LOCK ENTRANCE CAISSON, PANAMA CANAL.

IN connection with the various equipment required for the maintenance of the Panama Canal locks, there is a huge floating gate or caisson which will be used for closing the entrance to any one of the lock chambers of the Panama Canal, when it is desired to paint or make repairs to any one of the mitering lock gates, and for similar use in the Balboa dry dock. It also can be used for unwatering any one of the lock chambers, for the purpose of making an inspection of the culvert, rising stem gates, or cylindrical valves. Its construction and use is most interesting, as indicated in the following description written for the "General Electric Review" by L. A. Mason of the maintenance engineering staff of the canal.

The clear width of the lock chambers is 110 feet. Beyond the line of the emergency dams, the approach is widened by an offset of three feet on both sides. The

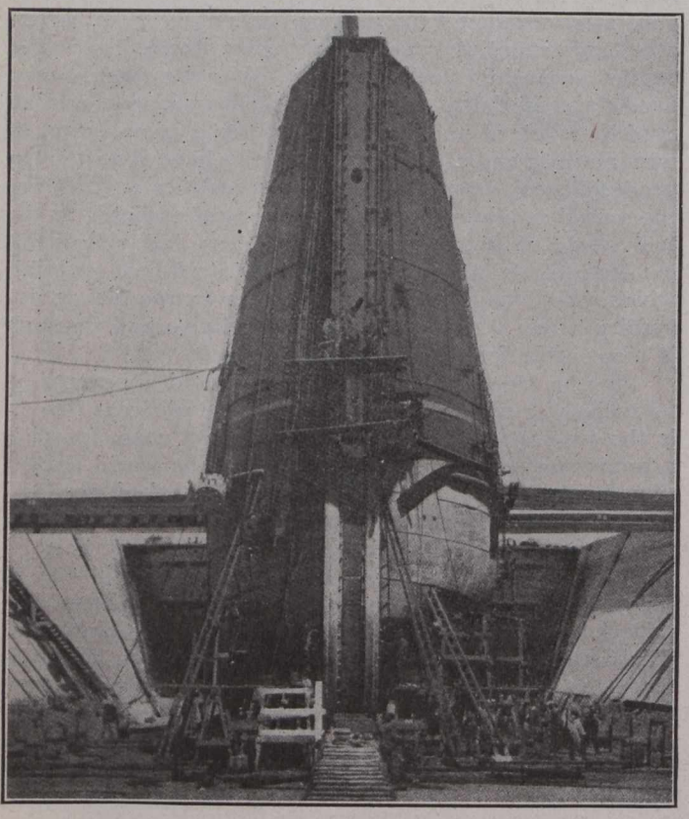

Fig. 1.—Caisson Under Construction for Panama Canal Locks.

shoulders so formed, with the connecting horizontal sill across the bottom of the chamber, afford a frame or seat into which the caisson is fitted to dam off the interior of the lock chamber.

This is accomplished by floating the caisson from its mooring position by means of a tug boat, or other motive-power water craft, to the particular lock chamber entrance which is to be dammed. After being placed in its recess across the lock entrance, water will be let into the lower compartments, thereby causing it to sink until properly seated. When this is completed, an electric power cable will be connected from the main power cables, provided within the lock walls, to a terminal box located on the top deck and at the end of the caisson. This point is electrically connected through the switchboard within the caisson to the various motors that operate the pumps. The pumps will then unwater the lock chamber, and the water pressure on the outer side of the caisson will force it securely against its seat in the masonry.

When it is desired to remove the caisson, the lock chamber will first be filled with water by opening the culverts within the lock walls. This will balance the water pressure on both sides of the caisson, at which time the water within it will be pumped out, thereby causing it to float and allow it to be towed away.

The caisson is designed for use at all of the lock entrances, and has a light-draft of 32 feet to permit its being handled conveniently through the various locks. The top of the sill at the Pacific end of the Miraflores locks is 50 feet below mean sea-level, and with the tidal fluctuation which raises the level of the water as high as 11 feet above mean tide this requires that the caisson be sunk to a draft of 61 feet when used at high tide. Provision for a proper freeboard requires an aggregate depth of the structure of 66 feet. The achievement of statical stability at the various depths of immersion without undue bulkiness or excessive weight in the different drafts makes the caisson of especial interest.

In form, the bottom of the hull is convex, the ends pointed, and the sides sloped inward from the maximum width of 36 feet, at about one-third the way up from the keel, to a breadth one-half as great at the top deck.

A typical transverse cross-section of the caisson resembles in outline the vertical section through a pear-shaped, carbon-filament electric globe. The horizontal lengthwise sections vary with the inward slope of the sides; in general, they resemble those of the ordinary vessel of commerce, and may be described as flattened ellipses, blunt at the ends in order that they may connect to the vertical end-girders, or stems. The maximum length of the caisson from vertical end to vertical end is 112 ft. 6 in. The extreme length is 113 ft. 10 in. This includes the timber cushions.

It is desired that the side walls of the locks shall carry practically all the static load from the caisson when it is supporting the water pressure. Accordingly, there are a number of horizontal decks and breasthooks, or short decks, between the main decks at the ends which carry the hydrostatic load to the vertical ends. A system of vertical framing built intercostally and extending from the keel to the top deck transmits the panel loading to the various horizontal decks and breasthooks. The essential features of the structure are the transverse and longitudinal framing, with bulkheads; the horizontal plate decks, girders and stringers; the girders at the vertical ends and along the keel; the end breasthooks; and the sheathing plates to cover the skeleton for forming the hull proper. These elements are made from open-hearth structural steel.

The transverse framing system consists of nine cross-frames, spaced 12 feet apart from the middle of the caisson and extending to its entire height, and the intermediate frames, spaced two feet apart between the main cross-frames. All are built intercostally between the five horizontal decks.

The last cross-frame at each end is made water-tight, by the same principle as is used in merchant ships, in order to form peak trimming tanks for maintaining a level keel when placing the caisson in its recess across any one of the lock chambers. The seven other cross-frames serve as swash bulkheads for controlling the water within it.

The five horizontal decks are located at the respective following distances above the centre-line of the keel plate: 16 ft., 25 ft., 37 ft., 49 ft. and 65 ft. The 16-ft. and 25-ft. decks are entirely plated over with the exception of