

girders, consisting of plate-bulkheads. In the compartments under the walls the plate-girders are replaced by special lattice-girders. In addition to the bulkheads, the deck and bottom platings are stiffened by means of a series of longitudinal frames which run fore and aft over the length of the pontoon, intercostal between the transverse girders. In addition to the transverse lattice-girder under the wall, intermediate transverse ordinary frames are fitted, 2 ft. 6 in. apart, and are prolonged upwards, forming the ordinary frames of the walls. The central bulkhead between the transverse girders is stiffened by vertical "breathing" plates, which are well stiffened and connected to a longitudinal curtain plate. Outside this framing of breathing plates and longitudinal curtain plate, the pontoon deck and bottom are stiffened by longitudinal framings consisting of angles, connected to the transverse bulkhead stiffeners by gussets and diagonals. These framings extend to the line of the face of the wall. In the centre section several of these frames are provided with plates riveted to them, to take the load from the side keel-blocks. The intermediate longitudinal bulkheads are formed of vertical plates, intercostal between the transverse girders, to which they are attached, as they are also to the top and bottom plating. To facilitate the complete withdrawal of all water in the pontoon, shallow troughs are fitted, which form a gutter. The walls of the dock are placed horizontally and have a batter on the face or inside wall. The top deck of the walls is plated longitudinally, and is connected to the side plating by double-chine angles. An engine-deck, on which is placed all the machinery of the dock, is fitted about 16 ft. below the top deck, and is arranged water-tight. Each wall is divided, in addition to the joint chambers, into ten water-tight divisions by plate-bulkheads, coming in line with the bulkheads in the pontoon, of which they are a continuation. At each end of the wall a docking land is formed, on which the central portion can rest when being self-docked. The framing of the walls is of two types, braced and ordinary. In line with the transverse girders of the pontoons, of which they form a continuation, the frames consist of single angles stiffened by vertical web-plates, the front and back plates being cross-connected by a series of diagonals and gussets. The ordinary frames of the walls consist of single angles back and front, cross-connected by a series of horizontal struts. Special stiffening is fitted in way of machinery. About one foot below the top deck a running deck is provided for enabling ropes to be easily handled and run from one end of the dock to the other outside the stanchions. Timber-heads and such fittings required in berthing vessels are fitted on this deck. At a distance of about 15 feet and 29 feet respectively below the running deck, two further stages, known respectively as painting and shoring stages, are provided. Each end of the central section and each square end of the terminal sections are provided with a joint chamber, by means of which the sections can be joined together or parted. For the purpose of dealing with commercial vessels, which ordinarily will not have the weight or dimensions of the dreadnoughts, the dock has been designed so that it can work when required in two independent units of unequal size, and to facilitate the rapid connection of the two portions, cast-steel rocking joints, in the form of knuckles, are fitted at the level of the keel-blocks. The pumping installation of the dock is driven by steam generated in boilers carried on the dock itself. Each section of the dock has its own complete pumping installation, and each installation consists of two boilers and two engines and pumps installed in specially constructed chambers on one of the walls. The pumps, which are of the centrifugal type, 17 inches in diameter, are seated on a main drain at the bottom of the dock, which is continued over practically the whole length of each section. From the main-drain com-

partment pipes are led to each separate water-tight division of the dock. Each compartment is governed by its own separate valve, and the main inlet pipe and pump discharge pipe are governed by separate screw-down valves, and in addition have each a non-return flap-valve on the outside. The compartment valves of each section of the dock are all operated from a valve-house placed on the top deck of each section, by means of the Westinghouse electro-pneumatic system, which is based on the principle of operating presses by compressed air and controlling the same from a distance by means of valves operated by an electro-magnet. Each valve house is in telephonic communication with its respective engine-room and also with the others when the dock is working as a single unit. Each section of the dock is also provided with a direct-acting steam-pump, arranged to draw from the sea, and capable of providing a full stream of water for fire service or washing down vessels. These pumps are also connected to the main drain, so that they may be used as a drainage service for completely emptying the compartments. Two similar steam-pumps are also fitted on the opposite wall of the dock.

Steam heating is provided to prevent water in the compartments from freezing, and also for the mechanism that could be affected by frost. Each water-tight compartment is provided with the Gardner and Ferguson indicating system, to show, in the valve house, the level of the water inside it.

Similar gear is also provided for indicating the draft of water over the keel-blocks. The dock is provided with eight steam capstans, four on each wall. The spindles of the capstans are carried down vertically to the level of the pontoon deck, where, in a small chamber in the wall at this level, cable-lifters are fitted, so that the mooring cables may be hauled in or paid out when the dock is being moved about. Donkey boilers are provided on the wall remote from that in which the main boilers are fitted, to provide steam for the capstans and fire-pumps fitted on that wall. On the top deck of this wall a three-ton electric travelling gantry crane is fitted and arranged to traverse the whole length of the wall. At both ends of the combined dock a pair of flying gangways or swinging bridges are fitted, affording access from one wall to the other.

The dock will be lighted throughout the machinery compartments by means of electric lamps. The outside lighting consists of bracket standards, each supporting a cluster of lamps. Box terminals are also fitted on the walls, from which lamp clusters can be taken by flexible leads for lighting any particular portion of the ship on the dock. Electric current will be supplied through cables from the shore.

The dock is provided with the usual bollards and timber heads. Roller fenders are also fitted to protect the walls of the dock from an entering steamer. Eight mechanical side shores, four on each wall, are provided. These can be screwed in or out by a standard fitted in the top deck. Keel-blocks, side or docking keel-blocks, and bilge blocks are provided; the latter are arranged to pull in or out to suit the shape of the ship when she has taken the keel-blocks. The keel-blocks are strongly made and closely spaced, to enable them to take the weight of the heaviest and most modern ironclads. Ladders are fitted leading from the upper deck of the dock to the pontoon deck, and also into the various compartments of the dock. Suitable hand-rails are fitted all round the top deck. Ventilation by means of cowl and downcast pipes is arranged to each boiler and engine room, and also to the interior of the walls. A valve-house large enough to contain the valve-control table and the recording instruments is fitted on the top deck of each of the three sections; each valve-house contains the apparatus necessary for controlling the valves of its own particular section.