

cutting edge, and at intersections one is halved over the other, and both are clamped in place by a vertical strut to the roof of the working chamber, and two 1½-in. vertical rods which have nut-bearings on the lower side of the bottom strut, and on the upper side of the caisson-bracing. Above the caisson deck there are horizontal 12 by 12 in. cross struts in the vertical planes of the bulk-heads, and of the struts for the cutting edge, and intermediate between each pair of these, dividing the caisson in plane into squares of about 6-ft. centres. The transverse and longitudinal struts are in alternate planes so as to clear each other at intersections where they are drift-bolted together. At the ends they are dove-tailed into the horizontal courses of the side walls.

There are six 36-in. steel air shafts in sections about 8 ft. long bolted together with gaskets and outside flanges, and connected to the deck with twenty-four ¾-in. bolts passing through a special cast flange and the three-deck courses. This flange has a Z-shaped cross-section with transverse stiffening webs for the flanges. The cross-section of the main shaft is about 300 degrees of a circle with a bent plate offset beyond the circumference for the remainder of the distance to afford an extension for the ladder outside of the 3-ft. cylinder which is left clear for the passage of buckets. The shafts, which are used exclusively for materials, are plain cylinders without extensions. The air locks are about 12 ft. high and 5½ ft. in diameter,

of the pipe against escape of air from the caisson and opening automatically to admit pressure from the compressors.

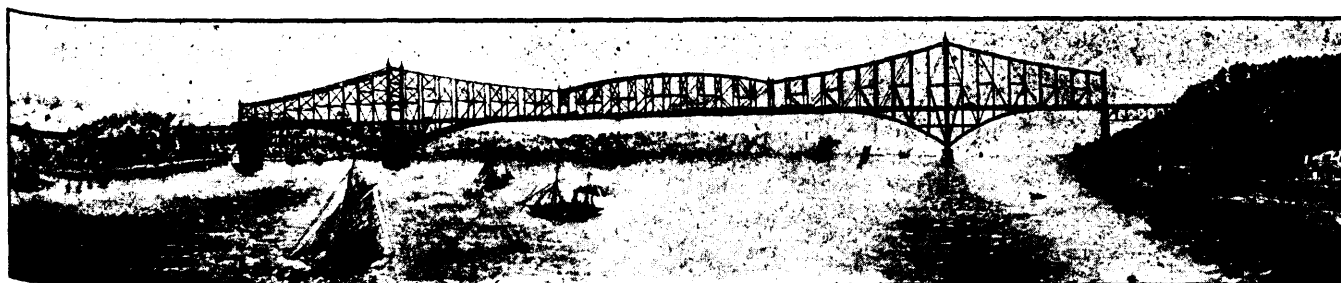
A very complete plant was installed for crushing the stone and mixing the concrete mechanically, using a minimum of labor. This plant was set up on the face of the cliff and adjoining the west end of the north anchor pier. The stone was quarried above the top of the stone crusher, and descended to the latter, where it was crushed and dropped into a small bin holding about 25 cubic yards. From this bin it was drawn through a trap door into a charging hopper which delivered it to the concrete machine. The concrete was discharged from the machine into cars which ran on tracks along the line of the north anchor pier, and also across the trestle which extended from this concrete plant across the rocky shore, a distance of 500 ft. to the working platform which surrounded the north main pier. From these cars the scales containing the concrete were lifted by derricks and deposited at any point within the range of each derrick. The sand required was gathered in carts and batteaux from the adjacent beach, and was elevated to the mixing platform by link belts, carrying malleable iron buckets, which deposit the sand into a rotary screen, which latter removes the gravel. From the moment the stone is quarried it is passed downward by gravity through the entire process of converting it into concrete. The crusher is capable of producing about 30 cubic yards an hour, which is the maximum

the concrete plant. The working platform at the north main pier site was about 40 ft. wide and extended across the west end of the pier site and along the north side and was built of spruce piles driven to refusal on about 7 ft. centres.

The compressing plant was located in temporary buildings at the west end of the working platform, and consisted of four 100-h.p. boilers, a boiler feed pump, a feed water heater, three high-pressure jet pumps, three duplex 16 x 18 x 18 inch air compressors, two high-speed automatic engines driving two electric generators for supplying light, and two powerful hoisting engines for operating the two derricks, which have booms 75 ft. long and 16 ins. square in the middle, these latter being British Columbia fir. The lighting plant was connected with the caisson and also with the concrete plant, so that the latter could be operated at night while filling the cribwork of the caisson, and while sealing the air chamber.

