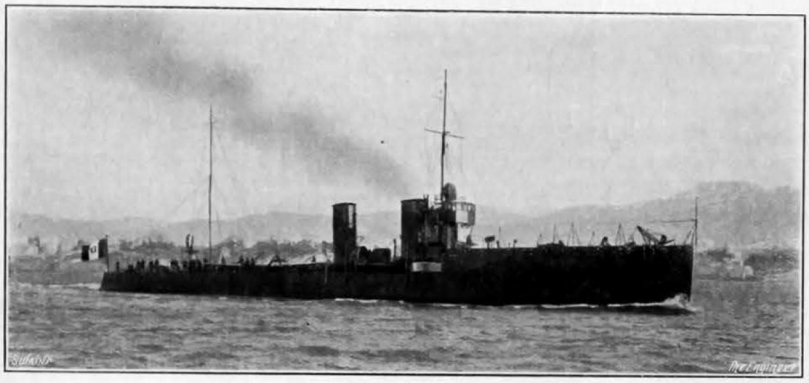
Italian Flotilla Leaders.

MAINLY in consequence of the financial situation, but partly owing to experience gained during the war, the Italian Government proposes to revise its naval policy, and in future to build and maintain only relatively small vessels, such as scouts, destroyers, and submarines Pursuant to this decision the majority of the armoured ships are to be paid off and the battleship Caracciolo is to be completed as an oil fuel depôt. So far as is known, the only war vessels now under construction are eight or more flotilla leaders of an unusually powerful type, which, displacing as they do from 1900 to 2200 tons, are more akin to small cruisers than torpedo craft proper. Irrespective of these new vessels, the Italian Navy



FLOTILLA LEADER, POERIO CLASS

already includes a number of destroyers or flotilla leaders, which are perhaps the most powerful representatives of their type afloat. Although of slightly smaller tonnage than our flotilla leaders of the "Scott" class, the four Italian units of the "Aquila" class, originally designed for Roumania, have a more formidable armament and virtually the same speed. The Aquila, Nibbio, and Sparviero each mount three 6in. and four 14-pounder guns, and the Falco has six 4.7in., as compared with a standard armament of five 4.7in. in the British "Scott" class. In the new Italian leaders, designated as the "Leone" and "Improved Aquila" classes, a uniform battery of eight 4.7in. is to be mounted, together with six torpedo tubes. Through the courtesy of Messrs. Gio. Ansaldo and Co., of Genoa, a firm whose long and honourable association with Italian naval development is well known, we are able to give below a detailed description of two separate groups of flotilla leaders, recently constructed by them, which embody to a marked degree the essential characteristics of modern Italian torpedo craft. The first group comprises the Carlo Mirabello, Auguste Riboty, and Carlo Alberto Racchia, launched respectively in 1914, 1915, and 1916; the second consists of the Alessandro Poerio, Cesare Rossarol, and Guglielmo Pepe, launched in 1914–15. All six vessels were completed in time to take part in the operations of the war. As their official classification—Esploratori—indicates, they were designed to act as scouts as well as torpedo vessels, and to this end were given dimensions and sea-going qualities superior to the average run of destroyer, while special regard was also paid to strength of construction. They proved, without exception, to be fast, weatherly vessels, able to keep the sea in nearly any weather likely to be encountered in the Adriatic and the Mediterranean. Their good speed and powerful armament made them more than a match for the largest Austrian destroyers and equally a terror to enemy submarines. Thanks to careful design and skilled workmanship, the propelling machinery developed on trial a power some 20 per cent. in excess of contract requirements. The completion of the three "Mirabellos," which had been ordered at the end of 1914, was somewhat delayed in consequence of labour and material shortage, but these and other difficulties incident to war-time construction were not permitted to prejudice the quality of the work.

We shall deal first with the "Mirabello" class, the principal dimensions of which are as follows:—

Length between perpendiculars	340ft.
Breadth moulded	32ft.
Draught over keel	9.8ft.
Normal displacement	1570 tons
Ratio of breadth to length	10.395
Block coefficient	0.517 (metric)

Structure of the Hull.—A vertical central keelson runs the entire length at the same height as the double bottom in the engine-room and as the boiler-room floors. The frames are of the usual type, consisting of floor, principal, and reverse angles, channel-shaped at the sides; they are spaced 21.6in. apart and are joggled to save the weight of strips between them and the outer strakes of the shell plating. In the engine-room special reinforced frames are fitted where possible. The cellular double bottom, of 31½in. height under the propelling machinery, is arranged for carrying oil fuel. The deck extends from the forward to the after perpendicular; the beams are cut in way of wing cofferdams and are continuous from side to side where no longitudinal water-tight bulkheads are fitted. The forecastle deck is carried aft as far as the forward funnel. Below this deck there is a partial flat forming a 'tween deck of nearly 7ft. 6in. Specially strong beams are fitted both under the main and forecastle deck plating at intervals between the ordinary deck beams. Longitudinal lateral girders run beneath the deck fore and aft, and a girder is worked in at each side between the main and forecastle decks.

