The coastguard cruisers not only watch the coast but proceed to the fishery grounds to act as international marine police. They are controlled by an admiral, with headquarters at 66 Queen Victoria Street, London, who in 1910 had at his services the torpedo gunboats “ Halcyon,” “ Leda,” “ Skipjack ” *and* “ Spanker the old composite gunboats "Ringdove” and “Thrush”; the vessels “ Colleen,” "Julia ” and “ Fanny,” purchased and fitted up for the work; and the “ Squirrel ” and "Argus,” two yacht-like vessels specially built for the service. The “ Colleen,” a wooden vessel built in 1869 and propelled by horizontal trunk engines of 250 I.H.P., is 145 ft. long and 415 tons displacement, and at one time the engines gave her a speed of 8½ knots; the “Argus” is a steel vessel built in 1904, 130 ft. long, 380 tons displacement, 23 ft. beam, 8 ft. 10 in. draught; she has a light fore and aft rig, and vertical triple ex­pansion engines of 500 l.H.P. give her a speed of 12 knots. The Fishery Board of Scotland has provided itself with some small cruisers, such as the "Freya," built in 1904, of length 138ft., beam 24 ft., moulded depth 12 ft., and gross tonnage 280 tons; and the “ Norma,” built in 1909, which is 159 ft. long, 25 ft. beam, 14 ft. moulded depth, 457 tons gross tonnage and 950 I.H.P. In 1908 the Irish Fisheries Board procured the small cruiser “ Helga,” built by the Dublin Dockyard Co., 155 ft. long, 24 ft. 6 in. beam, 13 ft. 3 in. moulded depth; she obtained a speed of 14½ knots on trial with a total deadweight of 140 tons carried.

*Salvage and Fire Vessels.—*Several private companies maintain special vessels which are available for assistance of vessels in distress, salvage, wreck-raising, &c. Many of these vessels are powerful tugs fitted with derricks and winches for hoisting out cargo and ships’ fittings, and provided with powerful steam or electrically driven pumps and special hoses for pumping out flooded compartments of the vessels in distress. Some have been specially built and fitted up for salvage and wreck-raising ; others have been built and fitted for salvage and fireboats.

A fire and salvage boat at Elswick is 45 ft. long, 11 ft. beam and 3 ft. draught; she is fitted with a Merryweather quick-steaming boiler, and engines arranged to drive the boat at 8⅛ knots, or as an alternative to pump out vessels on either side, or to pump from the river for fire purposes and deliver up to 1500 gallons a minute. Many small vessels of this character are provided for harbours, docks and shipbuilding works. One of the most powerful in England is that built for the Manchester Ship Canal. This boat is 90 ft. long, and is fitted with salvage pumps capable of clearing 5000 gallons a minute, as well as independent fire service pumps capable of delivering 4000 gallons per minute at a pressure of 150 lb per square inch. Fire and salvage boats of much greater capacity have been provided at San Francisco, New York and Chicago. Two fireboats of special design were built in 1908 for Chicago. They are 120 ft. long over afl, 28 ft. beam, 15 ft. moulded depth, and 9⅛ ft. draught. Power- ful turbine pumps are driven by two Curtis steam turbines on the <⅞ame shafts, which also carry 275-volt 2oo-kilowatt electric motors for operating the propeller motors. The pumps can be worked so as to deliver 4500 gallons per minute at 300 lb per sq. in., 9000 gallons at 150 lb or larger volumes at lower pressures; the maximum speed of the turbines and pumps is 1700 revolutions per minute. Twin screws are fitted and each is driven by a motor arranged to develop 250 H.P. at 200 revolutions per minute. The boats are fitted with electric light, search-light, and steam steering gear. New York has ten powerful fireboats, several of which can throw over 10,000 gallons of water per minute. The “ Beta ” of the London Fire Brigade is too ft. long, 11 knots speed, and can deliver 4000 gallons per minute at a pressure of 140 lb per sq. in., engines and pumps being driven by vertical steam engines.

*Lifeboats and Vessels.*—The lifeboat services around the British shores are maintained almost entirely by the Royal National Life- boat Institution. In March 1910 there were 281 lifeboats in service, varying in length from 30 ft. to 56 ft. All are fitted with air-casing or watertight air-cases of sufficient capacity to keep them afloat if completely filled by the sea, and all arc arranged so as automatically to relieve themselves of any sea breaking into the boat. The type of boat varies according to the service intended and the views of the men who use them—182 are self-righting if capsized and 99 not self-righting. The conditions of service are such that the application of steam or other motive power to assist the crews presents many difficulties; these difficulties have, however, been successfully overcome by the institution and its advisers, and details of the power-driven boats are given in a paper read by Mr J. R. Barnett at the Institute of Naval Architects, March 1910. Four steam lifeboats have been tried and found very useful under the conditions in which they are employed, while three petrol-driven lifeboats, 40 to 43 ft. in length, 13 to 16 tons weight, 24 to 40 H.P. and about 7 knots speed, have been supplied as an experimental measure, and on their voyages to their stations proved to be very seaworthy and reliable boats. The institution employs one steam­ship, the steel twin-screw tug“ Helen Peel" of 230 tons displacement, which is stationed at Falmouth and used to tow lifeboats to sea and assist them in their work, and also to render aid to vessels in distress which have no chance of getting private tugs. The United States government has, however, taken the lead in this direction, in building and equipping a special vessel, the “ Snohomish,” for life-saving services on the North Pacific coast. This vessel is officially termed a revenue cruiser, and is 152 ft. long over all, 29 ft. beam, 17 ft. 6 in.

moulded depth, and displaces 795 tons at a draught of 12 ft. 4½ in.; a single screw driven by triple-expansion engines of 1370 I.H.P. gave a speed of 13½ knots on trial. (See Lifeboat.)

