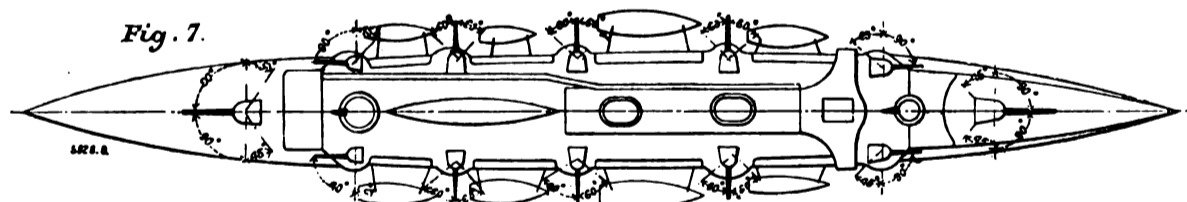
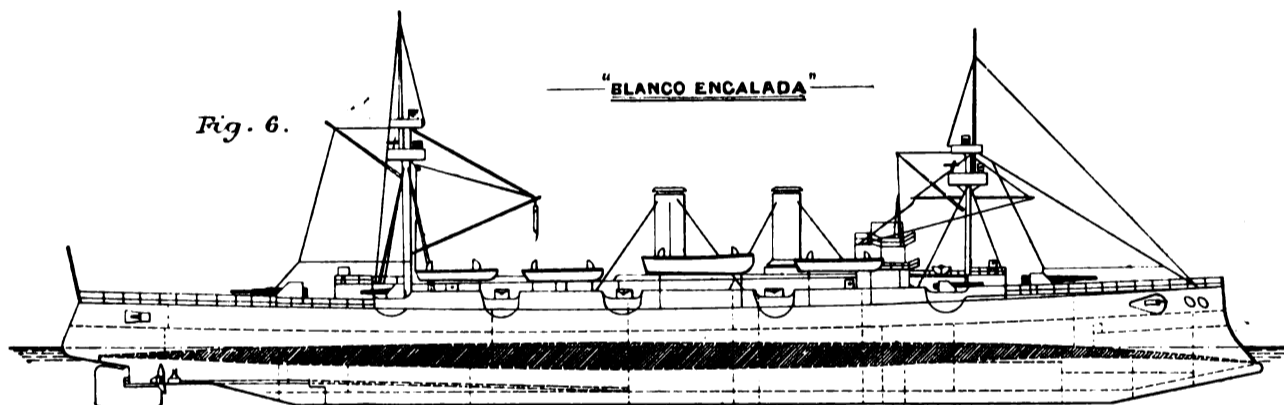
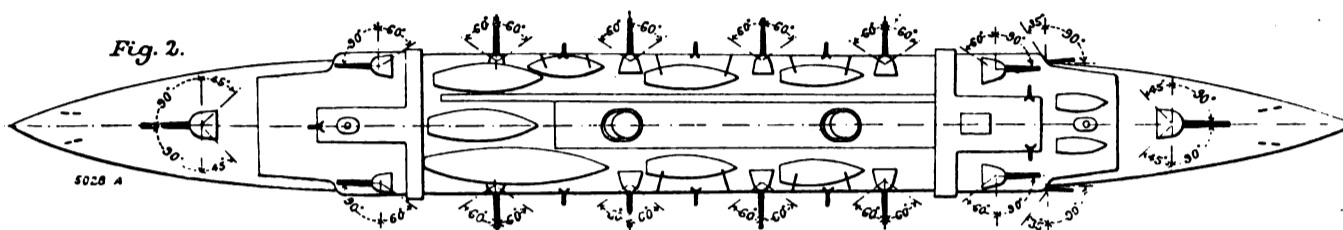
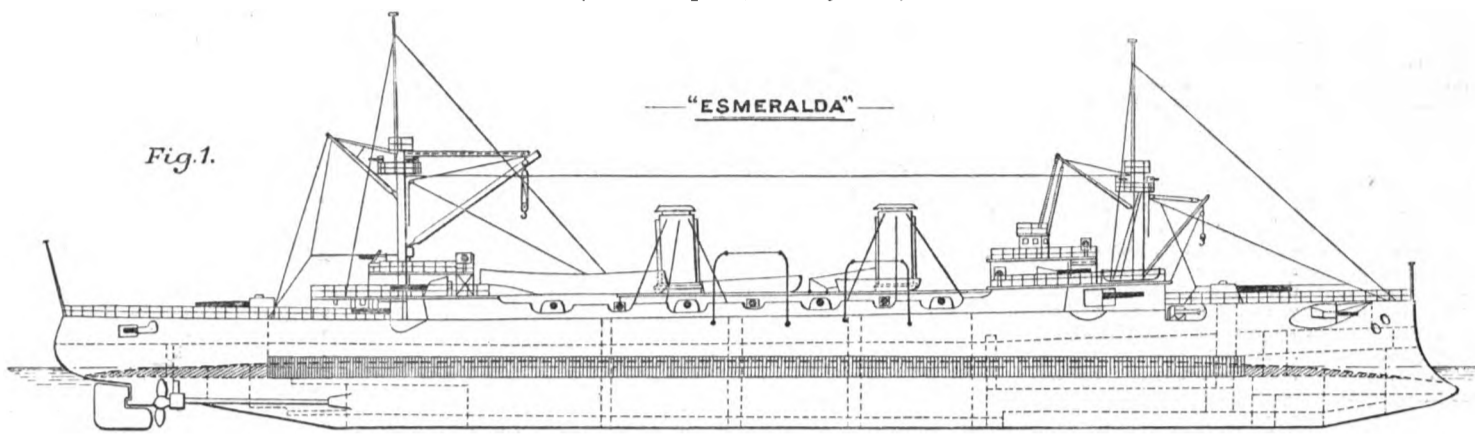


ELSWICK CRUISERS.

(For Description, see Page 156.)



At the annual meeting of the Federation of Master Cotton Spinners, held in Manchester at the close of last week, the report of the past year's working was adopted, the position and outlook being regarded as generally satisfactory. The president spoke of the long years of depression, which for duration and severity were unparalleled in its history. A year ago trade began to improve, and that improvement had continued and had been maintained. The outlook for the immediate future was satisfactory. He then referred to the amicable manner in which the wages question was dealt with this year, as in 1897, and expressed the opinion that the operatives never before realised how nearly identical were the interests of employers and employed, and he believed that in future they would work more harmoniously than ever. The amicable relations were mostly due to the Brooklands Agreement, and he hoped that the conciliation scheme now being drafted would bring about an equitable treaty of a permanent character. He then referred to the way in which the Compensation Act had been worked, the claims under which had been comparatively small. The premium rates quoted by the various companies were very large—too large to be undertaken—but by mutual arrangement the risks were small. Altogether the work of the Federation had been successful, although very arduous, and the joint committee of the two parties had worked together extremely well. The Federation represents 18,000,000 spindles, and it is hoped that the whole of the employers will shortly be enrolled as members. The great feature in the report,

and in the speech of the president, is the successful way in which the millowners and the operatives now deal with all labour questions, inclusive of accidents occurring in the course of employment. The general belief is that a Conciliation Board will now be formed which will deal with all such questions, and avert strikes and lock-outs in the future. This is the end aimed at.