Internal Compartments and Oil Fuel Service.—The system of main water-tight transverse subdivision is indicated on the drawings on the next page. The oil fuel compartments, having a total capacity of 8200 cubic feet, are subdivided into eighteen separate water-tight tanks, of which the ceiling, where not formed by the double bottom inner plating itself, is in all cases at a level below the normal water line of the ship. The tanks can be filled from the exterior at four different stations, two of which are situated in the forward part and two amidships. Oil can also be taken in by means of two steam pumps carried on board; these pumps, of the Simplex type, have a capacity of 32 tons per hour and are housed in separate compartments. They are equipped with piping and valves to permit the transfer, in case of emergency, of fuel from one compartment to another. Four pumps with a capacity of 12 tons per hour convey the oil through heaters and filters to the burners. The oil fuel piping consists of a ring collector with an independent branch to every compartment.

Bilge and Fire Service.—For bilge and fire service there is a main suction pipe of 3in. clear diameter, with several branches to the bilges, and eight 40-ton steam ejectors. The fire main, of 2.36in. clear diameter, is fitted below the deck beams. Pipe ends have standard threads and couplings for use with canvas hose. The pumping plant comprises the following:—Two duplex steam pumps, capacity 15 tons per hour, one in each engine-room; one turbo-electric pump, 30 tons per hour, in engine-room aft; one Challenge type portable pump of 5 tons capacity; one Downton pump fitted on deck.

Fresh Water Supply.—Certain of the lateral cofferdams are used for reserve feed water, the total capacity being 33 tons. Drinking water is carried in two independent galvanised tanks with a total capacity of 3 tons. The fore peak tank and a second compartment below the flat are utilised for storing water for washing purposes. These tanks can be filled from the exterior and also by means of the Excelsior quadruple pumps used for filling the gravitation and distributing tanks.

Sanitary Arrangements.—Connections are taken from the fire main to distribute salt water to baths, wash places, and water-closets for officers, warrant officers, and crew. The officers' water-closets are also fitted with small Excelsior pumps for direct service from the sea. Effective sanitation is secured by a small turbo-electric pump of 10 tons capacity hourly, with direct suction from the sea and delivery to the main fire collector pipe.

Ventilation.—Large exhaust fans are fitted in the wardroom, petty officers' mess, and dynamo room, and ventilators in the men's quarters forward.

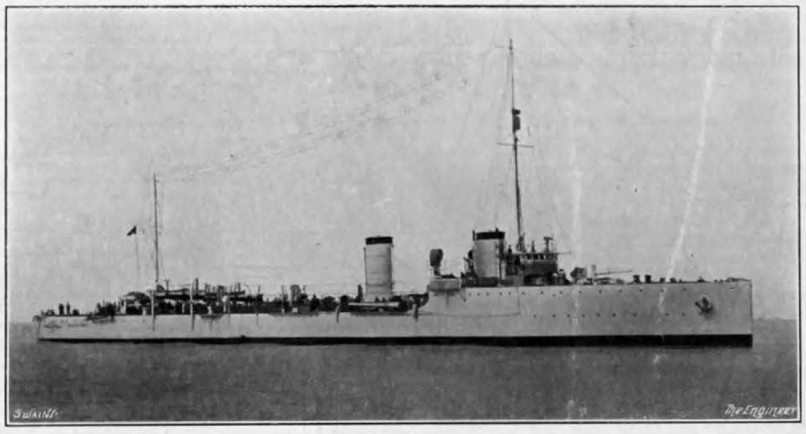
Steering Gear.—Powerful hand and steam steering gears are provided, both working on the double-screw system. The steam steering gear situated in the after engine-room consists of a vertical two-cylinder engine capable of being safely driven at full boiler pressure. Seventy revolutions suffice for putting the rudder from the centre to hard over. The hand steering gear has two wheels of the usual large diameter. A suitable arrangement of couplings and pins enables the change over from steam to hand gear to be effected instantaneously. Should the double screw gear be put out of action through damage, resort may be had to an auxiliary mechanical gear, consisting of a toothed sector normally loose on the rudder shaft, which can easily be fixed with strong pins after the cranks of the damaged gear have been dismounted. Furthermore, a reserve bar is provided for working the rudder by hand with tackles.

