1. The weight of the moving leaf, which is a vertical force passing through the centre of gravity of the moving leaf.

2. The link stress (link pin reaction) which passes through the second link pin and which coincides in direction with the counterweight link. Since this pin is connected at both ends and would not be in equilibrium under any other condition.

3. The main trunnion reaction.

Since the bridge is balanced this third force must pass through the point of intersection of the two others. When the bridge is closed this point of intersection falls near the centre of the span and somewhat below the bottom chord and the D.L. main trunnion reaction is, therefore a force which passes through the trunnion and is directed towards the point of intersection, while the moving leaf butts against the trunnion in a direction that is inclined slightly upwards and towards the tower. It follows that according to the design the base (or body) of the main trunnion bearing, which is rivetted to the heel of the bascule truss, will always bear against the trunnion, which is keyed to the tower truss, and that the cap on this bearing might, therefore, be omitted if it were not for practical reasons (lubrication, etc.). This also is shown by analyzing the stress in the truss members. The D.L. stresses in the four members intersecting at the hip point (2nd link pin), including the end post, are all tension. Of the two members intersecting at the main trunnion, the D.L. stress in the end post is tension, as stated, while the D.L. stress in the bottom chord member is compression and the resultant of these two forces is a force inclined slightly upward and acting away from the moving leaf against the tower, which again produces a reaction from the tower, as described above.

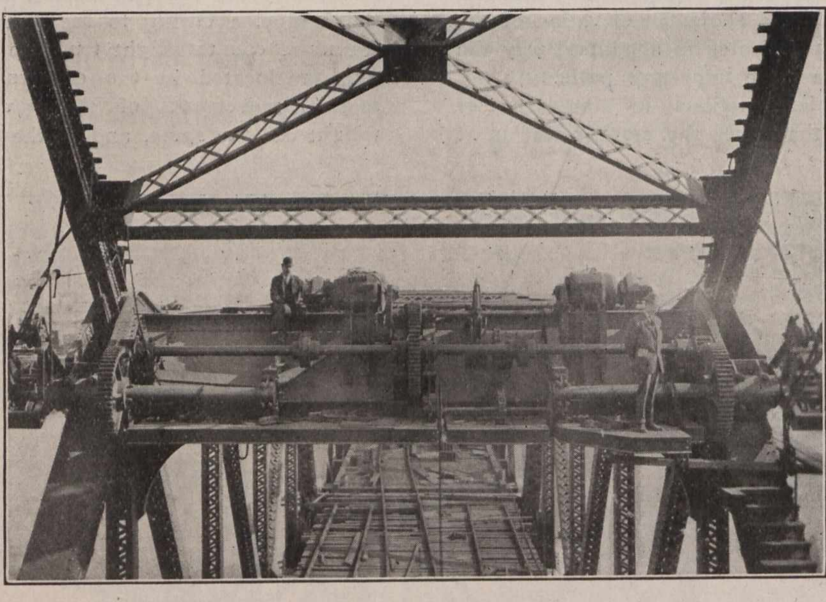

Fig. 2.—Portal and Machinery of Moving Leaf, as Seen from Counterweight Tower.

The L.L. reaction on the trunnions and the L.L. stresses in the truss members are in no way different from those in an ordinary truss. The thrust of a train (breaking load) coming from the trunnion end of the bridge, however, will tend to push the moving leaf away from the trunnion (that is, produce bearing on the cap of the trunnion box and tension in the cap bolts), but in all cases so far investigated, this force has not been sufficient to overcome the D.L. going in the opposite direction, and it could in any event be properly cared for by making the cap sufficiently strong.

In designing the bascule span, the regular Dominion Government stress of 16,000 pounds per square inch for tension was used, but compression stresses were not allowed to exceed 13,000 pounds per square inch, and stresses, either tension or compression with the bridge moving were kept down to 13,000 pounds per square inch.

The moving leaf spans a clear waterway of about 110 feet, and in general outline it resembles the four 150-ft. fixed spans between the east abutment and pier No. 4. The trusses are 32 ft. 8 in. deep centre to centre of chords and are made up of five panels, the one next the main trunnion being 30 ft. 10 in. and the other four 24 ft. 8 in. each, making a length centre to centre of 129 ft. 6 in. The cuts in the floor of the bridge are made at the front end of the bascule and at a point a few feet east of the main trunnion, so that the floor of the moving leaf will in both cases lift from the fixed floor when the bridge is opened. The end floor beam at the trunnion end is set 6 ft. 2 in. east of the trunnion, making a span for the stringers in the end panel of 24 ft. 8 in., or the same as in the other four panels of the moving leaf. The front end of the moving leaf is received when the bridge is closed on two cast steel pedestals securely anchored to pier No. 4. These pedestals have tapered cast steel guides fastened on top of them so that the span descending to its horizontal position is brought into perfect alignment with the rest of the bridge. There is no dead load reaction at this end of the moving leaf so the span is latched to the pedestal to keep it in position. There is a latch on each side attached to the ends of the trusses and operated by an electric motor fastened to the bottom chord. The latches can also be worked by hand.

The moving leaf and the counterweight are supported on a triangular tower spanning between piers No. 5 and No. 6, a distance of 40 feet, which is the horizontal distance between the main trunnion and the counterweight trunnion. The vertical position of the concrete counterweight is governed by the height of 22 ft. 6 in. clear beneath it, necessary for trains when the bridge is closed. The horizontal distance from the counterweight trunnion to the centre of gravity of the counterweight, is governed by the necessity of its swinging clear of the top of the rails when the bridge is open. As the two link pins and the two trunnions form the four corners of a parallelogram the angular motion of the counterweight will be equal to the angular motion of the moving leaf, or 80 deg. 30 min. when the bridge is fully open. The line joining the main trunnion with the centre of gravity of the moving leaf will point slightly upward, therefore the line joining the counterweight trunnion with the centre of gravity of the counterweight must point slightly downward and the weight of the counterweight is greater than that of the moving leaf in proportion as its leverage is less.

As will be seen by referring to Plate No. 3, the trusses of the moving leaf and of the counterweight frame itself are set with their centres 31 ft. 3 in. apart centre to centre transversely. These bear against the main trunnion and counterweight trunnion pins which are at right angles to the centre line of the tracks and span, a distance of 5 ft. 0 in. transversely, their outer ends being supported on the trusses of the main tower, which consequently are spaced 36 ft. 3 in. apart centre to centre. The inner ends of the main trunnions are supported on auxiliary shoes 26 ft. 3 in. apart resting on pier No. 4, and the horizontal component