The building trades dispute may now be said to have been settled. In its later stages the plasterers have acted alone, and the other branches in combination, the latter endeavouring to arrange a scheme of conciliation for dealing with labour disputes. At the conference held towards the end of last week, at the Salisbury Hotel, a general scheme for the establishment of a Board of Conciliation was adopted. At the next conference, in about a month's time, the rules are to be submitted and ratified. The arrangement arrived at so far has had the effect of putting an end to the Yorkshire lock-out, this being one of the conditions of such an arrangement. The important feature in connection with this scheme is that it affects the building trades generally throughout the country. The board will represent the carpenters and joiners, masons, bricklayers, plumbers, painters, and now also the plasterers. Probably the labourers will also be included—the whole representing a vast body of organised and skilled labour.

The dispute with the plasterers may also be said to have come to an end. At a conference held at the

Salisbury Hotel last week various points at issue were discussed, some questions being held over for another meeting. The question of rates of wages in Manchester, and the differential rates at Rochdale, Ashton-under-Lyne, and Stalybridge, was referred to the Lancashire and Cheshire Federation, the secretary of the plasterers to visit the city of Manchester in reference thereto, and report thereon. Practically, therefore, the dispute is at an end. It is to be hoped that the principle of conciliation will now govern all branches of the building trades, and thus avert strikes and lock-outs which have in the past been so frequent, and on a large scale. Every step in this direction increases the force of the movement. It is more difficult to start conciliation than it is to continue it when once started. The strides in this direction recently have been great and important.

The condition of the engineering trades throughout Lancashire continues to be good, all the leading departments being fully employed. Machine tool-makers are exceptionally busy, a large export trade being done, particularly to China. Locomotive builders are exceedingly pressed with orders, and so also are boiler-makers and makers of electrical cranes. Ironfounders, smiths, and machinists generally are also busy. In some cases it is reported that orders are not coming forward so freely, but this probably is due to the advance in prices, some customers holding back in the hope of some abatement. But there does not at present appear to be any chance of this. For

this reason some makers of tools are content to keep up a stock rather than diminish the output, as customers can only wait a certain time or buy elsewhere. In the iron trade there is little change. The advance in the price of pig iron has, perhaps, tended to check buying, but makers are well sold and prices are firm. The demand for finished iron is larger than for many years past, and the indications are that it will be maintained for some time. The steel trade is exceptionally brisk, and nut and bolt makers are very busy at advanced prices. Altogether the position is favourable and the outlook is good.

The wages question in mid-Lancashire looks rather threatening, as notices have been tendered to cease work unless an advance of 1s. per week is conceded. But the chances are that a settlement will be arrived at, as the employers agreed to give that advance if trade continued good in July. The question has been on hand ever since January, and it is not very likely that at the last moment a stoppage will be risked, except for very good reasons. At a recent meeting the employers stated that trade did not warrant the advance, but things have not gone worse since then.

In the Wolverhampton district the demand for iron and steel is far in excess of the supply, pig iron being very scarce, the hot weather having decreased the output. Quotations are very firm all round, but the Ironmasters' Association has not given any sign of a further advance. Steel manufacturers report heavy bookings and large inquiries for future supplies. Indeed there seems to be no abatement in the demand for material of nearly all kinds and qualities. The local trades, users of iron and steel, such as the engineers, ironfounders, boiler makers, smiths, bridge and girder constructors, tank makers, and the workers at the railway sheds, are all very busy. It is the same for the most part in the hardware trades, both light and heavy. There is scarcely an industry that can rightfully complain of slackness, though some are less busy than others. The heat has been so great that at the mills and forges, as well as at the furnaces, the men have had to give in for a spell for health's sake. The advance in the men's wages will doubtless affect the rates of bar iron of the best qualities, probably this week.

In the Birmingham district the iron and steel trades are exceedingly busy. Certain specialities of bar iron have been in great request for Government purposes, some qualities realising exceedingly heavy prices per ton. Unmarked bars continue in good request at the advanced rates, even on the basis of no discounts. Pig-iron makers are said to have sold in advance the entire output for the current quarter. Engineers, ironfounders, smiths, boiler makers, &c., continue to be well employed, and so are most of the other iron, steel, and metal-using industries. There is scarcely an industry that can complain of slackness, though in a few cases they may complain of comparative dullness in view of the great activity in certain branches. There is peace in all the chief centres of industry throughout these districts.

The miners of South Wales commence the current month with an advance of 1½ per cent., making the total equal to 25 per cent. above the standard of 1879. This advance is given under the old sliding scale.

While old-age pensions are being suggested at 65 years of age, it appears that labourers and gardeners in the Royal parks are being discharged at 60 years of age. How are they to live to 65 to get the pension? As a matter of fact workmen at the age of 60 find more and more difficulty in finding employment, especially if they have been in one firm for a long time. Even with the roving class when age is apparent, the men find a difficulty. Strength and endurance are pitted against age and experience, often to the latter's disadvantage.

One of the saddest things in connection with labour disputes is the increasing violence, especially in America, Australia, and other new countries where labour has an equal voice in all matters pertaining to legislation. The rioting and outrages at Cleveland, Ohio, U.S., are sad from every point of view. The wrecking of cars by dynamite and the maiming of innocent people who happened to be in them is a mode of argument not to be tolerated. In all such conflicts the innocent suffer, and in case of death the crime is murder. If the mob is faced with Gatling guns the fault lies with the rioters, not with the authorities. The mob was furious with the conductor who shot a boy, but what of the miscreant who blew up a car, injuring fourteen persons, four of them most seriously? The labourers' strike at Leicester was bad enough, and might have ended disastrously, a bad example enough in the old country. Violence cannot be defended on any ground, and, as a rule, it ends badly for the men. In England we are learning,

slowly it may be, but surely, that amicable settlements are the best for all parties in labour disputes.

The labour war in Denmark is not yet settled; the men are showing great persistency in standing out. The English trades are sending some assistance, but it is not much for the number of men requiring assistance. But the Danish men are peaceful in their attitude, action, and language. So far no riotous scenes are reported.

ELSWICK CRUISERS.\*

By Mr. PHILIP WATTS, Member of Council.

I PURPOSE in this paper giving some particulars of Elswick cruisers built during the last ten years.

In the *Esmeralda*, Figs. 1 and 2, page 156, built in 1882-3, from designs by Mr. George Rendel, considerable advance was unquestionably made towards what may be called the modern protected cruiser. The features which it was sought especially to develop in the design of this vessel were, first, great speed and manœuvring power;

particulars, armament, protection, &c., of a number of typical cruisers completed at Elswick during the past ten years, including those of the *Piemonte*, which were also given in my paper to this Institution at the spring meetings in 1889; the illustrations show some of these vessels in outline, and particularly the disposition of armament, armour, &c.

The vessels given in Table II. have protective decks and no side armour; those in Table III. have side armour. The *Piemonte* and *Yoshino* (Figs. 3, 4, and 5) have each a poop and fore-castle. The other two vessels in Table II., which are upwards of 4500 tons displacement, and the three vessels in Table III., which are upwards of 7000 tons displacement, are all flush-deck ships. The *Piemonte* had only a single bottom, as had also the *25 de Mayo* and the *9 de Julio*, but the *Yoshino* and all other cruisers since built at Elswick, some five-and-twenty in all, have been provided with inner bottoms.

