LOCK ENTRANCE CAISSON, PANAMA CANAL.

A VERY interesting feature of Panama Canal construction is the lock entrance caisson which is to act as a floating gate or dam for closing the entrance of the lock so that any of the chambers may be unwatered for inspection, cleaning, or repairs. The following description of it is from the "Canal Record":—

The width of the lock chamber is 110 ft.; beyond the line of the emergency dams, the approach is widened by an offset of 24 in. on either side. The shoulders so formed, with a connecting horizontal sill across the bottom of the chamber, afford a frame into which the caisson is fitted to dam off the interior of the lock. This is accomplished by floating the caisson against the shoulders and letting water into its hold to sink it on the sill.

Pumps in the interior of the caisson are then employed to unwater the chamber, while the water pressure from the outer side will force the caisson securely against the frame, reducing leakage around the edges. When it is desired to remove the caisson, the lock chamber will be filled with water, relieving the pressure, and the water within the caisson will be pumped out to allow it to be floated away. The general principles of construction are the same as in the caissons for Gatun and Miraflores Spillways, but the requirements and conditions of its use make the design of the lock caisson more complex than that of the spillway caisson.

The caisson is designed for interchangeable use at all locks, and will have a draft when light of 32 ft., to allow its convenient handling through the locks. The lower elevation of the sill at the Pacific end of Miraflores Locks, 50 ft. below mean sealevel, in connection with the tidal fluctuation which raises the surface as high as 11 ft. above mean, requires that the extreme draft of the caisson, when sunk, be 61 ft. Provision for a proper freeboard makes the aggregate depth of the structure 65 ft. The achievement of statical stability at the various depths of immersion, without undue bulkiness or excessive weight in the different parts, makes the design of especial interest.

In form, the bottom of the hull will be convex, the ends pointed, and the sides will slope inward from a maximum width of 36 ft. at about one-third the way up from the keel, to a breadth half as great at the top. A typical transverse cross-section of the structure resembles in outline the vertical section through a pear-shaped carbon-filament electric lamp. 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 to contain the girders and breasthooks by which the pressure will be transmitted to the vertical sills, or shoulders, on the lock walls. The length between the vertical ends will be 112 ft. 6 in., and the extreme length, including the timber cushions, 113 ft. 10 in.

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 will be a number of horizontal decks and end breasthooks to carry the load to the vertical ends; and a system of vertical framing, built intercostally and extending from the keel to the top deck, will transmit the panel loading to the horizontal decks and breasthooks. The essential features of the structure will be the transverse and longitudinal framing, with bulkheads; the horizontal plate decks, girders, and stringers; the girders at the ends and along the keel; the end breasthooks; and the plating to cover the skeleton in forming the hull proper. These elements will all be made from open-hearth structural steel.

The transverse framing system will consist of nine cross frames, spaced about 12 ft. apart and extending the whole height of the caisson, and intermediate frames, spaced at intervals of about two feet between the main cross frames. All will be built intercostally between the five horizontal decks. Two of the cross frames will be built watertight and designated as "Collision bulkheads," to form trimming tanks at each end of the vessel, for maintaining longitudinal stability and settling the caisson on even keel when it is to be put in use. The seven other cross frames will have apertures in their lower sections to make them serve as swash bulkheads for controlling the water within the caisson by which the depth of immersion will be regulated.

A longitudinal bulkhead will extend the entire distance between collision bulkheads, from keel to operating deck, along the centre line. Its lower part will be sufficiently watertight to form two distinct lengthwise compartments, dividing the free surface of the water ballast and increasing the static stability of the caisson, as against lateral motion.

There will be 5 horizontal decks, built continuously from vertical end to vertical end. The two lower decks, 16 and 25 ft., respectively, above the base line, will be entirely plated over with the exception of openings for hatches and manholes, the hatches being made large enough for the installation or removal of the pumps through them. The operating deck, 37 ft. above the keel, will be entirely plated from end to end, and made absolutely watertight. This deck will support the motors for the pumps, with switchboards, gauge registers, etc. The plate-stringer deck, 49 ft. above the base line, will be an open truss with diagonal bracing for the central two-thirds of its length. The top deck, 65 ft. above the base, will be plated over from end to end, with openings for manholes, skylights, deck cranes, companionways, and scuppers.

Six plate breasthooks will be built at each stem of the vessel, at intervals between the decks. They will serve to transmit the end shears from the decks to the vertical girders. One of these breasthooks, situated 31 ft. above the base line, will have its plating calked to watertightness and serve as the bottom for the end trimming tank. At the same level as the breasthooks will be longitudinal intercostals, securely riveted to the transverse frames and to the sheathing.

The skeleton will be entirely sheathed over with steel plating worked in in-and-out strakes, running longitudinally over the frames, making lap seams and butt joints which are to have double splice plates. At all the horizontal decks, and around the pipe discharge and suction openings, the sheathing will be doubled. Fenders against external impact will be provided between the 25 and 49-ft. levels, by bent plates securely riveted to the sheathing, the space between being filled with poured rosin. Towing rings will be attached along the 37 and 43-ft. levels.

End reaction castings will provide connection of the decks and breasthooks, up to and including the 49-ft. stringer deck, with the vertical girders, for transmitting to the latter the reactions of horizontal forces. They will be made of carbon steel and closely fitted during construction.

Along the exteriors of the ends and keel will be fastened cushions of British Guiana greenheart timber. They will be planed to make even contact with the plated sill and reduce leakage to a minimum. Greenheart timber