the Motor Union, have not yet been published.

10,000 Mile Motor Car Trial.

A 40 h.p. four cylinder Wolseley-Siddeley car has just completed a 10,000 miles test under ordinary touring conditions, and the Royal Automobile Club has granted a certificate. The car ran nearly 3,000 miles when the fracture of the change gear hand-lever caused an involuntary stoppage. Altogether the car, which ran every day except Sundays, was travelling 78 days, and took on an average 26 minutes per day for repairs, other than tyre repairs. At the end of the trial the officials of the Royal Automobile Club reported the condition of the car as exceptionally good. " Elastes " filled mechelm tyres were used with good effect.

" The Most Perfect Sewerage Works in the World."

There has just been completed for the town of Hanley (Staffordshire) what is called by the medical officer of health to the Staffordshire County Council the most perfect sewage scheme which has ever been put to work in this or any other country. The cost of the scheme has been nearly £75,000, and includes detritus tanks, septic tanks, and filters to deal with a volume of sewage equal to six times the dry weather flow. A four foot barrel sewer conveys the sewage to the works where it is delivered into a screening chamber. Here all floating garbage and larger solids are transferred into a special trough through the agency of mechanically driven rakes. There are three detritus tanks which treat the sewage by settlement after it leaves the screening chamber. In one of these tanks all the heavier solids are deposited. The total capacity of these three tanks is 342,000 gallons; the capacity of the 4 high level septic tanks 2,050,000 gals.; and

the capacity of the 4 low level septic tanks 2,200,000 gals. In these tanks the organic solids in suspension are so to speak, pulverized, and subsequently decomposed in the bacteria beds. The latter are on two levels, in order to provide for double filtration of the dry weather flow if necessary. Of the total area of beds of 9 acres, 3¾ acres are on the high level area, and 5¼ acres on the low level area. They are divided into one acre plots, each of which are divided into four sections for distribution purposes. The bacteria beds have 14-inch brickwork walls, with 18-inch reinforcing fillers; a 6-inch concrete floor and 6-inch half pipe effluent drains placed 6 feet apart. From these latter the effluent is collected into a main chamber from which the main effluent carrier discharges into the River Trent. The whole of the works are driven and lighted electrically, power being supplied by the corporation.

Coalite.

A new smokeless fuel is being much boomed here, for which some exceptional properties are claimed. It rests on the basis of partially distilling coal and freeing it from its more bituminous constituents, and compressing the partially carbonized coal into briquettes. In fact, it is probably in the latter procedure that the real novelty exists, and the present "Coalite" company seems to have secured some good patents for this purpose. In fact the prospects are that the by-products from the partial distillation of the coal in the first instance, will be a greater source of income than the staple itself. The main hopes of the company rest upon whether it is possible to use cheap, slack, or coal dross for the purpose. Naturally their secrets are well kept, and no definite information has been published yet.

An Interesting Bridge.

The illustration of the bridge over the River Usk, on the main high road from Newport to Abergavenny, is of interest, in that the bridge in question replaces a picturesque old suspension bridge, in connection with the demolition of which much local prejudice and feeling had to be overcome. But the old bridge, became too insecure, and practical utility had to give way to sentiment. There is nothing special in the construction. The width is 134 feet. It is somewhat apropos to mention that across the River Usk at Newport there is an electrically-driven transporter bridge which was put into operation last year.

150 Ton Electric Derrick Crane.

My other illustration shows the largest electrically-driven derrick crane yet built in Great Britain, and claimed to be the largest in the world. It has a lifting capacity of 150 tons, and is erected at the Clydebank shipbuilding works of Messrs. John Brown & Co. As is seen, the crane is mounted on steel cylinders, which are sunk about 60 feet below the quay level, and filled with concrete. Two sets of lifting gear are fitted, each driven by a separate motor, one for loads up to 30 tons and one for loads up to 150 tons.

WOOD VERSUS IRON FOR WATER PIPE.

For centuries past wood pipe has been used as a means for conveying water. Long before cast iron pipe was made, public water services had been built in which the supply mains and distribution system consisted of wood pipes. The first water supply of the city of London had lead and wood mains, the former having been taken out and wood used to replace them. The city of Philadelphia built its public water works about 1799, and used not only wood pipe for its distribution mains, but wood fire hydrants, wood pumps and wood boilers. These wood pipes consisted of spruce and pine logs bored out, mortised and tenoned at ends, with wrought iron bands fastened around each end. Many of these were in continuous use until 1844.

Cast iron water pipe was first made in America about 1820. At this early date the capacity of a wood pipe depended upon the diameter of the log from which it was made, the diameter of the bore rarely exceeded six inches, more frequently three and four inches, therefore when it was found that cast iron pipe could be cast to an inside diameter of eight and even to ten inches, the problem of larger supplies with one line of pipe was practically solved, and from that time until steel pipe was manufactured, cast iron pipe was universally used for water pipe.

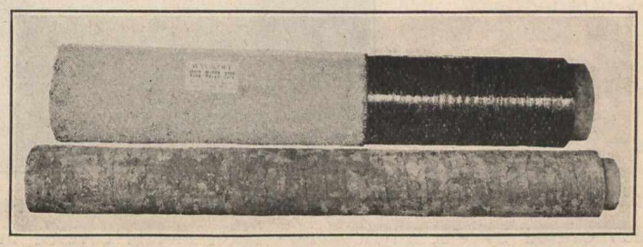
Wood pipe is not to be preferred to cast iron pipe under all conditions. Where there is a necessity for tapping mains for house connections the banding is exposed to possible damages, both to the coating and metal, and detrioration begins. Wood pipe should not be used when the normal or constant pressure exceeds 200 pounds, and there are many other conditions under which cast iron pipe might be recommended in preference to wood.

Each kind of pipe has its proper place, and we believe it is for the competent hydraulic engineer to determine that which should be used in each case.

By those familiar with the properties of the softer woods, it is known and admitted that these woods when subjected to complete saturation will last longer than is generally known.

The Wyckoff Supply Company, of Elmira, N.Y., manufacturers of wood water pipe and steam pipe casing have given us the following: "Our wood pipe is made from the best obtainable selected Canadian white pine. When put under a pressure the outside of the pine is damp at all times, and the penetration of water is complete.

The band used is coated during the winding with a protective coating of asphaltene, which thoroughly coats both faces of the band. After the pipe is wound, it is placed upon tolls which revolve through a hot bath of the same kind of coating, which adheres to the outer face of wood and steel,



effectually protecting them from the decomposing and oxydizing influences contained in the water and in the ground through which the pipe is laid. We have found after twenty years of observation that this coating does completely and satisfactorily protect the steel and wood, and as long as this result is obtained we claim to have an indestructible pipe.

The accompanying photograph is a section of this company's pipe taken from the mains at Elmira, N.Y., having been in service forty-two years under a pressure of thirty pounds. This pipe was found to be in a perfect state of preservation, and the interior of the pipe was free from filling or corrosive action that would increase the friction.

ANNUAL OUTING: ENGINEERS' CLUB OF TORONTO

That engineers are able to break away from the work of their profession was evidenced a week ago to-day, when some 35 of the engineers of Toronto went on their regular annual outing to Jackson's Point. A special car on the Metropolitan Railway left North Toronto station at 8.15 a.m. A few miles from the Point a stop for lunch was made, the lunch being served in regular picnic style. The entertainment committee had arranged for games, and as soon as the inner man was satisfied some amused themselves with a game of quoits, while others endeavored to show their fitness as throwers—not hewers—of stone, the target being an empty bottle placed on a post.

At about 2 p.m. a return was made as far as Morton Park. At this point loafing (not usual with engineers at this season of the year), bathing, baseball, and several other amusements were engaged in. After a dinner, at which there was an abundance of good things, the party started for home, reaching the city about half-past ten.

On the return trip expressions from the picnickers proved that the day had been fully enjoyed by all. Messrs. Canniff and Fielding turned out to be very efficient chaperons.

ELECTROLYTIC CORROSION OF IRON AND STEEL IN CONCRETE.

By A. A. Knudson.

In these days of wide and rapidly growing use of reinforced concrete and hydraulic cements in all kinds of structures, the question often comes up as to whether concrete will afford to iron and steel the same protection from stray currents of electricity that it does from ordinary corrosion or rust. In the practice of investigating movements and results of currents upon underground pipes and other structures, several instances have come to our notice where damage has been caused by electrolytic action upon metals covered or incased in concrete or Portland cement.

During the last year we have frequently been asked about the probability of electrolysis upon various underground structures where the use of cement or concrete was being considered or had been used. In view of the importance of this question, therefore, we have thought it would be of service to those who are interested in the subject if more light were thrown on the true value of concrete as a supposed insulator. With a desire to obtain some definite data as to the amount of current and time necessary to cause corrosion upon metals incased in concrete or hydraulic cements, and also to test their value as electrolytes, we have made some laboratory experiments, and herewith give the results, trusting they may be of some value.

In March, 1903, blocks of concrete containing iron tubes were prepared by the writer for this purpose. These blocks or samples were made of equal parts of Portland cement and sand. They were made in ordinary metal pails slightly larger at the top than at the bottom. In the center of each block was placed a 2-inch wrought iron pipe. The illustration show blocks and pipes after the tests. A few preliminary tests at this time indicated that a series of tests might bear important results, and as we lacked opportunity for making daily tests and observations, they were sent to the Electrical Testing Laboratories of this city, where excellent facilities were had for making the required measurements. Preliminary tests were made with the object of "feeling our way," and of selecting such strength of current for the series as seemed advisable. These preliminary tests not being especially important, the details are not given; but with the information obtained it was decided to commence a series of tests extending over a time of thirty days with the three blocks immeresd , and under the following conditions:—

Block 2, Fig. 1, was immersed in fresh water and Block 4

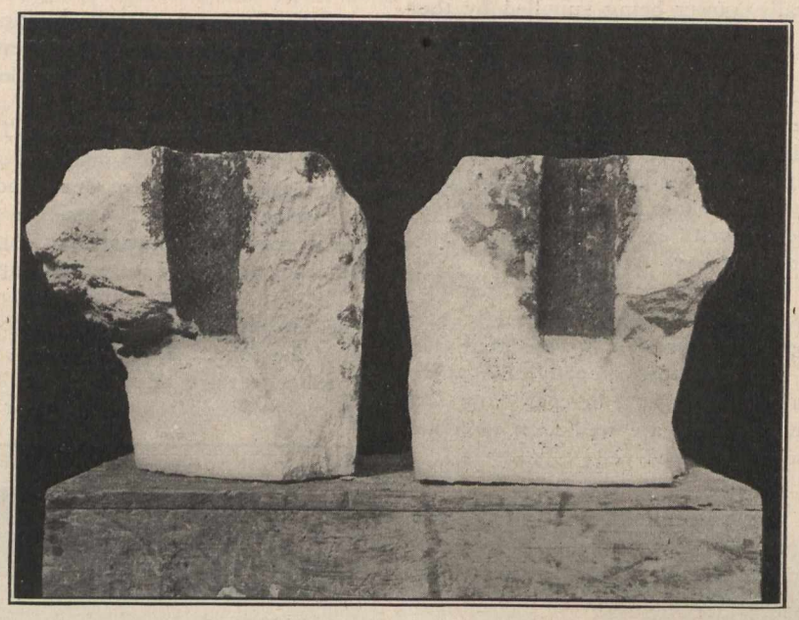


Fig. 1.

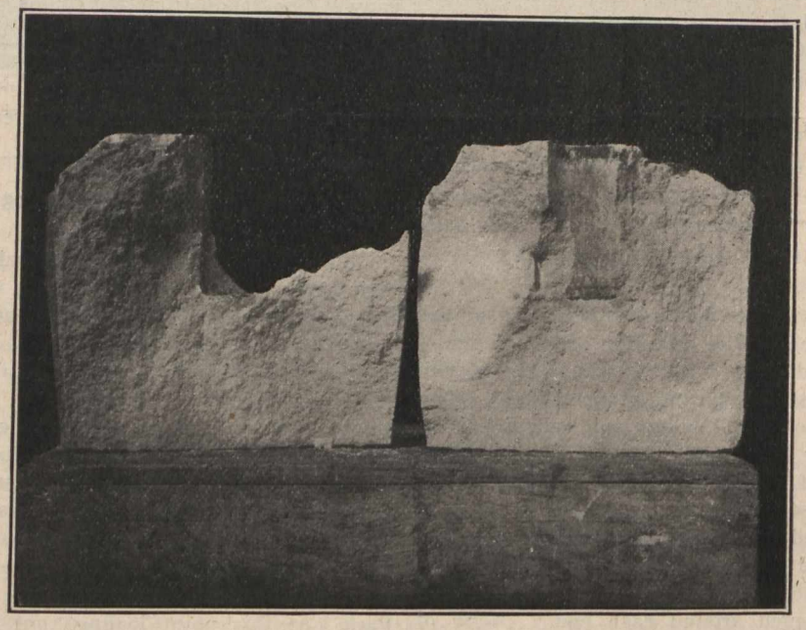


Fig. 2.

* Paper read before the Am. Inst. of Elec. Engineers; copy furnished by author.

in sea water. These were connected in series, with 0.1 am pere continuously flowing through them. Block 3, Fig. 3 was also immersed in sea water, but no current was sent through it. This was for the purpose of comparison after the blocks were broken open.

These tests were commenced on February 1, 1906, and ended March 2, 1906. The results of importance upon this first group of blocks were found in the gradual disruption of the concrete, as shown by the cracks as time went on, and the appearance of electrolysis and loss in weight of the iron tubes of both No. 2 and No. 4 when the tests were concluded. Block 4 is not shown, it being quite similar to the others. During the test these cracks were noted as follows: On the 17th day a small crack down one side of block 2 was observed. On the 27th day this crack in No. 2 had a maximum width of ⅛-inch and extended clear down one side, across the bottom and nearly to the top of the other side. Two cracks also appeared in No. 4. This disintegration of the concrete was a genuine surprise. The report furnished by the laboratory on this first set of experiments concludes as follows:

After the conclusion of this test, which extended over thirty days time, the blocks were removed, and after allowing

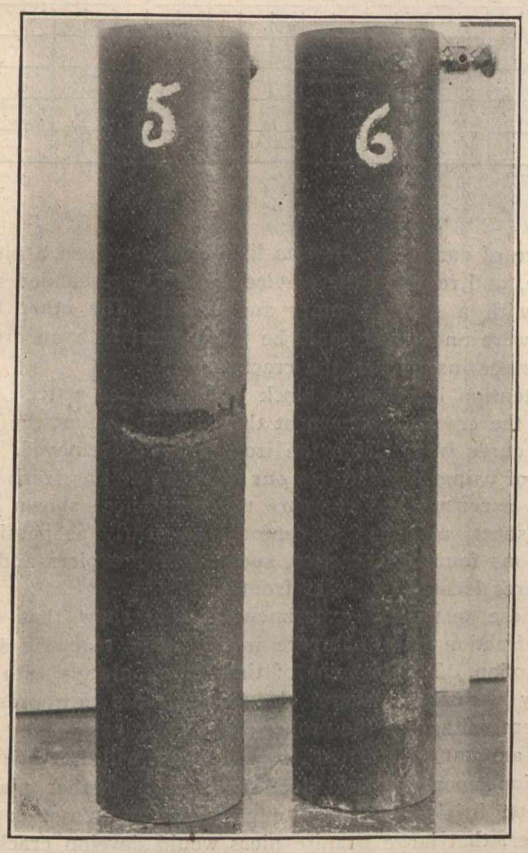


Fig. 3.

them to dry they were broken open. It was found to be quite easy to break open blocks Nos. 2 and 4 which had already become cracked. Block No. 3 which had not been subjected to electrolysis, was broken with the greatest difficulty. Blocks No. 2 and 4 showed on their interior strong evidences of electrolytic action in the form of what was apparently a deposit of iron rust extending from the pipe toward the outside of the block. Along certain lines which acted like lines of cleavage, the cement was found to be softened so that it could readily be cut or scraped with a knife. This softening was such that the point of a blade of a pocket knife could be inserted into it far enough so that the knife was supported in an upright position. The pipes inclosed in Nos. 2 and 4 were found to be considerably corroded. A portion of the scale on the corroded parts of these pipes was removed and the pipes were weighed. The pipe in block No. 3 was as bright as a new pipe. The concrete showed no evidences of a deposit of iron rust. An idea may be formed of the condition of the concrete blocks from the photographs given herewith.

Weighing of the pipes had been made before casting them in the blocks. Weighings made at the conclusion of the experiment, together with these initial weighings, are given in the following table:

	No. 2 Fresh Water.	No. 4 Salt Water.
Initial....	3 pound 12.50 ounce.	3 pound 7.5 ounce.
Final.....	3 pound 10.95 ounce.	3 pound 6.4 ounce.
Loss...	1.55 ounce.	1.1 ounce.

As has been said above, the scale was not entirely cleaned off from pipes Nos. 2 and 4 before the final weighing was made, so that the loss in weight does not represent the entire amount of the electrolysis which had occurred.

The results of these experiments seemed so important that it was thought best before drawing conclusions to have the tests repeated, and, therefore, another set of experiments similar to the first was made to see how the data would compare.

Second Set of Experiments.—In this case two blocks of concrete were prepared, numbered 5 and 6. These were made the same as the others, except the Rosendale cement was used, called in the trade "Brooklyn Bridge Brand." The object of using a different cement was to see if there was any change in the results that could be attributed to the use of a different brand of cement. In these tests more careful and more frequent measurements were employed than in the first set of experiments. They were commenced on April 12, 1906. Two readings were made every twenty-four hours through the entire thirty days, and the appearance of the blocks was closely watched. The source of current, as in first test, was from a storage battery, and the pressure was increased or decreased according to the resistance, in order to maintain a constant current of 0.1 ampere.

The variation of resistance in both blocks during the test of thirty days is important. The figures showing ohms are given as relative, as they may not quite accurately represent the true values. They were obtained by simply dividing the volts by the 0.1 ampere. It was found in the preliminary trials that resistance measurements by the usual methods, such as the Wheatstone Bridge, were not accurate, owing to strong polarizing effects. For this reason the resistances as shown by these curves, while not considered absolutely accurate in every case, are sufficiently so for our purpose of examination and study.

The curves on Fig. 5 represent the sudden fall or practical breakdown of concrete as insulation in 48 hours. The measurements in this test were made by the Wheatstone Bridge, using alternating current and a telephone receiver. They are considered fairly accurate.

Quoting from the report on the second series of tests, the following notes are of interest:

Second Day of Test.—Water appeared around the pipe of No. 5, having soaked through the concrete.

Sixth Day of Test.— Cracks were observed in both samples of concrete, those in No. 5 being the most prominent. A small amount of water was found standing in the bottom of pipe No. 5. None in pipe No. 6.

Seventh Day of Test.—The cracks in the concrete are increasing in the case of both samples.

Ninth Day of Test.—A yellow, frothy substance appeared at several points at the top of the concrete, close to the iron pipe of sample No. 6. Later this turned rust color.

Eleventh Day of Test.—Same rust colored deposit observed around pipe of sample No. 5. The cracks of both samples have increased in prominence.

Eighteenth Day of Test.—The cracks have assumed such proportions that it appears as though the concrete might easily fall apart, being ⅛ to 3-16 of an inch in many places. There is considerable rust colored, frothy deposit on top of sample No. 5, especially near the pipe.

It appears from these observations that before the ninth day the process of electrolysis had arrived at quite an advanced stage on both blocks and before the rise in resistance took place, which afterwards in fresh water reached 300 to 400 ohms, requiring some 30 to 40 volts to maintain the 0.1 ampere. We should not, therefore, conclude that because such high readings are not found in practice, it is a sign

there can be no electrolysis. In the salt water block it is observed that even to the 11th day of the test 5.5 volts only were required to pass the 0.1 ampere, and at that time the record states the cracks in both samples have increased in prominence.