Anchors, Chains, and Capstans.—The bower anchors are each of 40 cwt. stockless type, with a shank of forged iron and steel flukes cast in one piece. Nine lengths of cable, each 82ft. long, are provided. Adjacent to the bow there are two electric capstans, each operated independently and having a rotary converter of the closed and ventilated type, which in normal service requires nearly 295 ampères and 105 volts, feeding a motor of 27 horse-power. Transmission is effected by a helicoidal gear, which can be rigidly connected with the capstan by means of skin friction discs. A switchboard for control is fitted under the forecastle. It is possible to weigh the anchors at a rate of 39ft. per second, the normal tension exerted being more than 5½ tons, although for a few moments a maximum pull of nearly 12 tons can be attained. A third electric capstan of smaller type is mounted aft for mooring purposes and for serving the derrick.

Four boats are provided, including a 26ft. petrol launch with a speed of 12 knots.

The masts are built principally of steel, the main mast being reduced in height and of specially stiff construction to obviate the use of shrouds, which interfere with the training of the guns.

All living spaces throughout the ship are sheathed with wooden planking, the decks being covered with linoleum. The washing places have running water with overboard discharge. The ship is heated and lighted by electricity.



FLOTILLA LEADER, MIRABELLO CLASS

The front and sides of the bridge, which is built at a height of 4ft. 8in. above the forecastle deck, are enclosed by a framing of brass and wood with sliding windows. Below and abaft the bridge are situated a small cabin for the commanding officer, the charthouse and the wireless telegraphy room.

Magazines.—The magazines, two in number, are entirely sheathed with insulating material, viz., cork slabs 2in. thick, with a covering of reinforced "litosilo." Racks are provided for the 4in. cartridges and the after magazine contains boxes for storing torpedo war-heads and depth charges. Both magazines are equipped with an electric fire alarm system and with Kingston flooding valves, which can be operated

from the deck. The 4in. guns are served by a special electric hoist controlled from the deck, which can deliver eighteen rounds per minute. The 6in. bow-chaser is supplied by a cage hoist with an electric winch. All these hoists are of the Ansaldo patent system and are furnished with emergency hand gear.

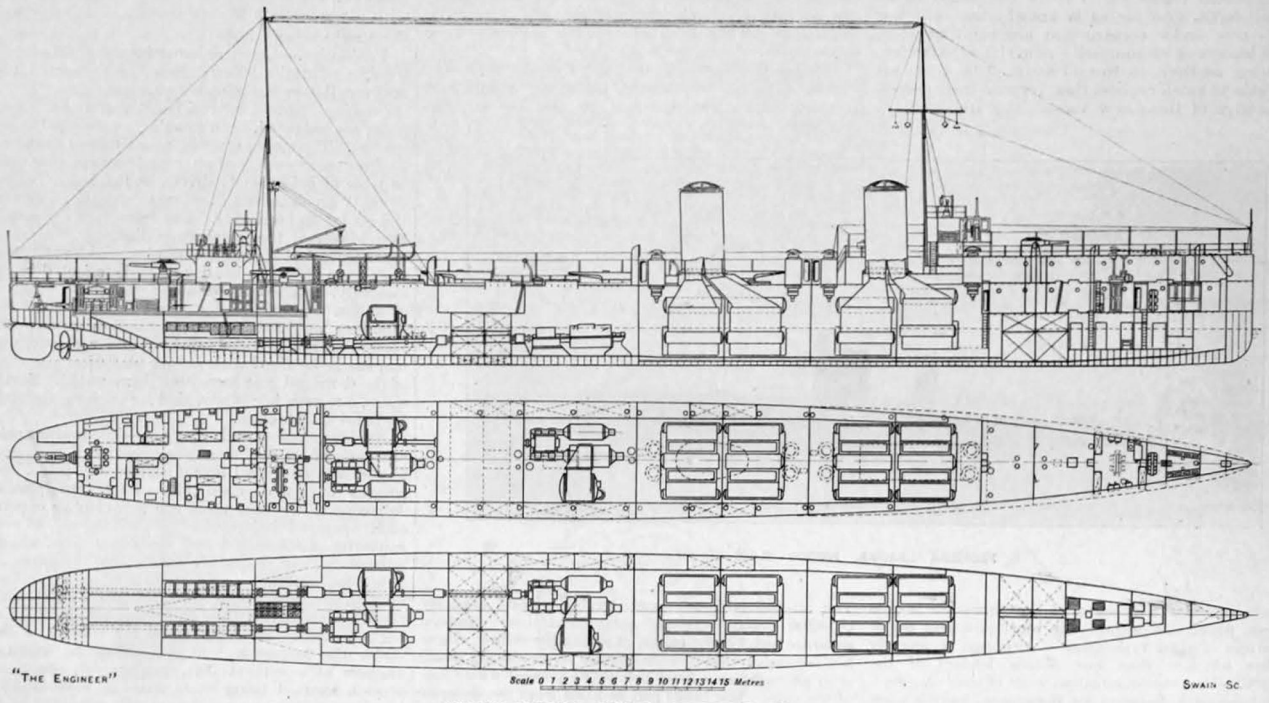
Refrigerating Plant.—The refrigerating plant consists of two independent sets, each of 5000 calories per hour. Refrigeration is performed on the direct carbonic acid expansion system. The compressors are operated by belt transmission from electric motors of 5 horse-power. An air cooling system is fitted to each magazine.