*Machinery, Speed, &c.*—The vessels given in Table I. were provided with horizontal engines; but all the vessels built by my firm during the past ten years, including those shown on Tables II. and III., have had vertical engines wholly below the water line. I believe the *Piemonte*, laid down in 1887, was the first cruiser

TABLE I.

	"Esmeralda." (Chilian.)	"Naniwa" and "Takachiho." (Japanese.)	"Dogali." (Italian.)	"Chih Yuan" and "Ching Yuan." (Chinese.)
Year of launch .. .. .	1883.	1885.	1885.	1886.
Length between perpendiculars	270 ft.	300 ft.	250 ft.	250 ft.
Breadth, moulded .. .. .	42 "	46 "	37 "	38 "
Draught, mean .. .. .	18 ft. 6 in.	18 ft. 6 in.	14 ft. 6 in.	15 "
Displacement, in tons .. .	2950	3727	2050	2300
Indicated horse-power—				
With forced draught .. .	6083	7120	7179	6850
With open stokeholds .. .			5012	
Speed, in knots—				
With forced draught .. .	18.3	18.77	19.66	18.5
With open stokeholds .. .			17.68	
Armament .. .. .	Two 10-in. B.L.R. guns; six 6-in. B.L.R. guns; two 6-pdr. R.F. guns; five 37-mm. Hotchkiss; two Gardners	Two 10-in. B.L. guns; six 6-in. B.L. guns; two 6-pdr. R.F. guns; ten 1-in. Nordenfelt; four Gatlings; four torpedo tubes	Six 6-in. B.L. guns; nine 6-pdr. Hotchkiss; six Gatlings; four tor- pedo tubes	Three 8-in. B.L. guns; two 6-in. B.L. guns; eight 6-pdr. Hotchkiss; two 3-pdr. Hotchkiss; eight 1-pdr. Hotchkiss; six Gatlings; four tor- pedo tubes
Protective deck—				
Thickness on slopes .. .	1 in.	3 in.	2 in.	4 in.
Thickness, horizontal parts ..	1 "	2 "	1 "	2 "
Conning tower .. .. .	1 "	2 "	2 "	3 "
Coal supply, normal .. .. .	400 tons	350 tons	160 tons	200 tons
" bunkers full .. .. .	600 "	600 "	480 "	520 "

TABLE II.

	"Piemonte." (Italian.)	"Yoshino." (Japanese.)	"Blanco Encalada." (Chilian.)	"Buenos Aires." (Argent ne.)
Year of launch .. .. .	1888.	1892.	1893.	1895.
Length between perpendiculars	310 ft.	360 ft.	370 ft.	396 ft.
Breadth, moulded .. .. .	38 "	46 ft. 6 in.	45 ft. 9 in.	46 ft. 6 in.
Draught, mean .. .. .	15 "	17 ft.	18 " 5 "	17 " 11 "
Displacement, in tons .. .	2500	4180	4668	4788
Indicated horse-power—				
With forced draught .. .	12 786	15,750	14,500	
With open stokeholds .. .	7,060	10,320	9,500	13,292
Speed in knots—				
With forced draught .. .	22.3	23.0	22.8	23.20
With open stokeholds .. .	20.41	21.6	21.7	
Armament .. .. .	Six 6 in. Q.-F. guns; six 4.7-in. Q.-F. guns; ten 6-pdr. Hotchkiss; six 1-pdr. Hotchkiss; four 10-mm. Maxim; three torpedo tubes	Four 6-in. Q.-F. guns; eight 4.7-in. Q.-F. guns; twenty-two 3- pdr. Q.-F. guns; five torpedo tubes	Two 8-in. Q.-F. guns; ten 6-in. Q.-F. guns; twelve 3-pdr. Q.-F. guns; ten 1-pdr. Q.-F. guns; two Gatlings; five torpedo tubes	Two 8-in. Q.-F. guns; four 6-in. Q.-F. guns; Six 4.7-in. Q.-F. guns; Sixteen 3-pdr. Q.-F. guns; six 1-pdr. Q.-F. guns; five torpedo tubes
Protective deck—				
Thickness on slopes .. .. .	3 in.	4½ in. and 3½ in.	4 in. and 3 in.	3 in.
Thickness, horizontal parts ..	1 "	1½ in.	1½ in.	1½ "
Conning tower .. .. .	3 "	3 "	6 "	6 "
Coal supply, normal .. .. .	200 tons	350 tons	350 tons	350 tons
" bunkers full .. .. .	400 "	1000 "	866 "	1000 "

second, exceptional power of attack; third, protection other than by side armour.

Lord Armstrong advocated this class of vessel in the early days of protected cruisers almost to the exclusion of armoureds, and, before the introduction of high explosives, there can be no doubt that such vessels were very much more on an equality with armoureds, as fighting ships, than they have been since.

Particulars of the *Esmeralda* are given in Table I. She was 270 ft. long, of 2950 tons displacement. Her engines were of 6083 horse-power, and she attained a speed of 18.3 knots. Her armament consisted of two 10-in. guns, six 6-in. guns, and a number of smaller guns. Her machinery, magazines, &c., were wholly below the water line, and were protected by an arched deck of 1-in. armour from stem to stern.

After the *Esmeralda* the *Giovanni Bausan* was built, practically from the same designs, and later the *Naniwa*, *Kan*, *Dogali*, *Chih Yuan*, and *Ching Yuan* were also built by my firm from designs by my predecessor, Sir William White. The *Dogali* was of 2050 tons displacement, some 950 tons less than the *Esmeralda*, but she steamed at 19.6 knots speed. Her armament consisted of six 6-in. guns and a number of smaller guns, and her armour deck, which extended from stem to stern, consisted of a central flat portion 1 in. thick, and sloping sides 2 in. thick.

In Tables II. and III. are given the dimensions, par-

ticulars, armament, protection, &c., of a number of typical cruisers completed at Elswick during the past ten years, including those of the *Piemonte*, which were also given in my paper to this Institution at the spring meetings in 1889; the illustrations show some of these vessels in outline, and particularly the disposition of armament, armour, &c.

The vessels given in Table II. have protective decks and no side armour; those in Table III. have side armour. The *Piemonte* and *Yoshino* (Figs. 3, 4, and 5) have each a poop and fore-castle. The other two vessels in Table II., which are upwards of 4500 tons displacement, and the three vessels in Table III., which are upwards of 7000 tons displacement, are all flush-deck ships. The *Piemonte* had only a single bottom, as had also the *25 de Mayo* and the *9 de Julio*, but the *Yoshino* and all other cruisers since built at Elswick, some five-and-twenty in all, have been provided with inner bottoms.

*Machinery, Speed, &c.*—The vessels given in Table I. were provided with horizontal engines; but all the vessels built by my firm during the past ten years, including those shown on Tables II. and III., have had vertical engines wholly below the water line. I believe the *Piemonte*, laid down in 1887, was the first cruiser

\* Paper read before the Institution of Naval Architects.