*Tugs or Tow-Boats.*—On canals and rivers steam barges are often employed for towing, and small tugs are also built for this purpose, but on swift, large rivers the tugs are often of considerable power. The tug “ Little John,” built by Messrs Yarrow for service on the Trent canals, is 80 ft. long, 14 ft. 6 in. beam, draught with steam up 22 in., displacement about 40 tons. Twin screws are fitted working in tunnels, and this little vessel has towed five barges, weighing with their loads 247 tons, at a speed of 5¾ knots. A river tug recently built by Messrs Thornycroft & Co. for service on the swift waters of the Upper Yangtse, and named the “ Shutung,” is 150 ft. long, 15 ft. beam, with a depth of 6 ft. 6 in., fitted with compound surface-condensing engines of 550 I.H.P., driving twin screws working in tunnels (as the draught of the vessel is very limited) and giving a speed of about 11 knots. After trial at Southampton the tug was taken to pieces, the sections shipped to China, with sections of a barge of corresponding dimensions, and both were put together and completed at Kiangnan. This was the first steamer to attempt regular passages in these troubled waters, and steamer and consort per­formed their first voyage with success. The American river tow-boat “ Sprague ” is 318 ft. long over alb 64 ft. 8 in. wide, depth amidships 7 ft., displacement 2200 tons, registered tonnage 1479. She is fitted with a stern wheel 40 ft. in diameter and 40 ft. in width, driven by two tandem compound engines of 12-ft. stroke, the cylinders being 28 in. and 63 in. in diameter; and at 9½ revolutions per minute her horse-power is estimated at 1500 H.P. In 1907 she towed on one occasion 56 coal boats, each 180 ft. long and 26 ft. wide, loaded with over 67,000 tons of coal and covering a water area of nearly 7 acres. On the American rivers the superiority of the screw propeller is, however, now realized, and shallow-draught tow-boats with propellers working in tunnels have been adopted. Interesting tugs have been built by Messrs Cox & Co. of Falmouth for work in the North-Eastern Railway Docks on the Tyne. Great power in small length was required, and engines of 1000 I.H.P. are installed in vessels 75 ft. long, 26 ft. beam, 12 ft. 6 in. deep, having a mean draught of 10 ft.; twin screws set widely apart being provided to give manoeuvring power. Tugs in common use in harbour and coasting services are often 90 ft. to 120 ft. in length, 20 to 23 ft. beam, 10 to 12 ft. depth, 9 to 12 ft. draught, 400 to 600 I.H.P. and 11 to 12 knots speed ; tugs fitted with independent acting paddle-wheels are popular for some sendees on account of their great handiness, but the great majority of new vessels are fitted with single or twin screws. For ocean service larger vessels are built. A steel tug built by the Bath Iron Works for the American coal trade is 165 ft. over all and 1045 tons displacement, with triple-expansion engines of 900 H.P. The “ Cornell ” is one of the largest American sea-going tugs; when towing she has developed 1390 I.H.P. at 97 revolutions, and when running light 1900 I.H.P. at 135 revolutions and a speed of 15½ knots. The “ Hearty," built to go out under her own steam to work in the Hooghly, is 212 ft. long, 30 ft. beam, 12 ft. 6 in. draught, 1300 tons displacement, vertical compound engines of 2100 I.H.P. drive, twin screws, and the vessel can steam at 14½ knots. Recent screw tugs of the “ Rover ” type, built for the British Admiralty, are 154 ft. long, 27 ft. 4½ in. beam, 11 ft. draught, 615 tons displacement, 1400 I.H.P., giving 13½ knots with twin screws. The latest paddle tugs of the “ Grappler " type are 152 ft. long, 28 ft. beam moulded, 53 ft. 3 in. over guards, 11 ft. in. draught and 690 tons displacement. Inclined compound engines are fitted with means to work the wheels independently or together as desired. 1250 I.H.P. gives a speed of 12 knots. In these tugs the towing hook is carried well forward to permit the tugs to manœuvre freely, and good beam is given so that in case of a heavy side pull the tug will not capsize.

Each year from 20 to 30 tugs are built in the United Kingdom, and many of them are fitted with powerful pumps and heavy derricks and winches, so that they are of service in case of fire or salvage. The North-Eastern railway tugs referred to are able to pump 500 gallons a minute, *i.e.* about 140 tons an hour, while the “ Lady Crundall,” belonging to Dover, can pump 700 tons an hour.

*Yachts.—*Vessels built for pleasure purposes and for racing have for many years been known as *Yachts.* (See Yachting.)

. In 1825 Mr Assheton Smith built a steam yacht, and although the building of such yachts was discouraged by the clubs, he continued to build, and produced between 1825 and 1851 nine steam yachts of various sizes; one built in 1844 had a screw propeller, the others were fitted with paddle wheels. In 1856 the ban on steam yachts was withdrawn by the clubs, and others began to build; but as late as 1864 there were only 30 steam yachts afloat. In 1876, however, Lloyd’s Register Committee issued *Rules for the Building and Classification of Yachts,* and from about that date great improvements were made in the design and construction of yachts of all classes, as well as in their propelling machinery, and steam yachts were built in much greater numbers.

As with trading vessels, the machinery at first fitted in yachts was only regarded as auxiliary; a well-known example of a successful auxiliary steam yacht is Lord Brassey’s “ Sunbeam ” (fig. 42, Plate XL), built in 1874, of the following dimensions: length over all 170 ft., beam 27 ft. 6 in., depth of hold 13 ft. 9 in., displacement 576 tons, registered tonnage 334 tons gross, 227 tons net, and Thames