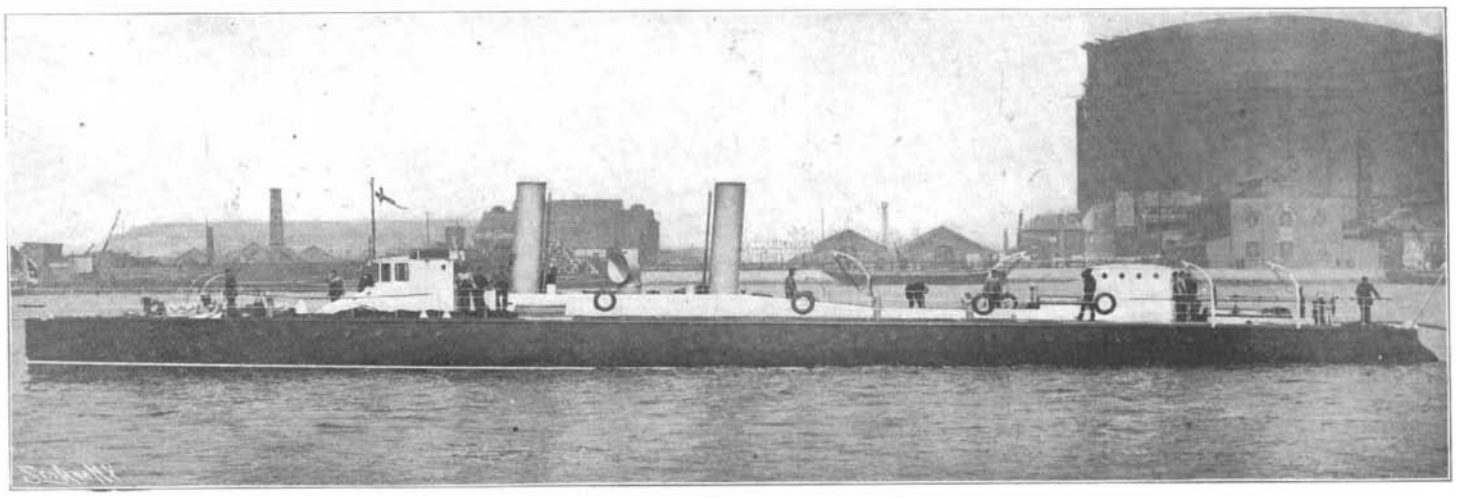
the water. The method adopted on the "Ariadne," of which we present a detailed drawing, is one that was designed and patented in 1868 by Mr. R. R. Bevis, a former manager of Messrs. Laird's building establishment in Great Britain. This type was fitted by that firm to several auxiliary cruisers in the British navy, among which was the corvette "Calliope," which it will be remembered, was present at the terrific hurricane at Apia in the Samoan Islands, when so many American vessels were lost, and barely managed to steam out against the hurricane into deep water. The object of the device is to enable the angle of the blades of a propeller to be altered, while they are in place under water, to the pitch most suitable for working with steam under varying circumstances, as well as to feather them in a fore-and-aft direction when the vessel is under sail, and the steam power is not in use. The propeller blades are rotatable on their axes, and they are moved by a pair of levers which are attached to a yoke at the outboard end of a rod that passes entirely through the propeller shaft into the engine room. Here the interior rod is coupled by means of a pin, sliding in a slot cut through the propeller shaft, to an outer, threaded sleeve, which is capable of fore-and-aft movement on the propeller shaft by means of a thread cut on the shaft. This sleeve is formed with a pinion on its outer periphery which is engaged by a spur wheel that can be operated by hand. To feather the blades, that is, to place them with their surfaces approximately parallel with the keel of the ship, the sleeve is moved forward into the position shown in our drawing. When it is desired to use steam power, the sleeve is screwed back upon the propeller shaft, forcing the interior rod to the rear, and by means of the connecting levers swinging the propeller blades around to the proper angle of pitch. The connecting levers, arms, etc., are entirely inclosed with the hollow boss of the propeller, and it will be seen that when the blades are in the fore-and-aft position, the drag or friction of the propeller is reduced to a minimum.

ENGLISH TURBINE-PROPELLED YACHTS.

