

first class ironclad from 400ft. to 300ft., increased the thickness of armour, doubled the size of the guns, saved £100,000 in first cost, and made the *Bellerophon* the handiest ship, and, therefore, the least exposed to attack, in the whole navy. Fortunately this great change was so successful as to debar for ever any responsible persons, however strong their prejudices, even from attempting to revert to great length in such ships. In certain cases I succeeded in carrying the same principle still further, but to nothing like the extent which I could have wished. The time arrived when it seemed undesirable to press one's views further from within the Admiralty, and I resigned the chief constructorship. But in Russia there was an officer who sympathized with these views of mine to the fullest extent, who saw clearly enough what would be their ultimate development, and who found in the circumstances of the Russian Navy ample reason for their immediate adoption in an extreme form which I had never contemplated. This is Admiral Popoff's own account of the origin in his mind of circular ironclads, and having obtained for them the approval, at least for special purposes, of the Government, I have to-day been able to inspect a finished circular vessel, carrying 11-inch armour and two 28-ton guns on a displacement of less than 2500 tons, and a draught of water of less than 13ft., and to-morrow is to be launched a second ship to carry 18in or 19in. armour, and two 40-ton guns, on a displacement of 3500 tons, and a draught of water still less than the other. It is quite true that these are not fast ships—they have not been built for speed; but as war vessels, carrying such armour and such guns on a light draught of water they are full of interest and significance.

"After a general survey of the *Novgorod*, I was shown the manner in which the large 28-ton guns are worked by seven men only. The loading arrangements, the running out and in, the elevation and depression, and the training of these guns, are all of the simplest character, and insure great rapidity of action. I observed one quality which these guns possessed, which our guns in revolving turrets do not possess. While capable of being fired in parallel directions like our own guns, each has an independent action for training, that, within certain limits they can be directed at different objects. The *Novgorod* is propelled by six screw propellers, driven by parallel shafts, three on each side of the centre line, and while furnished with a powerful rudder, under the action of which she revolves, I am told, with great rapidity, it is obvious that, in the event of accident to this rudder, she could be steered by the screws alone with the greatest ease and rapidly. The starting and stopping gear for each set of three engines is brought to one point, so that one man has them under perfect command. The accommodation of the *Novgorod*, for officers and men, is very good indeed, especially for a vessel essentially of the monitor type as regards height of freeboard. Much of this accommodation is secured by means of a deck-house superstructure, forming a forecabin forward, and extending down the middle of the ship to the stern. But even that part of the cabin accommodation which is below the armoured deck, is exceedingly well lighted and ventilated, primarily by means of ample deck openings through and around the fixed turret, and also by means of deck illuminators. Throughout the construction of the vessel below, wherever water-tightness of bulkheads and frame-plating is not an object,

much skill and pains have been expended in providing ample openings for the free circulation of air, and, so far as possible, of light. All the arrangements for carrying and working the anchors and cables are satisfactory, not differing very materially from those of ordinary ships.

"Of the seaworthiness and speed of this vessel I shall speak hereafter; but here we obviously have a form of ironclad of light draught, of great offensive and defensive powers, of extreme handiness, of comparatively very inexpensive construction, and withal a good habitable ship for officers and men. In order to indicate the value of such vessels to Russia, I would remind you of one feature only of the great war of 1854-6. Every one who remembers that war will be able to recall the ease with which our light-draught unarmoured vessels and gunboats carried insult and injury around the shores of the Sea of Azof. No vessel was too contemptible in size an power for this purpose. But I should like to know what class of vessels now exists either in the English or the French Navies fit to perform a similar service in the presence of the Popoffka. Not only have we no vessels capable of entering shallow waters and there engaging the *Novgorod* and the *Admiral Popoff*, but I say without hesitation that such vessels cannot be produced possessing the necessary capabilities unless it be either by constructing vessels substantially like themselves, but still larger and more powerful, or else by building far larger and more expensive vessels of previous types. But it may occur to some to ask what chances the Russian circular ironclads would have against rams and torpedo boats. I am bound to answer that the circular form of construction lends itself much more readily than any other which at present exists to defence against these forms of attack. Both the existing circular vessels have circular bulkheads running completely round the vessel at some distance from the side; and if the development of ram and torpedo warfare should show that this distance may with advantage be increased, it will be perfectly easy to increase it, and even to place a second bulkhead within the first, so as to carry the subdivision into cells to almost any reasonable extent. Certain it is that no form of ship presents facilities for subdivision equal to those offered by the Popoffka. If to this fact we add the further one that in this form of ship, owing to the light draught, the armour may be carried, if necessary, down to the very bottom of the vessel, we shall see how great reason there is for looking in the direction of these vessels for the further development of ironclad shipbuilding.

