caisson, the end over the torpedo tubes projecting 17 ft. in cantilever and forming an observation chamber for watching the course of torpedoes discharged from the tubes. The discharging chamber, occupying the central part of the caisson, is 45 ft. long by 18 ft. wide and has five tubes, three of which are below and two above water-level. The latter are in embrasures protected by steel shutters which can be closed in rough weather, and provision was made for the insertion of a timber cofferdam whenever required to permit the space in front of the subaqueous tubes to be pumped dry for the purposes of examination or repair. At the level of the lower deck in the superstructure a gangway runs around the top of the discharging chamber, and landing stages are provided for hoisting boats and materials. A travelling crane runs transversely through the battery below the second deck, the ends of the rails projecting 11 ft. 6 ins. at each end to facilitate loading and unloading operations. Another travelling crane is installed longitudinally over the discharging chamber for handling torpedoes and workshop material. On the lower deck are machine rooms and workshops, the machine rooms being equipped with two 65-h.p. internal combustion engines direct coupled to 40-kw. generators. From these sets current is supplied to air compressors, pumps, hoisting appliances, travelling cranes, and machine tools in the workshops. On the upper deck living accommodation is provided for the resident staff, the deck above being equipped with a look-out turret, masts for signalling, and other accessories.

When completed in readiness for its voyage across the sea the battery had a displacement of 2,600 tons and drew 26 ft. of water. After having been sunk in position, the total deadweight of the battery, with its contents and ballast added for sinking, was 9,000 tons, and its displacement was then 3,700 tons.

The stability of the battery on its foundation bed is amply assured by the excess weight of 5,300 tons over that of the water displaced, and the monolithic nature of the reinforced concrete construction, combined with a well-designed system of reinforcement, insure the elastic strength and rigidity necessary for withstanding the impact of waves in the roughest weather.

Before the adoption of this ingenious application of reinforced concrete was decided upon, several alternative projects were considered, the most practicable of these embodying the construction of an open steel platform with a moored workshop, lighter carrying torpedoes and machinery. This would have provided a somewhat inconvenient fair-weather installation, far inferior to that represented by the compact, self-contained battery, briefly described above, embodied in the scheme submitted by Mr. Hennebique. of Paris.

Floating Caissons.

While of less striking character than the structure just considered, reinforced concrete caissons for pier and jetty construction are not without practical interest. Floating caissons for this class of work have been used on a large scale in different parts of the world, a good example being furnished by those applied in the construction of new quays in Alexandria Harbor, where five large caissons were built on shore, towed out to position, and sunk to form a jetty some 330 ft. in length. The caissons were 65 ft. 8 ins. long by 26 ft. 3 ins. wide near the top, where the width was increased to 29 ft. 6 ins. by cantilever projections. Two caissons were 17 ft. 9 ins. high, and the other three 23 ft. high. The largest caissons weighed about 400 tons and drew between 6 ft. and 7 ft. of water when being towed out to position. After they had been filled their total weight was 2,500 tons, approximately, this being the weight of material it would have been necessary to transport and deposit on the bed of the harbor to obtain the required stability. By the adoption of reinforced concrete caissons the total weight of material towed out was only 400 tons, the remainder, employed as filling, having been very easily transported along the top of the caissons after the latter had been sunk in place.

It may be pointed out here that one of the problems to be solved in the design of floating caissons is to provide economically for the severe strains due to the considerable head of water acting upon the sides of the structure. The latest development with this aim provides for the construction of caissons designed so that the strains shall not act upon plane surfaces but around circular surfaces disposed with the outer walls. In this type of caisson patented a few years ago by Mr. J. S. E. de Vesian, pressure being distributed practically all around the circle, no bending moments are developed and nothing but compressive stresses have to be resisted.

Other types of floating structures in reinforced concrete for which there should be a big future are floating docks and railway ferries. The examples of pontoons already cited are sufficient to indicate that there would be no difficulty in constructing reinforced concrete ferry vessels capable of transporting railway trains and other classes of vehicles. Reports from Norway show that a small floating dock for lighters is in course of completion at the present time.

Effects of Sea Water.

In conclusion, brief reference may appropriately be made to the objection sometimes raised against the employment of concrete in sea water on the ground that the material may be injured by the action of saline substances in solution. The universal employment of concrete in marine works all over the world, including undertakings of such importance as the National Harbor at Dover, and the Panama Canal, ought to be sufficient answer to any doubts that may be entertained. While badly made concrete has suffered deterioration in a few cases, there is ample evidence of the fact that correctly proportioned and carefully prepared concrete is not injured by prolonged immersion in sea water. A series of tests commenced seven years ago in Boston Harbor, U.S.A., and still in progress, showed in 1914 that specimens made of really good concrete were in splendid condition after five years' alternate immersion and exposure to air, while other specimens of poor concrete had suffered considerably under the same conditions. Practical experience in this country is equally convincing.

Statistics just completed under the supervision of J. D. Northrop. of the Interior. indicate that for the year 1916 the quantity of "natural" asphalt, including bituminous rock, grahamite, gilsonite, wurtzilite, and the natural paraffin, ozokerite, produced and sold at mines and quarries in the United States was 98,477 short tons, a gain of 22,726 tons, or 30 per cent., in quantity compared with 1915. Ozokerite from domestic sources reappeared in the statistics of production for the first time since 1907. The quantity of asphalt produced in 1916 by refining from crude asphaltic oils of domestic origin increased only 3½ per cent. as compared with that produced in 1915. and the quantity of similar material refined in the United States from Mexican petroleum increased 47 per cent. as a consequence of which the net gain over production in 1915 was nearly 20 per cent. California led all other states in the production of refined asphalt, its output from sixteen refineries in 1916 amounting to 257,930 short tons.