BY THE LONDON CORRESPONDENT OF THE SCIENTIFIC AMERICAN.

Of the three high-speed yachts to be fitted with the Parsons marine steam turbine, two have up to the present been launched. They are the "Tarantula," owned by Col. H. McCalmont, M. P., and the "Emerald," belonging to Sir Christopher Furness, M. P. The "Tarantula" is of very special design, having been built on the lines customary to all vessels of the torpedo-boat class. As regards the hull and boilers the "Tarantula" is in fact identical with all first-class torpedoboats. The boiler is of the Yarrow water-tube type. She is driven by three turbines, one high-pressure and two low-pressure. The high-pressure turbine is placed on the central shaft and the two low-pressure turbines on the two outer shafts. There are thus three propeller shafts in all and three screws on each shaft, making nine screws in all.

The "Tarantula" is 160 feet long and 16 feet beam. Her designed speed was 24 knots and her horse power is estimated as a little over 2,500.



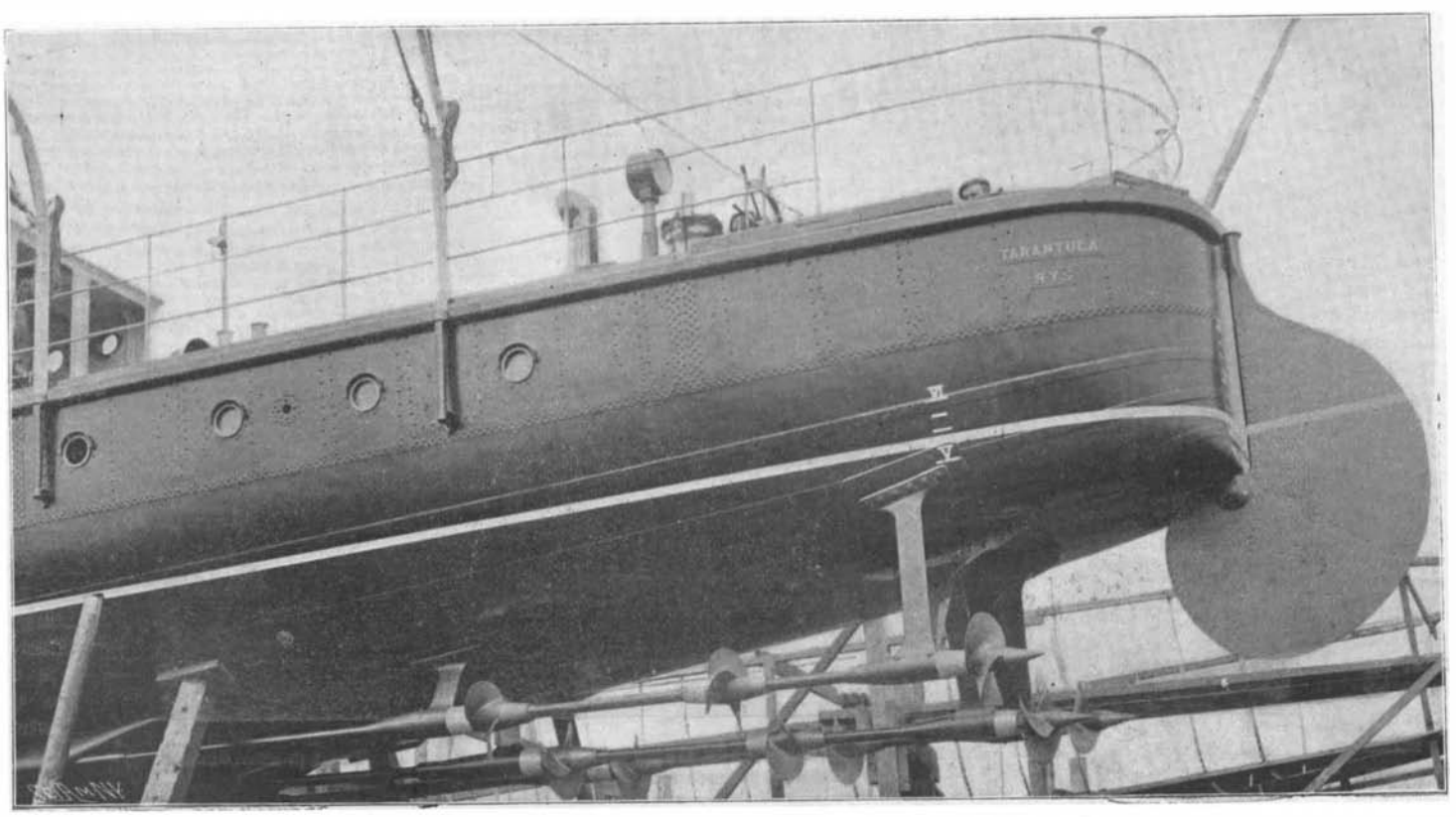
Length, 160 feet; beam, 16 feet; designed speed, 24 knots.