"The draughts of water of the two vessels are not materially different. The armour of the *Novgorod* is about equivalent to 13-inch plating; that of the *Admiral Popoff* to about 18 inches. The horsepower of the former vessel is 480 nominal, and of the latter 640. Each has six screw propellers, but in the latter vessel two of them are of much larger diameter than the others, and have their shafts situated lower down, so that in deep water these screws will sweep through the water much below the bottom of the vessel, while in shallow water they will be kept at rest in a position which keeps them up above the keels. The deck is on each ship plated with 2½-inch armour, and has great curvature, so that although the nominal freeboard is in each case not more than about 18 inches to the top of the side armour, the actual surplus buoyancy is far greater than this would indicate. This is the first armoured ship afloat carrying

armour of 18 inches, and intended for guns of 40 tons (more exactly, of 41½ tons). After the launch, the Lord High Admiral (the Grand Duke Constantine) went over every part of the ship, to examine for himself the watertightness of the hull, and to discuss other details of the vessel. The pumping and ventilating arrangements, the subdivision into compartments the propelling apparatus, the cabin dispositions, all seemed alike matters for his personal inquiry and of his intimate knowledge. In a subsequent visit to the dockyard, and to the various shipbuilding machine shops and stores, it was interesting to find this Emperor's brother, and head of the business of a vast empire, acquainted with the minute characteristics and details of radial drills, horizontal planing machines, rectangular punching machines cast steel cutting tools, anthracite coal, the coking properties of certain coal in dust, and other like matters."

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The German Navy.

The Berlin correspondent of a morning contemporary furnishes the following interesting account of the German Navy.—"The German Navy at this moment is 5000 men strong. Of this total, about 3000 are sailors levied by conscription and taken from the merchant service. The remaining 2000 are—some of them seamen educated in training ships, some operatives raised by conscription, and employed in their several trades, either on board ship or in the government dockyards. Of the 3000 conscripts, 1000 are annually allowed to take their departure, and are placed by fresh levies, the average time of service being two and a half years. Notwithstanding the small number of men required, recruitment for the German Navy has peculiar difficulties to contend with. The German seafaring population is calculated at 125,000 men—a total far in excess of what can be ever wanted for the Imperial Navy; but as German sailors take to their calling early in life and frequently join foreign merchantmen before they are liable to serve in the navy, the consequence is that, as a rule one-third of those called out fail to answer the summons of the recruiting officer. Many of these defaulters return after a few years, when they must expect to take their turn on board one of His Majesty's ships; others who have stayed away too long to relish quarterdeck discipline remain abroad through fear of conscription, and die in America, China, or the East Indies. However, when once enlisted the Imperial Navy, they seldom desert. In the last three years there were but four fifths per cent. of deserters in the German Navy, against six per cent. in the English.

Seamen are exclusively levied from the fishing and seafaring population. Most of them are Pomeranians, Schleswig Holsteiners, Mecklenburghers, and Hanoverians, the East Prussian shore being strangely unproductive of the article. None are taken but such as have had a year's previous experience at sea. If they have no taste for the navy, a three year's service is all that can be exacted. After this they are classed with the *Sewer*, a naval counterpart of the *Landwehr*, in which they remain for nine years more, without any serious impediment to their re-entering the merchant service and making distant voyages. Those who are willing to remain in the navy alter a four year's service become full sailors; after a six years' service, second mates; and after a seven years' service,