Armament.—The armament comprises one 6in. 40-calibre gun—45 calibres in Mirabello only—seven 4in. 35-calibre guns, two 2-pounder anti-aircraft guns, four 18in. torpedo tubes on twin mountings. The torpedo tubes are constructed of steel, the torpedoes being fired by a charge of powder. The compressed air system for the torpedoes is tested to 400 atmospheres, and a branch leads to the boiler fronts for tube cleaning purposes. The after deck is fitted for the carrying of 100 mines, with a tramway for mine-laying, racks for depth charges, and davit gear for explosive paravane sweeps.

Electrical Equipment.—Continuous current at 110 volts is used. The generating plant includes two 30-kilowatt turbo-dynamos and one 15-kilowatt Diesel dynamo. There are seven independent wirings from the main switchboard, viz., one lighting circuit for engine-rooms, boiler-room, magazines, and gun positions; one lighting circuit for living quarters, pantries, &c., with commutators for changing over from the normal white light to blue light in action; one circuit for the wireless telegraphy, one for signals, one for auxiliary engines and heating apparatus, and two circuits for the searchlights. Six small independent accumulator batteries are supplied for emergency lighting in the machinery spaces and magazines.

Propelling Machinery.—The propelling engines consist of two sets of simple geared turbines situated in two separate water-tight compartments, each set being complete in itself and capable of being operated independently. Each set comprises one high-pressure and one low-pressure ahead turbine. Astern turbines are cased in with the low-pressure ahead turbines. Adjusting blocks of the pivoted oil film type are fitted at the forward end of the turbines, which transmit their power to the gearing through flexible couplings of the claw and sleeve type. In the low-pressure ahead turbines provision is made for admitting steam exhausted from the auxiliaries. Steam is generated by four water-tube boilers housed in four separate water-tight compartments. The total heating surface is 40,900 square feet.

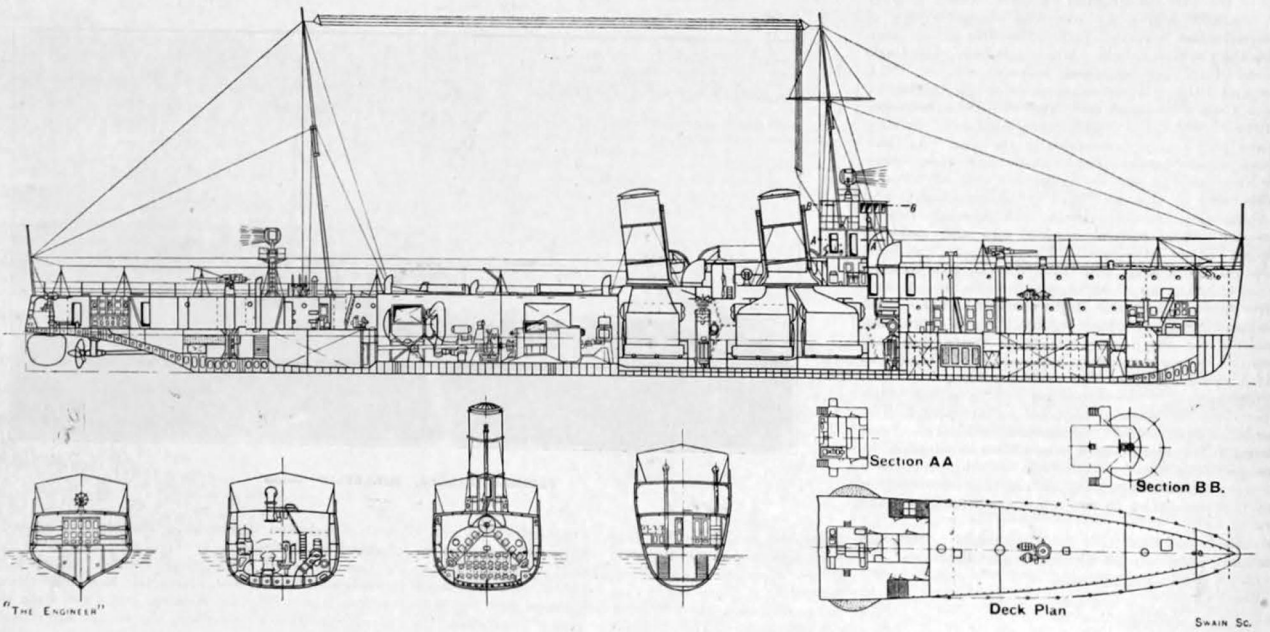
The machinery has developed an aggregate of nearly 46,000 shaft horse-power, and on trial a maximum speed of 36.8 knots was attained, while the contract speed was 35 knots. The power developed when going astern is almost half the figure reached when steaming ahead.