ENGLISH TURBINE YACHT "TARANTULA."

STERN VIEW SHOWING THE NINE PROPELLERS.

The "Emerald" will displace 756 tons and her indicated horse power is expected to be about 1,500. The propelling machinery consists of three sets of steam turbines, each driving one length of shafting—one central and two side shafts—one propeller of about 3 feet diameter being attached to the center, and two propellers, each of about 20 inches diameter, to each of the side propeller shafts. All the propellers of the "Emerald" are of manganese bronze. The hull has been specially strengthened to prevent any vibration in the structure from the great speed at which the shafts will revolve. Her over-all length is about 236 feet, beam 28 feet 8 inches and molded depth 18 feet 6 inches, giving a tonnage of about 756 tons yacht measurement, and her speed will be 16 knots. At her launching her owner, Sir Christopher Furness, remarked that about all the Hon. C. A. Parsons, Messrs. Stephen and himself had in view in fitting the "Emerald" with turbines was to put into the vessel such power as would enable her to steam at the highest rate compatible with entire freedom from vibration. He believed that object would be attained and, still further, he believed as a business man, and as one engaged with ships and shipping, that the steam turbine would practically revolutionize yachting and yacht owning in the United Kingdom.

The third yacht, the "Lorene," is being built to the order of Mr. A. L. Barber, of New York. She will displace about 1,400 tons and she will be 260 feet 8 inches long and 33 feet 3 inches beam. The hull and boilers are being constructed by Messrs. Ramage & Ferguson, of Leith, Scotland, and her turbine machinery will come from the Parsons Marine Steam Turbine Company. Mr. Barber's yacht is expected to be launched shortly.



VIEW OF PROPELLERS, SHAFTING AND BRACKETS OF "TARANTULA."

THE APPLICATION OF TURBINE PROPULSION TO PASSENGER VESSELS.

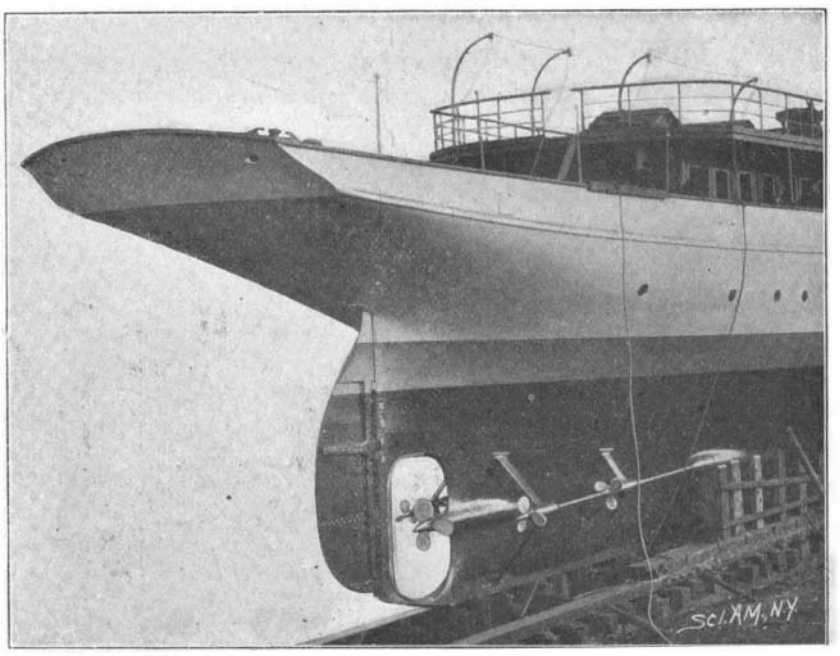
BY HERBERT C. FYFE.

