

form was built complete, then launched and afterwards placed in position.

A watertight diaphragm was placed near the top of the form, and sides caulked so that it would float in a vertical position after launching and also to facilitate setting. The shaft form was filled with concrete and reinforced coping built above the top of the form. The form was left on as a guard to the concrete.

**Pier No. 5.**—The caisson for this pier was of the open dredging type double walls, with a cutwater at each end, 34 ft. long by 20 ft. wide between cutwaters. It had been built up 62 ft., weighted by 600 cu. yds. of concrete in walls and sunk 25 ft. into the river bed. It was out of plumb with a decided lean towards pier No. 4. The difference in elevation between the high and low sides was 2 to 3 ft. in a distance of 20 ft., throwing the top 6 ft.

water level at extreme low tide, consequently, the work on this was confined to about two hours a day. The caisson leaned towards pier No. 4. It was 2.7 ft. between high and low sides and  $3/10$  ft. between high and low ends, throwing the top 7.5 ft. out of position. The concrete in the walls was about 5 ft. from top so that the same system of struts used on pier No. 5, similarly placed, might displace the unfilled wooden walls unless precautions were taken. Vertical 10 x 10 timbers were set against the low side struts set against these and No. 4, provision being made for wedges and jacks to act on the struts. To assist the action of the struts, a sling of  $1\frac{1}{4}$ -in. cables was placed around the caisson below the top of the concrete. Tackle consisting of double steel sheave and steel blocks was fastened to the sling and run to pier No. 2 which acted as an anchor. A strain was

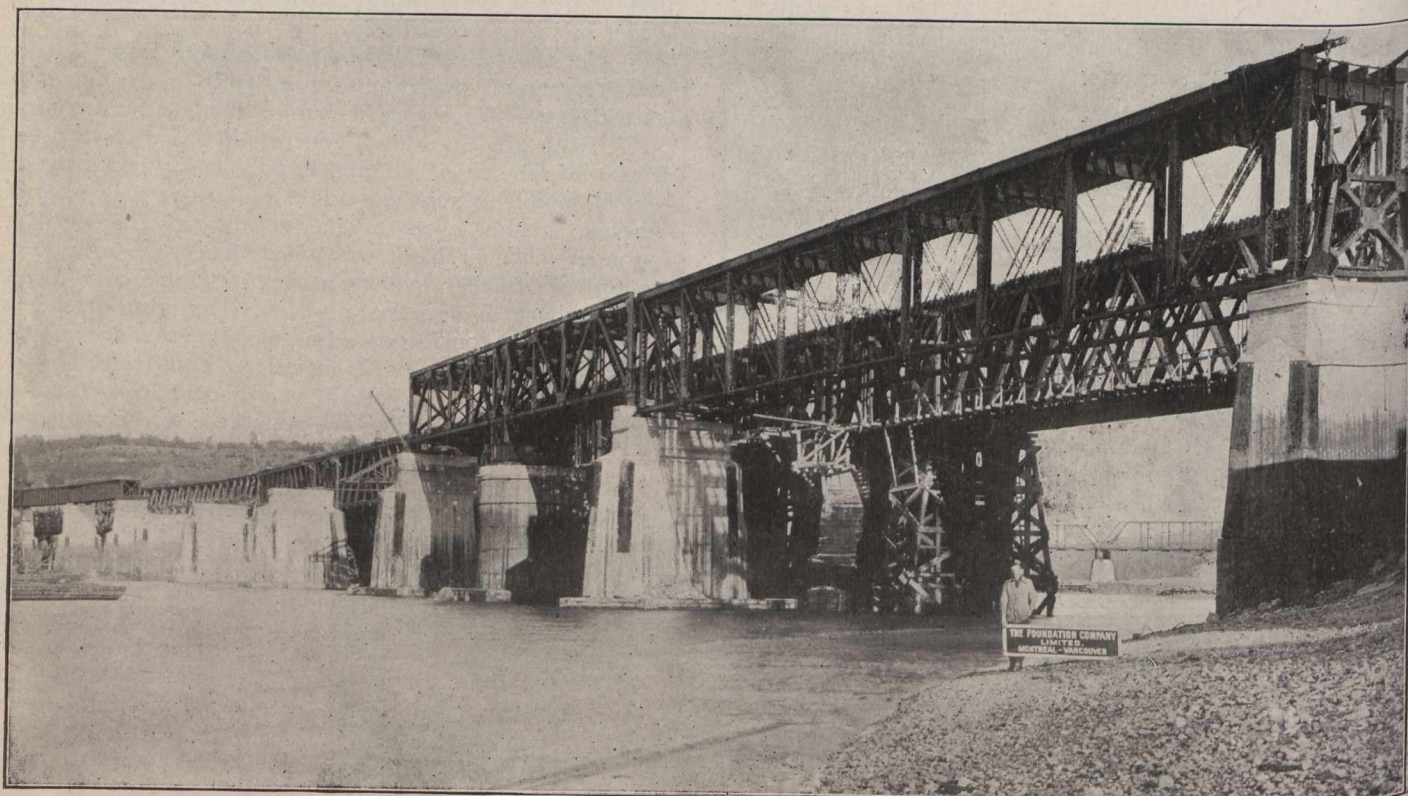


Fig. 2.—The Bear River Bridge Under Construction.

out of position towards pier No. 4. At low tide the top was 6 ft. out of water. With pier No. 4 firmly founded and piers Nos. 3 and 5 each leaning towards it, a system of struts was erected between piers 4 and 5 and piers 4 and 3. Against 5 and 3 shoring jacks supplemented by wedges 8 ft. long and driven by a hammer operated by a hoisting engine arrested further movement of piers 3 and 5 towards pier No. 4. The jetting so efficient in pier No. 4 was repeated and combined with dredging outside on high side, gradually brought the caisson to within an inch of vertical, which was considered satisfactory. At high tide the depth of water inside the caisson was 80 ft. The operation of cleaning out the concrete and placing the shaft form was similar to pier No. 4, except the forms, being much lighter, were picked up from building stages and set by a travelling crane.

**Pier No. 3.**—The caisson was same type as pier No. 5, like dimensions and cross-sections. It had been built up 63 ft., weighted with 700 cu. yds. of concrete and sunk 23 ft. in the river bottom. The top was about

taken to the full power of a 7 x 10 hoisting engine. By keeping a strain on the sling, following up by jacks and wedges, and following similar methods to those used on pier No. 5, jetting and dredging, the caisson was brought to its correct position, interior cleaned and concreted and shaft built, as in the case of pier No. 5.

**Piers 6 and 7.**—The caisson for No. 6 had been commenced. The structural steel cutting edge had been removed and utilized in a caisson of somewhat different design. The caisson was 31 ft. by 51 ft. at cutting edge (outside dimensions) double walls about 7 ft. apart for a distance of 20 ft. above cutting edge. Single walls of timber from top of double wall to the top of caisson. Inside single walls 17 ft. by 38 ft. The caissons were built on launching ways, as high as depth of the water at ways would permit, then launched and towed to deeper water, there built up as high as possible and still float in vertical position. The sites of the piers partially dredged, the caisson placed in position and weighted by rails and sunk by carefully dredging. Cutting edge was sunk 18 ft.