

open topped turret amidship. Mr Reed points out that the ship is admirably planned as regards water tight bulk heads, the system of ventilation, and the berthing of the crews. He urges in favour of these ships, that their small draught of water—not more than 12 feet—enables them to operate in waters into which no British ship adequate to come with them dare venture. We shall not produce the encomiums which he passes on circular iron clads, it will be enough to say, perhaps, that he really makes out a strong case in their favor.

Admiral Popoff is not, we need hardly say, the inventor of circular warships. They were proposed very many years ago, and the proposal was revived, in a very complete form, by the late John Elder. To the Russian government is, however, due the credit of first testing the scheme on a practical scale; and the experiment they are now trying will be watched with no small interest. The prominent question is, of course, this—should the British government follow the Emperor of Russia and build a circular iron clad? There is a great deal to be said against ships of the kind; but there is also much to be urged in their favor. It is in this country, at least, regarded as an axiom that an iron clad to be useful must be fast. If this axiom is really true, then, circular iron clads are almost useless, for the simple reason that the *Norogorod*, at all events, does not steam at more than half the velocity of one of our own iron clads; and there is no reason to assume that the *Admiral Popoff* will be quicker in her movements. It will be seen, however, that this want of speed is in part accounted for by the small power of the engines. On the other hand, it is certain that if the available power of either ship were employed to propel a hull built on moderately good lines, and of the same tonnage and draught as those of the iron clads, a far higher speed than six or seven knots would be attained. If it be possible to get anything like as good a coefficient with a circular iron clad as can be had with, say, our own *Bellerophon*, then it is evident that naval architects have been wrong all along, and that the lines of a hull have very little indeed to do with the power required to propel her at a given speed. We think it may be taken for granted that the existing practice of naval architects in designing the hulls of ships for speed is not erroneous, and that to propel a circular iron clad at anything like a high speed—say, twelve or thirteen knots—would be almost impossible, unless, indeed, everything was sacrificed to get in large boilers and powerful engines. On the other hand, it is not certain that the circular iron clads are so slow that their utility for a given purpose—that of coast defence—is seriously impaired. We can conceive of the existence of circumstances under which they would be quite fast enough for all practical purposes. Thus, let us suppose that a fleet of circular iron clads propose to defend a given fort, then it is obvious that, operating inshore against an attacking squadron, there might be no necessity for putting them in rapid motion. The attacking party must come to them or stay away. If they adopted the latter course, the object of the commander of the *Popoffka* fleet would be attained; if the former, then there would be a naval engagement. In this, speed would only be required under two conditions. In the first place, it might be needed to enable the defenders of the port to avoid being rammed; in the second, it might be required to cut off any ship or ships which by making a rush could break through the line of *Popoffkas*, and, getting inside, attack them in the rear, or even enter the harbor on its defence. At

sea, however, the slow ships would be manifestly useless, because they could easily be surrounded and attacked on all sides; or because the fleet they were intended to attack could easily elude them. On the whole it is evident that speed can only be given up with much risk and that although lack of it will not render her useless under all circumstances, or even seriously impair her efficiency under some circumstances, yet the want of it must, as a rule, place a slow ship at a very important disadvantage. It remains to be seen how much speed can be got out of a circular iron clad, and we willingly admit that, if such ships could only be built to steam as fast as ships of normal type, they would probably be the best species of fighting ship it is possible to build, so long as armor is retained. We fear, however, that, until some new motive power is introduced, it will be simply impossible, as we have said, to get anything like the velocity now considered indispensable in a war ship out of a circular iron clad.