The report concludes as follows:

After the conclusion of the test, which continued over thirty days' time, the concrete blocks were removed from the water and allowed to dry. They were then broken open. Block No. 5, which had been under test in the salt water, was **found to have a rust colored deposit extending along the sides of a crack from the external surface to the pipe, as shown by the accompanying photograph. The rust colored** deposit in sample No. 6 was only about the pipe.

There were spots, especially in the fresh water block No. 6, where the concrete had softened to such an extent as to be readily dug out with a knife.

The weights of the pipe before and after the tests are given in the following table:

	No. 5 Salt Water.	No. 6 Fresh Water.
Initial.....	3 lb. 7.1 oz.	3 lb. 6.6 oz.
Final.....	3 lb. 5.5 oz.	3 lb. 5.5 oz.
Loss.....	1.6 oz.	1.1 oz.

Since the scale was not entirely removed for the final weighing, the loss in weight indicated does not represent

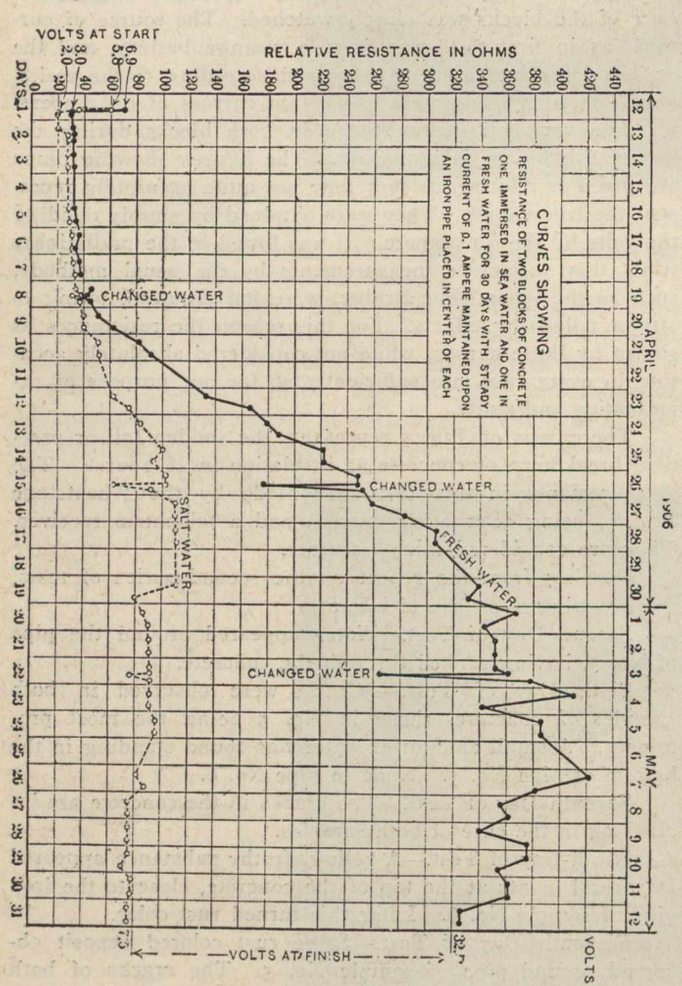


Fig. 4.

the actual total amount of electrolysis which had occurred. However, all scale that could be readily removed was removed before the final weights were taken.

This second series of tests show results very similar to the first, only more pronounced; and we believe they also show that the results would be practically the same with concrete made up with any of the different brands of cement found in the market, or made with different proportions of sand, or made of brick, or stone masonry.

The photographs of the different pipes show to some extent the effects of electrolytic action upon their surface which was in the concrete. No. 5, Fig. 3, which was in the salt water block, shows the most severe case, having a hole through the iron. This hole is 1 inch long and ⅜ inch wide at its widest part, as genuine a case of electrolysis as any we have seen in larger pipes removed from a street.

Referring to the photographs of the blocks, all but No. 3 (which had no current) show the discoloration made by the iron rust, extending, in most cases, through what were cracks to the outside surface. No. 3 shows a perfectly clean and hard interior surface. As the report states there was no

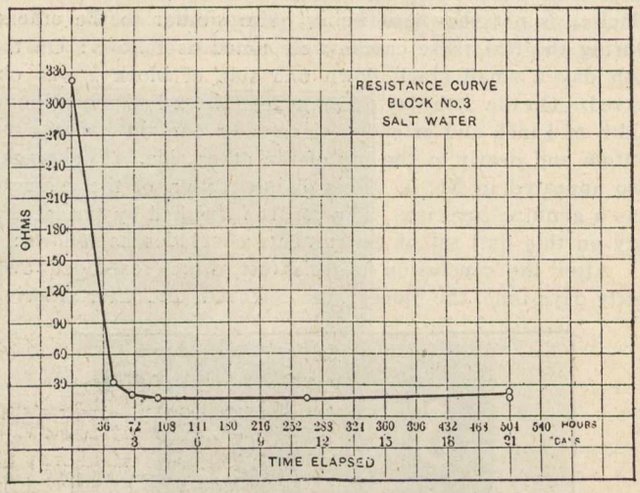


Fig. 5.

evidence of corrosion. It was like breaking open a piece of granite, and required the services of a "hard-handed son of toil" with a sledgehammer and chisel. The other blocks which were under test could be pried apart with an ordinary screwdriver inserted in the cracks.

Attention is called to block 5, Fig. 6 (sea water), where one of the cracks is shown at the back and about the center of the curve from which the iron tube was removed. The object of using sea water in our tests, as well as fresh water, was to ascertain and compare the resistance shown in the curve sheet, and also to conform as nearly as possible to conditions found in practice, such as bridge piers and other structures located on water fronts.

These tests and experiments go to show that only a small fraction of an ampere is necessary to cause electrolytic action. The element of time being always with us, it is only necessary where electric currents are present of sufficient voltage in the proper direction to cause even a very small amount of current to pass that will in time cause corrosion upon interior steel structures, whether placed in concrete, brick or in granite masonry. It is not expected, however, that large granite piers would develop cracks, but electrolysis to interior steel work and to bridge anchorages may go on just the same. Cracks may develop, however, in concrete piers of small bridges, such as those which cross creeks or canals.

By way of a practical illustration, there is a bridge in this city of this description over the Gowanus Canal, South Brooklyn, at Hamilton Avenue. A portion of the Bridge Commissioner's report ending June 30, 1906, referring to this bridge, is as follows:

Since construction, the foundation walls of this bridge have developed some rather serious cracks, occurring on both sides of the canal, and there has been a movement of the walls towards the center of the canal. During the last three months this movement has amounted to ½ an inch. Previously the movement totalled about 3½ inches. From October to March there was practically no movement. A continuation of this movement for several inches more will result in the necessity of alterations in the center of the leaves, as they will interfere before the bridge can be fully closed.

With a view of ascertaining the electrical conditions, we have made a few tests at this bridge. The voltmeter readings show the steel structure to be positive to the canal, positive to the water mains in the street, and positive to the

trolley rails on the bridge, ranging from 0.5 to 1.5 volts. These readings were taken when the car traffic was light. Some of the cracks on the concrete had been plastered over, but others were quite visible. The tests indicate that the trolley tracks on the bridge are in connection with the steel structure. Tests were also made on another bridge of the same construction a little farther north over the same canal, at 9th street. The readings here were exactly the reverse of those found at the Hamilton Avenue Bridge, the structure being negative to canal, to water mains and tracks. There were no visible cracks in the concrete of either foundation. Although the cracks in the concrete of the Hamilton Avenue Bridge are attributed to other causes in the Commissioner's report, we believe these tests and observations point strongly to electrolytic action from trolley currents as being the true cause. This seems to us the more reasonable cause for these cracks, in view of the results of our laboratory experiments just described. Ordinary care would suggest that costly structures of this kind in this or other cities should be periodically inspected for evidence of electrolytic action upon the interior steel work, especially if located contiguous to water, or in the vicinity of electric railways or railway power stations as in the case just cited. Furthermore, this question should be carefully considered when such structures are planned, and tests made at locations of proposed bridges or other structures to ascertain the electrical conditions and the possibilities of injury due to electrolysis from stray currents.

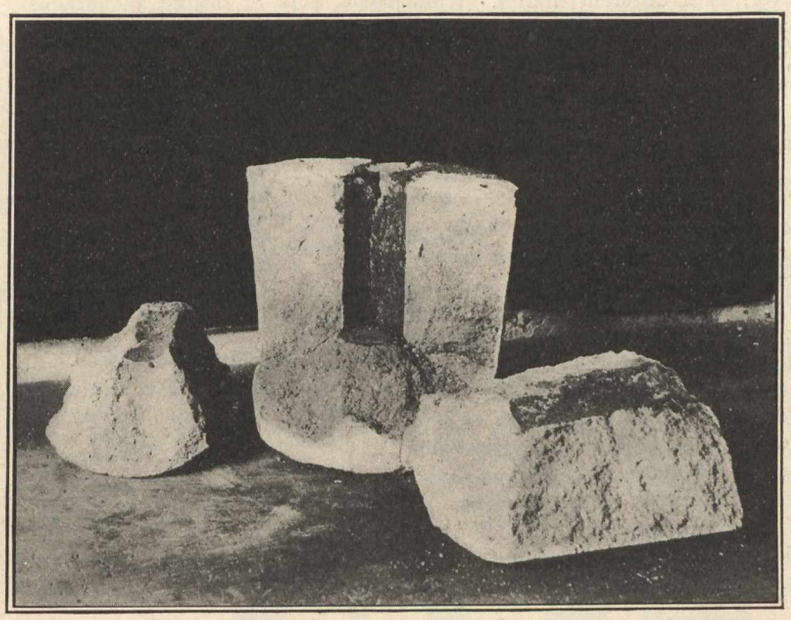


Fig. 6.

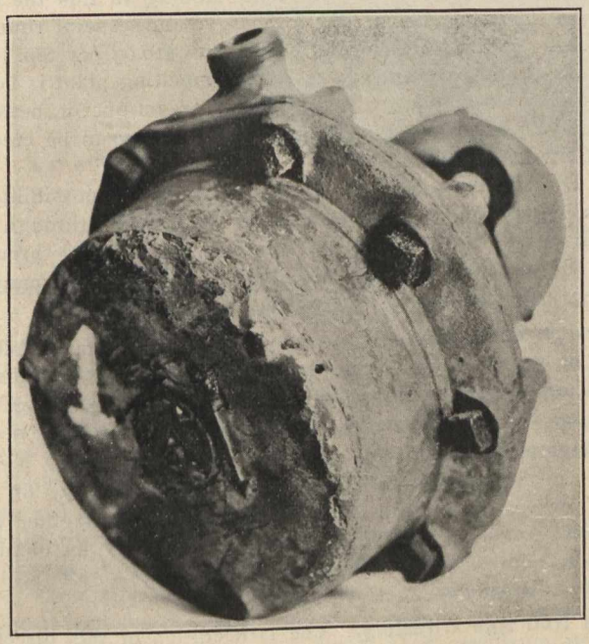


Fig. 7.

This question of electrolytic corrosion of interior steel in the construction of high buildings, however, has not been entirely neglected. There is at least one case, that of the New York "Times" Building, where provision has been made in advance as a protection. In the "Building Supplement," issued by that paper, dated January 1st, 1905, an interesting description is given in detail of the entire construction of that building. The following extract, referring to electrolysis, will be of interest:

The danger that in the case of the steel frame, rust and the disintegration of electrolysis would hasten the process of dissolution so much as to make structures of this kind prematurely unsafe through the destruction of their supports, was recognized in time to permit of ample safeguarding in the case of the steel frame of the "Times" building. It is axiomatic that columns to which moisture has no access will not be impaired by rusting, and that those effectually insulated from vagrant electrical currents will not be affected by

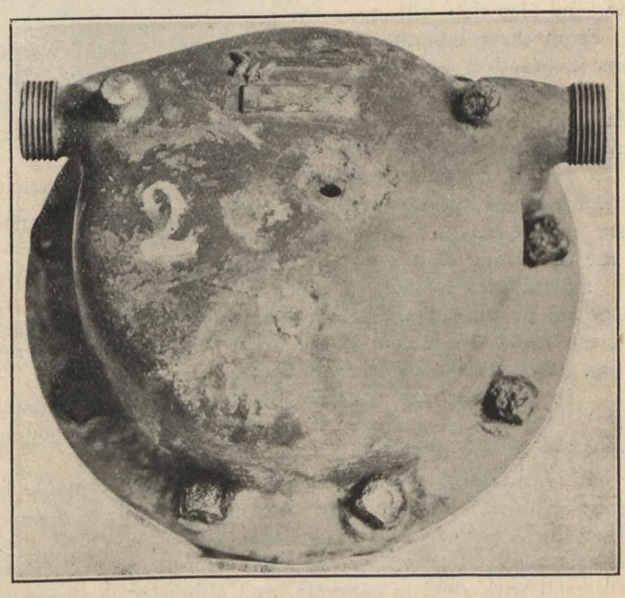


Fig. 8.

electrolysis. The first consideration was to keep the basements dry. Hence the thorough waterproofing and draining of the retaining walls already described, which was carried under the floor of the press room occupying the great area of the sub-basement. As a further safeguard, all the steel members up to the street level are incased in Portland cement mortar, to the minimum thickness of ¾ inch. This is effectual protection against rust deterioration. Under these conditions electrolytic disintegration is deemed im-

possible, but the probability of its occurrence in even microscopic degree is rendered still further remote by as perfect insulation as can be provided. There is sufficient grounding to relieve any electrical tension which may exist in any part of the steel frame by drawing off the current at points where electrolytic action cannot be set up.

This is the first instance we have noticed where a large corporation has recognized this danger and has taken steps beforehand to avoid it. The protection of steel structures already constructed, however, is a different matter. While plans may be made to provide insulating methods and waterproofings, before construction, it is not easy to prevent corrosive action, when the conditions are favorable, after construction.

Another point which may have an important bearing on this subject is the great pressure upon pillow blocks, and upon piers supporting as they do enormous weights, which serve to make excellent electrical contact with concrete or masonry on which they stand, and, therefore, offer further opportunity for inviting stray currents.

Figs. 10 and 11 are photographs of the under side of two water meters which were practically destroyed by electrolysis while in service in the cellars of dwellings in a distant city. They were discovered during a survey by the writer in October last. They are shown as an illustration of how railway currents will follow a service pipe for a considerable distance from the tracks, enter a building and find an outlet to ground in the damp soil of a cellar. This furnishes an opportunity for current to pass into the iron foundations of large buildings where such service pipes, either water or gas, are connected, as they usually are, to the framework of such structures.

These illustrations are by no means isolated cases. We have discovered many similar cases of current straying into buildings in different cities in this country. There were three meters found destroyed in this way in different sections of the city from which they were taken. They were from 1 to 2 miles apart. The distance from the tracks of Fig. 7 was 300 feet, and of Fig. 8, 675 feet. All of these meters were on side streets, at right angles to the car tracks.

In Regard to Remedies.—Coatings of various kinds of paints or varnishes will be of little use as an insulation, for it must be borne in mind that not only a moisture resistant is required, but an insulation that will resist continual moisture, and also that will stand the pressure of great weights.

From these laboratory experiments, as well as observations in practice, we draw the following conclusions:

1. Steel structures are well preserved from ordinary corrosion by concrete, if placed either in salt or fresh water. This, however, has long been known.

2. If but a small fraction of an ampere of electricity passes from an interior metallic column or structure into concrete or masonry as usually made, there will be corrosion of the metal and disintegration of the concrete or masonry.

3. Structures of steel in concrete that are subject to sea water are in more danger from electrolytic action than those in fresh water, by reason of the lower resistance of concrete in sea water, as shown by the laboratory experiments.

4. In no sense can concrete be considered an insulator, and, as shown, it is from all appearance just as good an electrolyte as any of the soils found in the earth.

Other investigators in this field have given valuable information on this subject. Mr. Maximilian Toch, in a paper before the American Electrochemical Society in June 1906, gives an interesting account of some experiments conducted by himself with steel in concrete, and although on somewhat different lines to our own, arrives at practically the same results.

Mr. M. P. Wood, in his excellent work entitled, "Rustless Coatings, Corrosion and Electrolysis of Iron and Steel," refers to this subject as follows:

It is a false reliance that masonry, mortar, concrete, or cement is impervious to moisture and incapable of acting as an electrolyte such as would induce electrolysis. They are not insulating substances, or at the best only in the smallest degree under the most favorable circumstances. They are positively porous and in nearly every case, whether tested in large or small mass, are permeable to all waters or moisture and gases, and in but a few exceptional cases ever become thoroughly dry.

It is, therefore, to be expected that so long as the single trolley with its grounded return is in general use, just so long may we look for electrolytic action in some form upon various underground structures, and reinforced concrete is no exception to this rule.

It is not at all surprising that such currents are busy at steel work of bridge anchorages. Whether inclosed in concrete or masonry, these materials, as we have endeavored to show, are no protection from straying railway currents when the conditions are favorable for electrolytic action. In view, therefore, of these items presented and the enormous uses to which concrete and hydraulic cements are now put, it would seem that this question should receive due consideration by those who have to do with planning and constructing important public works and buildings, as well as those who are intrusted with the care and safety of such structures.

NEW PUBLICATIONS.

The Electro-thermic Process.—Report on the experiments made at Sault Ste Marie, Ont., under Government auspices, in the smelting of Canadian iron by the Electro-thermic Process, by Dr. Eugene Haanel, superintendent of mines.

The results of the experiments conducted during the early part of last year at Sault Ste Marie, with the thermo-electric process of smelting Canadian iron ores has been given by Dr. Haanel, under whose supervision the work was carried on.

These experiments, as was stated in the Canadian Engineer at the time, were very successful, and demonstrated that the large deposits of magnetite ores to be found in Canada, can be as economically smelted as hematite ores, by the electric process. It was also shown that ore containing a very high percentage of sulphur can be converted into pig-iron in which the sulphur is almost eliminated.

An estimate of a 120-ton plant is given in the report. Dr. Haanel estimates that a 10,000 horse-power plant, producing 120 tons of pig-iron per twenty-four hours would cost $700,000, and that after allowing for interest and depreciation the iron would cost $2.43 per ton. Adding to this the cost of ore, charcoal, labor, electric energy, and general running expenses, the pig-iron would cost about $10.69 per ton.

As already announced, an electric smelting plant is being erected at Welland, which will have an output of between 35 and 40 tons per day. A large plant is also to be erected in British Columbia.

Dr. Haanel gives particular attention to the possibility of developing Canada's numerous iron ore deposits through the utilization of the water powers that are to be found throughout the country. He calls attention to the fact that many of these water powers are surrounded by iron ore fields.

Norwich University.—The catalogue of the Military College of the State of Vermont for 1906–07 has just come to hand. It contains much information regarding the school, which is in its 88th year. Size, 6 x 9, pp. 79.

Refrigerating Engineers.—The 1907 year book of the American Society of Refrigerating Engineers is now off the press. It contains a list of the members, together with the constitution and by-laws. Copies may be obtained by addressing the secretary at the offices of the society, 258 Broadway, New York, N.Y.

The Iron Age Directory.—The 11th edition of this directory contains an alphabetical list of iron and steel products of every description, giving names of manufacturers where they may be secured. This is the most comprehensive issue that has yet been published. Size, 4½ x 6½, pp. 331.

Steam Boilers.—Robb Engineering Co., Limited, Amherst, N.S. Steam boilers for every purpose are set forth in this catalogue, special attention being given to "Robb-Mumford" boilers. The text and illustrations are of the very highest order. Size, 9½ x 6, pp. 50.

