crossed on the skew, and as the line of the Transcontinental commences to curve to the south at a short distance beyond the Bascule span, it will be readily understood that the actual size of this viaduct, though not inconsiderable, gives a most inadequate idea of the amount of work in the design and manufacture. The curve continues to the west and south, the tracks being carried on an earth embankment with vertical retaining walls of concrete. The embankment is pierced at four points: first by Thistle Lane and a spur track, next by another spur track and then at Notre Dame Street and at Water Street, the opening at Notre Dame Street being 66 ft. 0 in. clear, and that at Water Street 60 ft. 4 in. clear. In general, the floors of the viaduct and of the isolated spans forming this western approach are similar to that of the Taché Avenue bridge, consisting of four deck plate girders, two under each track, carrying a concrete floor and ballast. The concrete floor is supported on I beams running across the tops of the deck girders and cantilevering out on each side supporting longitudinal facia girders. In the viaduct, and at Notre Dame and Water Streets, the main girders are carried on posts and heavy cross floor beams. Where the tracks cross under the viaduct, through plate girders were used instead of deck girders, to give the necessary headroom. At the two small openings in the embankment, for Thistle Lane and the two spur tracks, the solid floor was not necessary. A through girder span with four stringers under each track was used at Thistle Lane, and at the other opening the stringers rest directly on the retaining walls, without floor beams or side girders. As shown on Plate No. 1, the main bridge, with its long curved tail of a western approach spotted here and there with small bridges, resembles a huge rocket fired from Fort Garry station, which is only a fraction of a mile farther west.

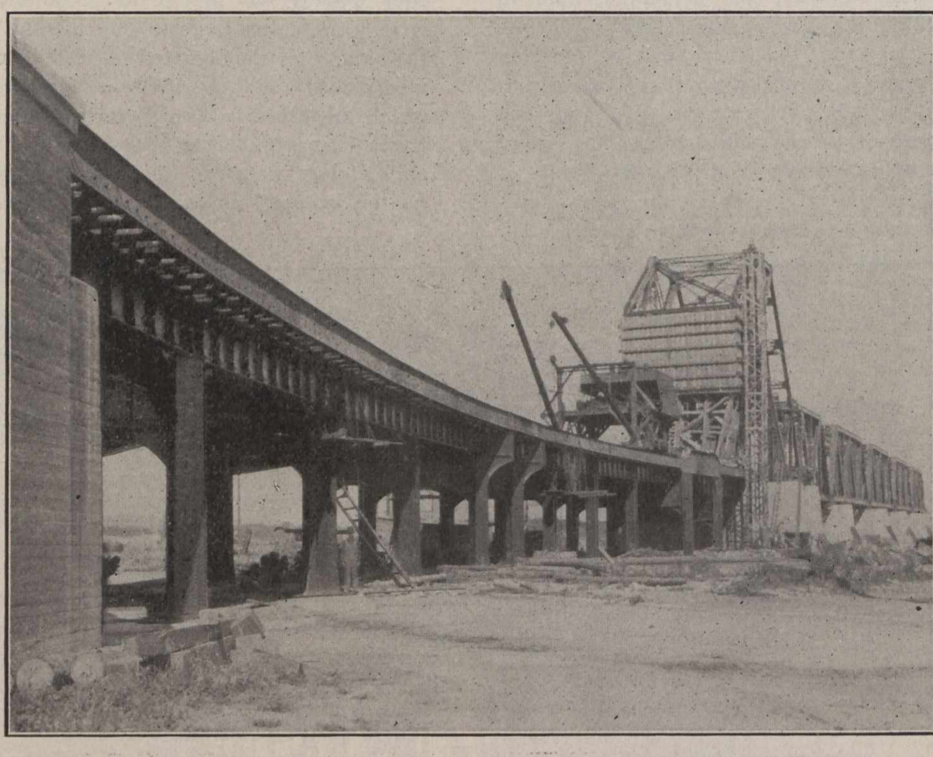

Fig. 2.—View Showing Viaduct and Erection Traveller.

The general design of substructure and superstructure was made in the Bridge Department of the Transcontinental Railway. The designing of the details of the whole of the steel work was made by the Dominion Bridge Company, of Montreal, the Strauss Bascule Bridge Company, of Chicago, furnishing the drawings and details of the Bascule span, from which the shop drawings were prepared. All detail shop drawings were made by The Dominion Bridge Co., and the steel work was manufactured by them at the Lachine shop and erected by their own erection department. The contractors for the substructure, including piers, pedestals, retaining walls, etc., were Messrs. Haney, Quinlan and Robertson, Toronto. The entire structure was completed at the end of the year 1911.

The river piers, numbered from 1 to 6 on Plate No. 1, are of concrete construction and of the dimensions shown in the plate. It has been stated that this is the only bridge in the vicinity in which the foundations rest on solid rock. The abutments and retaining walls on land are not carried down to bed rock, but rest on piles driven into the superstratum, which is a thick clay. The drawings of all concrete foundations were prepared by the National Transcontinental Railway.

The steel work was designed in accordance with the general specifications for steel superstructures of the Department of Railways and Canals, of 1908. The assumed live load was the two standard locomotives followed by the uniform train load, belonging to class "Heavy" of the specification, or a load of 120,000 lbs. on two axles 7 feet apart, whichever gave the greater stress. This live load is given in detail on Plate No. 1, and is the live load for which all Transcontinental Railway bridges are designed. To provide for impact the resultant from the dead and live load stresses is increased by the quotient of the square of the live load stress divided by the sum of the dead and live load stresses. In spans under 80 ft. in length a further allowance is made for impact by multiplying the live load by the factor

$$\left(1.40 - \frac{L}{200}\right)$$

in which L = the length of the loaded distance in feet, which produces the maximum stress. The permissible unit stress in tension on medium steel was taken at 16,000 lbs. per square inch. The allowable stress for compression was:

$$\frac{16,000}{1 + \left(\frac{L^2}{9,000 R^2}\right)}$$

L and R both being in inches.

but in no case was the stress in compression allowed to exceed 13,000 lbs. per square inch. In the Bascule span the maximum allowable stress in either tension or compression with the bridge moving was 13,000 lbs. per sq. inch. The permissible stresses in shop rivets were for shear 10,000 lbs. per square inch, and for bearing 20,000 lbs. per square inch. All field rivets being driven by power, the number was increased ten per cent. over the number necessary for shop rivets. All rivets throughout the work were made ⅞ inch diameter.

The deck span over Taché Avenue has a cross section similar to that shown on section B.B. on Plate No. 1. The cross beams carrying the concrete floor are 9 in. I's at 21 lbs. spaced 18 in. centre to centre. These rest on the top flanges