\* See ENGINEERING, vol. xlvi., page 568.

All the vessels given in Table II. and in Table III. have been engined by Messrs. Humphrys, Tennant, and Co. They all have boilers of the ordinary cylindrical type, having a working pressure of 155 lb. per square inch, excepting the O'Higgins, which has been fitted with Belleville boilers. The boiler tubes in these vessels have been fitted with Messrs. Humphrys' patent tube connections.

In the Piemonte, as I have already stated, a stroke of 2 ft. 3 in. was adopted, and 7050 indicated horse-power were realised on the trial with open stokeholds, and 12,780 indicated horse-power with forced draught. The number

horse-power, with about 145 revolutions, and a piston speed of about 940 ft. per minute, and with less than  $1\frac{1}{2}$  in. air pressure in the stokeholds the engines developed upwards of 20,000 indicated horse-power, with about 160 revolutions and a piston speed of about 1040 ft. per minute.

It may be remarked that with this quick-running machinery low powers may be developed more economically than in slower running machinery, as they are developed in smaller engines. In this respect increased piston speeds and revolutions for full powers appear pre-

our agent, he had unwisely argued that our undertaking to give the additional half-knot could make no possible difference to us. These two vessels, at their official trials, exceeded slightly their contract speed. The speeds given for the vessels in Table II. are the means obtained over a number of hours. Natural draught and open stokehold speeds have usually been taken over six hours, and forced draught speeds have usually been taken over three or four hours. Curves of speed corresponding to revolutions have been constructed from data obtained by running the vessels over the Admiralty measured mile at the mouth

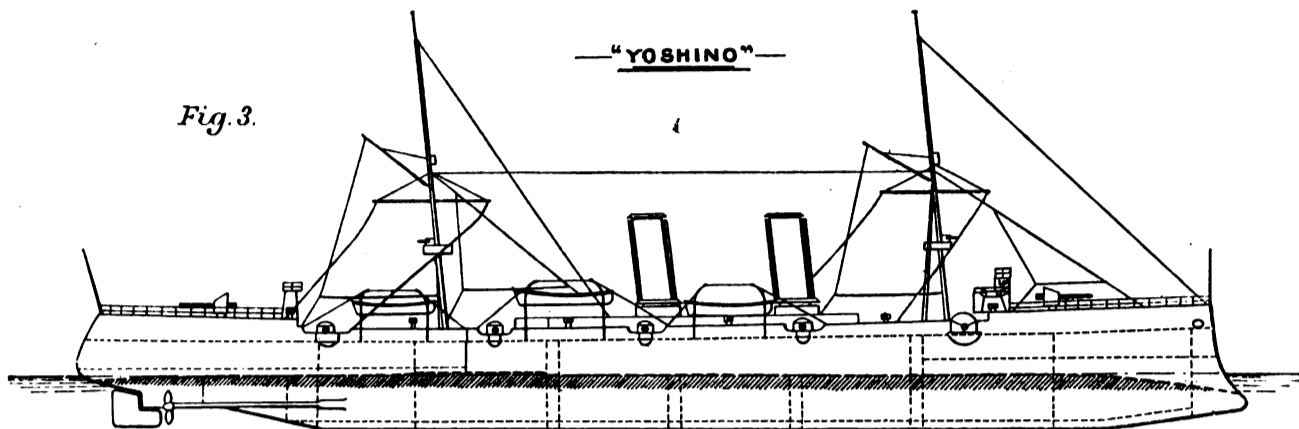


Fig. 3.

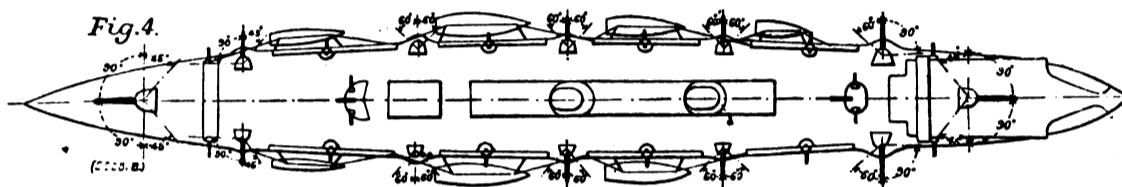


Fig. 4.

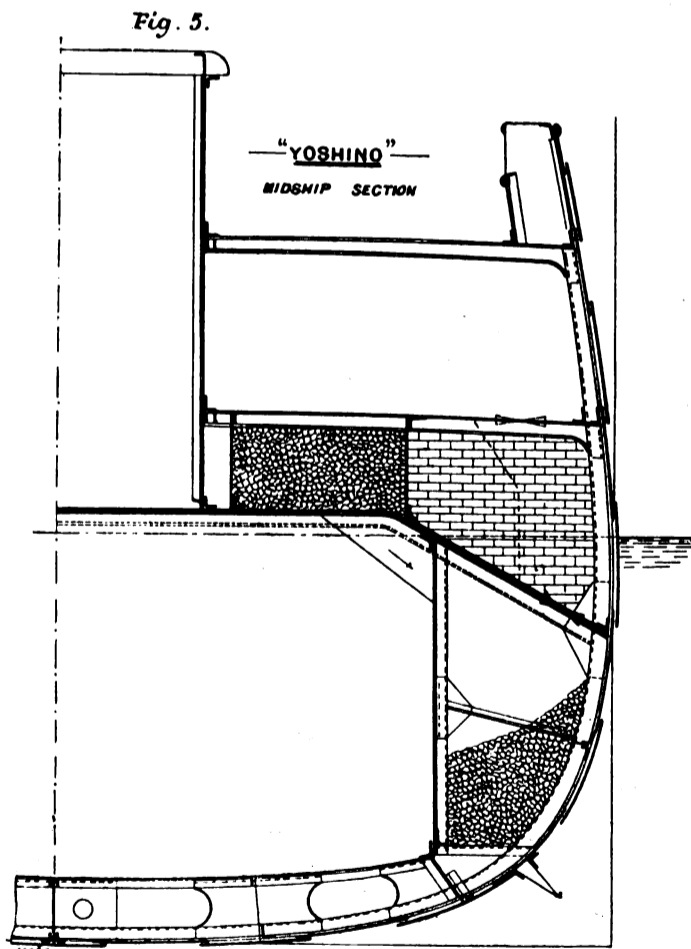


Fig. 5.

of revolutions corresponding to these powers were respectively 160 and 185, and the corresponding piston speeds 720 ft. and 832 ft. per minute respectively. In the 25 de Mayo, 9 de Julio, and Blanco Encalada (Figs. 6 and 7, page 155), the low-pressure cylinders were each 66 in. in diameter, and the stroke 2 ft. 6 in. In the Yoshino and Takasago the stroke was 2 ft. 9 in., and in the Buenos Aires the stroke was 3 ft., while in each of the vessels given in Table III., the Esmeralda, and O'Higgins (Figs. 8 and 9) Asama and Tokiwa (Figs. 10 and 11) the stroke was 3 ft. 3 in. In all of these vessels and others, at full speed with open stokeholds, the number of revolutions varied from 155 to 185 per minute. In the Tokiwa, with open stokeholds, the engines developed about 15,000

ferable to the increased boiler pressures which have been adopted in many recent vessels.

