

The abutments on the north shore and piers Nos. 1 and 2 were built during March, April and May. On the 12th of May the first caisson was brought down for No. 4 pier. The foundation here was bare rock, so that all required to be done was to get the caisson into place and commence concreting. The caisson was towed out of Lachine harbor by two powerful tugs, both tugs pulling up stream, thus allowing the caisson to drop slowly down with the current. The caisson was built of 12 x 12 in. timber, spiked together by rag bolts, and braced at every 10 ft. with 12 x 12 braces, as shown on the plan; the joints were caulked and made water-tight, by long screw bolts, so arranged that by turning the bolts they could be taken out and the upper courses of timber detached after the pier was built, thus removing all timber which would otherwise appear above water.

Three string posts were built into the front of the caisson for attaching the anchor cables to, and two similar posts at the stern end for fastening guy ropes to, when the caisson had to be twisted round so as to set it at right angles to the bridge centre line. A crew manœuvring 23 x 70 feet was placed on either side of the caisson, and two timbers stretched from scow to scow crossing the caisson at the bow of the stern, these timbers were made fast to the caisson by chains, and the ends jacked up from the sticks of the scows so as to lift the caisson several feet out of the water, thus lessening its draught, this was found necessary in order to avoid striking boulders or rocks on its way down.

The caisson carried 3 anchors weighing 4 tons each, and each scow carried one weighing one ton, the chains attached to the 4 ton anchors were formed of 1 1/2 in. links, and the steel wire rope 1 1/2 in. and 1 1/4 in. diameter. The chain for the smaller anchors was made of 3/4 in. iron, the wire employed in the contract 12 1/2 ton anchors and 12 one ton anchors with 2 miles of chain cable and 2 miles of steel wire rope. When the caisson was about 600 feet above the site of the pier, which place was marked by a buoy, one of the 4 ton anchors was dropped, and the whole draft of scows and caisson allowed to hang on it so as to make certain of its having taken hold in the bottom, then this chain was loosened and another anchor thrown over, and this operation tested in a similar way, and then the third anchor, so that each caisson had always three anchors out of any one of which was capable of holding it, besides the smaller anchors from the scows. The anchors from the caisson were not in one line, but spread a little so that by losing one chain and keeping the others tight the caisson could be placed directly over the site of the pier. The caisson was thus lowered down till it was within a few feet of the bridge line.

As it happened towards the north shore the current ran very oblique to the bridge line, thus necessitating the swinging of the caisson round, so as to bring it at right angles to the bridge line; this was often a slow operation, as the moving of the caisson round generally threw its centre north or south of site of the pier, it required about one day to place a caisson in position, as there was an allowance of 5 feet between the outside of the caisson and the masonry of the pier all round, it was considered sufficiently accurate if the caisson was placed within 6 inches of its intended position.

The foundation of piers 4 and 5 were bare rock, so when the caisson was placed over the site of the pier it was loaded down with ashlar laid along the top timbers.

The next operation to prevent any current passing between the bottom of the caisson and the rock, by driving sheet piles of 5 inch plank all round the bow and spiking them to the caisson.

A curtain of canvas fastened round the inside of the caisson, at a distance of a few feet from the bottom, was spread on the rock and loaded with bags of concrete; this was necessary in order to exclude any current from washing over the concrete and running the current.

When this was finished the concrete was prepared by mixing Portland cement and sand in the proportion of one to one, to this was added as much broken stone as would make the whole into a mass of stone, whose interstices were filled with mortar, the whole thoroughly mixed. The stone was broken to pass through a 2 1/2 inch ring. The proportions were about 3 of broken stone, 1 of cement, and 1 of sand. This concrete was lowered into place by means of an iron box holding 2 1/2 yards, the box was constructed of iron 1/2 inch thick, with a floor hinged about 2' 6" from the bottom, and opening at the centre by turning a lever; this floor was allowed to fall, permitting the concrete to slip through, but being still protected from the action of the water by the sides of the box, by this means with two gangs by day and two at night 80 yards could be placed in 24 hours.

