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THE RED RIVER BRIDGE FOR THE NATIONAL TRANSCONTINENTAL RAILWAY

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PART 2.

The Strauss Bascule span of the National Transcontinental Bridge over the Red River is of the so-called Heel Trunnion type, the Main Trunnion being placed at the heel of the moving leaf. Plate No. 3 shows an elevation of the whole span and Plate No. 4 indicates in a general way the stresses and material of the more important parts.

Relative to the D.L. pier reactions in this type of bridge, it should be noted that since the moving leaf is at all times perfectly balanced, there is no D.L. reaction at the front end, and the weight of the entire structure is, therefore, carried by the two tower piers. Disregarding for the sake of simplicity the weight of the counterweight link and the operating strut, the reactions are due to:

1. The weight of the tower.
2. The weight of the moving leaf.
3. The weight of the counterweight including trusses and bracing.

(1) The reactions due to the weight of the tower are vertical and constant.

(2 and 3) The moving leaf and the counterweight are supported on the tower as on a carriage; they do not rest directly on the pier, and if the tower is properly designed, it takes care of all the horizontal forces, the horizontal component of the main trunnion reaction neutralizing the horizontal component of the counterweight trunnion reaction through the tower.

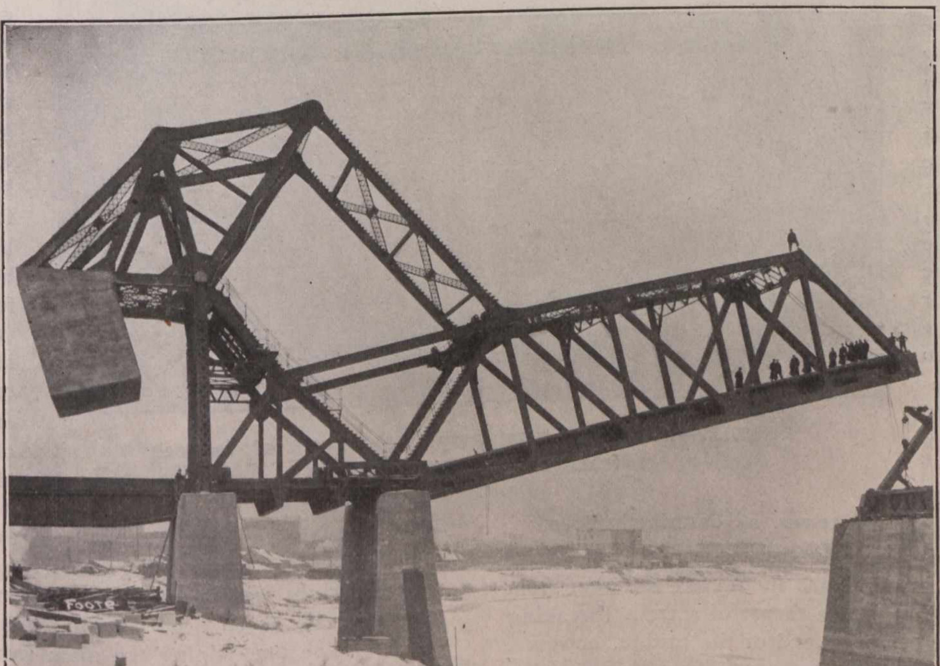

Fig. 6.—General View of Bascule.

It follows that the pier reactions due to the weight of the moving leaf and the counterweight are vertical. Furthermore, they are constant during the opening and closing of the bridge. Owing to the fact that the four pins, main trunnion, counterweight trunnion and first and second link pins are located in the corners of a parrallelogram, the angular movements of the moving leaf and the counterweight are the same, and as the weight of the moving leaf is as much smaller than that of the counterweight as the lever arm of the latter is smaller than that of the former, it follows that the centre of gravity of the system as a whole is not disturbed during the operation of the bridge, and, therefore, the pier reactions cannot vary. This proved, it can be seen that the D.L. reaction on the main trunnion pier (disregarding the reaction due to the weight of the tower) is equal to the weight of the moving leaf and the D.L. reaction on the counterweight trunnion pier equal to the weight of the counterweight. If, namely, the bridge is open to such an angle (about 90 degrees) that the centre of gravity of the moving leaf falls directly over the main trunnion, then at the same time the centre of gravity of the counterweight falls directly below the counterweight trunnion; the trunnion reactions have no horizontal components and it becomes evident that of the two piers the one carires the moving leaf and the other the counterweight.

In considering the reaction on the main trunnion, we note that the moving leaf is subject to three outside forces only, viz.:—

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