are deep, they may be connected at suitable intervals between bracing-points by batten-plates, or may be latticed continuously. In the case of the Boucanne Viaduct the batten-plate system was employed, and 9-inch by ⅜-inch plates 1 foot 3 inches long were provided on each face at intervals of about 5 feet. In the tower 7-8 under consideration the lowest story was built up of two 20-inch I-beams, each weighing 90 lbs. per lineal foot, with a diaphragm I-beam 15 inches deep and weighing 60 lbs. per

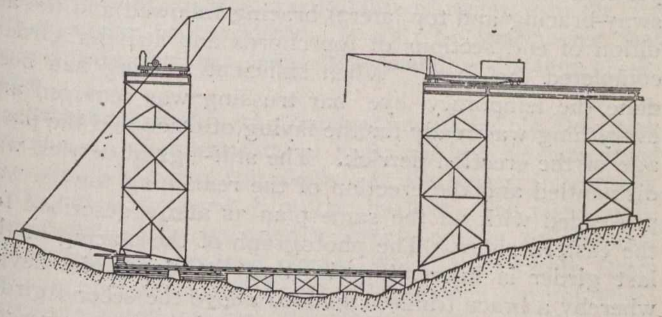

Fig. 6.—Method of Moving Tower.

foot. In addition, there were two 16-inch by ½-inch side plates, one on the outside of the web of each 20-inch beam, giving a total gross section of 86.6 square inches. The beams are of heavy American standard sections, and were rolled by the Carnegie Steel Co. The loads on this post, No. 8, are computed to be as follows:

Dead load	149,500
Live load	276,900
Impact	179,800
	606,200
Wind load	264,000
Brake load	231,200
Total	1,101,400

These loads are the maximum that can co-exist according to the specification and not necessarily the maximum amount of each and every class of load. Now the unit compressive stress allowed by the specification is that given by the formula $16,000 \div \left(1 + \frac{l^2}{9,000\, r^2}.\right)$ This applies, however, to the combination of dead, live and impact loads which, as above detailed, amount to 606,200 lbs. In the story under inspection $l/r = 72$ and consequently $f = 10,150$ lbs. per square inch. But in consideration of the remoteness of the possibility of all the wind load and all the brake load occuring together and at the same time as such a large impact load, which the braking load either removes or replaces, the allowed unit for the full combination of live, dead, impact, wind and brake loads is increased above that already determined by 25 per cent. There are thus two cases to be considered in every post—first, the ordinary combination at the ordinary unit; and, second, the extraordinary combination at the increased unit. In the present case, as with most cases of high towers and long spans, the second case governs and so the unit of 12,688 is used, necessitating 87 sq. ins. of section.

The feet of the posts are shod with a steel shoe plate 2 ins. thick which rests upon a steel bed plate 1½ ins. thick, the latter being anchored to the pedestals. The anchor bolts for bent 8 were 1¾ ins. diameter and 6 ft. long, two to each post, whilst to bent 7 were given 2½-in. diameter bolts 13 ft. 3 ins. long, two to each post. A few inches of each bolt project above masonry to receive nuts and washers above shoe plates, and the rest is built into the pedestals. A space is left around the bolt to allow of slight adjustment and then after the towers are completed this space is filled with cement grout.

One post of each tower was rigidly fixed to its bed plate, but the other three were allowed freedom to move under expansion or contraction from temperature or loading. Each of the posts adjacent to the fixed one is permitted to move in the direction of the line adjoining to the fixed one; that is, the one transversely to the viaduct axis, and the other longitudinally with the viaduct axis, while the diagonally opposite post can move in any direction. In other words, one shoe being fixed two had one degree of freedom and the other two degrees. Tongue and grooves in the bed and shoe plates, respectively, were used to accomplish this, and in the particular tower under notice the S. E. post was the fixed one. The tongues were 2½ x 5/16-in. flats and the grooves were planed out 7/16-in. depth.

Construction Details.—The viaduct was erected from the east end, and as the line itself was the only approach, the steel had to be forwarded from Montreal to the station on one of the existing railways nearest to the constructed track. This meant the carrying of all steel by the derrick cars from the east end storage to the actual site and over the erected portions. The process, therefore, was to erect bent 14 and place the 60-ft. girders from the east embankment. The derrick then moving into the 60-ft. girders erected bent 13 and the longitudinal bracing and the 30-ft. girders. This method, obvious and ordinary, was followed to bent 9. For the higher bents a horizontal temporary strut is employed to steady and support the first bent of a tower, being erected between it and the last completed tower. These temporary struts serve to stiffen the bent while the 60-ft. girders are placed and the derrick advanced to erect the rest of the tower. They were wooden in the case of the Boucanne River Viaduct, but are of steel for larger and higher towers.

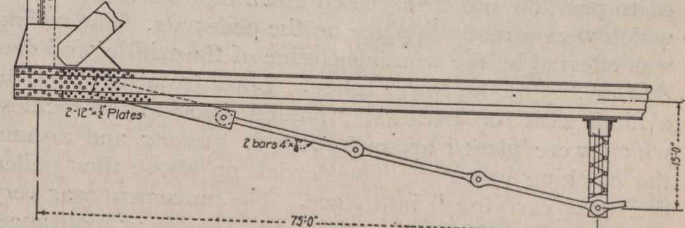

Fig. 7.—Method of Bolting and Trussing Bottom Chord for a One-Piece Erection.

When the tower 9-10 was completed, the next necessary undertaking was bent 8, which in its final position was to be 150 ft. west of bent 9. As this could not be erected from the west end, there being no line, it was essential to scheme out some method of building the complete tower 7-8 before the truss span which it was destined to carry. Although the river was but a foot or two in depth, falsework for the truss was considered too expensive and troublesome, and the plan now to be presented was selected as the most feasible and desirable means of erecting both the trusses and the tower. The outline of the scheme was the building of tower 7-8 on low staging close to 9-10 within reach of the derrick booms and approximately at its final level, and then rolling or sliding it westward into place. The company had before had experience with the moving of towers by this means and