ITALIAN FLOTILLA LEADER, MIRABELLO CLASS

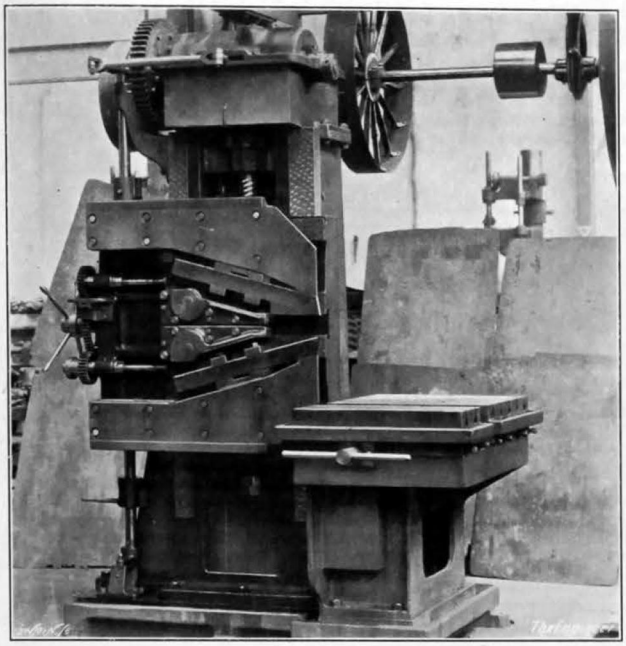
The turbine cylinders are of hard, close-grained cast iron, smoothly bored inside and divided horizontally into two parts. The rotating parts of the turbines, consisting of the rotor shaft and wheels, are made from ingot steel forgings, while the blading is of drawn bronze bar. The bearing bushes for the rotor shaft are made of gun-metal lined with white metal. The whole of the bearings and adjusting blocks are arranged to work under a system of forced lubrication, with oil baffles fitted at the ends of the bearings.

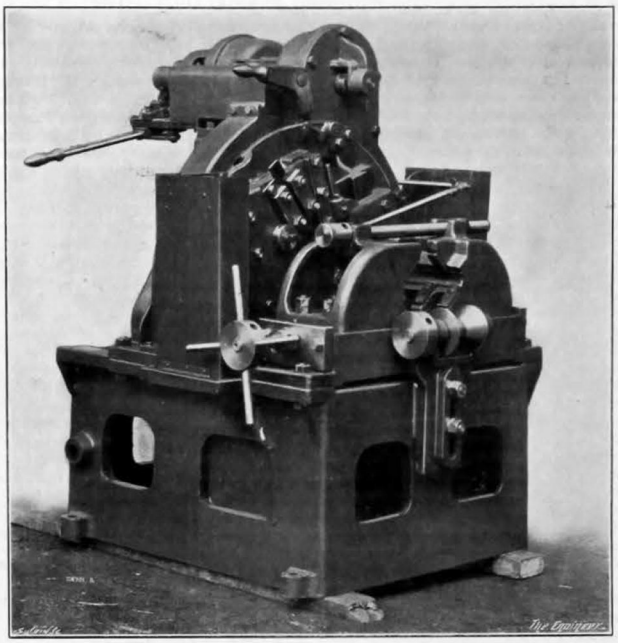
The gearing is of the double helical type suitably dimensioned to give the necessary ratio between the turbine and propeller revolutions. The rims and shaft of the main gear wheels are made from ingot carbon steel forgings, while the bosses of the wheels are of cast steel. The pinions, which are forged solid with their shafts, are of nickel steel. The gear cases are



ITALIAN FLOTILLA LEADER, POERIO CLASS

MACHINE TOOL EXHIBITION AT OLYMPIA





FIGS. 27 AND 28—CLIFTON AND BAIRD'S CUTTING-OFF MACHINES

made in upper and lower sections, the first built up of steel plates and angle bars, the lower section of cast iron. To obtain efficient lubrication oil sprays are fitted to the gear cases in such positions as to spray oil upon the engaging teeth of pinions and wheels when moving either ahead or astern.

Lubrication is effected by oil pumps mounted in pairs in the two engine-rooms. In connection with the forced lubrication system each engine-room contains the necessary oil drain tank, oil reserve tank, oil cooler, and suitable piping and mountings.

The shafts are of hollow forged steel, the tail shafts being of nickel steel. The screw propellers are built of manganese bronze and are secured to the shafts by means of a key and nut. The thrust of each propeller is taken on a pivoted thrust block supplied with forced lubrication on the same system as that applied to the turbine adjusting blocks.