A NEW TYPE OF INTERNAL COMBUSTION MOTOR.

By H. A. Johnston.

Inventors have been working for years to solve the problem of the utilization of heavy crude petroleum, in an internal combustion engine.

With the exception of the Diesel, all the so-called "oil engines" are in reality, oil-gas engines. The oil is vaporized either before or after its introduction into the cylinder, mixed with a definite proportion of air, to form an explosive mixture and fired after the mixture has been made.

In the true oil engine, the oil is burned without any explosive mixture being formed, and up to the present time the Diesel engine has been the only one of this type.

There are a number of defects inherent in the principle of operation of these oil-gas engines, which makes it impossible to satisfactorily use heavy crude oil in them for fuel. Certain constituents of all crude oils will not vaporize under the action of heat, either inside or outside of an engine cylinder, and this non-volatile matter often amounts to a considerable percentage of the oil. This tarry residue accumulates in the vaporizing chamber, wherever it may be, and eventually clogs it up completely if not removed. If a separate vaporizing device is used most of the tar and carbon will remain in it, but a small proportion of the oil is carried over to the cylinder, and, condensing on the walls helps to foul them.

If the oil is introduced directly into the cylinder or combustion chamber, conditions will be worse. In any case the tar and carbon will have to be periodically removed to keep the system in operation. This is a very dirty and irksome piece of work, besides which, the heat value of the tar and carbon is entirely lost.

While there are a number of engines that will run fairly satisfactorily with kerosene, a great many so-called oil engines show a tendency to clog, even with this refined fuel.

One reason for the accumulation of carbon in a kerosene engine, is, that all but the very lightest of petroleum products, when subjected to a high temperature, show a tendency to "crack," breaking up into carbon and the lighter hydrocarbon gases, instead of vaporizing completely.

The most of the carbon seems to be deposited on the cylinder walls.

Another defect of the oil-gas system is, that the limit of allowable compression is very low, because of the danger of pre-ignition. This danger is increased by the necessity of heating the air and oil somewhat, to make vaporization possible. Owing to this necessity for the use of low compression pressures, the thermal efficiency of these oil-gas engines is not as high as might otherwise be attained.

For the past three years the writer has been engaged in developing a new crude oil engine and the principles essential to the successful commercial operation of a motor of this type, have been deduced from the experiments made and are formulated below.

(1) The fuel must not be heated until it enters the working cylinder.

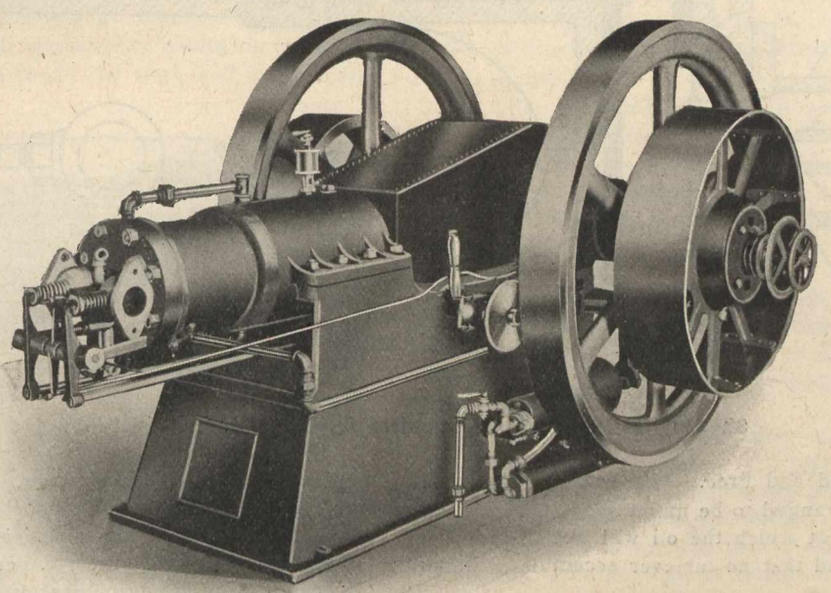
(2) It must be thoroughly atomized.

(3) It must be ignited immediately when entering the cylinder.

(4) The walls of the combustion chamber must be at a temperature high enough to prevent the deposition of tar from the fuel.

While it is absolutely essential that these laws be respected in designing an engine, there are certain minor points which as the writer has found out by sad experience, are quite worthy of consideration.

If any small passages through which the oil flows are subject to heat they will clog. Atomized fuel cannot be conducted through tubes or the fine drops of fuel will re-combine into larger ones. If the atomized fuel can be formed, before it strikes the cylinder walls, the best results will be obtained.



15 Horse-Power Johnston Oil Engine.

To further explain these statements:—

1. As long as the oil is not heated, it remains perfectly fluid and will not clog the finest holes. The writer has used spraying devices with holes only 3-100-inch in diameter in them, but in no case has a sprayer ever been clogged.

2. In experiments extending over the best part of three years, hundreds of spraying devices have been tried, and it it is found that the mean effective pressure obtained in an engine is entirely dependent upon the degree of fineness to which the fuel is broken up, all other things being equal. A poor spraying device will not only lower the M.E.P., but will cause the exhaust to be dirty and waste the fuel. With the perfected sprayer now used, the exhaust is quite clean and colorless, even when running on heavy black fuel oil.

3. If the oil is not ignited immediately upon entering the cylinder the spray will have time to settle and to reach the walls of the cylinder or combustion chamber.

The best results are to be had when the oil is fired as it enters the cylinder; each minute particle of oil is then surrounded by sufficient air to burn it, and it matters not what

the constituents of the fuel are, as the conditions are such that tar, carbon, or anything else will be completely consumed.

When heavy oil is heated in a retort there is a tarry residue left, because there is no oxygen present to combine with the carbon, and the temperature is not high enough for ignition; but when an infinitismal particle of oil is ignited in a hot chamber of compressed air, the entire substance must be completely burned. Even if there was an unburned residue, the size of the individual particles of unburned material would be considerably under 1-1,000 of an inch in diameter, and could not under any circumstances foul a cylinder.

4. If the walls of the combustion chamber are water cooled, as in the ordinary type of engine, any of the small particles of fuel strike the walls adhere to the surface, the light portions burn off or evaporate, the tar remains, and by constant repetition of the process, an accumulation of material occurs which eventually clogs the machine.

In the engine designed by the writer, no water cooled surface is presented to the charge until a considerable period after the oil is injected and fired. The walls of the combustion chamber are arranged to be maintained at a temperature, higher than that at which the oil will wet the interior surfaces, and it is found that no tar ever accumulates under these circumstances.

Any oil which may not be consumed as it enters the cylinder is believed to rebound from the hot walls of the combustion chamber, in the same manner as drops of water bounce from a hot stove lid.

As the engines are now constructed it is believed that practically all the oil is consumed before it can reach the walls of the combustion chamber.

The use of a hot combustion chamber is still further an advantage, in that the air is raised to quite a high temperature before the oil is injected, and hence is in a better condition for combination than if it were cooler.

A number of engines have been constructed embodying these principles, ranging from 10 horse-power to 200 horse-power; they have all proved successful.

The first commercial engine built, a 9 x 12-inch cylinder, has been running the factory of the Johnston Oil Engine Co., Toronto, for nearly 18 months, and a number of similar engines are now running factories in Toronto.

These engines will run on any liquid fuel that may be obtained—crude oil, fuel oil, kerosene, benzine or gasoline, and without any change whatever in any part of the mechanism.

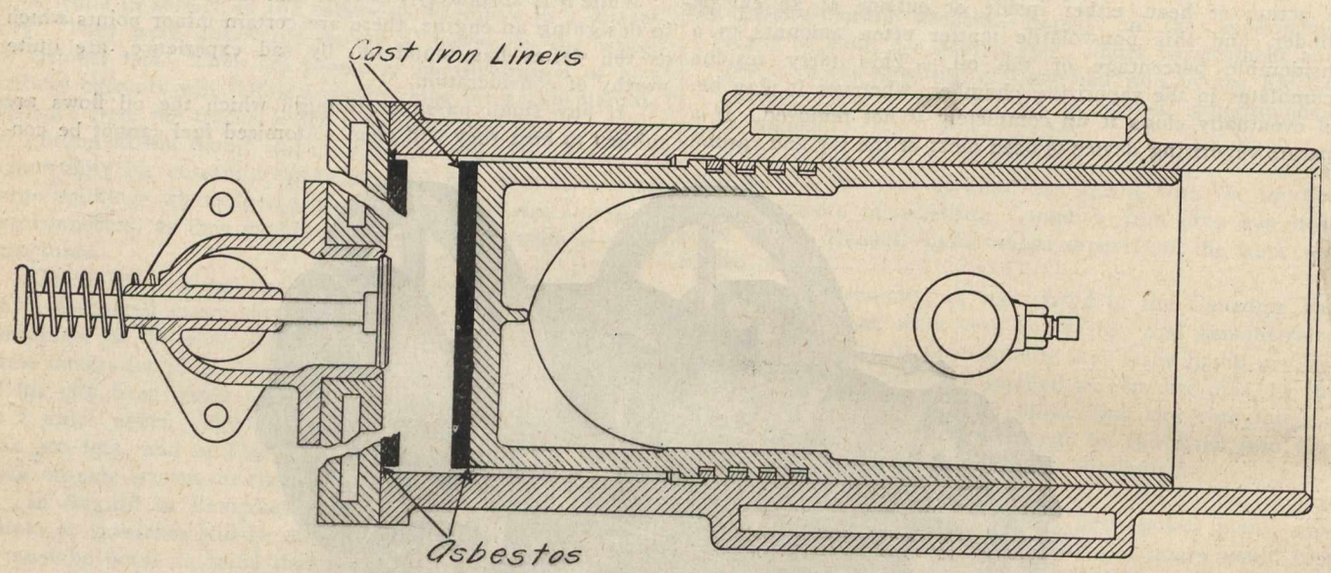
The oil used in Toronto is a refuse from the crude oil, after the gasoline, benzine, kerosene and paraffin wax have been extracted. The engines are guaranteed to develop 10 horse-power hours on ¾ gallons of this or any other petroleum oil. This oil can be obtained here cheaper than the crude, and gives no trouble in the engines. It is a dark greenish black in color, specific gravity .875, flash point 170° F., open test.

Samples of oil from all available sources have been tried in the engine, but in no case has there been any signs of clogging or necessity of making any adjustments, The oil is not prepared in any way, except to strain it through a fine sieve. The writer will be glad to communicate with any person who wishes a test made of any particular sample of oil.

The features of the engines now being put on the Canadian market are briefly these:—

They run on any grade of fuel, require only three minutes heating to start with ordinary equipment, or start instantaneously with an electric attachment.

No cranking, start made with compressed air. When once started will run indefinitely until stopped. Ignition troubles unknown. Mixer or carbureter troubles the same. No clogging of any parts.



Showing construction of cylinders up to 12 inch diameter.

The great question, however, before power users is, "How much does the power cost?"

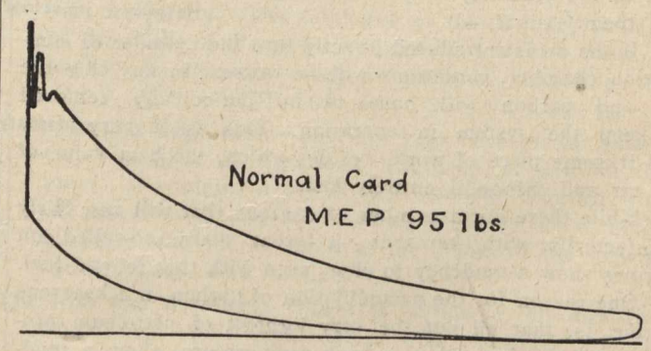
Fuel oil costs in Toronto 6c. per gal., retail, delivered.

Gasoline, 21c., city gas, 75c. per thousand feet.

The Johnston oil engine uses ¾ gal. oil per 10 h.p. hours 4½c.

The gasoline engine uses 1 gal. gasoline per 10 h.p. hours 21c.

The gas engine uses 200 feet of gas per 10 h.p. hours 15c.



Thus it will be seen that the cost of power from fuel oil is over four times cheaper than from gasoline, and over three times cheaper than from city gas.

These comparisons are for small units; for large plants the oil should be figured at 4½c. per gal., as it would then be brought in tank cars.

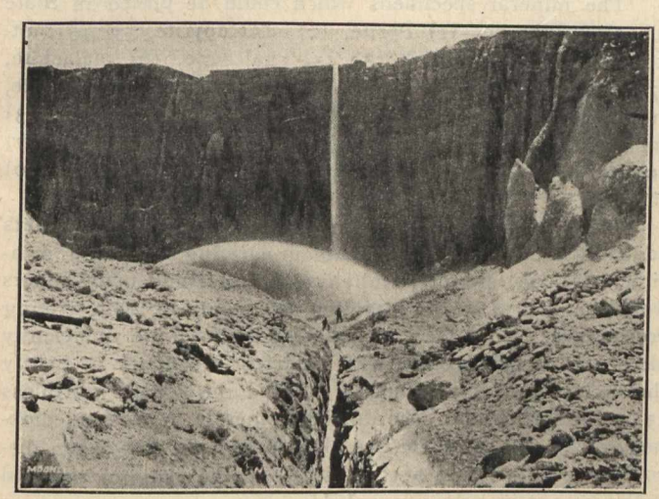
The saving over ordinary steam plants amounts to from 50 to 70 per cent. when changing to fuel oil.

No fireman is needed with the oil engine.

MINERAL RESOURCES OF NEW ZEALAND. †

PART III.—THE ARGUMENTS PRO AND CONTRA IN CONNECTION WITH THE PROPOSED MINERALS FUND.

(1) From the prospector's point of view.—(a) The profit that is theoretically possible will be much less than under the old condition of things. Every man, however, who has discovered a lode which subsequently proved of some value knows too well how little his hopes of personal gain were realized. (b) Some profit must accrue, however, to the lucky prospector under the new system. Should he only receive a few shillings for his time he will be better off than at present, if the reef prove unworthy of exploitation. (c) If the property prove valuable his reward will be large, and it will be certain. (d) His labors will end with his second visit to the ground. There will be no need for him to lose time in order to hang around after likely capitalists. Of these the last point is by far the most important. Many a miner would do a little prospecting when not working if he were assured that he would have no difficulty in disposing at a fair price of any find he might happen to make. It is also quite possible that in the not-too-distant future prospecting may become as popular a sport as, say, trout-fishing; tourists even may arm themselves with a geologist's hammer instead of a camera. How people of all classes may obtain the necessary knowledge to enable them to do the work will be indicated subsequently.



Hydraulic Sluicing Claim, Moke Creek, Otago.

(2) From the investor's point of view.—(a) Throughout the operations preliminary to flotation no one liable to be under the influence of pecuniary considerations will have come in contact with the property. Even if the prospector "salts" the expert, he will have to deceive the men engaged in the development-work. There will be no "laying on the color," no glossing over of unfavorable points. (b) The capital will not be watered, no money or blocks of shares having been paid over to outsiders for information, etc., supplied—or suppressed. (c) The maps and plans supplied will be absolutely correct, geological points will be properly brought out, and the data generally will be reliable. (d) The inhabitants of New Zealand being co partners in the venture, investors will have less reason to fear hasty and injudicious legislation for the benefit of any particular class.

(3) From the point of view of the New Zealand public. —(a) If the property is a valuable one the State will correspondingly benefit. Should the deed of sale stipulate for the purchase price to include sufficient cash to pay preliminary expenses, then the State's holding in the venture will be less than if no cash were paid, and the profits in the event of success would also be less. Each property and each tender must be considered on its merits. It will, however, be best for the cash in payment for the first one or two flotations to recoup previous outlay on the lease. (b) The departmental experts, if selected with discretion, will not be concerned with the state of the local labor-market, and there will therefore be no risk of prospecting operations being disguised relief-works.

Some practical difficulties are as follows:—

(a) There is a danger that, if the lode "peter out" very early in the history of the mine, disappointed shareholders may sue the Minister. This can be prevented by the insertion of a proviso in the lease or prospectus, as the case may be, to the effect that, although the facts are published as sworn by reputable and competent men, the deductions therefrom are matters of inference only, and that shareholders must waive all right to sue should such deductions be unconfirmed by actual results.

(b) As regards the making of roads and bridges specifically for the benefit of the new mine, each case must be considered on its merits and provided for in the lease. The fact that the district is well roaded will increase the value of any neighboring deposit the Minerals Fund may subsequently exploit.

(c) For the drainage of deep levels, for repairing the effects of mishaps, for the alteration of reduction plant, or for some similar cause, it may become necessary to increase the capital of the company. The question then arises whether the Minister may be called upon to pay his pro rata share of the money thus raised. This must be provided for beforehand.

(d) Amalgamation between different companies may defeat the chief object of the proposed scheme—namely, the securing of a reasonable share of profits to the State. This danger can easily be obviated by clauses in the articles of association.

(e) There is a risk that after all the public may not "rush" the property, and it is a very real objection so far as the first one or two flotations are concerned. But it must be remembered that every undeveloped property has a value, small though it may be, and that, if one person or syndicate will not buy, another can be found that will if the price be reasonable. So that, although the development syndicates that will be the purchasers of the initial propositions will only offer a price which barely recoups out-of-pocket expenses, yet after one or two fairly successful mines have been opened up the public may be approached direct. Even if the price never exceeds the bare minimum, the country will be no worse off than at present, when the gold fields revenue is partly swallowed up in the expenses of administration, and partly handed over to local authorities.

The Location of Deposits.

The above suggestions all assume that payable mineral deposits exist in New Zealand, but are as yet undiscovered. If this is not correct, then the sooner it is proved so and the expenditure on prospecting and on private labour ceases the better for the community.

If, on the other hand, these reefs do exist, it is advisable that they should be located as soon as possible. In this connection much is hoped by the general public from the work of the Geological Survey.

The "Old-Timer."

The prospector of the companies—and, for that matter, the ordinary man of to-day—knew free gold when showing in his dish. If he had Cornish experience he could probably identify certain lead, copper, and tin ores, but as a rule he called grey minerals "antimony" or "platinum," and all yellowish minerals "pyrites" or "mundic." For the rest he was a man of great energy, perseverance, and stamina.

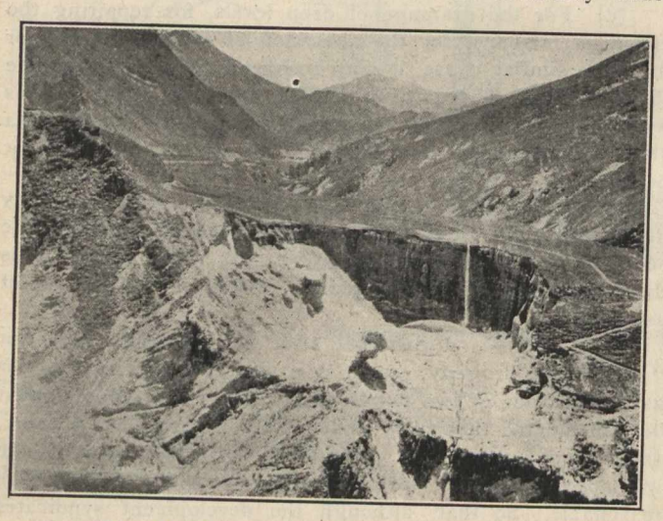
† Prize Essay in New Zealand Mines Record.

