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THE

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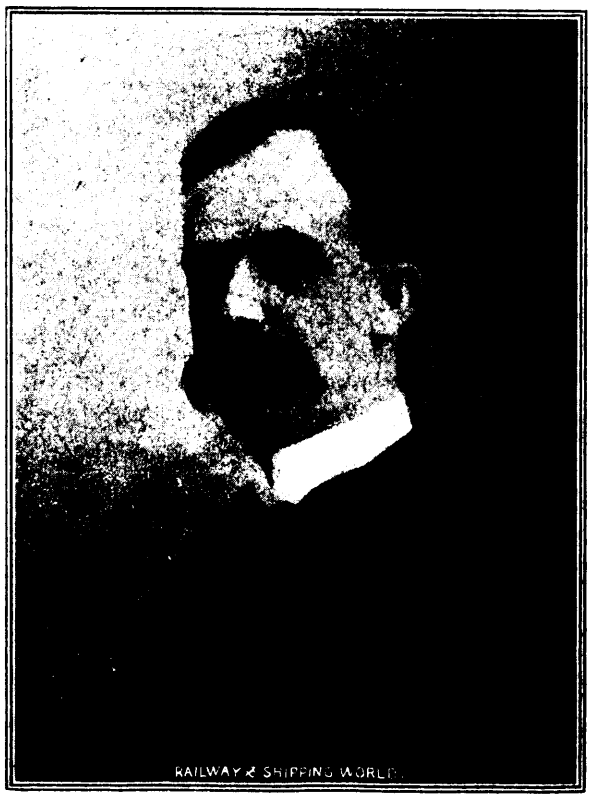
THE QUEBEC BRIDGE.

This bridge is being constructed over the narrowest portion of the River St. Lawrence between Montreal and Quebec, about 6½ miles west of the commercial centre of the latter city. The river at this point flows between high rocky cliffs on both sides, the waterway being about 1,900 ft. at low tide, and about 2,500 ft. at extreme high tide, the tidal rise varying from a minimum of about 14 ft. to a maximum of 20 ft. The maximum depth of water in the channel is about 180 ft., the tidal current being 6 to 7 knots an hour. The depth of water decreases rapidly towards the main river piers, where at extreme low tide it is 10 feet deep, the maximum depth at high tide being 30 ft. These piers are 1,800 ft. apart between centres.

The channel will be crossed with a suspended span and two cantilever arms, making an unsupported structure 1,800 ft. long between centre of main piers, which will be the longest span in the world. The length of anchor arms on each side of the main span will be 500 ft., with one approach span of 220 ft. at each end between anchor piers and terminal abutments. The total length of the structure, including abutments, will be 3,300 ft. A clear headway of 150 ft. between underside of lower chords and highest tides for vessels in the channel will be provided. There will be a clear width of 62½ ft. between trusses for two steam railway tracks in the centre, divided by screens from a single electric track and highway on either side. The coping of main piers will be 30 ft. above high tide, and the highest point of superstructure above coping will be about 330 ft. The depth of the suspended span at the centre will be about 120 ft. The substructure will consist of two main piers, two anchor piers, and two abutments. The anchor piers are placed at the foot of the rocky cliffs bounding the river and beyond the limits of high water. The north anchor pier is founded on solid rock commonly called Sillery grit. The south anchor pier will be founded on a formation of hard blue clay about 85 ft. in thickness, containing large boulders. Both piers are of granite backed with concrete, 105 ft. long by 24 ft. wide at coping, and about 30 by 111 ft. at the base, and 56 ft. high from bottom of anchorage to coping or base of steel towers. The north abutment is built into the face of the cliff, near the summit, at which point the surface consists of loose masses of rock overlying the main body, which is of a very irregular and seamy nature, large quantities of which had to be removed before a solid foundation could be obtained. The abutment on the south side of the river will be built on the same formation. Both are massive U-shaped structures built of granite backed with concrete, having the same lateral dimensions, 80 ft. wide by 40 ft. deep, the maximum height of front wall for both abutments being about 40 ft. The main pier on the north side of the channel is built of concrete, faced with massive rock-faced granite masonry—with the exception of the upper part of the pier for a depth of 19 ft. below coping—which is laid with solid granite blocks throughout.



GUY C. DUNN, M. CAN. SOC. C.E.

The coursed masonry commences below the river bed on a level with the top of the caisson, which is entirely buried. The total height of pier from top of caisson to coping is 57½ feet, at the latter point its length is 133 ft., and width 30 ft. The caisson was sunk through a very compact mass of granite boulders bound together with cobble stones and fine gravel. In such hard material the daily progress was very slow, the penetration only averaging about 4 inches in 24 hours, and at times it was too small to be recorded. Finally the caisson became wedged by the pressure from the outside, which held it up after all the material was removed from under the cutting edge. After several unsuccessful attempts to continue sinking with a load on the roof of about 20,000 tons, the excavation was discontinued, it being considered unsafe to risk such a load unsupported any longer. Concreting in the working chamber was then commenced and finished in the short space of six days, working day and night. The pier was built to a height of 42 feet above the top of caisson before the latter was ceiled, the remaining portion being completed seventeen days later. The excavation was performed by three gangs, each working 8-hour shifts in every 24 hours. Each gang averaged 50 men exclusive of foremen.

The caissons for the two main piers are 150 by 49 ft. and 25 ft. high. They are built of southern pine, brought to the site in the rough, and milled by a plant consisting of a circular saw, butting saw and a sizing machine cutting four sides at a time. The caisson for the north pier was built on the north shore about 4,000 ft. east of the pier site, and was successfully launched on June 20, 1901, towed into position, and made fast in a berth previously prepared, in the short space of 70 minutes. At the site of the two main piers, the water having a depth of only about 10 ft, at low tide, and as the caisson draws about 12 ft. unloaded, it grounded at low tide, but floated at high tide, the water being then about 29 ft. deep. The concrete was being placed in the crib-work on top of the working chamber of the caisson for the north pier, on June 28, and excavation in the chamber was being carried on only during low tide, and it was continued until sufficient concrete was put in to overcome the buoyancy of the air pressure, after which the excavation was continued without interruption. The walls of the caisson are vertical and are made with double courses of planed timber, the outside course being laid horizontally, and the inside course, which does not extend above the deck, being set vertically. The timbers in the outer course are halved together with oblique joints at the corners, have three square lapped splices, breaking joints in every course, and are fastened together with 1 in. drift bolts, 30 ins. long, and 3 ft. apart up to the 11th course from the bottom, and 4 ft. apart above that. The walls are sheathed outside with a double course of crossed diagonal planks, each course being secured with a row of ½-in. spikes 2 ft. apart, and staggered. There is a deck of three crossed layers of timber which forms the roof of the working chamber, 7½ ft. high in the clear above cutting edge. The ends of these timbers extend through the ver-