With reference to the speed of these vessels, our rule at Elswick has been to aim at giving half-a-knot more speed than we have undertaken by contract, and with one exception we have succeeded in doing this; the one exception being the case of two cruisers recently built for a distant country, in completing the contract for which our agent exceeded his instructions, and undertook to give the half-knot which we had in reserve. There were no penalties in the case, the purchasers only reserving the right of refusing the vessel in case a certain speed, considerably below the contract speed, should not be obtained; and as this minimum speed was not changed by

of the Tyne, and these curves have been used in determining the speed over the four or six hours' run from the mean number of revolutions of the engines during these runs. Four consecutive runs with and against the tide have been made over the measured mile under the rules which hold for the British Navy. The Commissions receiving the ships have taken the times of the runs and the revolutions of the engines. The times and revolutions on the runs have also been taken by my staff, the latter electrically against a time scale on a continuous sheet of paper passing over a cylinder.

In vessels of from 3000 to 5000 tons displacement, a speed of about  $21\frac{1}{2}$  knots has been obtained with open stokeholds, and a knot or so more with forced draught. The 25 de Mayo, of 3100 tons displacement, obtained  $21\frac{1}{2}$  knots with open stokeholds, and 22.6 with forced draught. The 9 de Julio, of 3500 tons displacement, obtained  $21\frac{1}{2}$  knots with open stokeholds, and  $22\frac{1}{2}$  with forced draught. The Yoshino, of 4180 tons displacement, obtained  $21\frac{1}{2}$  knots with open stokeholds, and 23 knots with forced draught. The Blanco Encalada, of 4560 tons displacement, obtained 21.7 knots with open stokeholds, and 22.8 knots with forced draught. Exceptionally high speed was provided in the Buenos Aires, of 4800 tons displacement; she steamed 23.2 knots with open stokeholds, but no official trial with forced draught was made.

The Piemonte, and some other vessels, of less than 3000 tons displacement, have been provided with speeds lower than  $21\frac{1}{2}$  knots. The Piemonte herself, of 2500 tons displacement, attained a speed of 20.6 knots with open stokeholds, and 22.4 knots with forced draught.

Of the first-class cruisers given in Table III., the Esmeralda, of 7000 tons displacement, attained a speed of 23 knots with open stokeholds; the O'Higgins, of 8500 tons displacement, attained a speed of  $21\frac{1}{2}$  knots with open stokeholds; and the Tokiwa, of 9700 tons displacement, attained a speed of 20.9 knots with open stokeholds, and 23.1 knots with forced draught.

With reference to the manoeuvring power of these vessels, the resistance to turning has been reduced as much as possible, chiefly by the removal of the after deadwood, and in some cases of ships even exceptionally long and of deep draught, remarkable results have been obtained. In Table IV. the diameter of the circles turned in by several of the vessels given in Tables II. and III. are recorded, together with the length of the ship over all, ratio of the diameter of the circle turned in to the length of the ship, and time required to turn through 180 deg. at full speed. Each of these vessels can turn in about  $3\frac{1}{2}$  lengths, and reverse their course in about two minutes.

We have received many reports on the steaming performances of our ships during the past ten years, and without any exception they have been of a most encouraging and satisfactory nature. In some cases speeds exceeding those attained on trial have been reached, and long distances involving many days' steaming have been frequently traversed at full speed. One naturally looks to the stress of war for bringing to light defects in warships, but although we have learnt a great deal from recent wars, the steaming performances of the ships have always been most highly spoken of. Admiral Ito, who commanded during the recent war between Japan and China, wrote us: "In no less a degree do I recognise the important part played by the ships which were built

in your yard, and I cannot here miss the opportunity of expressing to you and to my friends at Elswick my high sense of admiration for the behaviour of these magnificent cruisers. Throughout this war they have never failed to fulfil our strictest expectations, and they have been of immense service to us in executing the manifold duties of a modern naval operation." With reference to Yoshino, Admiral Tsuboi, whose flag she bore during the war, has since unfortunately died, but Admiral Dewa, who was Chief Staff Officer of the Flying Squadron during the war, states that being "the fastest

armaments of the 25 de Mayo, Blanco Encalada, and Buenos Aires include two 8-in. guns. The Blanco Encalada carries also ten 6-in. guns, and the Buenos Aires four 6-in. guns and six 4.7 guns. All of these vessels carry also a large number of smaller guns, and all carry five above-water torpedo tubes excepting the Piemonte, which carries only three. The whole of the main armament is in each case carried on open decks, the gunners being protected only by strong shields carried on the guns themselves.

Passing to Table III., the armaments of the vessels

Ten 6-pounder quick-firing guns.  
Four machine guns.  
Two under-water broadside torpedo tubes.  
One above-water torpedo tube.

The Asama and Tokiwa, of 9700 tons displacement, carry:

Four 8-in. quick-firing guns.  
Fourteen 6-in. quick-firing guns.  
Twelve 12-pounder quick-firing guns.  
Seven 2½-pounder " " "

Fig. 8.

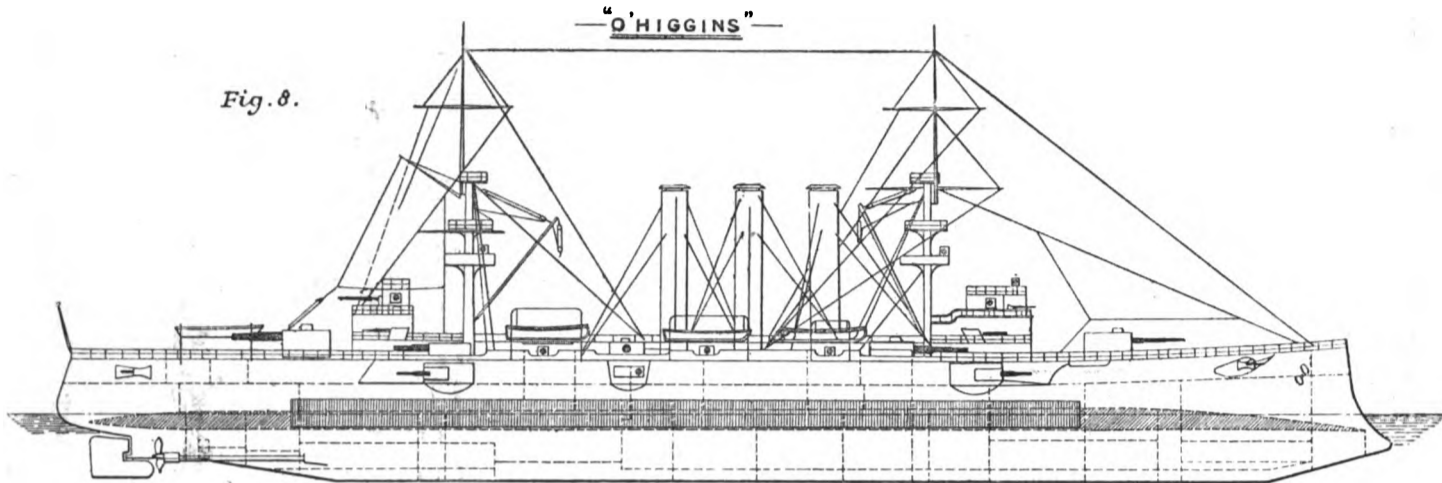


Fig. 9.

