

The original scheme contemplated the use of part of the submarine crossing as a standby until some future date when an additional overhead crossing identical with the present one would be installed. However, the success that has attended the operation of the steel cables as messengers has led us to the conclusion that it is possible to use the present crossing for two circuits and thus to eliminate most of the expense of an additional overhead crossing. We have at present under consideration two alternatives for the accomplishment of this object. One alternative provides for the use of the steel cables for one circuit and the suspended conductors for the other circuit. The other alternative contemplates the carrying of two conductors on each steel cable. This would be accom-

plished by suspending the two conductors from the ends of light triangular steel or aluminum frames attached to the steel cables at intervals of 200 to 500 ft.

The anchor piers are large mass-concrete "dead men," each anchor being designed to take the full overturning moment when submerged.

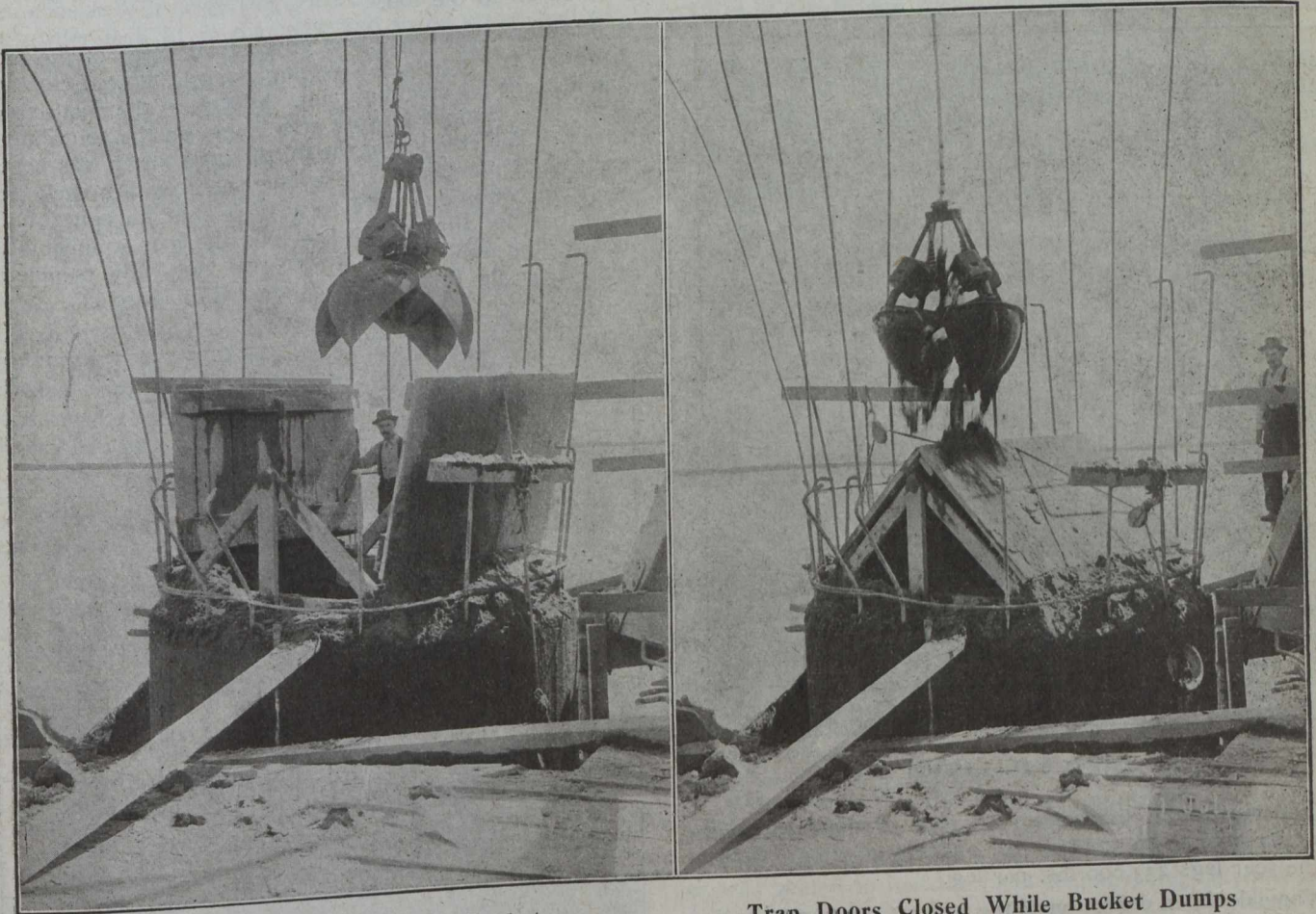
Foundations

During February, 1917, a number of borings were taken about the site of the towers to determine the nature of the river bottom. These borings penetrated to a depth of 100 ft. and we found that the foundation on which we would have to build our towers consisted for the full depth of these borings of very fine white sand with occasional strata in which a little clay was mixed with the sand. The difficulty of obtaining a secure pile foundation in this kind

of soil and the uncertainty as well as the cost of placing a mat foundation in the dry, led us to adopt the form of pier foundation which we used.

The piers were constructed in the form of hollow cylinders of reinforced concrete, with an outside diameter of 11 ft. and an inside diameter of 7 ft. These cylinders or caissons were poured in 6 ft. lifts, the first tapering on the inside towards the bottom to a diameter of 10 ft. and being shod with a 6" by 6" angle cutting edge. This lift was poured on a working platform and lowered into the water by means of four 2" screws.

The second lift was then poured and after the concrete had set, the bottom was excavated by means of an orange peel bucket rigged up on a derrick. As the cais-



Trap Doors Open to Admit Bucket

By this arrangement the bucket could be dumped without swinging it from over the caisson, thus avoiding objectionable swaying, especially in windy weather, and saving time.

Trap Doors Closed While Bucket Dumps

sons gradually settled, successive lifts were poured until they had penetrated to a depth of 40 ft.

Little trouble was experienced on the north side, but on the south side we encountered large numbers of boulders, some of which were so large that they could not be picked up by the bucket, so that we had to drill and shoot them. In order to do this the caissons had to be unwatered, a tedious process which delayed the work considerably.

When a caisson had reached its penetration of 40 ft. a plug of rich concrete was poured in the conical section at the bottom and the inside of the caisson was then filled with mass-concrete. The four piers forming one foundation were finally connected by reinforced concrete beams.

This work was begun early in the year and we expected to have it finished by midsummer, but high water, high