Up to the present moment there have been built eight vessels that have been fitted with the Parsons marine steam turbine, while five are now in process of construction. The first was of course the little "Turbinia," launched in 1896 and in her day the fastest vessel afloat, her maximum horse power being 2,300 and speed 34½ knots. Next came H. M. S. "Viper," whose maximum speed was 39.113 knots or nearly 43 statute miles, the horse power being 12,300; and H. M. S. "Cobra," whose maximum was 35.6 knots. The "Viper" was lost during the British naval maneuvers in the summer of 1901, owing to her striking a rock in a thick fog, while the "Cobra" went down off the outer Dowsing Shoal while on her way from the Tyne to Portsmouth on the 1st of Sep-

tember, 1901. In 1901 the "King Edward" was built, the first passenger vessel to be fitted with the Parsons turbine. This year (1902) a companion vessel to the "King Edward," the "Queen Alexandra," has been built, as well as a destroyer, H. M. S. "Velox," fitted both with reciprocating engines and turbine machinery, and two turbine yachts, one for Col. McCalmont, M. P., the "Tarantula," and one for Sir Christopher Furness, the "Emerald." The turbine boats under construction are H. M. S. "Eden," destroyer, H. M. S. "Amethyst," third-class cruiser, one yacht for Mr. A. L. Barber, of New York, and two passenger steamers of about 8,000 horse power for the Chatham & Dover and Southeastern Railway Company, for the Dover-Calais Channel service, and the other for the London, Brighton and South Coast Railway for the Newhaven-Dieppe service.

It is to the "Queen Alexandra" that we desire to draw especial attention in the present article. The "Queen Alexandra" was built by Messrs. William Denny Brothers, of Dumbarton on Clyde, Scotland, who also built the "King Edward" and who are building the two new turbine cross channel boats of about 8,000 horse power. The machinery was made by the Parsons Marine Steam Turbine Company, of Wallsend-on-Tyne. When the "King Edward" started running in 1901, the Earl of Glasgow said that she would create a revolution in the coast passenger carrying trade on the Clyde, and she has certainly proved very successful, both as regards speed and coal consumption. On one season's work she ran ten more miles than a paddle-boat of about the same dimensions and speed (the "Duchess of Hamilton") with a coal consumption of 480 tons less. The "Queen Alexandra" is generally very similar to the "King Edward," but of larger dimensions, her length being 270 feet, breadth molded 32 feet and depth to promenade deck 18 feet 9 inches, and to main deck 11 feet 6 inches. In appearance she strongly resembles a small cross-channel steamer. A long shade deck, on which the boats are carried and upon which passengers are allowed to promenade, is a new feature of the vessel. The boiler, which is a large double-ended one having a funnel at each end, was supplied by Messrs. Denny & Company, and the turbines, of which there are three, by the Parsons Marine Steam Turbine Company, Wallsend-on-Tyne. The total ratio of steam expansion is about 125 fold as compared to the 8 to 16 fold in triple-expansion reciprocating engines. There are one high-pressure and two low-pressure turbines, the high-pressure one being in the center line. Each drives one shaft, the center one having one propeller and the outside ones two, making five propellers in all. At ordinary steaming rate the revolutions of the center shaft are 900 and each of the side shafts 1,000 per minute.

The "Queen Alexandra" on her trial made 21.63 knots, with the central turbine making 750 revolutions and the outside turbines 1,100 revolutions, thus beating the "King Edward," whose maximum is 20.40 knots, and proving herself to be the fastest excursion steamer in the world. Her usual speed is 21 knots. Both vessels only run on the Clyde during the summer months, and their running was regular and without a hitch. The "Queen Alexandra's" astern turbines which are placed inside the exhaust ends of the low-pressure turbine cylinders, reverse the action of the two outer shafts.