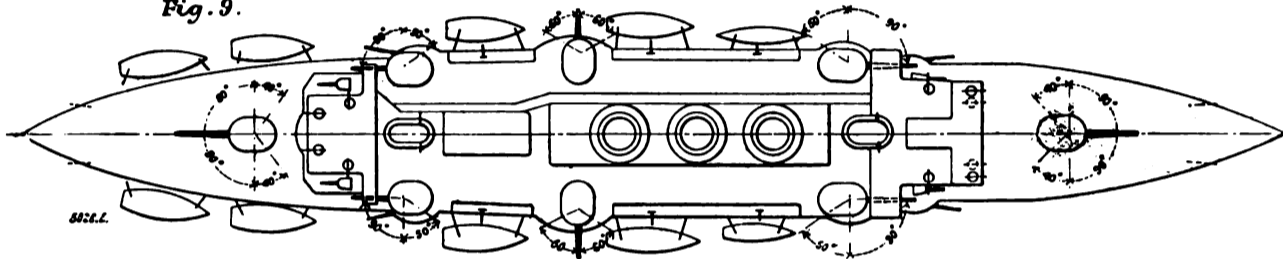


Fig. 10.

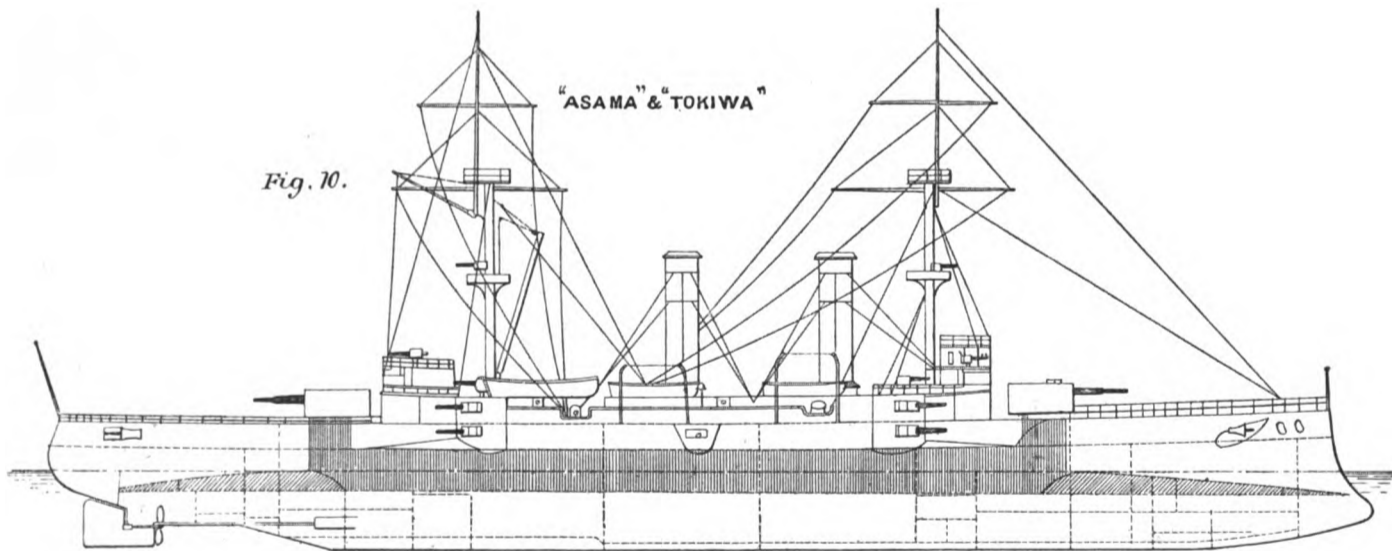
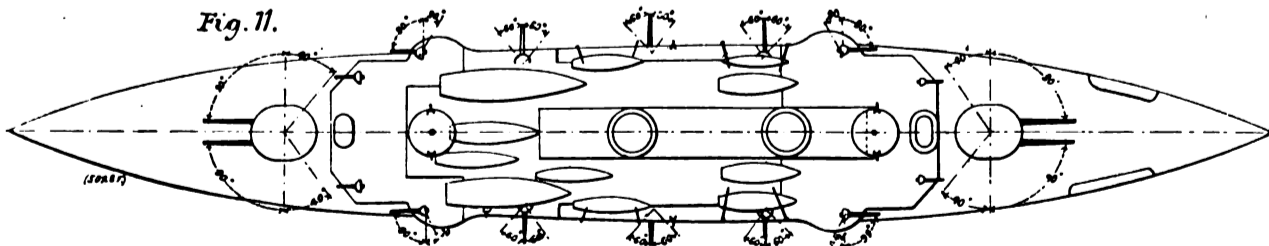


Fig. 11.



vessel in the fleet, and being armed with quick-firing guns and smokeless powder, she was taxed to the uttermost throughout the whole war, and performed numerous long distance runs extending over many days at speeds of 21 knots and upwards, and the machinery never failed or gave trouble or anxiety on any occasion."

**Armaments.**—The Piemonte was the first ship provided with quick-firing guns, and with her powerful main armament of six 6-in. guns and six 4.7-in. guns her power of attack was at the time greater than that possessed by any other cruiser afloat, and many other vessels of twice her size. The Yoshino, 9 de Julio, and several other vessels were provided with similar armaments, while the main

here shown are still heavier. The Esmeralda, of 7000 tons displacement, carries:

Two 8-in. quick-firing guns.  
Sixteen 6-in. quick-firing guns.  
Eight 12-pounder quick-firing guns.  
Ten 6-pounder quick-firing guns.  
Four Maxims and three above-water torpedo tubes.  
The O'Higgins, of 8500 tons displacement, carries:  
Four 8-in. quick-firing guns.  
Ten 6-in. quick-firing guns.  
Four 4.7-in. quick-firing guns.  
Ten 12-pounder quick-firing guns.

Four under-water broadside torpedo tubes.  
One above-water armoured torpedo tube.

The whole of the guns of the Esmeralda (Figs. 1 and 2) are carried on the upper deck, except two 6-in. guns carried upon a spar deck forwards, and two 6-in. guns carried upon a spar deck aft, and four 12-pounders, two forward and two aft on the main deck. The arrangement is such that one 8-in. gun can fire all round the bow from 45 deg. abaft the beam on one side to 45 deg. abaft the beam on the other side; and the other 8-in. gun can fire all round the stern from 45 deg. before the beam on one side to 45 deg. before the beam on the other side. All the

TABLE III.