The condensers are of the heart-shaped pattern now generally adopted, each having a cooling surface of 9420 square feet. They are constructed with a steel plate shell, rolled Muntz metal tube plates, and solid-drawn brass tubes. The low-pressure turbines are connected with the condensers by means of large exhaust bends built up of steel plate and angle bars.

Feed water is supplied by two Ansaldo type evaporators, each delivering 4400 gals. of fresh water per twenty-four hours, and combined with a distiller condenser delivering 1750 gals. of water in the same period.

The main steam piping is so arranged that steam may be conveyed to each set of turbines from any of the four boilers. The tubes are of welded steel plates with forged steel flanges. Any boiler may be cut out of service by intercepting valves. The auxiliary engine steam piping is independent of that of the main steam supply, but in each engine-room a special connection with suitable valves is provided between the main and auxiliary steam piping. The exhaust steam pipes are arranged to lead exhaust steam to the turbines, condensers, or atmosphere as it is needed. There are two independent feed pipe systems, one main and one auxiliary, each complete for supplying all the boilers. The main pipe conveys the water to each boiler through a surface heater and an automatic feed regulator connected with two relief valves, fitted on the water pockets of the boiler. The auxiliary pipe supplies water direct to the boilers through the hand-worked feed valves. Air pumps deliver the water into the tanks, from which it is drawn by the feed pumps. These are eight in number, placed in pairs in each boiler-room, each pair comprising two single pumps. The feed pumps are able also to draw the fresh water direct from the reserve tanks through suitable piping.

As stated above, the four water-tube boilers are housed in separate compartments. The heating surface of each boiler is 10,225 square feet, the total heating surface of the four boilers being 40,900 square feet. The working pressure is 250 lb. to the square inch. Oil fuel is used exclusively on the closed stokehold system of forced draught. There are single and multiple sprays, with their respective air cones, of the usual type. Oil is supplied to the burners by four pumps, one for each boiler-room, which pass the fuel successively through the cold filters, heaters, and hot filters to the distributing valves attached to the boiler fronts. Air for combustion is supplied by turbine-driven steam fans, two for each boiler, each having a capacity of about 32,000 cubic feet per minute.

Stability and Rolling.—Stability trials carried out when the vessel was nearly completed, on a normal load displacement of 1530 tons and with a mean draught of 9ft. 2in., gave an effective metacentric height of 30in.—0.762 m. In order to reduce the rolling a system of anti-rolling tanks and gyroscopic stabilisers had been installed, but the behaviour of the vessels at sea proved to be so satisfactory that this system could be dispensed with, and the spaces provided for anti-rolling tanks have consequently been utilised for the storage of oil fuel. The following table gives the distribution of weights :—

	Tons.
Hull and structural parts	512.4
Deck sheathing	9.5
Complementary steel structures	18.2
Cement and paintwork	8.4
Pumps and piping	18.0
Fans and ventilators	6.2
Steering gear	12.8
Capstans, bitts, bollards, &c.	14.2
Distillers, lavatories, baths, &c.	9.0
Officers' and petty officers' furniture	12.0
Mess deck fittings and shelves in stores	13.0
Masts and rigging	2.6
Anchors, chains, and cables	19.0
Boats	4.0
Voice-pipes and accessory equipment	2.5
Equipment stores	20.0
Awnings, canvas covers, and sails	1.2
Wireless telegraphy equipment	2.7
Electric plant, including dynamos	28.9
Armament	53.3
Ammunition	22.0
Store-room fittings	10.4
Magazine equipment	16.8
Torpedo tubes and accessories	12.9
Torpedoes and war heads	4.4
Main engines, complete	239.6
Propellers, shafts, and bearings	52.2
Boilers, uptakes, and funnels	305.2
Spare parts, ladders, &c.	27.4
Water in boilers and condensers	62.3
Consumable stores	6.0
Complement and appurtenances	15.0
Drinking water	3.0
Washing water (normal)	10.0
Washing water (extra)	10.0
Reserve feed water	32.9
Oil fuel in filter tanks	47.9
Oil fuel in compartments (normal)	213.6
Oil fuel in compartments (extra)	112.5
Total (full load displacement)	1972.0

The three vessels of the "Alessandro Poerio" class, comprising the name ship, the Cesare Rossarol, and Guglielmo Pepe, are somewhat smaller than the "Mirabellos." Their principal dimensions are :—

Length between perpendiculars	278.88ft.
Breadth moulded	26.25ft.
Draught	8.60ft.
Normal displacement	930 tons
Ratio of length to breadth	10.5
Block coefficient	0 505 (metric)

In these vessels, as in the preceding class, high-tensile steel has been largely employed, especially for the shell and deck plating. Details of the vessels are shown in the engravings on pages 268 and 278. The oil fuel compartments are furnished with pipes of a number and diameter sufficient to permit the filling of all tanks in a space of two hours. The pumping system for bilge, fire, and fresh water service and the sanitary arrangements are, generally speaking, very similar to those in the "Mirabello" class, of which these vessels are smaller editions.

