All the pedestals and foundations on the land were completed by August 31, 1908.

Foundations.—For the foundations of the bridge various estimates were made in connection with the cost of timber piles with concrete pedestals and concrete piles, with the concrete pedestals on top. It was finally decided to adopt concrete piles and concrete pedestals, and a contract was let on this basis. All the land piers, with the exception of six, were built on concrete piles, the excavation for the same averaging 7 feet deep, but in some cases running as deep as 18 feet. The length of the concrete piles varied from 12 feet to 20 feet.

The greater part of the concrete for piers was mixed with a three-quarter yard Smith mixer, and conveyed from the mixer to the piers in ordinary contractors' iron dump-cars.

The general formation of the river-bed is gravel over hard shale, there being an average of 10 feet of water, then 10 feet of gravel. On account of the hard formation of the river-bed no piles were used, the excavation for the piers was made with clam-shell buckets before the caissons were placed. The caissons were made of 10-inch by 10-inch material, and were floated into place and sunk; sheet-piling made of three pieces 2 inch by 10 inch nailed together to form tongue and groove was driven outside caisson, a second row of sheet-piling being driven about 3 feet outside the first to leave space for puddle. These caissons were pumped out with some difficulty, and the excavation finished with pick and shovel, the material being raised by bucket and derrick. Three centrifugal pumps were required to keep the foundations dry, excavations were made to hard shale, and drillings made to a further depth of at least 20 feet to make sure there was no change of formation. In three of the piers it was found that the pumps could not hold the water down long enough to erect the forms, and it was therefore necessary to have the bottoms carefully cleaned by divers before concrete was deposited; 4 feet of concrete was placed in the bottom, the full size of the caisson, and allowed to set. The caisson was then pumped out and the balance of the pier finished as usual.

On account of the steep side hill special pile-drivers had to be made for driving concrete piles.

Owing to the nature of the west slope all foundations were carried down to such a depth that if the ground takes a natural slope, the foundations will be well below it, besides which the ground in the immediate vicinity of the piers was sloped as shown on the profile marked "B" attached.

In addition to this, in order to keep water away from the west bank a reinforced-concrete retaining wall has been built, a sketch of which is shown on the plan marked "B," this concrete wall is built strong enough to withstand the pressure of saturated quicksand. This was adopted altogether as a precautionary measure. In addition to this piles were driven up-stream from the piers on the flat to catch any drift-wood which might come down in the flood and lodge in the steel-work, and it is further intended that booms will be anchored up-stream in the river which will deflect any débris through the 100-feet openings.

Details of Design.—Numerous preliminary studies were made in connection with this structure, and the design finally decided upon consists of forty-four plate girder spans 67 feet 1 inch long, twenty-two plate girder spans 98 feet 10 inches long, and one riveted deck lattice truss span 167 feet long, carried on thirty-three rigidly braced riveted steel towers. The distance centre to centre of towers in each column was made 67 feet 3 inches, and the distance centre to centre of columns in adjacent towers 100 feet. The tower spans were made 67 feet long, in order to give longitudinal stiffness to the towers, and reduce stresses in the tower legs. A batter of 1 in 6 was given to the legs, which, with the spacing of the girders of the spans at 16-feet centres, gives ample spread at the base of the towers to keep the uplift at the piers within a reasonable amount; 100-feet intermediate spans between towers were decided on for that portion of the structure over 125 feet high, these spans being the longest thought feasible to handle, from an erection standpoint, although theoretical economy would call for still longer intermediate spans. On account of the severe winds experienced in this region, and considering the great height of the structure, it was decided to use through plate girder spans instead of decks on this viaduct, so as to render it practically impossible for cars to leave the deck from derailment or wind, and give greater security to the viaduct, since a derailed car might fall and knock out tower legs and bracing, on account of the great batter of the bents, and cause great delay to traffic. This type of span has since been adopted for a similar high viaduct in New Brunswick.

In order to take care of the uplift from wind the columns were securely anchored to piers by means of four 2½-inch diameter bolts built into the piers to such a depth as to engage a mass of masonry weighing 1½ times the uplift. Special steel castings were designed to secure the bases of these columns to the anchor-bolts, and between the shoe-plate and bed-plate the Canadian Pacific Railway standard disc-bearing was used, so as to provide for proper bearing in the event of the masonry not being absolutely level. Contraction at the base of the towers was taken care of by fixing one corner and allowing the other three corners to slide on the bed-plates. This was arranged by making 5-inch holes in the steel casting, shoe and disc-plates. At the fixed corner a hollow cast-iron cylinder was placed around the bolt, filling up the hole. At the other three corners, where movement takes place, a piece of steam-pipe was placed around the bolts, having a length of about ⅛ inch greater than the distance from the top of the bed-plate to the top of the steel casting, so as to allow the washer of the anchor-bolt to bear tight on this filler, which, in turn, bears on the bed-plate, and allows sufficient slack between the underside of the washer-plate and the steel casting for the latter to move. Dry graphite was placed in the recess of the bed-plates in which the disc-plates rested, to act as a lubricant. Tongues were made on the bed-plates at two corners of the towers, and the fourth bed-plate was made without any tongue, with the idea of its moving in a diagonal direction. Details of this arrangement are shown on the blue-prints of typical details, Nos. $36{,}542_1$ and $36{,}542_2$ attached. On the latter drawing typical details are also shown of the 100-feet plate-girder spans, as well as a stress-sheet and material diagram of one of the towers, the live-load diagram to which the bridge was designed, and a general small-scale elevation of the bridge.

At the western end of the bridge a high cut bank of hard clay had to be crossed, and although this bank was cut down to a slope of 1½ to 1, it was considered inadvisable to place pedestals on this bank, and it therefore became necessary to span this with a deck lattice truss span 167 feet long. The top chords of this span had to be built of special design in order to carry the heavy erection traveller, which will be referred to later on, and to give the effect of through plate-girders as viewed from the bridge floor; the bottom of these chords being at rail-level, while the top is flush with the top flanges of adjacent plate-girder spans.

As will be seen from the sheet of typical details, the columns are of very liberal dimensions, the bottom sections being composed of six angles, two web-plates 25 inches wide, one cover-plate 26 inches wide, in addition to two 6-inch plates placed in the inside of the columns. Longitudinal and transverse bracing is composed of angles laced together, the diagonal bracing being figured for tension only, and struts composed of channels placed back to back and latticed, are used to take compression stresses. Long struts are supported in the centre.

The use of double triangular type of bracing (without the horizontal struts) was considered, but was not used because of the great length of compression diagonals.

Details are also shown of the bearing of the spans on column caps, consisting of steel keys set in slots in the cap of the column and riveted to the girder shoe. In the fixed end the key is a neat fit in the groove of the column cap, but in the expansion end the key is made narrow so as to provide clearance on either side for movement of key in the slot. The underside of these keys is bevelled at the edges