The granite for the masonry of the entire sub-structure is brought from Rivière à Pierre, Que., located 60 miles north of the city of Quebec, the stone being brought to Quebec by railway, and thence on scows by a powerful tug, which constitutes part of the working plant. The last of the sub-structure will be completed before the end of the current year. The steel for the shore spans is delivered, all of which will be erected this year.

A very complete and efficient plant has been provided by the contractor for sinking



THE QUEBEC BRIDGE.

very much resembling the Moran-Stuart material lock used on the caissons of the new East river bridge. The lower end of the lock has an extension to receive the double-hinged circular door, and allows it when open to swing clear of the bucket. The upper door is made with two leaves hinged to links, which work in guides carrying them back out of the way of the bucket as they descend. The doors close on rubber gaskets, and are operated by shafts counter-balanced at both ends. A long stuffing box is set in the centre of the upper door, and allows the bucket hoist rope to render through it when the lock is closed.

A 4-in. water pressure pipe is run along the deck of the caisson, and has six 3-in. vertical branches into the working chamber. There are also six 4-in. blow pipes through the deck, all of which terminate in valves screwed up tight against flat washers on the ceiling of the working chamber. The water pipes have gate valves, and the blow pipes have special cast-iron plug valves with a clear way for the passage of mud, sand and small stones. Air pressure is supplied to the caisson by a 6-in. vertical pipe passing through the roof, and terminating in the working chamber with an elbow which is screwed up tight against a washer on the ceiling. On the upper side of the deck an outside sleeve is screwed down tight on a corresponding washer. The open horizontal end of the bottom elbow is closed by an iron disc, faced with leather, and hinged at the top to make a flap falling to a vertical position by gravity, and closing the end

consumption when all the work is in operation. This entire plant was driven by a high-speed engine located underneath the crusher platform, and on a level with the mixer platform, steam being supplied to both this engine and the two hoisting engines, which operated the two adjacent derricks by a 100-h.p. boiler.

The shore is covered with huge boulders, which are brought down and deposited by the ice during winter, and which make it very hazardous to bring any materials to that point by water unless deposited on the shore at about low water. For this reason a double-track railway was constructed from a dock located about 4,000 ft. east of the site of the bridge, and over these tracks are conveyed all the cut stone, steel and cement required in the construction of the north abutment and north anchor pier. A trestle work connected these tracks with the working platform which surrounded the north main pier, and was used for conveying all classes of material to the latter work when it became necessary. All of the cut stone, however, for the north main pier was brought on scows and landed at high tide under the two derricks which commanded this pier, and unloaded before the water became too low, as the scows could not lie in this berth at low tide, owing to the bottom being covered with huge boulders. The working platform was constructed of ample strength to store a supply of cut stone to last several days in case of emergency, the trestle work leading to the shore was used only for conveying concrete and mortar, produced by

the caissons and building the piers. In addition to this there is a very complete equipment at the quarry—situated near the summit of a mountain—for quarrying and moving exceptionally heavy blocks of granite, which are cut and finally transferred by a double track inclined tramway to the loading siding on the Quebec, and Lake St. John Ry. at the foot of the mountain.—E. A. Hoare, Chief Engineer, Quebec Bridge Co., in Canadian Engineer.

Bradstreet's says:—"The Canadian railways are being kept busy handling all the freight offering for shipment at present. The freight service in Canada was never as good as it is at present, notwithstanding the delays which have occurred in handling the Western grain traffic. Fast freight services have been inaugurated, and small shippers have much to be pleased with considering the present general arrangements compared with that of previous years, when trade was depressed and the railways could not see their way to give the increased facilities now enjoyed."

The Reid Newfoundland Co. has issued some special reading matter in connection with its steamship trips to the Labrador coast. The round trip tickets at \$60 include passage from North Sydney, N.S., to Port aux Basques, Nfld., the railway trip across the island to St. John's, and passage on the boats along the coast. The trips are fortnightly from June 12 to Oct. 30. Full information can be obtained from H. A. Morine, General Passenger Agent, St. John's, Nfld.