

of 794. 301 vessels were also surveyed for seaworthiness and efficiency under section 226 of the Act: this number is an increase of 146 over the previous year's total. Department's certificates were issued for the first time to fifty-four vessels, of which eight are seagoing steamers and motor-vessels, and four sailing-ships.

One of the vessels surveyed for the first time is the s.s. "Torora." She is owned by the Devonport Steam Ferry Company, and was built in Auckland. She is of composite construction, and of the following dimensions: Length, 130 ft. 9 in.; breadth, 31 ft. 5 in.; depth, 9 ft. 9 in.; gross tonnage, 309; register tonnage, 197. Her certificate permits her to carry 1,221 passengers when plying within the Auckland river limits. Plans and specifications of a vehicular steamer for the same owners were approved during the year. This vessel will be of similar dimensions and construction to the new passenger-vessel.

An interesting vessel surveyed during the year is the stern-wheel steamer "Rawhiti." She is engaged carrying cargo and passengers on the Waikato River. The vessel and her machinery were built in Glasgow, and then taken down and shipped in sections to the Waikato, where they were re-erected. She has a length of 190 ft.; breadth, 35 ft.; depth, 5 ft. 6 in.; draught, 2 ft. 9 in. The tonnage is 410 gross and 299 register. The vessel is propelled by a set of twin-cylinder horizontal non-condensing engines, with cylinders 18 in. diameter by 60 in. stroke, driving a stern paddle-wheel 17 ft. in diameter. Steam is supplied from two boilers of the marine locomotive type working at a pressure of 160 lb. per square inch. The boilers are 13 ft. long and 5 ft. 9 in. diameter at the barrels.

The "Arahina," a new tug and pilot vessel owned by the Wellington Harbour Board, was built and surveyed in Auckland during the year. She is built of wood, on the diagonal principle, and is of the following dimensions: Length, 62 ft. 7 in.; breadth, 14 ft. 8 in.; depth, 5 ft. 1 in. She is propelled by a set of four-cylinder semi-Diesel engines of 100 b.h.p.

During the year very extensive alterations and repairs were carried out to the s.s. "Marama." The vessel was converted from coal-burning to oil-burning. Several oil-fuel tanks were built into the hull above the double bottom, and most of the double-bottom tanks were made suitable for the carrying of oil fuel. The passenger accommodation was rearranged, and altogether the vessel has had a very thorough overhaul. Before final approval of the plans of the alterations, investigation was made as to the effect the alterations would have on the stability of the vessel. The matter was found to be of such importance as to justify a request for the preparation of new stability data. This the owners readily agreed to, and they further carried out in a very thorough manner the Department's suggestion that the new stability data should be more amplified than usual, and that it should be simplified as much as possible so that the master of the vessel could predetermine the margin of stability his vessel would have under various conditions of loading, ballasting, and weather. A good case can be made out to support a regulation that the properties of stability of all vessels should be recorded on board for the information of the ship's officers. Shipbuilders prepare stability data for certain types of vessels, and the owner can obtain this information if he requires it. To be of much service, however, to the navigating officers the form in which it is at present generally supplied should be simplified and made more handy.

A number of sailing-vessels in the Auckland district have been fitted with oil-engines as an auxiliary means of propulsion.

It was found necessary during the year to issue circulars dealing with the construction and design of air-receivers for motor-ships and of small crude-oil-fuel tanks. With this information before them engineers can now quote firm prices for such work. This was impossible previously when they had no guide to the Department's requirements.

Owing to the increasing number of steam and motor vessels now carrying oil in tanks, the time has probably arrived when regulations should be framed to protect Surveyors and workmen when they are engaged in the inspection of and repairs to tanks. In New Zealand our experience in connection with repairs to oil-tanks has been very limited. Unless the risks attached to such work, and the precautions necessary to minimize these risks, are made known accidents cannot be avoided. Twelve lives were lost at Cardiff in 1919 by a serious explosion on a ship, and at Millwall in 1920 seven lives were lost on a barge undergoing repairs. Both these vessels carried oil. As a result of these accidents an engineer on the Home Office staff was instructed to make inquiries into the risks attached to the carrying-out of repairs on oil-carrying and oil-fuel ships. A report has been issued summarizing the results of his inquiry, and specifying the minimum precautions which are considered necessary to ensure the safe conduct of repair work on oil-carrying and oil-fuel ships, the term "oil" including petroleum spirit, petrol, or similar materials.

A circular was issued dealing with the fireproof lining of the engine-room of motor-vessels constructed of wood. The previous instructions were prepared when motor-engines were mostly of petrol type. The semi-Diesel engine using crude oil, and (for launches) engines adapted to use kerosene, are coming into favour. The risks of fire are not so great when crude oil or kerosene is used as is the case with petrol. The previous instructions as to lining of engine-rooms were therefore modified to permit of both the steel and insulating linings being less extensive for the engine-room of vessels propelled by crude-oil and kerosene engines.

Two wooden scows were fitted out during the year to carry petrol below decks. One of these vessels is flat-bottomed. Very careful attention was therefore given to the design and workmanship of the bulkhead. The bulkhead was constructed of steel plating suitably stiffened with steel angle-bars. The plating was secured all round the edges to heavy wood margin-planks bedded on to the ship's frames, sides, and decks. The margins were thoroughly caulked, and all seams in way of the margins were stop-watered. The bulkhead was first hose-tested and afterwards tested for airtightness by burning sulphur for eight hours in the hold with the hold sealed up. The test was very satisfactory. Altogether the bulkhead has been tested with sulphur fumes four times in less than three