His usual method of working was what he called " following float." As he travelled slowly along the creek-bed he continually turned over the shingle in search of " shoad-stones," pieces of quartz, say, with traces of mineral attached. Having found some he would trace them up the creek, picking his way along until he could see no more. He would then conclude that he had passed the outcrop from which the pieces of float had been broken, and would examine the banks till he found it. Often he had to remove much soil and undergrowth before his perseverance was rewarded. Sometimes he had to sink shallow pits, sometimes to trench, but he usually succeeded in bringing to light a block of "stone." From this he would break off likely looking pieces, powder them betwen two flat stones—or in a mortar, if he had one—and wash the powder in a dish. The lighter stuff would be swirled away under his manipulations, and finally there would remain some greyish sand, which might or might not contain a speck or two of gold. He did not concern himself greatly about any other metal, and his methods were undoubtedly primitive, yet it is really extraordinary to an outsider to see how close to the actual gold-content of a lode the ignorant prospector with his old-fashioned tin dish could arrive.

These " old-timers " were invariably patient and painstaking men, their time was their own, they travelled over the gound very slowly, and throughout the day their minds were fixed on " float."

Prospecting by the Geological Survey.

The parties of men engaged in the Geological Survey also travel the creek-beds, but here the similarity ends.



Hydraulic Sluicing Claim, Moke Creek, Otago, near Queenstown.

They are interested not only in quartz, but in rocks of all kinds They do not ignore shales and limestone, as the pioneer would have done—in fact they pay these especial attention. They are expected to mark down each prominent feature of the landscape, and to take its approximate bearing and distance. They have a certain amount of work to do in a given time. They are mostly geological students, and receive the ordinary local pay for casual labour. Some of them may be to a greater or less extent practical mineralogists, but this the majority certainly are not.

The fact that the ground has been traversed by the Geological Survey without any finds being recorded cannot fail to discourage others who might otherwise attack the district. It is to insure that any prospecting done shall be thorough that the suggestion is made re the addition of a trained mineralogist to each party. It would be well if the Minister satisfied himself of the fitness of candidates for these positions by actual test. These appointments will certainly entail some additional expense, but this will be more than counterbalanced by the increase of efficiency.

Briefly, it may be said that a geological survey resembles a military review by a general officer, and prospecting by an untrained man an inspection by a corporal of his file, while the work of the mineralogist will partake of the nature of a medical examination by a regimental surgeon.

Many elderly prospectors still survive among us, of whom a few managed to put a little by in the golden days, and by subsequent industry in various callings have arrived at a modest competency. By far the greater number, however, have been less fortunate, these including, in fact, practically all the men who devoted much time to prospecting as distinguished from actual mining.

The Prospector of the Future.

The modern youth cannot fail to notice that the old prospector is invariably a lonely, half-starved, and disappointed man, and he very sensibly refuses to drop steady work to go prospecting. When otherwise employed, or camping out at holiday times, he may wash a dish of dirt in an amateurish kind of way. He has, however, neither love nor aptitude for the work. If he finds specimens of a mineral which look interesting, but which he cannot recognise, he may consult a text-book on mineralogy. But he shrinks back appalled! It seems hopeless for him to attack unaided such a complicated subject. Possibly he may be a man of considerable continuity of purpose, and he decides to take the course in mineralogy at one of the schools of mines. He finds that the science is in a hopeless muddle, that similarity in name argues no similarity in the most obtrusive characteristics or in chemical composition, and that without a good skeleton knowledge of chemistry he can never attain to any real knowledge of the subject as taught at present. Yet it is possible somehow or other to distinguish certain minerals—as one distinguishes certain members of the human race—although unable to draw up inventories of their characteristics.

The mineral specimens which could be placed in State schools might be—(1) Pyrite, (2) chalcopyrite, (3) pyrrhotite, (4) niccolite or millerite (5) chalcocite, (6) malachite, (7) cinnabar (8) argentite, (9) proustite or pyrargyrite, (10) manganite or pyrolusite, (11) cuprite, (12) zincite, (13) sphalerite, (14) cassiterite, (15) wolfram, (16) scheelite, (17) apatite, (18) asbestos, (19) pyromorphite or mimetite, (20) chromite.

The list may have certain minerals deleted and others added if deemed advisable without altering the main principle. Galena, stibnite, wulfenite, bornite, and many others would not fail to attract attention on account of their striking appearance. Nos. 1, 2, 3, and 4 in above are sufficiently alike and occur together with sufficient frequency to justify the inclusion of the valueless (1) and the usually worthless (3). Garnierite and other nickel minerals, otacamite, dioptase, etc., would probably be classed as malachite when discovered. This would not detract from the value of the find so long as it was duly recorded.

Many of the specimens could be obtained by the Inspectors in the various districts by co-operation with the miners under their care. Others would be supplied from the museums and by the gold fields schools. Some might need to be purchased from such dealers as Kranz, of Bonn. In any case the expense would be trifling. Glass cases would not be required—would, in fact, be contrary to the spirit of the whole thing.

No extra mental strain would be imposed upon either teachers or children, as questions of crystallographic form, polysynthetic lamellae, et hoc genus omne, would not be considered. The youngsters would regard it as a new and fascinating game. It is true that they could not go far afield, but every pebble in the creek-bed, every crack in the hillside, would be examined by sharp, eager little eyes. " There are no fossickers like the children." Their elder brothers and friends would be pressed into the service, and every " old hatter " coming into town would be besieged for " specimens."

The knowledge thus gained would never leave them, and when they grew up and went out into the world it might be safely assumed that, whether working in bush or mine, or simply touring the country in search of health, they would make the most of any mineral possibilities that came their way. It may be argued that these advantages will only accrue after a lapse of some years; but, as already pointed out under "Copper," a deposit must possess other qualifi-

cations in addition to richness to make it of economic importance, and if it were possible to locate to-day the whole of the valuable minerals in New Zealand, their exploitation, in the majority of cases, could not commence for some years owing to lack of transport facilities.

The collections which would be made locally by the children would be sent to the Minister, or examined at the schools by a competent official, who would award prizes either to individuals or to schools. It would be an instruction that a plan of the district should be handed in also, showing where each specimen had been found. It surely should be within the powers of children of thirteen or so to draw a satisfactory map of their own district.

Whether the above suggestion is adopted in its entirety or not, there is no doubt that a little collection on these lines should be set up in Murchison (Upper Buller). This township is near the centre of a highly mineralised district, which, on account of its remoteness, receives but little attention. In the gullies around live some two or three score of "old hatters," each of whom possesses some little bit of exclusive knowledge concerning the minerals to be found in the neighbourhood. There is no doubt that a collection there of such minerals would lead to a discovery, although it might be of small importance.

Speaking of South Westland, a district of whose mineral possibilities much is continually heard, McKay says,* "No auriferous-quartz lodes have up to the present time been discovered in South Westland. The difficulties of prospecting, however, may in some cases account for this state of things, yet the district has not lacked enterprising prospectors, who have penetrated to the farthest recesses of the the mountains." The same might be said of many other parts of the colony. Evidently the man who would succceed where painstaking and energetic men have failed must know more than they. It is not to be supposed that the mineral specimens to be found in private or public collections throughout the colony, and which were mostly obtained by people travelling rapidly over the ground, do more than merely represent the deposits as yet undiscovered.

The great Comstock Lode in Western America was originally discovered by accident. Some miners were working a surface deposit of free gold when they encountered quantities of a blackish mineral, which they threw away. Curious visitors carried away specimens of this and had them assayed. The value was found to be $3,000 silver and $876 gold.†

Scheelite was noticed by a farmer in New South Wales as a hard material which damaged his plough.

Many more examples of fortuitous finds might be quoted.

The Provision by the State of Prospecting Batteries.

No suggestion is made by this essay in regard to this. The same arguments apply to them as to subsidised prospecting. The following points are also worth noting (it is presumed that the outfit will consist of a small battery of stamps with amalgamated copper plates and a small cyanide plant):—

(1) As the size of screen used and the strength and number of the cyanide washes must be arbitrarily fixed, if the ore is at all complex the returns obtained would not be within measurable distance of its true value. A gold-silver ore carrying much antimony, for example, would lose most of its value during amalgamation, and a cupriferous ore during the cyaniding. Even a second Waihi or another Mount Morgan would be condemned on the results thus obtained. A properly executed series of assays would be far more reliable.

(2) Admixed alluvial gold would be detected by the assayer, but not by the millman. The former could also detect chloride of gold if he suspected it. Thus a trial run "salter" than does an assay.

(3) A mine cannot be developed on the returns from on picked stone lends itself better to the operations of the the small quantity of stone which could be handled unless packing charges were low. To be of any real use, then, the number of batteries erected must be very great.

(4) The prospecting battery can give no information as to the value of ores of copper, antimony, lead, tin, zinc, etc., although these may be sufficiently rich to pay for working.

(5) The establishment of these batteries would encourage the theft of specimen stone.

(6) Little use has yet been made of the small plants which have been installed at some of the schools of mines and this points to the absence of any real necessity for further expenditure in this direction.

* "Gold deposits of New Zealand," 1903, p. 46.

† Le Neve Foster: "Ore and Stone Mining," 1900, pp. 95-96, q.v.

THE CEMENT INDUSTRY IN JAPAN.

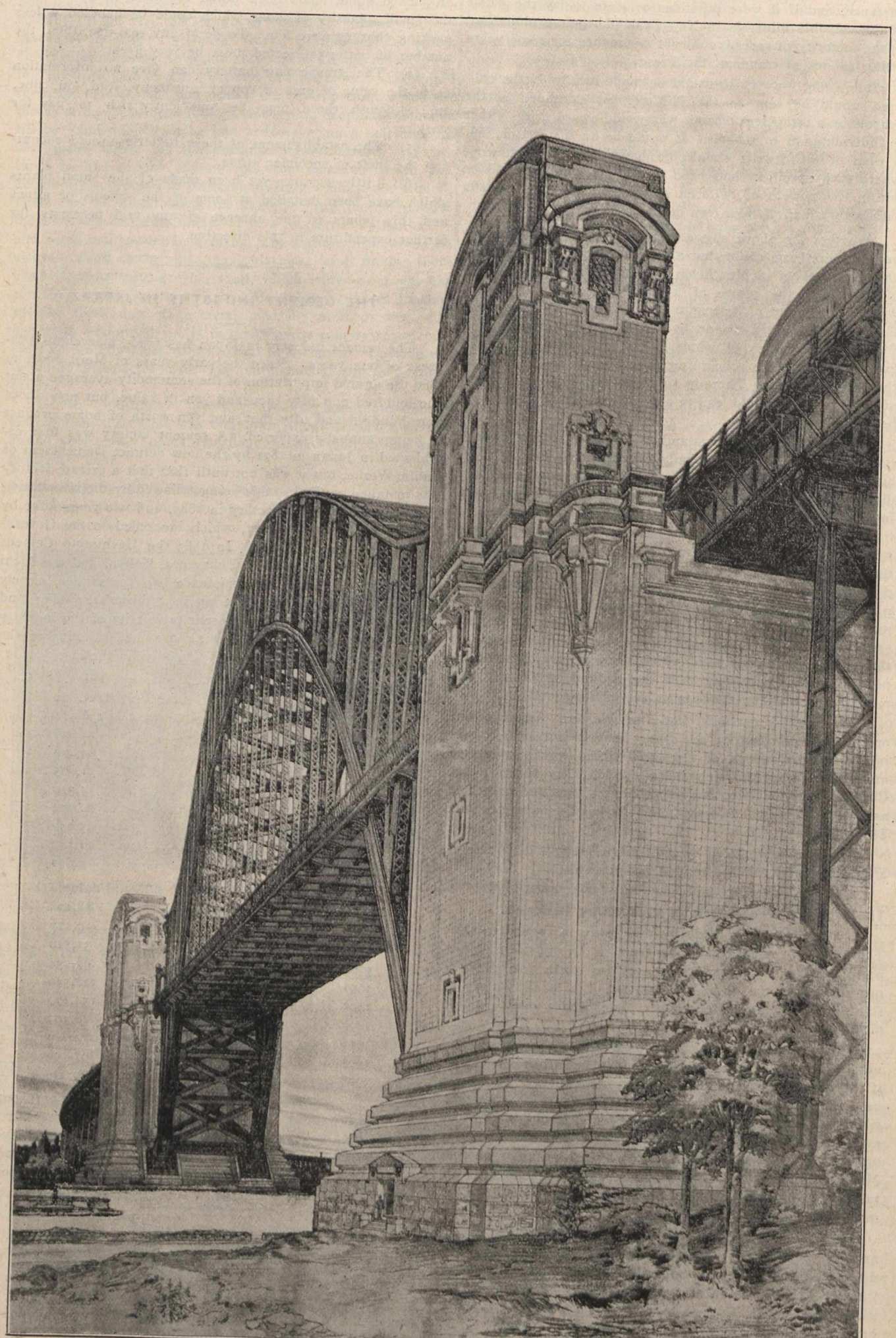
The cement industry in Japan has made marvellous progress of late years. Since the early years of Meiji down to 1880 the annual importation of the commodity averaged about one hundred and fifty thousand yen in value, but now about four hundred and fifty thousand yen worth of home product is being annually exported. A cement factory was first established in Japan in 1871 by the now defunct Department of Public Works, but it was not until 1882 that a private factory was installed at Osaka, this being followed by the installation of the Onoda Cement Factory in 1883, and two years later by the Asano Cement Factory, which succeeded to the Government enterprise in Tokyo. In 1883 the Hashimoto Cement Factory was inaugurated in Fukagawa, Tokyo, and the Aichi Cement Factory came into existence two years later, closely followed by the factories set up in Shidzuoka, Osaka and other prefectures, until the present prosperity of the industry has been attained. The following are the statistics of the import and export trade in the commodity in the last decade:

Import:—	Value.
1897	$413,604
1898	136,910
1899	29,628
1900	60,472
1901	31,865
1902	14,330
1903	20,374
1904	5,950
1905	11,347
1906	4,952

Export:—	Value.
1897	$8,128
1898	19,477
1899	31,316
1900	97,234
1901	122,540
1902	154,174
1903	248,102
1904	274,249
1905	197,196
1906	290,335

As shown above, despite a gradual increase of export, the importation of foreign-made cement does not entirely cease. The fact proves beyond all doubt that there is much room left for further development of the industry to meet the requirements both for home consumption and for export.

According to a recent Census Bureau Bulletin, the total value of the metal working machinery manufactured in the United States during 1906 was $32,408,766, an increase of $7,670,862, or 31 per cent. over the value of the product for 1900. By "metal working machinery" is meant power-operated machinery for the working of metals, including the parts and small tools required for the operation of the same. Machines and tools used in hand trades are not included.



Perspective View of Arch and Piers of Proposed Bridge over the East River: New York Connecting Railroad.

NEW YORK CONNECTING RAILWAY: HELL GATE BRIDGE OVER THE EAST RIVER.

The huge 1,000 feet arch span that is to be built over the East River at Ward's and Randall's Islands in connection with the New York Connecting Railroad, will be the largest structure of the kind yet built. The accompanying illustrations, reproduced from the designers drawings, show the general appearance of the proposed bridge, and at the same time give some idea of the magnitude of the undertaking.

Mr. Samuel Rea, vice-president of the Pennsylvania Railroad Company, through whose courtesy the illustrations herewith are shown, has submitted the plans for the bridge to the Municipal Art Commission of New York City, in accordance with the franchise granted to the company. This bridge will join the belt line now building around Brooklyn from Bay Ridge on the harbor, with the Harlem River branch of the New York, New Haven and Hartford Railway. It will form part of a steel viaduct more than three miles long. With a sweeping curve the viaduct will pass over Hell Gate, Ward's Island, Little Hell Gate, Randall's Island and Bronx Kills.

This immense arch will be 200 feet longer than the Niagara Gorge Arch, and is designed to carry much heavier loads.

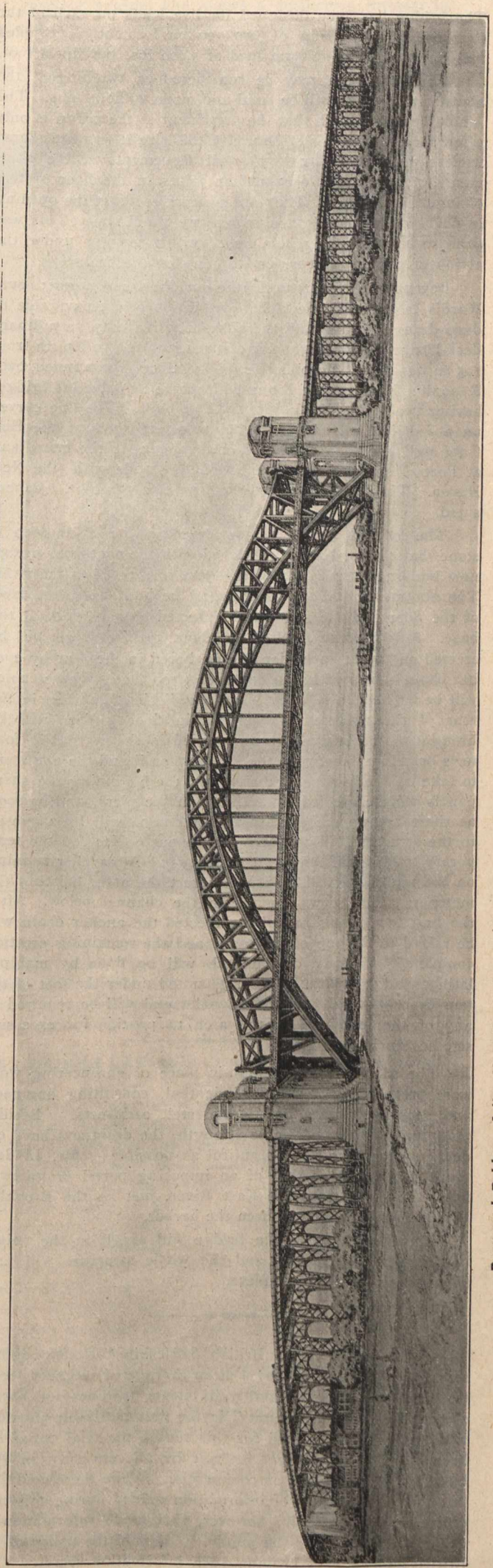
Upon completion of the undertaking New York City will, for the first time, have an all-rail route between New England and the South and West. Through trains may then run from any southern or western city without leaving the rails. Heretofore cars for through trains have been ferried around New York from the Bronx to Jersey City.

The south approach of the bridge is in Queen's County, Long Island. It is composed of a number of reinforced concrete arches and plate girders over the numerous intersecting streets, and the intermediate sections consist of an earth fill having heavy retaining walls of concrete. At one street crossing about 135 girders are required. The approach to the main arch is a steel viaduct consisting of a plate girder superstructure, which is supported on steel rocking towers about 75 feet apart. Concrete stability piers filled with gravel are placed about 800 feet apart, and to these the floor stringers are anchored. At the center of the distance between these piers expansion joints are provided. The design includes no roller bearings or other moveable supports.

The main arch is flanked on each side by the abutment piers, which are carried up 200 feet in the form of double towers. These will be of massive proportions and elaborately ornamented above the deck. They will rest on compact gravel and hard pan, the bottom of the foundations being above the high-water line, and will therefore, be much less expensive to build than would foundations for any other type of bridge requiring piers in or close to the water. The part below the springing line of the arch will be granite-faced masonry, and above that finished concrete. The main body of the piers will be hollow and filled with earth and stone to provide sufficient weight to counteract the horizontal thrust of the arch.

The arch will be 300 feet high at the crown, with a clear waterway under the floor of 140 feet. The panels are of uniform length, 42 feet 6 inches. At the crown the depth of 40 feet was imposed by the conditions of the design and similarly the height at the portal was that required for the end bracing and head room over the tracks. The peculiar but very symmetrical reverse curve of the upper cord resulted from the determination of the height of the intermediate panels to provide a uniform increase in the compressive stresses in the bottom chord from crown to abutment Ample wind bracing is provided between the arch trusses, which are spaced 60 feet, center to center, as well as in the floor system.