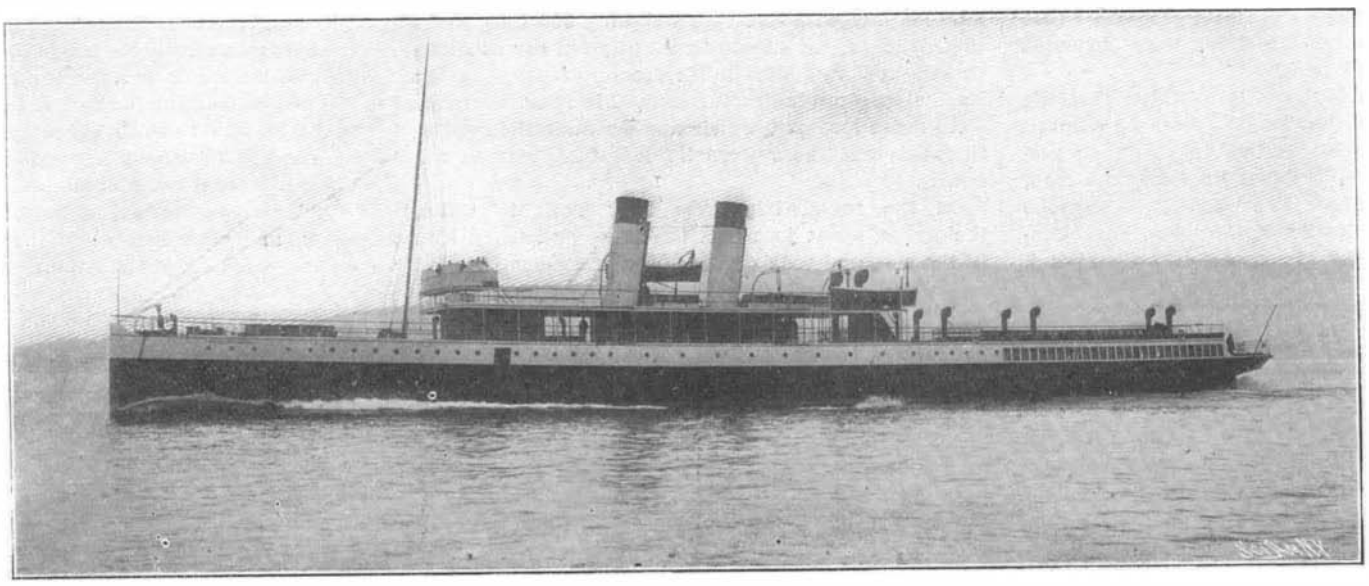


THE FIVE PROPELLERS OF TURBINE YACHT "EMERALD."