	"Esmeralda," (Chilian.)	"O'Higgins," (Chilian.)	"Asama" and "Tokiwa," (Japanese.)
Year of launch .. .. .	1896.	1897.	1898.
Length between perpendiculars .. .. .	436 ft.	412 ft.	408 ft.
Breadth moulded .. .. .	52 ft. 5 in.	62 ft. 9 in.	67 "
Draught, mean .. .. .	20 " 6 "	22 ft.	24 ft. 4 in.
Displacement in tons .. .. .	7000	8,500,	9,700
Indicated horse-power with forced draught .. .. .	16,020	15,930	20,550
Speed, in knots, with forced draught .. .. .	23.03	21.48	23.09
Armament .. .. .	Two 8-in. Q.-F. guns; sixteen 6-in. Q.-F. guns; eight 12-pdr. Q.-F. guns; ten 6-pdr. Q.-F. guns; four Maxims; three torpedo tubes (above water).	Four 8-in. Q.-F. guns; ten 6-in. Q.-F. guns; four 4.7-in. Q.-F. guns; ten 12-pdr. Q.-F. guns; ten 6-pdr. Q.-F. guns; four machine guns; three torpedo tubes (two submerged).	Four 8-in. Q.-F. guns; fourteen 6-in. Q.-F. guns; twelve 12-pdr. Q.-F. guns; seven 2½-pdr. Q.-F. guns; five torpedo tubes (one forward, armoured, and four submerged).
Protective deck—			
Thickness on slopes .. .. .	1½ in. to 2 in. at ends	1½ in. to 3 in. at ends	2 in.
Thickness on horizontal parts .. .. .	1½ in. to 2 in. at ends	1½ in. to 2 in. at ends	2 "
Conning tower .. .. .	8 in.	9 in.	14 "
Armour—			
Belt (length) .. .. .	328 ft.	260 ft.	414 ft.
" (width) .. .. .	7 "	7 "	7 "
" (thickness) .. .. .	6 in.	7 in. and 5 in.	7 in. and 3½ in.
Bulkheads .. .. .	6 "	5 in.	3½ in.
Citadel (length) .. .. .	..	..	260 ft.
" (thickness) .. .. .	..	..	5 in.
Barbettes .. .. .	..	..	6 "
Casemates .. .. .	..	6 in.	6 "
Coal supply, normal .. .. .	550 tons	550 tons	600 tons
" bunkers .. .. .	1300 "	1200 "	1200 "

TABLE IV.—Turning Circles.

Vessel.	L. Length of Under- Water Body.	D. Diameter of Circle.	Ratio D L	Time to Turn through 180 Deg.
Yoshino .. .. .	ft. 388	ft. 1205	3.1	min. sec. 1 54
Blanco .. .. .	398	1275	3.2	2 5
Ministro Zenteno .. .. .	355	1145	3.23	1 50
O'Higgins .. .. .	446	1540	3.45	2 6½
Asama .. .. .	442	1470	3.33	2 0

6-in. guns are placed on the broadside, but four of them, including the two on the spar-deck forward, can fire directly ahead and 5 deg. across the bow, and four of them, including the two on the spar-deck aft, can fire directly astern and 5 deg. across the stern. The gunners are protected only by gun-shields carried by the guns themselves.

In the O'Higgins (Figs. 8 and 9) the four 8-in. guns, and four of the 6-in. guns, are carried on the upper deck in gun-houses, which completely protect the gunners and the gun mounts, and the remaining six of the 6-in. guns are carried on the main deck in casemates. The gun-houses and casemates of the 6-in. guns have 6-in. fronts and 5-in. backs, and the gun-houses of the 8-in. guns have 7-in. fronts and 5-in. backs. Two of the 8-in. guns are placed on the middle line, one forward and one aft, with arcs of training as in the Esmeralda, the other two are placed on the broadside, with arcs of training from right ahead to some 50 deg. abaft the beam. The two aftermost 6-in. guns in gun-houses have similar arcs of training, i.e., from right astern to 60 deg. before the beam. Of the 6-in. guns in casemates on the main deck two can fire directly ahead and two can fire directly astern. Two of the 4.7-in. guns are mounted on a spar-deck forward, the other two are similarly mounted aft. There are thus: Three 8-in. guns, two 6-in. guns, and two 4.7-in. guns, besides a number of smaller guns, which can fire directly ahead; and one 8-in. gun, four 6-in. guns, and two 4.7-in. guns, besides a number of smaller guns which can fire directly astern; and three 8-in. guns, six 6-in. guns, and two 4.7-in. guns, with a number of smaller guns, can fire on either broadside.

In the Asama and Tokiwa (Figs. 10 and 11), two 8-in. guns are twin-mounted on the middle line forward in a strong gun-house of 6-in. armour, with an arc of training around the bow of from 40 deg. abaft the beam on one side to the same angle abaft the beam on the other side, and the other two 8-in. guns are similarly mounted aft. Four of the 6-in. guns are mounted on the upper deck in 6-in. armoured casemates, six are mounted on the main deck, also in 6-in. armoured casemates, and the remaining four are mounted on the upper deck in the open, the gunners being only protected by the gun-shields. Four of the 6-in. guns can fire directly ahead, and four directly astern, and two 8-in. guns in pairs and four 6-in. guns can fire directly astern, and the four 8-in. guns in pairs and seven 6-in. guns can fire on each broadside, besides which there are six 12-pounders and two 2½-pounders able to fire directly ahead, and similar guns able to fire directly astern, and six 12-pounders and two 2½-pounders capable of firing on either broadside.

Protection.—The thicknesses of the armoured decks in the vessels given in Table II, vary from 1 in. to 1½ in. on the horizontal portions, and from 3 in. to 4½ in. on the sloping portions. In a fully equipped condition the horizontal parts of the decks would lie from 1 ft. to 18 in. above the water line, and the sloping portions would extend to from 3 ft. to 4 ft. below the water line. An outline section of the Yoshino is shown in Fig. 5, in which patent fuel is shown stowed to a height of 4 ft. above the water line in the upper side bunkers. Most of the vessels in this class have been provided with 6-in. conning towers.

On the introduction of high explosives, and after a

series of experiments, it appeared to us very desirable that cruisers should be provided with side armour at least at the water line, and the 25 de Mayo, which was then building as a stock cruiser, was altered so as to carry a belt of side armour extending from the lower edge of the sloping deck armour to 3 ft. above the water-line. Her purchasers, however, elected to have her completed as originally contemplated.

In the cruisers given in Table III, side armour has been provided. The Esmeralda has a 6-in. belt extending over three-quarters of her length amidships 7 ft. wide, the O'Higgins has a belt over two-thirds of her length 7 ft. wide and 7 in. thick, and the Asama and Tokiwa have belts over their entire length 7 ft. wide and 7 in. thick, but tapered to 5 in. at the extremities. Each of these vessels is also provided with a strong protective deck from stem to stern.

[NOTE.—Many of the vessels mentioned in Colonel Watts' paper have already been illustrated in ENGINEERING, and the following are the pages on which they will be found: The Piemonte, page 622, vol. xlviii.; Nenu de Julio, page 224, vol. lv.; Blanco Encalada, page 78, vol. lviii.; Buenos Aires, page 568, vol. lx., and page 707, vol. lxi.; O'Higgins, page 664, vol. lxx.; and the Asama, page 232, vol. lxxv.—ED. E.]

LAUNCHES AND TRIAL TRIPS.