The floor system consists of deep plate girder stringers under each rail and crossbeams at each post, interlaced with diagonal bracing. There will be four tracks, two for passenger and two for freight trains, with material platforms between. The rails will be laid on ties embedded in 15 inches of stone ballast, laid on a floor of 8-inch creosoted and caulked timbers. This construction will be used throughout on the metal superstructure of the main arch and approaches.



Proposed Bridge of the New York Connecting Railroad over the East River at Ward's and Randall's Islands.

The bridge has been designed for live loads on each of the four tracks, consisting of two 190-ton locomotives coupled and followed by a uniform load of 5,000 lbs. per lineal foot.

While the arch may be considered as two-hinged, the abutment bearings will be solid and made without pins. The whole design is such that the movement at the crown is only a few inches, and in a structure of this size it was considered useless to provide for very small movements at the abutments. There are two expansion joints in the floor system of ingenious design. They are so arranged that the opening is never more than ⅛ inch under any conditions. This was done to prevent the whole floor system moving under the action of a train starting or stopping on the bridge.

Beyond the main arch the viaduct is continued over Ward's Island to Little Hell Gate, which is not navigable to deep draught boats, and therefore required only an ordinary deck lattice truss bridge of five spans, varying in length from 105 to 245 feet. Beyond this the viaduct is continued over Randall's Island to the Bronx Kill, where a double lift bridge, having two spans of 160 feet, will be built. The line curves on a 3 degree curve from a point 80 feet north of the Hell Gate arch and then continues on a tangent to the main land at Port Morris, where connection is made with the New Haven. The maximum grade will be 0.72 per cent. compensated.

The method proposed for erecting the main arch is somewhat similar to that employed with the cantilever bridge now building over Blackwell's Island further down the river. The abutments and towers will first be built up to the level of the floor and the skew backs erected on falsework at the base. A temporary steel tower about 175 feet high will be erected on top of each pier and anchored in the rear by eye-bar chain cables with a strength of 1,700 tons. These cables will be carried back to a " dead man " about 425 feet in the rear of the abutments. The main floor girders will be brought to the bridge site and buried in the ground in four rows or columns between the " dead men " and the abutment to take up the horizontal thrust. In the beginning the shore panels will be erected by derricks on the piers, and as soon as these are up the eye-bar anchor chains will be anchored to the structure, being carried up about 90 feet on the temporary tower and then down to the rear. A traveller running on the top chord will be used to erect the arch, hoisting the members from scows moored in the channel below. After the first few panels have been erected the anchor chain will be raised to the top of the tower and the remaining erection completed. Closing of the arch will be done by manipulating sand or hydraulic jacks mounted under the foot of the temporary towers. No additional metal will be required in any of the members in the arch to provide for excessive stresses during erection.

The plans for this gigantic piece of engineering work were prepared by Gustav Lindenthal, consulting engineer, and Messrs. Palmer and Hornbostel, architects. Besides planning a bridge of ample strength, the designers have endeavored to make it as beautiful as possible. Mr. Lindenthal's conception is that of an imposing portal or gateway from the Sound into the East River, just as the Brooklyn Bridge forms a gateway from the harbor.

The steel used in the bridge will weigh in the neighborhood of 80,000 tons, and the whole structure will take about three years to complete.

The return of the British battleship " Dreadnought " after a cruise of 10,000 miles at an average of 17 knots seems to demonstrate the reliability of steam turbines for battleships. The " Dreadnought " is the first battleship provided with steam turbines, and for this reason the trial cruise has been watched with great interest by all concerned in ship building, as well naval as commercial. While there doubtless has been a great deal of information gained during this trial cruise, it is not likely, however, that much information of value will be given to the public, in view of the policy of the British admiralty of keeping such information secret.

MODERN AMATEUR MACHINE SHOPS.

By W. L. McLaren.

With a fore-word by Mark G. McElhinney.

I.

In these days of mental activity, surplus energy often finds vent in the prosecution of hobbies, so that there is being established an increasing number of amateur machine shops.

In the old days the amateur machinist was compelled to be content with a very meagre outfit, most of which was home-made, but to-day, thanks to the extraordinary development of tool-making, he is well looked after.

Many leading tool-makers pay particular attention to the wants of the amateur, and there is now no requirement which cannot be adequately met. In times past small tools were so expensive that only the rich man of leisure could indulge his tastes in this direction, but to-day these requirements are supplied at a price so reasonable that no man of average income, who so desires, need be without a fairly complete amateur outfit.

Another important advance lies in the fact that while the older small tools were very light and inadequate, scarcely more then expensive toys, the modern small lathes, shapers,

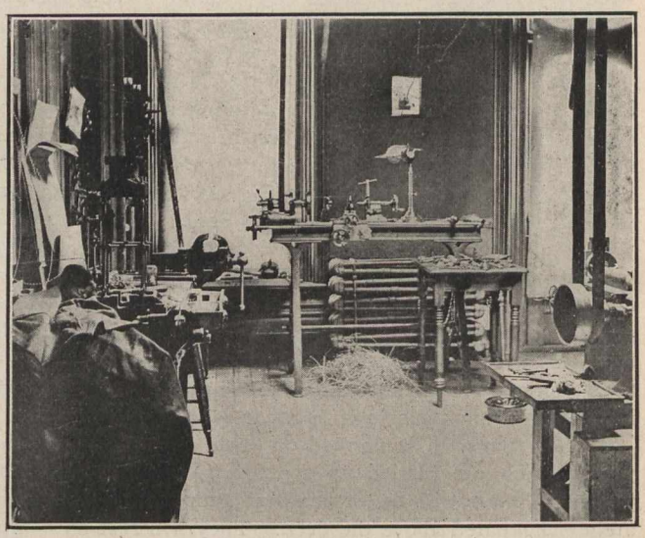


Fig. I.

drills, and other tools are marvels of efficiency and embody all the improvements and devices of their larger counterparts used by industrial concerns.

For a long time in England, France and Germany there were many amateurs amongst the leisure classes, and amateur work reached a high state of excellence, but in later years, since on our own continent there has been felt the results of rapid commercial development and consequent comfort, I think, that I may safely state that to-day in the United States, and in Canada, amateur mechanics has reached a stage never dreamed of in England and on the Continent.

Furthermore, I believe that, after twenty years' experience with small tools, without prejudice to my own nationality as a British Canadian, in the production of practical, efficient and beautifully-made small tools the United States leads the world.

Not only this, but we look to them for the thousand and one requirements in the line of castings, steel and brass goods, which are so necessary and convenient to the amateur worker. The above statement was furnished me by Dr. Mark G. McElhinney, of Ottawa, Ontario, and I include it in this article in order to show the attitude of the amateur machinist toward the subject, and more particularly as an opinion upon the high quality of the tools and materials which are manufactured in the United States.

Dr. McElhinney's shop is located in a brick addition to his residence. It is heated by hot water and lighted by elec-

tricity. Power is supplied by a one horse-power, 500-volt motor from the Ottawa Electric Company's service.

The tools consist of a 12-inch Star lathe, made by the Seneca Falls people, a 6 by 8-inch Worcester shaper, a Champion Forge and Blower Company's drill of one and one half inch capacity, an emery grinder and a small air compressing plant of his own construction.

The outfit of small tools is very complete and kept in first-class order. The drills, reamers, mandrels, taps, dies, calipers, gauges, rules, levels, clamps, and dogs are all kept in properly arranged cases and racks.

A complete inventory is kept and breakages are replaced as made. The chief breakages occur with small drills and taps, but these accidents are wonderfully few. The owner has found that the self--hardening tools are by far the best for the amateur, and so has a complete set of Armstrong tools of the required sizes.

Since the time of the amateur is limited it does not pay to be continually reforging tools except for some special purpose.

Dr. McElhinney has built a number of small machines, including dynamos, motors, water-wheels, small lathes, steam and gasoline engines, besides many smaller jobs of various kinds.

He has also made a number of instruments and appliances relating to his profession, that of dentistry, and several scientific instruments, the last of which was a microphotographic apparatus.

Fig. 1 shows a 9-inch Star lathe, which has since been replaced by a 12-inch of the same make. It has the pan and simple and compound rests.

Fig. 2 shows a 2½ by 3-inch twin marine engine with piston valves and loose eccentrics, and Fig. 3 shows a 3⅜ by 4½-inch marine engine, which he used for two years in his launch. He also built the boiler, which is a water-tube of the Salamandrine type.

This outfit he replaced last spring by a 4⅜ by 4½-inch two-cycle gasoline motor and evidences show that he has deserted the army of steam-users for the more convenient

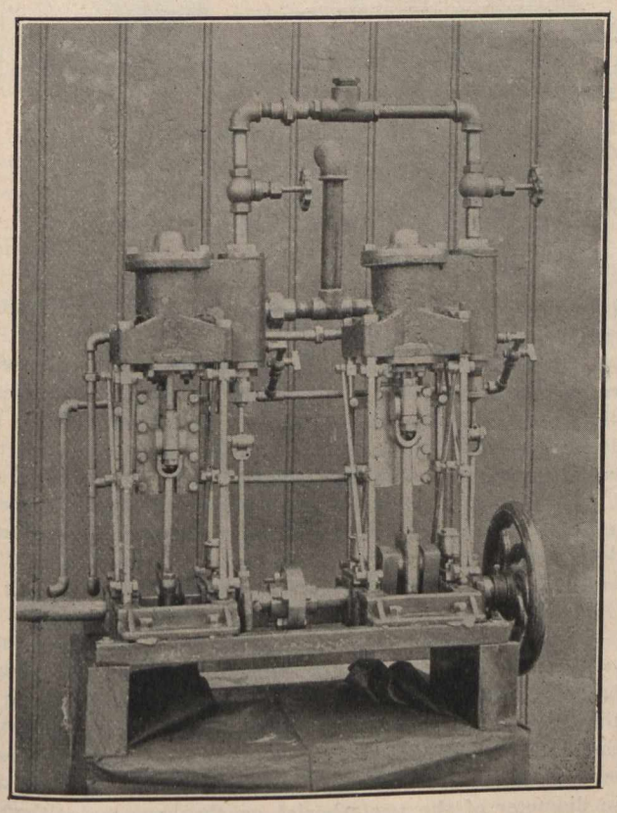


Fig. 2.

power. He certainly has few of the usual troubles with his gas engine which is probably due to the fact that he built it himself and knows how to run it. He also uses a motor-cycle, and has been heard to say that a man that can run a motor-cycle successfully ought to be able to run anything short of the universe itself. At present he is building a larger gasoline engine, and shows a suspicious interest in books and catalogues pertaining to automobiles.

Dr. McElhinney's father, Capt. Mark P. McElhinney, is a member of the American Society of Marine Architects, and is Nautical Advisor to the Department of Marine at Ottawa. He was a pioneer in the designing of the ice-breaker type of

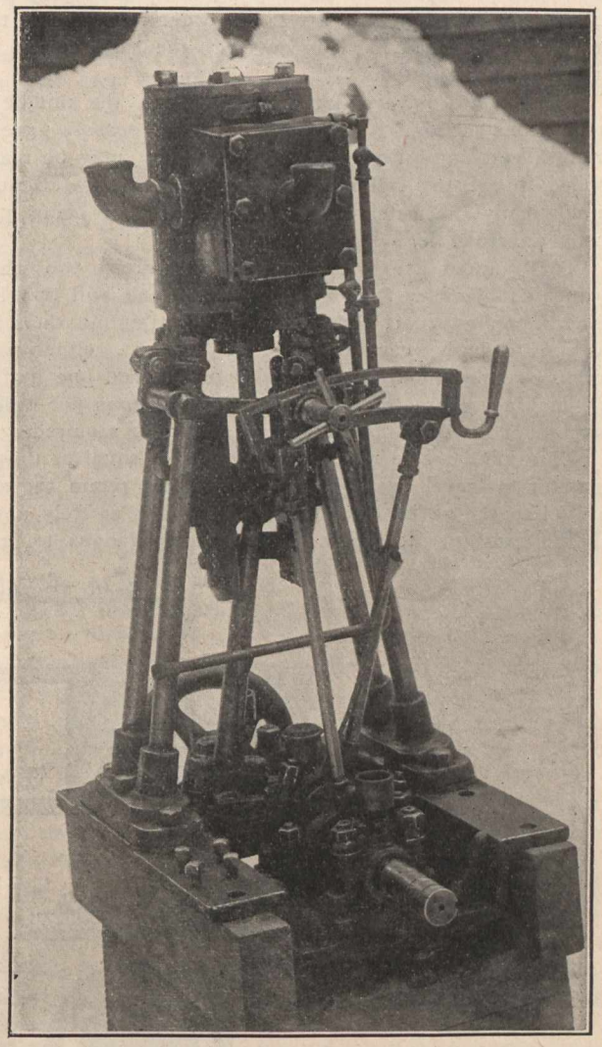


Fig. 3.

steamship. The Canadian Government steamers "Stanley" and "Minto" being from his designs. Since the doctor as a boy spent considerable time on board ship, and has lived all his life in a nautical atmosphere his love for machinery and marine engines in particular is not to be wondered at.

GREAT GAIN IN CAR AND LOCOMOTIVE CAPACITIES

H. J. Small, general superintendent of motive power of the Southern Pacific Railroad, has compiled data showing the great increase and size and capacity of the locomotives and cars of that road. In 30 years the standard locomotive of the Southern Pacific Company's lines has increased in weight from 30,000 to 280,000 lb. The tractive power has increased in the same time from 11,600 lb. to 43,305 lb., the latter figure representing the capacity of the heavy consolidated type of engine. Comparisons between the freight car standards of 1888 and those of the present show an increase in weight of freight cars from 22,000 to 42,000 lb. The capacity has increased from 30,000 to 100,000 lb. In length the freight car has grown from 27 feet to 40 feet. Passenger car capacities have shown a marked increase also, the statement being made that in 25 years coaches have been widened two feet and lengthened 26 feet, the seating capacity increasing from 32 to 70. The height of passenger coaches on the Harriman lines has increased in 25 years from 10 feet 9 inches to 14 feet 2 inches, and the weight of coaches has been multiplied by four. While the numerical increase in railroad cars in the United States has been very great, it will be seen that the increase in total capacity is relatively much greater.

THE IDEAL SIMPLEX JOINTED CAR AXLE.

Every railroad man knows that there is considerable slippage of the wheels, when a train is rounding a curve. The result is that much more power is required, and flat surfaces are worn on the wheels. In order to overcome this, Mr. W. H. Law, M.E., has devised the axles herein described and illustrated.

These axles have a journalled joint in the middle, of simple construction. They are said to possess greater strength and durability than the solid axles, may be readily applied to existing rolling stock, require no extra attention, automatically lubricated and reliable, the joint being practically unbreakable.

This jointed axle provides means whereby two wheels of unequal diameter fixed upon the same axle will travel together upon any part of the track and maintain their true position to both car and track, without either wheel skidding along the rail, the smaller wheel and one half the axle making a greater number of revolutions per mile of travel than the larger wheel, as theoretically required.

This jointed axle will permit wheels of equal or unequal diameter to travel freely on any curve and retain the axles parallel to the radial line of the curve, thus entirely obviating the constant tendency of the wheel flanges to crowd against the outer rail; they will also prevent the skewing of tracks and greatly reduce the friction and wear between the wheel flanges and rail head. At the same time less power will be required to haul the train, insuring a greater degree of safety and eliminating torsion stresses in the axle. Under the present system, of rigid axles and wheels, two wheels of equal diameter running in a curve, the wheels on the outer and longer rail cannot revolve more frequently than the wheel on the inner and shorter rail, consequently the axles are never parallel to the radial line of the curve, but the trucks are always in a skewed position on the track, resulting in the flanges of the front wheel being forced with great pressure against the head of the outer rail and sometimes forced over it, and always tending to spread the rails.

The skewed position the car trucks usually occupy when travelling around curves, and which position they frequently retain for a considerable distance after they leave the curve, is caused by the wheels on the inner and shorter rail getting ahead of their fellow wheels on the outer rail, the latter having the greater distance to travel. Therefore, if the laggard wheels are to regain their proper position on the track, and the truck run at right angles to the centre line of the car, after leaving a curve, the wheels on one end of the axle must, and do skid along the rail, causing wear of wheel tread and rail head, involving an extra amount of power to haul the train.

With the "Simplex Jointed Axle" in use, no skidding will take place, each wheel and one half of the axle being independent of its fellow on the other half of the axle, revolve freely along either rail, therefore the trucks will retain their proper position in relation to car and track, either on a curve or tangent.

It frequently happens that a wheel has to be removed from an axle for causes, such as broken flanges, flat treads, etc., but its fellow wheel is good and sound, neither wheel having run half their guaranteed mileage, but both somewhat reduced in diameter. Now there is always a difficulty in getting a wheel to replace the defective one and be of equal diameter to the one on the axle, a new wheel is out of the question, as it may be considerably larger in diameter. Therefore, both wheels have to be removed. Under passenger cars, parlor cars, sleeping cars, etc., the wheels are steel tired, but they wear flat in spots and irregular in form, sometimes one tire will be softer than its mate and wear faster on the tread; from either of these causes the wheels must be removed from the car and sent to the shops to be trued up, then the good tire must be reduced to the same diameter as the defective one to obtain equal travel, and avoid slip on the rails, thus a considerable loss is sustained by having to reduce the good tire to the diameter equal to the defective one.

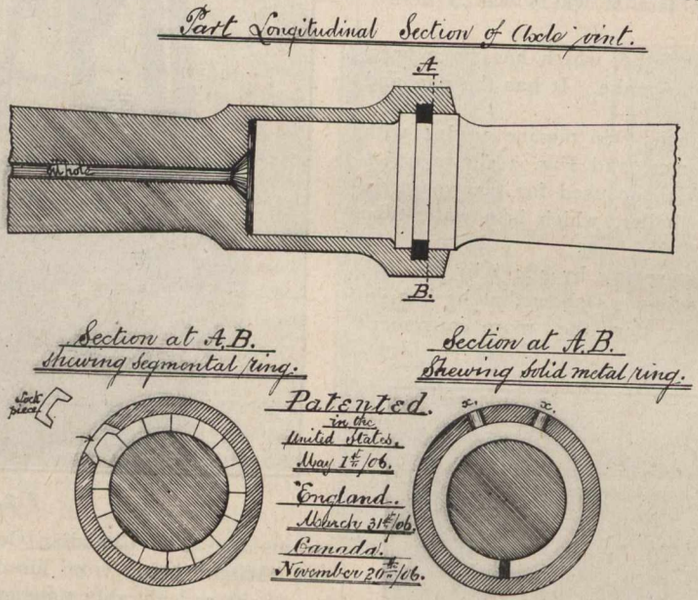
By using the "Ideal Simplex Jointed Axle" the before mentioned losses will disappear, because wheels of unequal diameter can be used on the same axle without risk, or slip. Therefore, in a tire with flat tread it is simply a case of trueing it up regardless of its diameter.

Either half of this axle can be renewed should it become injured from any cause, for instance, journals are frequently destroyed by becoming hot.

This is a distinct advantage over the solid axle as the whole axle must be scraped if one journal is injured.

With reference to the wearing qualities of the joint, there is not a doubt of the joint outwearing the main journals, because no movement takes place in the joint only at the time the car is travelling around a curve, then the revolutions are slow and few. On a straight track there is no movement in the joint. Unless there should be a variation in diameter of the two wheels on the same axle, then the movement is slow and only enough to compensate for the difference between the number of revolutions of the large and small wheels per mile of run.