The paramount advantage possessed by Admiral Popoff's ships lies in their power of carrying enormously heavy armour plates on a light draught of water. The displacement of an immersed cylinder will vary—the depth remaining constant—as the squares of the diameters, but the surface increases only as the diameter. Thus, if we suppose the *Norogorod* to have a perfectly flat bottom and vertical sides—which is known not to be the case—on a draught of 12 feet of water she would have a displacement of 95,500 cubic feet in round numbers. If we suppose her armour to be 3 feet deep—the freeboard of the vessel is only about 18 inches—then the whole area of armour plating will be 2,536 square feet, or, say, 38 square feet of displacement for every square foot of armor. The displacement of the *Admiral Popoff* under the same conditions of draught, etc., would be 134,784 cubic feet, but her armor surface, taking the depth of the belt as before at 3 feet, would be only 3,016 feet, or 1 foot for each 44.6 feet of displacement. It is clear, therefore, that on the same draught of water one ship would carry 18 inch almost as easily as the other carried 15 inch plates. The only way in which anything like a similar advantage can be gained with ships of the ordinary form consists in greatly augmenting their beam. Thus, for example, if an iron clad 250 feet long, and 50 feet wide has a given displacement, it is clear that, other things being equal we can double that displacement by doubling the beam. But by doing this we do not increase in anything like the same proportion the extent of surface to be covered with armour plates. Acting on this principal it may yet be found that the best plan of carrying very heavy armor at sea will consist, not in adopting circular iron clads, but ships which shall be a compromise between the *Popoffka* and the ordinary type; that is to say, we might have vessels with a beam one third of the length. To such a structure it would be possible to impart something like lines of easy curvature, and thus, without an extravagant expenditure of power, it may be possible to get a speed which, if not equal to that of the *Monarch* or *Hercules*, will at all events greatly surpass that of a circular ship. Such a vessel as we suggest ought to be handy, and she would be admirably adapted for propulsion by twin screws, which, indeed, would be so far apart that they would suffice to steer the ship even if the rudder were carried away, or to make her revolve rapidly in her own length. Ample room would also be afforded for the adoption of the space interval system of armor plating, which we have long advocated, while

an inner bottom might be placed so far from the outer, at the sides at least, that the ram of no iron clad afloat could touch it. An advantage of no small importance, we may add, would lie in the fact that turrets of sufficient diameter to take very long guns could be adopted. We know perfectly well that the proposal to build a ship with a beam of 70 feet or 80 feet, and a length of 210 feet or 240 feet, is sufficiently startling to lead to its rejection at first sight. But it will, we think, be seen, on examination, that such a vessel would not represent anything like as wide a departure from received notions on the subject of naval construction, as do the *Norogorod* or the *Admiral Popoff*, and we venture to think that such a ship would possess many advantages over any circular iron clad that can possibly be designed. It would, at all events, be worth while to try such a ship before we decide on the adoption of Admiral Popoff's system.

We learn from Malta that the eleven inch guns mounted in the battery beside the lighthouse at Fort St. Elmo, were fired for the first time on the 6th inst., in order to test the effects caused by the shock of the discharge on the lighthouse. Blank ammunition (ordinary service charges of 60lb) was first used, with no apparent result. Afterwards 'Palliser' projectiles with battering charges were used, the result being that every particle of glass in the lighthouse was shattered, and the ironwork connected with the lighting arrangements was much injured. Had an 80lb. been fired simultaneously from the three guns the probability is that the whole of the superstructure would have been destroyed. In case of an attack on Valetta this battery would either be obliged to remain silent or to imperil our shipping by the destruction of the lighthouse.—*Broad Arrow*.

The above would indicate the necessity for a reconsideration of the modern system of fortification—masonry would have a small chance against guns capable of producing such results by mere percussion and it is probable that new facings with earthwork banking must eventually be resorted to.

London April 17.—A special despatch dated Alexandria, Saturday, says reports have been received there that the Egyptian army has been surrounded by the Abyssinians, and its situation is critical, and that the Abyssinians demand indemnity for the expenses of the war.

The New York *Herald's* special from Vienna says reliable advices have been received from Constantinople, to the effect that the Sublime Porte intends, if driven to extremities, to arm the Mahomedan population, and declare the determination to postpone all payments of interest on debts, until after the restoration of peace.

St. Petersburg, April 17.—The *Journal de St. Petersburg* entreates the public to give no credit to the alarming reports which were in circulation last week. The *Journal* reproduces the pacific assurances which appeared in its Vienna political correspondence of April 13th, to the effect that there had not been the slightest difference between Russia and Austria, and that both Powers would continue to act conjointly for the pacification of Turkey.

Ragusa, April 15.—The insurgents have withdrawn from the vicinity of Trobinje.