THE steam yacht Golden Eagle, 445 tons, the property of Sir Samuel Scott, Bart., designed by Messrs. G. L. Watson and Co., and built by Messrs. Ramage and Ferguson, Limited, Leith, went on her trials in the Firth of Forth on Saturday, the 15th ult., when a mean speed of 13½ knots was obtained on a run from Inchkeith to the May Island.

On Thursday, the 20th ult., the official trial took place of the Sazanami, the fourth Japanese torpedo-boat destroyer constructed by Messrs. Yarrow and Co., and as this trial is somewhat exceptional as regards the high speed, combined with the low air pressure, we give particulars of it below. The vessel, we may state, was launched on Saturday, the 8th ult. Load carried, 35 tons; duration of trial, three hours; coal burnt during the three hours' trial, 15½ tons. The following figures were obtained on the measured mile:

Hour.	Air.	Mean Revolutions.	Time.	Speed.	Mean.	Second Mean.	Mean on Miles.
11.24	in. 0.82	381.4	min sec 2 3	29.268			knots
11.34	1.06	389.2	1 51	32.432	30.550	30.910	
11.43	1.10	390.5	2 2	29.508	30.970	31.119	
11.53	1.25	390.6	1 49	33.027	31.268	31.298	31.183
12.2	1.20	395.3	2 1½	29.629	31.328	31.405	
12.11	1.18	390.5	1 48	33.333	31.481		
Means	1½	389.6					

The boiler pressure was 230 lb. per square inch, and the vacuum average 24½ in. of mercury. Mean revolutions for the three hours was 392.09, equivalent to a mean speed during this time of 31.382 knots, and the mean air pressure was 1½ in.

The s.s. Newton Hall was launched on the 20th ult. by Messrs. Joseph L. Thompson and Sons, Limited, of the North Sands Shipbuilding Yard, Sunderland, and has been built to the order of Messrs. C. G. Dunn and Co., of Liverpool. The principal dimensions of the vessel are: Length over all, 379 ft. 6 in.; breadth extreme, 49 ft. 6 in.;

and depth moulded, 29 ft. 6½ in. The engines and boilers have been built by Messrs. The North Eastern Marine Engineering Company, Limited, of Wallsend-on-Tyne, the sizes of the cylinders being 26 in., 44 in., and 72 in. in diameter by 43 in. stroke, supplied with steam by three large boilers working at 180 lb. pressure. The launch, which was most successful, was effected by means of hydraulic power.

Messrs. Sir W. G. Armstrong, Whitworth, and Co. took the s.s. Luciline on her trial trip on the 20th ult. This vessel is a tank steamer built for Messrs. Lane and Macandrew, of London, under the supervision of Messrs. Flannery, Baggallay, and Johnson, of London and Liverpool. Her dimensions are as follow: Length, 335 ft.; beam 45 ft.; and depth, 29½ ft. moulded. The engines have been built by the Wallsend Slipway and Engineering Company, Limited, and have cylinders 24 in., 40 in., and 66 in. in diameter with a stroke of 48 in., and they are supplied by steam from two large single-ended boilers, having a working pressure of 160 lb. A speed of 11 knots was attained.

On Friday, July 21, the steamer Saxon Prince left the shipbuilding yard of Messrs. Short Brothers for her trial trip, which proved in every way satisfactory. A series of runs was made over the measured mile and a mean speed of 13 knots was attained. The vessel has been constructed of steel for the Prince Line, Limited, of Newcastle-on-Tyne. Her dimensions are: Length, 352 ft.; breadth, 45 ft., and moulded depth, 27 in. 9 in., with a large deadweight and carrying capacity, special attention having been given to the arrangement of the upper and main decks to enable a large number of cattle to be carried. Her engines are by Messrs. Thomas Richardson and Sons, Limited, Hartlepool, having cylinders 24 in., 39 in., and 66 in. in diameter, with a stroke of 45 in.

On the 24th ult. Messrs. Ropner and Son launched from their Shipbuilding Yard a steel screw steamer, the Riverton, 325 ft. long. The machinery of the boat will be supplied by Messrs. Blair and Co., Limited.

On Tuesday, July 25, 1899, Sir Raylton Dixon and Co., Limited, launched from their Cleveland Dockyards, Middlesbrough, a handsomely-modelled twin-screw mail and passenger steamer built for Messrs. Elder, Dempster, and Co., of Liverpool. Her principal dimensions are: 382 ft. by 46 in. by 25 ft. moulded. Accommodation will be provided for 108 first-class and 50 second-class passengers. Twin-screw triple-expansion engines will be fitted by Messrs. The Wallsend Slipway and Engineering Company, Limited, Newcastle-on-Tyne, having cylinders 21½ in., 34 in., and 59 in. in diameter. The ship and engines have been built under the supervision of Mr. G. H. Butterworth, resident inspector. On leaving the ways she was christened Elifeda by Mrs. Wayman Dixon.

The s.s. Elba, 1080 tons, recently launched by Messrs. Ramage and Ferguson, Limited, Leith, for Messrs. James Currie and Co., also of Leith, went on her trial trip on the Firth of Forth on the 24th ult. The engines worked perfectly, and a speed of ten knots was obtained on the measured mile.

There was launched on the 25th ult., from the yard of Messrs. S. McKnight and Co., Limited, Ayr, a fine steel screw steamer of the following dimensions—145 ft. by 24 ft. by 11 ft. 3 in., constructed for Liverpool owners. The vessel, on leaving the ways, was gracefully christened Blanche by the daughter of the owner.

Recently Messrs. Irvine's Shipbuilding and Dry Docks Company, Limited, launched from their shipyard a finely modelled steel screw steamer built to the order of Messrs. Robert Irvine and Co., Tower Chambers, West Hartlepool. She is of the following dimensions: Length, 352 ft.; breadth, 48 ft.; depth, 27 ft. 9 in.; and is of the single-deck type with poop, bridge, and forecastle, capable of carrying 6000 tons deadweight on a light draught with Lloyd's summer freeboard. Engines of the triple-expansion type are being supplied by Messrs. Thomas Richardson and Sons, Limited, Hartlepool, with cylinders 24 in., 39 in., and 64 in. in diameter by 45 in. stroke, and two single-ended boilers constructed to work at a pressure of 180 lb. As the vessel left the ways the christening ceremony was performed by Miss Irvine, of Ragworth Hall, who named the vessel Robert Irvine, in compliment to the founder of the firm of Robert Irvine and Co., Tower Chambers.

YORKSHIRE RAILWAYS.—The first sod has been turned of a new line to connect the Hull and Barnsley system with some additional South Yorkshire collieries. The growth of the coal traffic of the Hull and Barnsley Railway is evidenced by the fact that several miles of sidings constructed at Spring Head, about four miles from the Hull Alexandra Dock, are now nearly fully occupied with coal trucks. The new line, the first sod of which has been turned, will be about nine miles in length, commencing at Wrangbrook, and terminating at Wath-upon-Deane. It will pass through Elmsall, Hooton Pagnell, Thurnscoe, and Bolton-upon-Deane. The collieries it will serve are Hickleton Main, Wath Main, and Manders Main, which are among the largest in South Yorkshire; a large pit is about to be sunk at Frickey, which will also be connected with the line. These collieries will find increased work for new coal shipping appliances, which are about to be set up at the Alexandra Dock.