The load on the joint is small in comparison to the loads on the main journals, therefore, its journal friction will be low and the wear practically nil. The joint is lubricated from the axle-box through a hole through the centre of the axle, in one half only.



The Ideal Simplex Jointed Car Axle.

An increased speed of trains can be maintained with considerable decrease in the cost of haulage. From numerous tests made with various kinds of rolling stock it was demonstrated that the power required to haul a train of cars (with rigid wheels and axles) around a curve of four hundred feet radius, was double that required to haul the same train along a straight track.

A reduction in the cost for repairs to both track and rolling stock would result in an increased life of both, these results are insured by the use of the above mentioned axle.

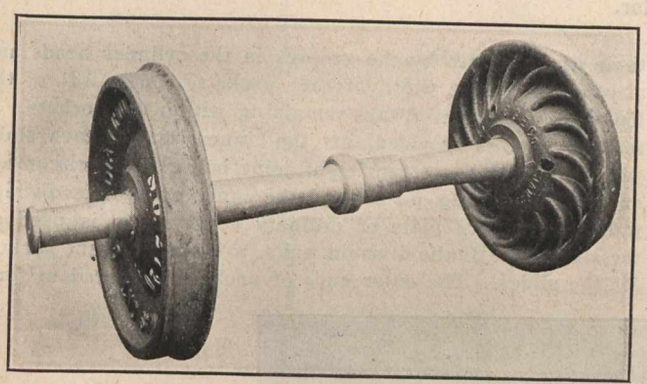
Furthermore, there would be a greater decrease in the danger of derailment at curves, involving loss of property and life.

This axle may be reduced in size without danger of failure, because torsional stresses are entirely eliminated, therefore, the axle will simply be subject to direct bending stress; with the solid axle the same is subject to bending and torsional stress, acting together. Axles are now frequently twisted apart in the middle with disastrous results; such could not take place with the "Ideal Simplex Jointed Axle."

The Construction of the Joint.

There are two methods of connecting the axle joint together, but neither bolts, nuts, screws or springs are used, nor is any part liable to excessive wear, or to become injured, unless the whole axle should be destroyed by wreck.

The axle is made in two parts and joined in the middle of its length, one end of one half journalling within a socket forged upon the end of the other half. Upon the inner or



Ideal Simplex Railway Car Axle.

journalled part two collars are raised, several inches from the end, leaving a suitable annular channel between them.

The socket on the end of the second half of the axle is enlarged, forming a band around the extreme end, and is made to fit over the journal and collars (which also form a part of the inner journals) within that part of the socket over the two collars is made an annular groove, corresponding in size, and immediately over the groove formed between the two collars of the first half of the axle. Into these two grooves or channels is fitted a steel or other metal ring in segments. By referring to the illustration it will be seen that the last segment is wider than all others, and projects up into the slot, and made taper on the two ends. The ends of the slot are similarly inclined, making the hole longer on the inside than outside. The slot is next closed by a lock piece, being forced in under pressure.

Both ends of the lock piece are parallel and of the same dimensions as the top of the slot in the socket, but the ends of the lock piece are shaped to exactly fill the space in the slot, not occupied by the head of the last segment. Therefore in forcing in the locking piece the ends are expanded by their contact with the taper head of the last segment, and cannot be removed without destroying it. After the lock has been driven, the joint is securely joined together, but one half of the axle can revolve within the socket half. Should either half of the axle become destroyed the joint can be separated by first drilling out the lock piece, and removing all the segments of the ring. But the lock piece must be destroyed before it can be removed.

The alternate method of making the joint is by pouring in any suitable molten metal (see section of joint), but the joint with the segmental ring is preferable.

Special machinery has been designed for the manufacture of these axles, and all the parts of each size and kind of axle will be produced in duplicate and to standard guages. So that either half of one axle will fit upon any other axle of the same carrying capacity. Therefore half axles may be kept in store to replace injured ones.

A series of experiments have recently been made to demonstrate what amount of power could be saved by substituting the Ideal Simplex Jointed Axle for the M. C. B. Standard Axles in the hauling of cars around curves.

An ordinary standard flat car of 60,000 pounds capacity was used, the car being new and in perfect condition. Four trials where made with M. C. B. Standard Axles under the car, on a curve of two hundred feet radius, starting off the straight track, and stopping near the end of the curve to get the true position of the trucks and wheels, and wheels occupied upon the curve at the end of the trial. The grinding of the flanges of the front wheels of the trucks against the outer rail tread was excessively heavy and the noise produced by the friction could be heard at a considerable distance. The trucks where skewed across the track until the flanges of the inner hind wheels were in contact with the rail.

Moreover the point of contact between the rail head and the wheel flange of the front wheel was from 6 to 8 inches forward off a perpendicular line dropped from the centre of the axle.

After the completion of the above tests the M. C. B. Axles were removed and the I. S. J. Axles substituted.

To insure fair lubrication of the axles the cart was run over the tracks and several curves, and finally taken to the curve of two hundred feet radius, and the point where the previous tests had been made. Four other trials where made under similar conditions to the first trials.

During these latter trials no noise was heard from rail and wheel flange contact, and the point of contact of the wheel flange with the rail head was almost under the centre of the axle, and both wheels of the trucks in the inner rail rolled freely without the flange coming in contact with the rail head.

The skew of the truck on the track was very slight. In conducting these trials a new "Giddens" self-recording dynamometer was used.

The results showed that with the I. S. J. Axles under the car, the pull on the draw bars was forty per cent. less than with the M. C. B. standard rigid axles and wheels.

This represents the power saved during the time trains are running around curves. This is only one item, add to it the amount to be saved in the wear of wheels, rails, etc., the sum total will represent a very large reduction in the operating expenses of railways.

Another serious loss in railway operation is the slowing down of trains at curves, due to the extra power required to get the train to its former speed and the extra wear of rolling stock, by the application of brakes, etc.

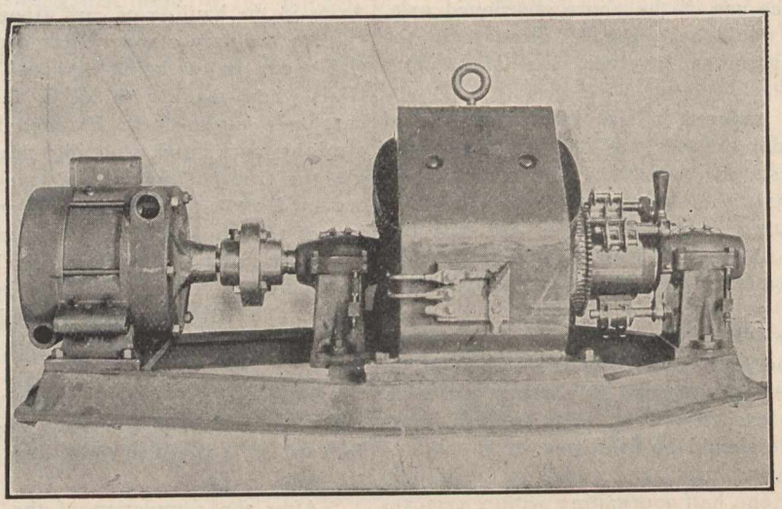
From these tests we may assume that the slowing down of trains running at moderate speeds need not be resorted to if cars are equipped with the "Ideal Simplex Jointed Axles."

Note.—On the results of steel tires sliding. If a tire has a flat spot up to 2½ inches long the tire must be reduced 1-16 inch in diameter, and ⅜ inch reduction in diameter if the spot is from 2½ to 3½ inches long.

Northern Italy, with her copious Alpine streams, is one of the world's most active workshops for the transformation of water into electrical energy. A recent development of that activity, described by Consul J. E. Dunning, of Milan, is worth the attention of American railroad interests. Milan and Genoa are to be connected by a railroad eighty-five miles long, to be run by water power generating electric current in three units of twenty-four thousand horse-power each. The road will cost $47,000,000, or nearly half a million dollars a mile. It will have nineteen tunnels, one of which will be twelve miles long and will take six years to cut, boring from ten points at once.

THE EVANS ROTARY ENGINE.

The name of the Rotary Engine is legion. More patents have been granted for engines of this class than for any other article, with the exception, perhaps of the lock-nut. Mr. Evans, who is the inventor of the engine herein described, has been about fifteen years in bringing his engine up to the present standard, and now claims that he has an economical and commercially satisfactory rotary engine.



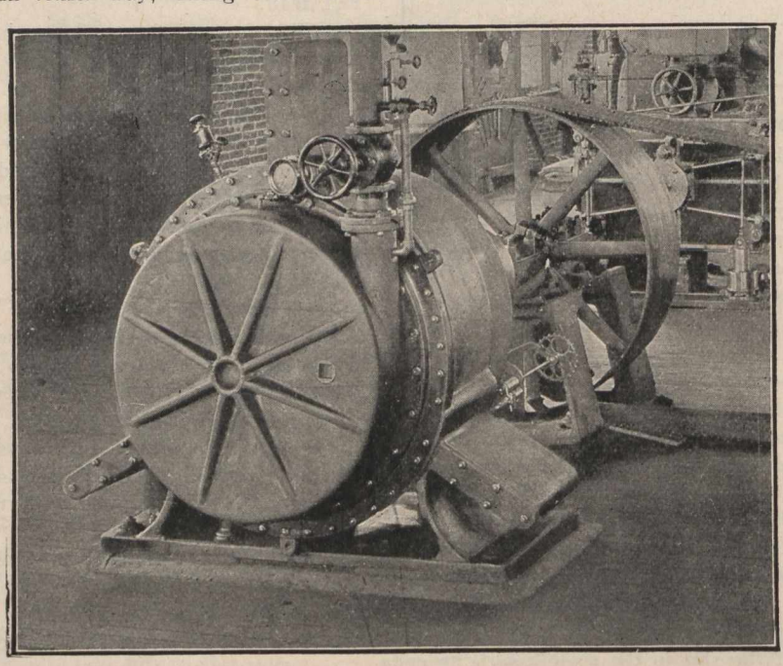
Twenty-five Horse-power Directly Connected to Electric Generator.

The engine is not an experimental machine by any means, and has been running for many months in actual practice. Its design and construction are such that it is steam tight under every possible condition. Its mechanism for steam taking, cut off, expansion and exhaust works with absolute and unvarying precision. Its arrangement is very simple, and it is very compact.

The steam chests are bolted to the cylinder on either side, so that the engine may run either way, taking steam from one side and exhausting on the other, the necessary difference in size of steam valve openings being easily and simply adjusted when changing from one to the other.

The steam valve consists of two parts, the disc and a sliding annular plate containing the same number of openings as the disc upon which it is carried, and adapted to be automatically rotated by a governor, or to remain constantly at a predetermined angle of cut-off as desired. In the latter case the cut-off may be varied while the engine is in motion ranging from the full opening of 120 degrees, to a point where all but two of the openings are closed.

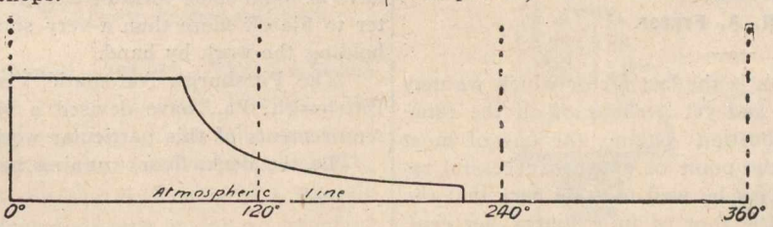
The working parts within the cylinder consist of the crank shaft which is built up, to allow of easily removing the working parts; the rolling piston journaled upon the crank pin and revolving upon the pin, with the outer circumference rolling in contact with the wall of the cylinder. Three division walls separate the cylinder into three 120-degree compartments, each of which has a separate steam entry and exhaust port. These ports are similar, each being on alternate sides. The dividing walls are supported on both sides for their whole length by the grooves in the cylinder heads and also by the whole width of the pockets, one-third of the length of the slides always remaining within the pockets. A rocking shoe is provided at the inner end of each slide, which maintains a steam tight joint between the circumference of the rolling piston and the inner end of its division wall. A balance plate of ordinary construction is used on the steam side of the division walls, to maintain tight pockets for the slides. The outer ends of pockets are cored to form pneumatic chambers to receive and return the divisions, the pressure of air being calculated to receive and overcome the momentum of the slides and return them without undue force.



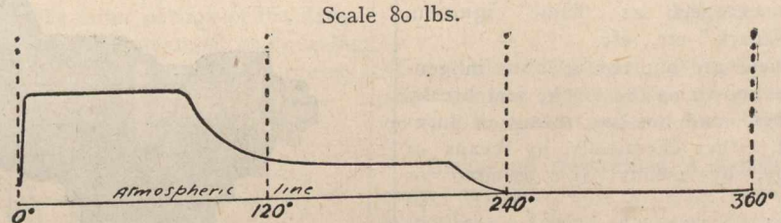
Five Hundred Horse-power Engine.

The piston is a disc of cast iron, bored to receive the crank pin and covered by two thin annular shells serrated in the centre of their circumference so as to move out against the cylinder heads without allowing steam to leak under the ends of the division walls or slides. They are turned down over the sides of the piston, so as to carry the grooves for the shoes of the slides, and are fastened to the piston by flat

annular rings of copper, the outer circumference of the rings being anchored to the inside of the movable shells and the inner circumference clamped to the piston by clamping rings and screws. This gives a steam tight joint of great flexibility and allows the sides of the shells to be held against the cylinder heads by the steam pressure in the chamber. As the steam and friction may be readily proportioned to each other on the principle of a balanced valve, it will be seen that the packings on all points of wear are steam-controlled and that they will remain tight to the limits of wear; also that these limits are much greater than in the ordinary engine. The motion of the rolling piston is epicycloidal in all its parts, so that there is no wear on the cylinder wall, very little on the crank pin, which is fitted either plain or with roller bearings, and the motion of the shells rubbing on the cylinder heads will keep both shells and heads flat to the limits of wear. The shoes on the ends of the slides rub against circumference of the piston shells, but owing to the shape of the shoe, it is steam controlled, and the great latitude of motion in the pocket will keep it tight until worn to the point where renewal is necessary. These shoes are easily inserted. All curves are circular and all planes flat and right-angled, making them easy of renewal with limited facilities, as would be the case on shipboard, or in small ports with poor machine shops.



IDEAL CARD.
Scale 80 lbs.



ACTUAL CARD.

R.P.M. 400	M.E.P. 40.9
Steam 80 lbs.	I.H.P. 12.1
Spring 80 lbs.	Water 33.5 lbs. per I.H.P. per hour.

The friction surface is very small—much smaller than in any reciprocating cylinder engine,—and less than most experts would believe until they have calculated the epicyloid curves with due reference to the diameters of cylinder and piston in relation to the crank-throw. Having an actual crank in the cylinder, the side pressure of the steam is taken off the shaft and utilized in holding the piston against the cylinder walls, while any wear on the crank pin will not affect the working parts of the engine, as the piston is entirely controlled by the steam and the cylinder wall. The wear on the crank-shaft boxes is, therefore, less than in the reciprocating type of engine, as the shaft is not subject to the side thrust of the ordinary engine at the ends of the stroke. With one chamber exhausting, one with steam expanding and one taking steam at boiler pressure, or with two expanding, or in any other position, the resultant of the forces maintains the thrust always at right angles to the throw of the crank. The steam valve contains large flat surfaces and the valve seat and all moving parts of the steam cylinder are oiled by the oil carried in by the steam.

In starting, the engine takes steam at boiler pressure in two of the compartments at once, but as it gathers speed the cut-off reduces the angular opening of the steam admission valve until the cut-off attained is sufficient to carry the load at a given speed, after which the steam is used expansively, the reduced valve opening admitting steam to the various chambers in rotation. The shape of the chambers is such as to obtain the full pressure upon the surface of the piston with a very thin layer of steam, and there being no clearance, the economy in this direction is marked. The condensation is also very small, as the steam is filling the live, and exhaust sides of the cylinder heads, and the periphery is of such shape as to be easily jacketed. Compounding is simple and is accomplished by placing the additional cylinders side by side with the high pressure, with steam chests between them.

The simple engine, as shown, can be used condensing, and when so used the entire surface of the rolling piston exerts power to operate the crank shaft. The surface upon which steam pressure is exerted is equal to a plane whose length is the sum of the chords of the arcs of steam area, multiplied by the width of the cylinder, which gives a very large pressure surface to be acted on by a very thin layer of steam. The steam exerts a very gradual increase of pressure upon the piston, as the steam entry ports are close to the division walls, and as the point of contact rolls past the port the surface exposed to boiler pressure increases steadily until the point of cut-off is reached, when the pressure gradually decreases until the exhaust ports open, obviating the heavy blows caused by the steam striking the full surface of the piston of the ordinary reciprocating engine. The epicyloidal motion of the piston allows the chamber to enlarge considerably after the angle of one-third revolution has been passed, hence steam may be admitted at boiler pressure for one-third of a revolution, and then be used expansively for another third of a revolution. This is true of each of the three compartments in each revolution, so that there is a similarity to the triple cylinder engine, one compartment constantly taking steam at boiler pressure, one using it expansively, and the third exhausting. Hence as the area exposed to boiler pressure increases in one chamber, the preceding one decreases its pressure by expansion, thus maintaining a nearly constant pressure on the crank shaft.

The engine will start with full boiler pressure on two chambers and cut off as speed is attained: this gives by actual test, when starting, a pull of about four times the power used when running regularly. This is a particularly valuable feature of reversing engines.

The exhaust valve gives ample time to allow of the escape of steam and thus all liability of back pressure is avoided, as the steam has twice as long a time in which to escape as in the ordinary engine.

It shows an economical efficiency at speeds ranging from 20 to 2,000 revolutions per minute, and the same conditions exist under low and high pressure, ranging from 20 to 350 pounds per square inch. Having no dead centres, it will start under full load in any position, and is instantly reversible.

The cost of this engine, it is claimed, is only one-tenth that of a reciprocating engine of the same horse-power; and the weight per horse-power is about 5 pounds, a figure considerably lower than that for the reciprocating engine.

The inventor describes the principle of his engine in a very simple manner, as follows:—

As an illustration take a freight car loaded with 40,000 pounds on a side track. To remove this a certain amount of power is required, a locomotive or possibly two or three horses. Yet a man with an ordinary pinch bar inserted between the car wheel and the rail will move this immense load, and in physical exertion only exercise about one-half a man power or less than 100 pounds pressure.

The principle of the engine is the same simple idea. The piston is the car wheel, the cylinder is the rail, and the steam is the pinch bar, constantly pinching the wheel over the rail, thus practically losing no energy in the complication of moving parts which are indispensable to the reciprocating engine. Unlike the reciprocating engine, it has a variable piston area. When the pressure is greatest the area is small and increases gradually as the pressure decreases by the expansion of the steam. This equalizes the force acting on the crank and crank pin, so that instead of a constantly varying strain, as in the case of reciprocators, there is an almost constant pressure equal from instant to instant, and always acting at right angles to the throw of the crank

THE GAS ENGINE.*

By R. A. Fraser.

The question of ignition is the last factor which we may take up for consideration, and yet perhaps of all the functions in the internal combustion engine, the one of most importance—viewed from the point of getting successful results in operation—and it may be well to state here that the question of ignition is at the root of fully ninety per cent. of so-called gas-engine troubles. Space will not permit my reviewing the earlier systems, such as "flame" ignition, "hot-tube" ignition, "wipe-spark," etc., etc.

At the present time there are but two systems in general use, namely, what are known as the "make and break" and the "jump-spark" system, and but two means of furnishing the electric current, either chemically, by means of batteries, or mechanically, by means of a dynamo or magneto.

