Volume 30. Toronto, May 4, 1916.

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The Canadian Engineer

A weekly paper for Canadian civil engineers and contractors

THE ROLLING AND FLOATING STEEL CAISSONS OF THE LEVIS DRY DOCK AT LAUZON, P.Q.*

PART I.

A DETAILED DESCRIPTION OF THE DESIGN, FABRICATION AND ERECTION OF THE ROLLING CAISSON.

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SEVERAL features in connection with the new government dry dock at Levis, P.Q., are very interesting, presenting as they do some rather unique ideas relative to marine work. In this paper, which has been read before the Canadian Society of Civil Engineers, it is the intention to describe only the caissons or gates, although it will be difficult not to stray from this object in attempting to make certain parts the clearer.

The problem which presents itself at the mouth of a graving dock is familiar to the engineering profession. Whatever device is used to close the entrance, must be capable of being swung in or out expeditiously, be able to withstand the hydrostatic load when the berth is unwatered, and also allow the sea water to enter through it when the berth is filling. By this means the dry dock is very quickly filled and a great deal of time is saved. The problem is seen at once to be very similar to that occurring at a canal lock, and it is owing to this similarity that so many of the early graving docks and even some later examples were equipped with mitred gates. There are, however, certain disadvantages connected with the use of mitred gates, such as the length of wall absorbed in housing them when the berth is open, and the absence of a communicating bridge for wheeled traffic when the berth is closed. The use of a rolling caisson, on the other hand, involves neither of these disadvantages, for it is housed in a recess lying transversely to the berth and a communicating passageway is always provided along the top as its width easily admits the economical construction of a folding bridge of some type.

The cost of either type of caisson will usually exceed that of a pair of mitred gates, but is, on the other hand, less than a pair of gates plus a small swing bridge.

The relative suitability of these various schemes to close dock entrances has been summed up by Mr. W. G. Wales in Proc. Inst. C.E., Vol. cxxii., as follows:—

"In conclusion, ship-caissons are adapted for dry docks, and for locks and entrances in sheltered and non-tidal positions; sliding caissons for locks and entrances in tidal and sheltered positions; and dock gates for entrances in exposed positions and for commercial docks."

The layout of the new dry dock is shown in Fig. 1. The main dimensions of the berth are: Length, 1,150 feet; width at top, 144 feet; clearance width at rolling caisson sills, 120 feet; depth of water over sills at mean water level, 25 feet; at extreme high-water spring tides, 50 feet.

At about mid-point of the berth will be noted the bearing sills lettered "C." These are the sills for the floating caisson and are to be used when it is desired to dock vessels less than 650 feet long. Owing to this arrangement it is not necessary to unwater the whole dock for small vessels. Near the outer extremity are seen the sills for the rolling caisson and its recess chamber, while still further out may be seen a pair of bearing sills lettered "A." These are duplicates of those at "C," being moulded to exactly fit the floating caisson. Hence the floating caisson may be used to close either half or the whole of the berth. In the latter capacity it may serve, too, as an emergency gate during a breakdown of the rolling caisson or any part of the interior of the dock, allowing the berth to remain unwatered during all repairs. Consequently, by reason of this layout, two caissons—one rolling and one floating—are able to close one-half or the whole of the berth, as desired, and also supply an emergency gate when necessary. This is a distinctly economical arrangement.

The large dimensions of these caissons are a little difficult to realize inasmuch as the gates are among the largest of their kind in the world. The floating caisson is larger than that at the new Ferrol Yard, Spain, and also longer than the one for the Panama Canal, though not quite so deep. Hence, with a dock length of 1,150 feet and a width of 120 feet there is no danger but that the largest boats that are even contemplated at present, may be berthed with ease at the new Levis graving dock.

In designing the rolling caisson it was necessary to take into consideration the severe climatic conditions to which it would be subjected. The caisson itself consists of a fabricated steel gate 123 feet long, 19 feet 3 inches broad and 46 feet deep. All elevations of this gate are rectangular, and all horizontal sections are trapezoids and similar in outline. The hydrostatic loads are carried to the vertical ends by means of two trusses and one plate girder, and a small proportion to the bottom sill by the skin stiffeners running between the lower truss and the bottom. It is important to grasp at the outset that the water loads are taken first by skin plates to stiffeners or ribs, and thence to two horizontal trusses and a girder;

*Extract of a paper read before a meeting of the Mechanical Section of the Canadian Society of Civil Engineers at Montreal, March 30th, 1916.