The armament consists of two 4.7in. 40-calibre guns mounted respectively on the forecastle and quarter deck ; four 3in. 40-calibre guns on the broadside ; and four 18in. torpedo tubes on two twin-deck mountings. Each of the two magazines contains 260 rounds for the 4.7in. guns and 560 rounds for the 3in. The hoists are worked by hand. Eight torpedoes are carried, four of which are in the tubes and four in reserve. The electric plant is operated by two 30-kilowatt generators with turbo-motors. The propelling machinery resembles in all essential features that of the "Mirabello" class. The maximum power developed on the trial runs was 25,200 shaft horse-power, equivalent to a speed of 33.4 knots. Although of comparatively moderate dimensions, these vessels have an extensive cruising radius, viz., 750 miles at full speed and 3000 miles at a speed of 15 knots.

The Machine Tool Exhibition.

No. III.*

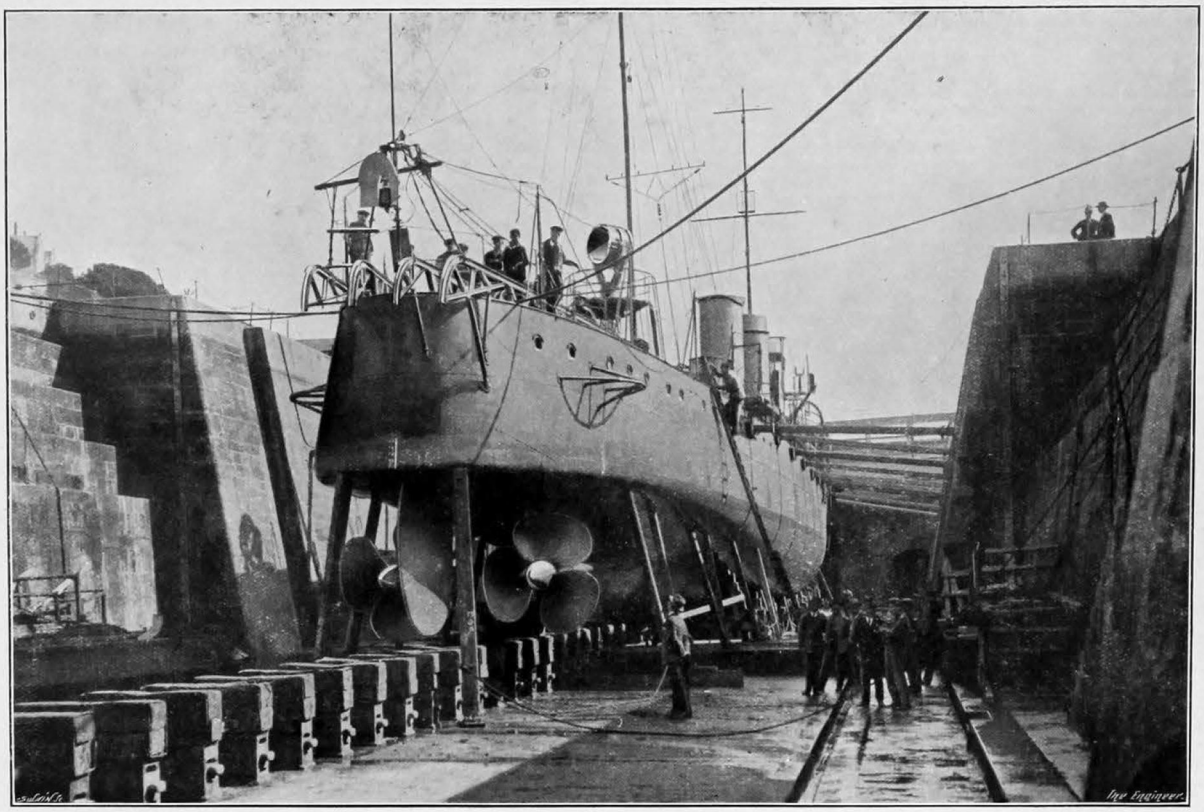
CUTTING-OFF MACHINES.