In the case of the "make and break" system, an electric circuit from a battery, or some other source of electric energy, is closed by means of the contact points within the compression space, the current passing through an inductive resistance, in the form of a spark coil, on its way from the source of energy. Upon breaking the circuit, the inertia produced by the induction raises the pressure of the circuit, and causes a hot spark to jump across the terminals. You will note that two conditions are necessary, in order to obtain a spark sufficiently hot and strong to ignite the charge, that is a comparatively strong electric current has to be available, and the mechanism of the igniter must be in good order, so as to produce a sharp break at the points. In other words, the current may be strong, but the igniter sluggish in operation, which would be fatal to obtaining a good spark, so that, in the case of having trouble with an engine it is always wise, in addition to make sure that electric current is sufficiently strong, to examine the igniter, so as to make sure that the springs have not become weakened, and it will often be found that by increasing the tension on the igniter springs the intensity of the spark can be increased, and the efficiency of the ignition mechanism materially improved.

In summing up, the strong points which go far towards efficiency in mechanical construction, are simplicity, durability, first-class material and workmanship.

Regarding simplicity, a man does not need to be an expert to appreciate the fact that the fewer number of working parts an engine, or, in fact, any machine, has and still works well, the better, as the less there is to renew, and the less renewals will cost.

Weight and speed are the two factors which make for durability. An engine must have weight, which also means strength to resist the stresses due to pressure and temperature, also an engine must run at a moderate speed to live long. If two engines pulling the same horse-power are set side by side the heavier built and slower speed machine will certainly outlive the higher speed light machine.

There only remains the question of workmanship and material, and these must necessarily be of the best. The only point to emphasize is the necessity of every portion being accurately machined, and the desirability of having all parts absolutely interchangeable.

In concluding, I may just remark, that no one man or firm can combine and retain all the points necessary to produce a perfect machine. All engineering, like everything else, is more or less in the nature of a compromise, and the best we can do is to endeavor to increase our efficiency from the point we have reached by careful study and well directed effort.

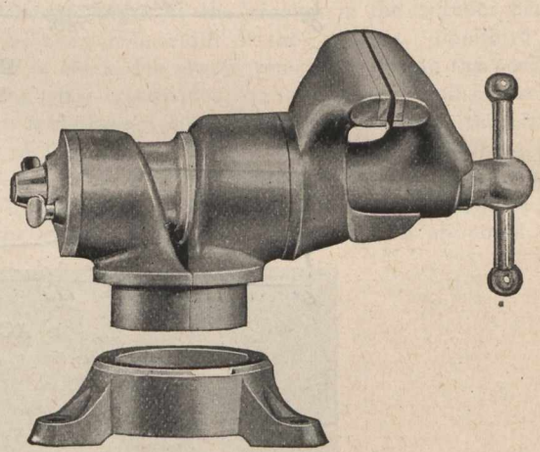
* Continued from June issue.

A MOTOR-BOAT AND AUTOMOBILE VISE.

It is often necessary and always convenient when an unforeseen break occurs about a motor-boat or automobile to have at hand some form of vise, it being a very difficult matter to file off more than a very small amount of metal when holding the work by hand.

The Pittsburgh Automatic Vise and Tool Company of Pittsburgh, Pa., have devised a vise suitable for the many requirements of this particular work.

To the deck, floor, running board or seat is attached a small unobtrusive base, 1¾-inch in diameter, and the vise is attached to this when it is to be used. At other times it is packed away in the tool box. The vise is set in the socket, in which it is free to turn in a complete circle. As soon as the jaws are tightened on a piece of work, the vise is automatically clasped in its base and cannot move. Release the work and the vise is again free to swivel.



The Pittsburgh Vise.

There is another swiveling motion. The jaws can be swung around on the axis of the screw, and, as in the case of the horizontal movement, the tightening of the jaws on the work clamps the swivel automatically. These movements make it possible to get the work into almost any imaginable position for convenience of access.

The vise has 1¾-inch jaws, opening three inches, weighs 3½ pounds, and is finished in both nickel and aluminum.

The parts subjected to stresses are of alloy steel, and the screw is a steel forging, all parts are interchangeable. The base is so designed as not to be affected by the clogging or accumulation of mud, dirt, water or any other substance, By the use of extra bases the vise can be utilized anywhere; work-bench, shop or wherever a base can be secured.

The output of gold in the Transvaal for the month of April was valued at $11,155,947. The coal at $308,170; silver, $37,659.

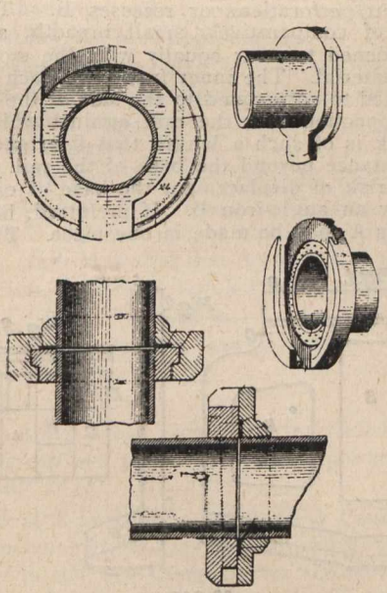
INTERNATIONAL PATENT RECORD

Dominion Houses of Parliament.

CANADIAN PATENTS.

Specially compiled by Messrs. Fetherstonhaugh, Dennison and Blackmore Patent Attorneys Star Bldg., 18 King St. W., Toronto; Montreal and Ottawa.

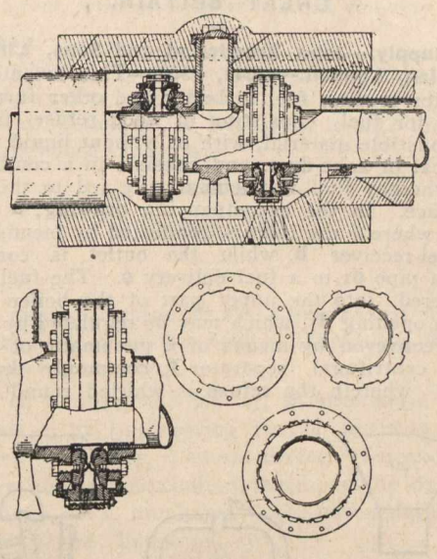
Pipe Flange.—E. L. Maxwell.—102,029.—The invention relates particularly to flange joints for pipes whereby the length of pipe may be joined together quickly and securely without the use of metal to secure the joints or bolts to make the joint water-tight, and it consists essentially of a flange threaded on the end of one length of pipe having an annular recess surrounding the end of the said pipe in which a suitable gasket may be placed. The outer portion of the flange has outwardly projecting lips vertically arranged and curving inwardly at the bottom, said flanges having inwardly project-



102,029.

ing flanged edges tapered from the top to the bottom. The other length of pipe has threaded on the end thereof a flanged member adapted to fit between the projecting lips formed on the other flanged member and is suitably tapered so that when dropped in place the tapered face will wedge against the tapered face of the outer portion of the other flange and consequently draw the two faces of the said flanges tightly together, pressing against the gasket and making the joint secure.

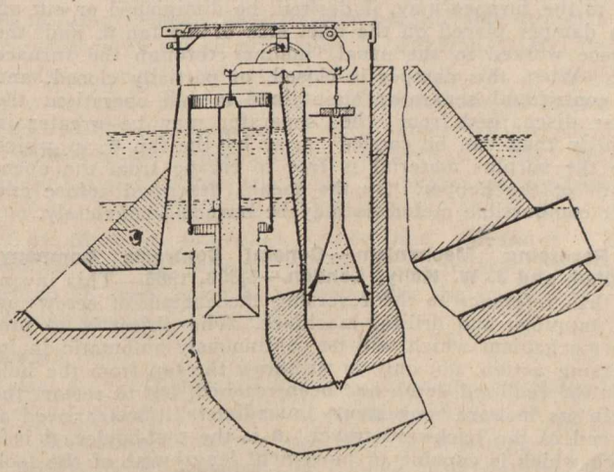
Underground Conduit and Joint.—B. R. Fales and E. L. Barnes.—102,023.—The invention relates to an improved expansion joint for underground conduits in which a T is rigidly supported in a suitable cement casing and held securely therein. Each end of the T has an outwardly projecting flange around which is loosely secured a bolted ring formed in sections and having two diaphrams secured therein. The outer of said diaphrams is secured to a ring flange which surrounds the pipe extension and is slidable thereon. The inner diaphram has an extensive sleeve portion fitting within the extension pipe and resting against the inner edge of said diaphrams. The ring supporting the diaphram loosely surrounds the flange of the T, and also a movable flange on the extension portion of the pipe and is provided with inwardly extending flanges at the edges there-



102,023.

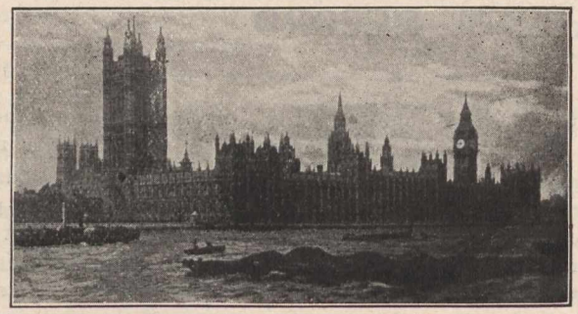
of to limit the outward movement of the expansion flange and extension pipe and sustain a continuous spring pressure on said flanges to make a water-tight joint.

Device for Controlling A Supply of Water.—R. C. Kennedy.—101,909.—The invention consists in an apparatus for controlling a supply of water in which a conical chamber is arranged above the inlet pipe. A movable cylinder forming a sluice for the inlet, is suspended in said chamber and has a central cylinder with a bell-shaped end rigidly secured thereto and projecting downwardly into the outlet pipe. The two cylinders are supported upon a fulcrum lever in a casing at the upper end of the cone-shaped casing, and a weighted



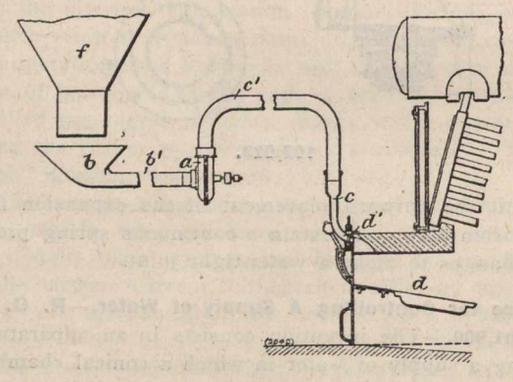
101,909.

member is suspended from the opposite end of said fulcrum lever in a dash pot to one side of said cone-shaped casing. The fulcrum lever is adapted to tilt upon its pivot and raise and lower the first mentioned cylinder to cut off and regulate a supply of water according to the force of the inflow acting against the bell-shaped end of the inner cylinder. Suitable means are provided to secure the fulcrum lever in any desired stationary position



British House of Parliament.
GREAT BRITAIN.

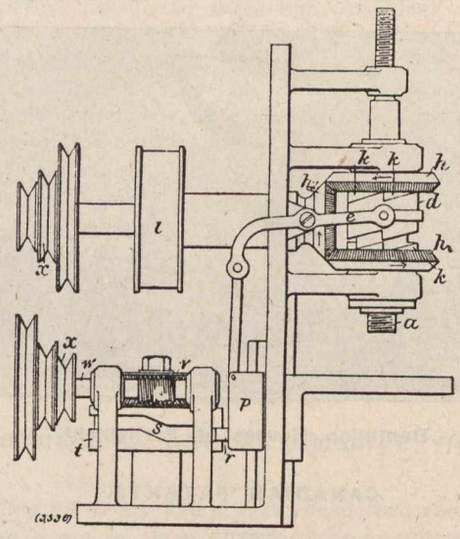
Fuel Supply.—John Broadwood and Sons, Limited, and R. H. Collen, London.—2,042, 1906.—This invention relates to means for feeding fuel to boiler and other furnaces, and is adapted for fuel consisting of wood refuse, ligneous or other combustible material, with or without liquid fuel, small coal, or coal or coke-dust, and consists in a combination of devices whereby fuel is pneumatically fed to the boiler or other furnace. In the accompanying drawing, **a** is the fan or blower, whereof the inlet is connected by means of a pipe **b**1 to a fuel-receiver **b**, while the outlet is connected by means of a pipe **c**1 to a fuel delivery **c**. The fuel is preferably delivered into the upper part of the boiler furnace **d** through an opening **d**1, which may be regulated by a damper. Refuse is conveyed by means of a pneumatic or other conveyor to a centrifugal separator **f**, commonly known as a "cyclone," wherein the refuse is whirled round in such a



2,042.

manner that the solid particles are separated from the air, the latter escaping at the top of the apparatus, whilst the solid particles are discharged at the bottom into the hopper **b**. The open mouth of the hopper **b** also serves for the reception of small coal, or coal or coke-dust, which may in this manner be mixed with the refuse. The supply of air and fuel to the furnace may, if desired, be diminished or cut off by a damper placed on the inlet side of the fan **a**, and the furnace worked in the usual manner through the furnace door. When this damper is closed, or partially closed, and the centrifugal separator maintained in full operation, the refuse discharged from the separator may be greater in quantity than can be carried away by the fan **a**, in which case the surplus material is free to escape from the open-mouth of the hopper. By the means described refuse and other combustible materials may be burned smokelessly.

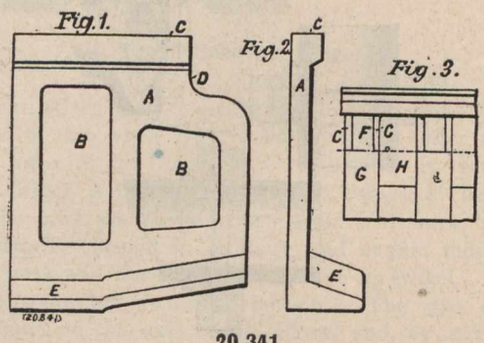
Reversing Mechanism.—General Contracts Company, Limited, and J. W. Kelly, London.—5,536, 1906.—This invention has reference to the reversing mechanism of screw-cutting, tapping, and drilling-machines. The object is to provide mechanism which will be continuously automatic in its reversing action, not only to withdraw the tap from the hole when the required depth has been reached, but to restart the tap in its forward movement, immediately it has arrived at the end of the backward travel. **a** is the tool-holder, **d** is a clutch which is capable of movement lengthwise of the tool-holder by means of a lever **e**; **h**, **h**1, **h**2 are gear-wheels, to which motion is imparted from a pulley **i**; **k**, **k** are teeth on the gear-wheels **h**, **h**1, which take into corresponding teeth on the clutch **d**. The lever **e** is connected to a sliding-piece **p**, having a stud **r** that takes into a path **s** in a circular cam-piece **t**, driven from a worm **v** on a shaft **w**. On motion being imparted to the pulley the tool-holder will be driven and caused to approach the work. While this motion is taking place the rotation on the cam-piece **t** will cause the stud or projection **r** on the slide **p** to move the lever **e**, so that when the required forward travel of the tool-holder has been obtained, the clutch **d** will be moved out of contact with the wheel **h** and into contact with the wheel **h**1, thereby imparting a reverse motion to the tool-holder, the backward and forward movement being repeated at each revolution of the cam-piece **t**. It will be evident that the duration of the backward and forward travel of



5,536.

the tool-holder will be regulated by the speed of rotation of the cam-shaft **t**, which may be readily varied by means of differential band wheels **x**, **x**.

Permanent-Way Blocks.—W. Baxter, Sen., Leith.—20,341, 1906.—This invention relates to blocks used in connection with the permanent-way of tramways to prevent the excessive tear and wear of the paving setts or other road-paving material immediately adjoining the sides of each rail, and its object is to improve the construction of such blocks so as to render them more satisfactory and efficient in use, non-slipping, whilst at the same time materially reducing their weight and cost of production. The block A, which is solid, and made of metal, may be cast, forged or stamped, with or without perforations or recesses B. The exposed surface C is of comparatively small breadth, and may be chilled or hardened to wear equally with the stone or other road-paving material. The inner face D of each block A is, as usual, formed to correspond to the side of the rail, or any fittings in connection with the rail, against which it bears, and each block is of such a length that it extends outwards for a short distance beyond the base of the rail. To reduce or eliminate risk of displacement the base of each block A is enlarged by an angle-iron E. If preferred, however, two of these blocks A may be made in one piece. The blocks A



20,341

are arranged in pairs, with their angle-irons E facing each other. The distance between each block forming a pair, and between each pair of blocks, may be varied. Between each block A forming a pair there is inserted a stone or other paving sett F which is the same length as the exposed surface of the blocks, but the next abutting sett G is approximately twice the length of the first sett F or of the ordinary size, so as to break joint with the row of setts H on either side.

United States Consul S. H. Shank reports from Winnipeg that during the past year there have been sold in that Canadian district about 10,000 grain drills, about one-third of which were American made, and about 1,000 cultivators, almost all of which were Canadian-made machines. He adds that there are some five or six American firms already in that market, but the development of the country will make a good opening for agricultural implements of all kinds.

Ontario.

The Ontario Railway & Municipal Board is inspecting the various trolley lines throughout the Province.

It is said that the Grand Trunk Railway Company are to rebuild their Stratford car shops on a large scale. The new shops will be 95 x 175 feet, and will be run with electricity throughout. A 120-ton crane will be installed.

President Mackenzie, of the C.N.R., says the report to the effect that a large amount of the common stock of the road is to be placed on the market is not correct, and that no such course is intended.

Quebec.

The inauguration of the Gasford Branch of the Quebec and Lake St. John Railway took place on August 1st.

The Canadian Northern Railway expect to complete the new line from St. Jerome to Montfort Junction, as well as the opening of the entire line from St. Jerome to Haberdeau.

Manitoba.

It is understood that the Winnipeg Street Railway Company will issue a million and-a-half of new stock. This has been rendered necessary in view of the improvements being made in the form of additional trackage and equipment.

Saskatchewan.

It is possible that a new depot, and roundhouse will be built at Indian Head during the coming year.

British Columbia.

A railway, for which the survey work is being done, is to be built from McGillivray, near Crow's Nest, through the Flathead Valley to Kalispell. This will give a line nearly 200 miles shorter than any road at present carrying fuel from the coal regions to the big Montana smelters.

It is reported that President Hill, of the Great Northern Railway stated that the road from Fernie to Michel will be completed this fall. Messrs. A. Guthrie & Co., of St. Paul, Minn., have the contract.

Col. D. R. May, of New York, and Mr. John Braden, of Victoria, have been to Port Simpson selecting a site for a wharf, which it is expected will be built from Hudson Bay to Port Simpson. Col. May says that the road will be completed three years before the Grand Trunk Pacific reaches the coast.

CONTRACTS AWARDED.

Ontario.

A ten-year contract has been let to the Hull Electric Co., at $15 per horse-power for the supply of power to run the municipal plant.

The National Transcontinental Railway Commission has awarded contracts for 65,571 tons of steel rails and fastenings; 22,000 tons go to the Soo Company for the Abitibi section, and the balance of over 43,000 tons go to the Sydney, N.S., Company, and will be distributed at Quebec, Levis and Edmunston.

The Richelieu & Ontario Navigation Company has awarded a contract to the Canadian Shipbuilding Company for a sister ship to the "Rapids King," to be known as the "Rapids Queen." Work will be commenced on the new steamer immediately, and it is expected she will be ready to go into commission next summer.

Quebec.

W. S. Barstow & Company, engineers and general contractors, of Montreal, have been awarded the contract for the extension of the Terminal Station of the Shawinigan Water & Power Company, at Maisonneuve, (Island of Montreal). The work is now under way.

New Brunswick.