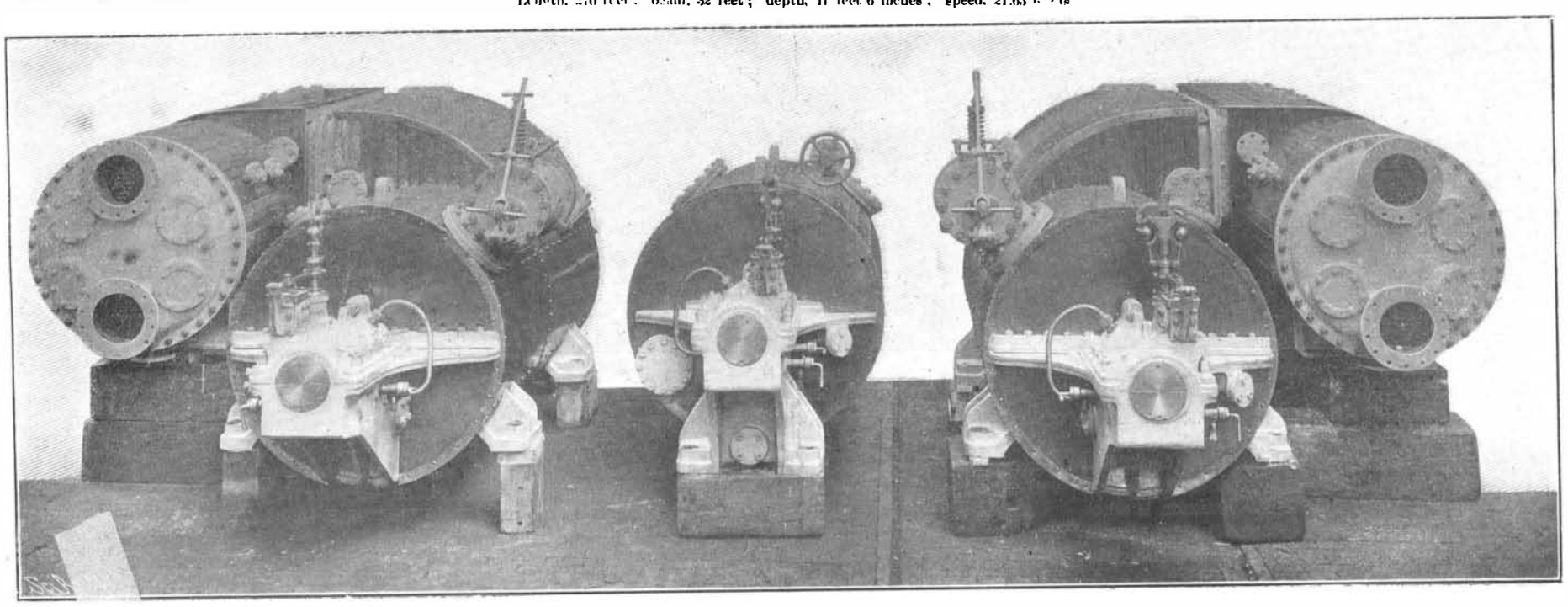
At the autumn meeting this year of the British Association at Belfast, the Hon. C. A. Parsons said that the adoption of the steam turbine system in vessels of large size, such as Atlantic liners, cruisers and battleships, would be attended with greater proportional advantages than in the case of smaller vessels. The large turbines would be cheaper to build, would be lighter, and would occupy less space in proportion to power. The design of such large turbines presented no difficulties beyond those already surmounted, and the greater size permitted the adoption of important features for the further reduction of coal consumption. He said that if the "King Edward" had been fitted with balanced twin triple-expansion engines of the most improved type, and of such size as would consume all the steam the existing boiler could make, the best speed she could possibly have obtained would have been 19.7 knots against the 20½ knots actually done by the "King Edward," showing an increase of speed of eight-tenths of a knot. This difference corresponds to a gain per indicated horse power in favor of the turbine steamer of 20 per cent. It would hardly have been possible to drive the "King Edward" at 20½ knots with ordinary engines, owing to the extra weight of the machinery and the necessarily increased displacement. The attempt to do so could only have resulted in the speed being obtained at an enormously increased fuel cost and a ruinous expenditure of coal and the like on service. The "Queen Alexandra's" coal consumption, it may be mentioned, has proved quite as economical as that of the "King Edward."

It may be interesting to mention that the Lancashire and Yorkshire Railway Company has recently sent an invitation to shipbuilding firms throughout the kingdom for designs and tenders for a new steamer for their Irish Sea service. Proposals are invited for the ordinary twin-screw reciprocating engines and also for steam turbine propelling engines. The speed desired is 19 knots. The question of propellers is one to which Mr. Parsons has devoted considerable attention, and he has made many experiments in order to discover both the right number of propellers and the best shape for each different class of vessel. The "Turbinia" originally had but one screw, which was driven by a single turbine engine at a speed of from 2,000 to 3,000 revolutions per minute.

Many experiments were made with screw propellers of various sizes and proportions, but the best speeds were quite disappointing. Mr. Parsons found that the excessive slip of the propellers beyond the calculated amount and their inefficiency indicated a want of sufficient blade area upon which the thrust necessary to drive the ship was distributed; in other words, that the water was torn into cavities behind the blades. A radical alteration was made in the "Turbinia." Three separate turbines were installed, one high pressure, one intermediate pressure and one low pressure, each of which drove one propeller shaft, with three screws on each shaft. The "Turbinia" was therefore driven through the water by nine screws, and the result was that she showed a great gain in speed; and held for a while the distinction of being the fastest vessel of any type in the world.



TURBINE PASSENGER STEAMER "QUEEN ALEXANDRA."
Length, 270 feet; beam, 32 feet; depth, 11 feet 6 inches; speed, 21.63 knots



TURBINES OF THE "QUEEN ALEXANDRA."