CLIFTON AND BAIRD, of Johnstone, are showing a new machine for use in steel foundries for cutting off flush the risers or headers of steel castings, illustrated in Fig. 27, above, of which the chief characteristic is that it employs two cutting tools of high-speed steel of such a simple form that they are cheap in first cost, easily prepared, and capable of being sharpened on any grindstone. The machine is a special form of double cutting slotting machine, one tool cutting on the up and the other tool cutting on the downstroke. The saddle carrying the tools is operated by a quick lead screw and is balanced by a weight inside the column hung on roller chains. The tools are supported by renewable steel plates which are fed forward automatically, the work being held stationary on the work table, which is bolted to the base plate and to the sides of the column. The stroke is adjustable and has an effective maximum cut of 18in., while the maximum depth of cut is 8in. The machine shown at Olympia is one of the smaller sizes, but others having an effective stroke of 30in. are also made. The larger machines are driven by a reversing electric motor with a vertical armature mounted on the top of the column, and are capable of removing all the risers within an area of 6ft. by 2ft. 6in. at one setting of the work. It will be noticed that the front face of the saddle is quite flush, so that risers can be cut off right up to the main body of the casting. We hear that one of these machines will cut off a riser measuring 15½in. by 6in. in 18½ minutes. Another exhibit on this stand is a bar cutting-off machine of the type in which the work is held stationary while the tools revolve. It is illustrated by Fig. 28, above, and is fitted with two tools. The tools, which are supported by renewable steel plates, are of simple inexpensive form and require the minimum of preparation. On

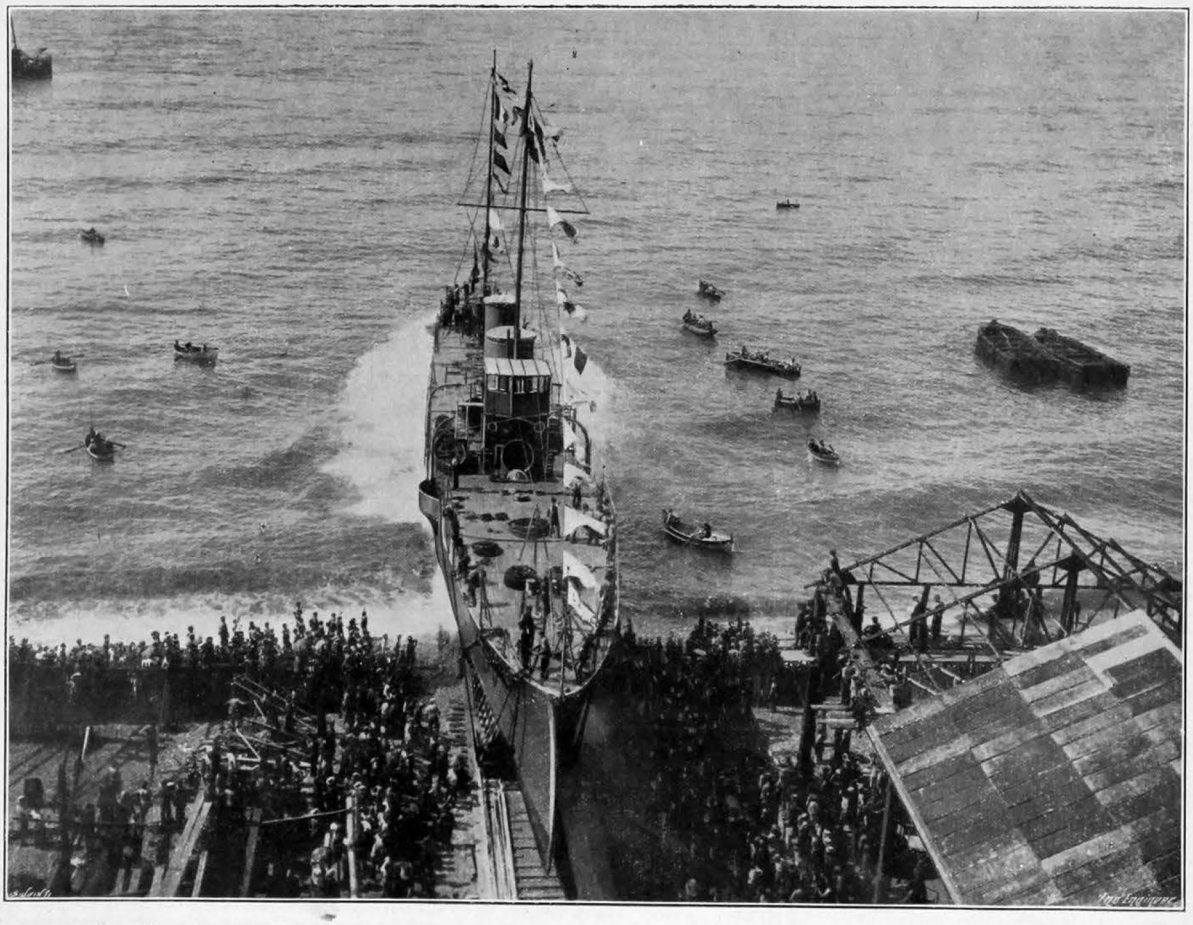
* No. II. appeared September 10th, 1920.

ITALIAN FLOTILLA LEADER POERIO

(*For description see page* 267)



STERN VIEW SHOWING MINE-LAYING TRAMWAYS



LAUNCH OF VESSEL FROM ANSALDO'S YARD