The Canada Foundry Co., Toronto, has been awarded the contract for the super-structure of the two new spans of the Fredericton-St. Mary's highway bridge. The contract price is about $22,000. The cost of the spans and two piers combined with the work of removing the two present spans will be between $50,000 and $55,000. Contractor Todd E. Brewer will remove the present spans.

Manitoba.

The Western Iron Works has been awarded the contract for the construction of the cells of the new police station, Winnipeg. The price is $10,880.

Alberta.

The Algoma Steel Bridge Company has been awarded the contract for building a steel bridge connecting the city of Calgary and St. George's Island. The bridge will be a steel span of 252 feet, with piers of reinforced concrete.

Saskatchewan.

The contract in connection with the installation of an electric light system in Battleford, has been awarded to the James Stewart Company, of Winnipeg, agents for the Canadian Westinghouse Company.

PERSONAL.

Ontario.

At the annual meeting of the International Association for the Prevention of Smoke, held in Milwaukee, R. C. Harris was re-elected secretary.

Mr. E. H. Keating and Mr. W. H. Breithaupt announce the formation of an Engineering Partnership with offices in the Aberdeen Chambers, Victoria Street, Toronto. They will carry on business as civil engineers, taking up all questions of railway work, municipal work, power developments, bridges, foundations, buildings, etc.

Mr. E. Irving, manager of the Sunbeam Incandescent Lamp Co. of this city, has just returned from Winnipeg. While there Mr. Irving completed arrangements in connection with the opening of a Western branch. In future a large stock will be carried at the Winnipeg branch, which will be in charge of Mr. F. C. Noice.

Mr. W. H. Booth, of London, England, arrived in Toronto from Quebec and Montreal on the 24th July. Mr. Booth, who is a member of the American Society of Civil Engineers, is consulting engineer and official lecturer to the London Coal Smoke Abatement Society, and has also lectured on the subjects of steam boilers and fuel combustion to the Royal School of Military Engineering at Chatham. For nearly twenty years he has been working on the subject of the combustion of bituminous fuel in Great Britain, and his articles on this subject in the "Electrical Review" of London and in other journals have directed considerable attention to the question of smoke prevention in England. Mr. Booth has always argued that the furnace must be considered separately from the boiler and by following his directions in respect to furnace design it has been found perfectly possible to render boiler furnaces quite smokeless. Mr. Booth claims that the trouble with many smoke producing boilers is not due to the design of the boiler, but to the furnace. In fact he advocates principles, rather than apparatus. He considers that the present conditions as regards smoke in Toronto are very much at variance with the general aspect and good keeping of the city.

Quebec.

Mr. J. V. O'Donahoe has been appointed assistant to Mr. C. J. Smith, general manager of the Richelieu and Ontario Navigation Company, with office at Montreal.

Mr. R. C. H. Davidson, of London, England, has been engaged by the Montreal Harbor Commissioners, for the purpose of giving them a report as to the improvement of the harbor. Mr. Davidson has had a wide experience in this line of work.

Foreign.

Mr. C. E. Crowley, a well-known Toronto man, having acted as assistant resident engineer of the middle division of the G. T. R. for several years, has been appointed resident engineer of the Northern Railway Co., of San Jose, Costa Rica.

TELEGRAPH AND TELEPHONE.

Quebec.

The Bellechasse Telephone Company will erect a line to Quebec, with an exchange in the Lower Town, which will require the stretching of a cable across the river from Levis. Plans have been completed for the Quebec exchange, and it is expected that tenders will be called for the construction of the entire system in Quebec in the near future.

Alberta.

A system of Government telephones will be installed in Leduc in the near future.

MUNICIPAL.

Ontario.

Two highway bridges 94 feet long and 16 feet wide, with reinforced concrete floor on steel joists, will be built at Belleville, Ont. W. R. Aylesworth is County Clerk.

A steel bridge, with concrete foundation, is to be built at Vienna. The following tenders on the work have been accepted. For concrete work, O. D. and A. L. Oatman, $1,995; for steel superstructure, Hamilton Bridge Co., $3,729; steel reinforcement, $200; total, $5,924. Mr. Bell, of St. Thomas, is County Engineer.

Efforts at smoke-abatement are being made in several directions in Toronto. Individual manufacturers have taken up the subject with the object of complying with the city by-law in this regard. We note with interest also that the Toronto branch of the Canadian Manufacturers' Association have it in view to appoint an expert on smoke abatement, to advise members of the Association as to the devices best suited for their individual plants. The secretary, Mr. G. Murray, says that the members are resolved upon complying with the requirements of the by-law. Not alone because they expect to save coal, but because they are public-spirited enough to want to see an improvement in the sanitary condition and the appearance of Toronto.

Quebec.

The municipality of Notre Dame has decided to put in a waterworks system. Mr. R. Rinfret, of Montreal, is the engineer in charge. The work will cost about $100,000.

New Brunswick.

The water-works system of Moncton, N.B., will be improved and extended at a cost of $18,000.

Manitoba.

Portage la Prairie will vote on a by-law for the issue of an additional $50,000 debentures for extension to the waterworks.

The Winnipeg Board of Control has decided to abandon the city's electric lighting plant, and will purchase power from the Street Railway Company, which will be a saving of 50 per cent. on what it can be generated for by the city. The city finds the steam turbine has been too costly and it will be abandoned entirely.

Saskatchewan.

Work has stopped temporarily on the traffic bridge at Battleford, owing to the difficulties met with by the contractors in getting bottom for the pier on the west side of the island. F. J. Robinson, Deputy Commissioner of Public Works, and Engineer McPherson, of the Public Works Department, Regina, is expected to inspect the work done and take steps towards the continuance.

The town of Estevan is considering the installing of a waterworks system. Mr. Willis Chipman,C.E., of Toronto, is making investigations, and reports that a system of waterworks, sewers, and waterworks for fire protection would cost $46,000. A municipal electric lighting plant, if run in connection with the waterworks system, could be installed for $15,000. Both of these would pay actual running expenses from the start. If in the future the waterworks were extended to the river the increased cost would amount to $31,000. If the whole plant were situated at the river now, the total cost would be $82,000. The main sewer from the town to nuisance ground would cost $10,000; the other part of the system would be paid by a frontage tax by the ratepayers benefited.

Alberta.

The town of Raymond will install an electric lighting system, and will make improvements on the waterworks.

British Columbia.

The Streets, Bridges and Sewage Committee, of Victoria, have recommended that all the wet sewage of the city be taken out to sea in scows and dumped. Since the property-owners voted against an incinerator, this is the only course left open.

It has been decided to build a swing bridge over False Creek, Westminster Avenue, Vancouver. City Engineer Clements will be in charge of the work.

Newfoundland.

Steel bridges are to be built at Goulds and Bay Bulls, Newfoundland. Mr. W. J. Ellis, of St. John's, Newfoundland, is in charge of the arrangements.

MADISON SQUARE CARDEN ELECTRICAL SHOW.

The opening of the Electrical Show at Madison Square Garden is announced by President George F. Parker for September 30th. All the larger interests in the electrical trade are taking a keen interest in this exhibition, and the management expect to put forth their best efforts to interest the trade and laymen in the latest and most up-to-date electrical appliances, inventions and devices.

Madison Square Garden will be laid out on a plan that is unique. There will be three avenues, Edison Avenue, Westinghouse Avenue, and Franklin Avenue, running from east to west, with three cross streets running from north to south. The interior will be decked with 300,000 electric lights, rivaling Dreamland in its resplendent glory. At each corner goose-neck lamp-posts will mark the intersections, and a magnificent arch in a blaze of incandescence is to mark the main entrance. Every exhibit will be fitted up with all kinds of wireless appliances connecting with stations now in vogue.

The New York Edison Co., one of the largest exhibitors, has in mind a plan for the exterior decoration of the Madison Square tower. It is to be one solid bank of lights, and this blaze of incandescence, it is expected, will surpass even the Dreamland Tower in brilliancy.

German and French electrical merchants and inventors have signified their intention of exhibiting at the Electrical Show, and every prominent firm in America will have floor space there, and with every invention known will have special demonstrators to teach buyers, tradesmen, electricians and the world in general all that is known concerning electricity.

"We will have on exhibition at the Electrical Show at Madison Square Garden everything electrical," says President Parker; "the modern motors and appliances of automobiles, but no complete machines. It is our intention to instruct the out-of-town trade or anyone interested in electricity, and its uses and mechanical appliances up to date. The show extends from September 30th to October 9th."

The Interstate Commerce Commission of the United States, has made public report of its inquiry into the railroad operations of Edward H. Harriman, and the operations of the so-called Harriman lines, which inquiry has been in progress for several months. The commission recommends: (1) That the function of railroad corporations be confined to furnishing of transportation. (2) That so long as the policy of the general Government and of the States to maintain competition between naturally competing lines, the ownership of any stock by one railway in a competing railway should not be permitted, and such lines of railway should be prohibited from any common directors or officers. (3) That railroads should be prevented from inflating their securities for merely speculative purposes.

Ontario.

The Bemis Bros. bag factory of Boston, Mass., will erect a large factory at Welland.

It is reported that the United States Steel Corporation will commence work on the proposed plant at Sandwich about the 1st of October.

The Eugene Deitzgen Co. of Ontario, Limited, has been incorporated. Capital $30,000. Head office Toronto, for the purpose of manufacturing and dealing in drawing instruments, supplies and scientific instruments.

During the last two weeks 76,000 tons of coal have been handled at Fort William. Last week 38,000 tons were handled despite the fact that the plant was shut down for half a day.

Nova Scotia.

It is reported that the dispute between the Dominion Iron and Steel Company and the Dominion Coal Company over the coal contract will be submitted to an arbitration board of the highest standing. The names mentioned in that connection are Sir George Drummond, president of the Bank of Montreal; Mr. E. S. Clouston, general manager of the same institution; Hon. W. S. Fielding, Minister of Finance; Hon. George Murray, Premier of Nova Scotia, and Sir Thomas Shaughnessy, president of the C. P. R. If the plan is carried out these gentlemen will endeavor to arrive at a settlement, and if they do the law suit will be withdrawn.

Manitoba.

Messrs. E. R. Watts and Son, manufacturers of surveyors and architect's instruments, London, England, have opened an office in Winnipeg, where they will carry a complete line of engineers' and surveyors instruments. They will also do all kinds of repair work.

Saskatchewan.

The Cement Brick Company at Radisson is turning out an excellent article. Its output for the season is practically sold in advance.

British Columbia.

Mr. J. F. Shadforth, a British iron master, is in British Columbia investigating conditions with regard to the establishment of blast furnaces for the manufacture of iron, and a steel plant for the manufacture of steel plates for shipbuilding, etc., and including branches for the manufacture of ordnance, steel rails, etc.

Foreign.

The Vredenburg Company, recently established, with an office at 1332 Monadnock Block, Chicago, is devoted to a consulting practice in engineering and general technical advertising. It is the only concern of the kind in the West.

The Westinghouse Electric & Manufacturing Co., of East Pittsburg, has received through G. and O. Brandiff and Company, agents for the former company in Mexico, an order for one of the electrical equipments of the Vera Cruz tramways, built by the Vera Cruz Light, Power and Tramway Company. Vera Cruz is the second city in Mexico to be electrified.

The Atlantic Coast Line Railway Co. have installed at South Rocky Mount plant, a 5-ton, 2-motor Electric Northern Travelling Crane, span about 72 feet, furnished by the Northern Engineering Works, Detroit, Mich. The same company have also supplied the Waterman Car Wheel Co., of Houston, Texas, with a second Newten Cupola.

The foreign trade of the Ideal Concrete Machinery Co. is growing in magnitude. Large shipments are being made to Mexico, and quite recently shipments have been made to Valparaiso, Chili, Panama, Central America, Khartum, Soudan, Egypt, Glasgow, and Budapest.

MINING.

Ontario.

It is said that gold has been discovered on Menzie's Island, near Kenora. Mr. Charles Brownlee is the owner of the property.

Cobalt ore shipments, in pounds, for the week ending July 27th were as follows:—Buffalo, 60,000; Coniagas, 312,000; Hudson Bay, 45,170; LaRose, 80,000; Nipissing, 60,975; Trethewey, 50,300. The shipments for the year to date total 7,221 tons.

Saskatchewan.

Ochre, in what is said to be unlimited quantities, has been found at Luke Lake, about 60 miles from Saskatoon. The property has been examined by an expert, who says that there is ochre to make all colors.

British Columbia.

The following shipments were made from Rossland last week:—Centre Star, 3,420 tons; LeRoi, 1,925; LeRoi II., 385; White Bear, 105. At Trail smelter 6,171 tons were received during the week. In the same period LeRoi smelter at Northport received 1,925 tons.

MARINE.

Ontario.

It is announced that the Richelieu and Ontario Navigation Company is comtemplating a 30-foot addition to the Toronto, to provide 40 new staterooms.

If permission is obtained from Ottawa, work on the sea wall, along Toronto's water-front will be commenced about the 5th or 6th of this month.

Quebec.

It is reported that the Allan Steamship Company will shortly place an order for two steamers, for 1909 delivery, which surpass anything in the Liverpool service.

Mr. R. C. Davidson, of London, England, has been appointed by the Montreal Harbor Commission, to make a report regarding the improvement of the harbor. Mr. Davidson says, that in all his experience he has not yet seen a river channel into the heart of a great continent such as the ship channel between Montreal and the sea. He is quite confident that there exists no reason to prevent the port of Montreal becoming, for quickness and economy of despatch, second to none in America or Europe.

Nova Scotia.

The Canadian Department of Marine and Fisheries has equipped the St. Lawrence River and Bay of Fundy lightships to send submarine signals, and are installing stations along the coast of New Brunswick, Nova Scotia and Cape Breton.

Manitoba.

The Department of Marine and Fisheries is to erect four new light houses at Warren's Landing. Mr. Egan, of Ottawa, will be in charge of the work.

A CONCRETE BUILDING COMPETITION.

The Ideal Concrete Machinery Co. are offering prizes to users of their machinery for the photographs which may be approved by a committee consisting of an architect, a contractor and builder, and an officer of the company, which represent the best and most artistic construction built of "Ideal" concrete blocks. The first prize will be awarded for the finest building constructed of "Ideal" concrete blocks other than rock face, and the remaining prizes will be awarded without regard to the design of "Ideal" concrete blocks used.

The conditions of the competition are as follows:—A clear-cut photograph, taken from an 8 x 10-inch negative, must be forwarded, and the following data must be supplied: Height of building; width of building; depth of building; size of blocks used; number of blocks used; selling price of

blocks used; total cost of building; proportions of material in facing; proportions of material in backing; were blocks waterproofed?; what waterproofing used?; was plaster applied directly to back of blocks?; name and address of owner of building; name of architect; name of architects in your city favorable to concrete block construction; when was building finished?; is the building occupied?

The prizes for the competition, which closes December 15th, 1908, are as follows: First prize, $100; second prize, $50; third prize, $25; fourth prize, $15; fifth prize, $10.

REFUSE DESTRUCTORS.

Messrs. Heenan & Froude, Limited, Manchester and Worcester, have been notified by the municipal authorities of Wimbledon and Cheltenham that their tenders for refuse destructors have been accepted.

The plant for the borough of Wimbledon will consist of a complete "Heenan" patent back feed refuse destructor installation, comprising furnaces, boilers, buildings, and chimney, and will be capable of dealing with 120 tons of refuse and pressed sewage sludge cake per day of 24 hours. The steam generated will be utilized in connection with the adjoining electricity station.

The plant for the borough of Cheltenham will consist of furnaces, boiler, buildings, and chimney, and will be capable of dealing with 60 tons of refuse per day of 24 hours. The steam generated will be utilized in connection with the electricity station, adjoining.

This makes a total of seven orders for destructors this firm have received this year, viz.: New York; Vancouver and Victoria; Redditch, Buxton, Cheltenham and Wimbledon, England.

A NEW FLOORING MATERIAL.

There has lately been introduced into Canada a stonewood floor called dolomeht. This flooring has been used in Germany for the past five years. The electrical firm of Siemans and Halske has had 70,000 square yards laid, and other large manufacturing concerns have also made use of it.

It was introduced in England last November, and has already been used quite extensively.

Dolomeht was only introduced into Canada last April. The company introducing it is called The Canadian Dolomeht Company, and Mr. E. H. Turnbull, formerly of New Brunswick, has been appointed managing-director, with headquarters in Montreal. Already the flooring has been put into several places.

Mr. Alcide Chausse, superintendent of buildings, in Montreal, speaks very highly of this new flooring material.

What differentiates "Dolomeht" from all other stonewood floors is its semi-elastic lower layer, which enables the Canadian Dolomeht Company to guarantee that it will not crack, bulge or blister. "Dolomeht" can be laid at a cost of 20 to 30 cents per square foot.

RAILWAY EARNINGS.

The gross earnings of the C. P. R. for June were $6,817,712; working expenses, $4,402,606; net profits, $2,415,108.

The earnings of the Toronto Railway for the week ending July 27th were $66,922, an increase over the same period last year of $7,578.

Alberta Coal and Coke Company is opening a mine near Lundbreck. Plans for a plant for an output of 6,000 tons a day are being prepared by Chicago engineers. H. N. Galer is manager of this property, conjointly with the International.

Ontario.

Bids will be received by the Department of Public Works, Ottawa, Fred. Gelinas, Secretary, until August 7th, for the construction of an addition to Rideau Hall, Ottawa.

Tenders are asked until the 26th inst. for three hundred tons, more or less, of Carbide of Calcium for the use of acetylene gas buoys and lights, to be delivered at the following places, viz.:—Prescott, Ont., Sorel, P. Q., Quebec, P.Q., Vancouver, B.C., Dartmouth, N. S., Charlottetown, P.E.I., St. John, N.B. Specifications as to the quantity required at each place, and the manner of delivery, can be obtained at the Department of Marine and Fisheries, Ottawa. F. Gourdeau is Deputy Minister of the department.

Bids will be received until the 24th inst. for the furnishing of two sets of triple expansion engines for steamer No. 21, and two sets of triple expansion engines for steamer No. 22. Separate tenders will be received for the engines of each steamer. Specifications and detailed information can be obtained from the Department of Marine and Fisheries, Ottawa, or from G. J. Desbarats, director of the Government shipyard at Sorel, and from the agent of this department, Montreal. F. Gourdeau is Deputy Minister of Marine and Fisheries, Ottawa.

New Brunswick.

Bids will be received until August 6th, by the Intercolonial Railway; Mr. D. Pottinger, general manager, for the construction of a flour shed and loading platform at St. John.

Saskatchewan.

Tenders will be received until August 3rd, for the erection of a court-house at Saskatoon. Messrs. Storey & Von Egmond, of Regina, are the architects. Mr. F. J. Robinson, Deputy Minister of Public Works, Regina.

British Columbia.

Bids are being received for the construction of proposed courthouse at Vancouver. F. C. Gamble is Public Works Engineer, Lands and Works Department, Victoria.

The Canadian Pacific Railway are calling for tenders for a steamer 330 feet long, with a speed of 20 knots, for a Vancouver service.

NEW BUILDINGS.

Ontario.

The Aluminum and Crown Stopper Company will erect a five storey building at Toronto to cost $50,000. Mr. Henry Simpson is architect.

The Colonial Weaving Co., of Peterboro', is contemplating erecting a factory 200 x 60 ft., and will install machinery costing $30,000.

Nova Scotia.

The new jail to be built at Ashley is to be constructed of re-inforced concrete. Mr. F. L. Dixon, of Sydney, has been awarded the contract at $18,000. Sydney cement will be used.

Manitoba.

A new municipal building at Carberry is now in course of erection. H. Abbey has charge of the work.

Saskatchewan.

The North Star Elevator Company is erecting a new elevator at Asquith.

Alberta.

A new planing mill will be erected at Lethbridge by the Waterton Land and Power Co. at a cost of $40,000.