When the concreting was finished the caisson was left for 2 or 3 days until the concrete had set, when the water was pumped out the concrete levelled off and the masonry commenced.

Very little pumping was required to keep the caisson dry.

The anchors were never removed until the masonry was above water level.

In sinking the caissons it was necessary to take into account that water might get between the concrete and the rock, and thus place the caisson in the same position as a tub when being sunk in the river with its edge above water and then laid out, in danger of rising and floating away bodily.

Over the foundations of Nos. 6 and 7 piers there was a considerable deposit of gravel, this was partially removed before the caisson was brought down by means of a large rake worked from two scows anchored over the foundation. The rake was hauled up stream along the sides of the scows by men, then dropped and pulled down stream by a horse and windlers.

The head of the rake was formed of an iron bar about 2 1/2 x 2 1/2 x 5 ft. long on which steel teeth 1/2 in. to 2 1/2 in. were fastened, and the whole attached to a long handle. This arrangement removed a quantity of loose stones and gravel, the remainder was removed when the caisson was in place by means of a Hayward excavator.

The next foundation commenced was for No. 8 pier. The surface gravel was removed by the rake and the caisson placed.

The rock here was covered with 4 1/2 feet of hard pan, so tough and hard that the Hayward excavator could make little impression on it. An ordinary clam shell dredge was tried, but without success; recourse was then had to dynamite, and holes were drilled to a depth of 2 1/2 feet at different places and charged, small quantities of hard pan were loosened in this way by each explosion.

Three weeks were occupied at this work with little effect. When a long iron bar was made with a chisel edge of steel at one end and a ring at the other. The bar was about 25 feet long and weighed 1,700 lbs., this bar was hoisted up vertically some 10 or 15 feet by an ordinary pile driving engine, and allowed to drop with its full weight, and by this means the remainder of the hard pan was loosened and removed by the excavator.

From the experience gained at No. 8, it was decided to procure a dredge from the remaining foundations, and, accordingly, dredges No. 5 and 6 were hired from the Harbor Commissioners; these worked in a most satisfactory manner, notwithstanding the hard, tough character of the material to be excavated. Nos. 9, 10, 11 and 12 caissons were brought down and placed without much difficulty.

Some of these were only partially built at Lachine, the remaining courses of timber added when the caisson was near the foundation for which it was intended, the water being shallow just above the site of several of them.

At No. 14 the foundation was covered with 14 feet of hard pan, requiring the constant employment of No. 6 dredge from June 22nd until August 6th.

From the foundation to the surface of the water there were about 33 feet with a current of 4 miles per hour.

Previous to dredging a guard crib was sunk in front of this foundation. The crib was 8 feet wide at bow, 26 at the stern, and 26 feet long.

This crib was sunk with its lower end 3 feet above the bow of the caisson (when in place), just far enough above to clear it, thus forming an eddy in which the dredge could work with little difficulty from the current. This crib was placed in position in a similar manner to the caissons, with the exception that one of its anchor chains was secured to an iron bolt on shore.

This caisson was so deep and required so much loading that rails were used as well as stone to sink it. Some of the rails were placed along the outside near the bottom, and the remainder rested on the cross timbers inside.

At this and several of the other foundations the electric light was used at night and also in the daytime under water, to assist the divers in clearing the foundations and placing the bags of concrete round the edges of the caisson. No. 13 pier was always looked on as the most difficult.

It stands in 28 feet of water and at the swiftest part of the current, and on it is to rest the caution spans 408 feet each.

It was of the greatest importance that the foundation should be first class in every way, so as to avoid any possibility of settlement when the weight of superstructure came on it. The pier is much larger than any of the others, and the placing of the caisson required much care.

A guard crib was also placed in front of this, similar to that used at No. 14, but a little larger, being 30 feet wide at the stern.