

the existence of sea-going ironclads, or deny that, for some time to come, they must be regarded as a necessity in naval warfare. But the objection to them is that their opportunities and use are circumscribed; and that in being employed to attack unarmoured vessels of less speed, they will be simply expensive and unnecessarily powerful vessels for the purpose. In fact, while ironclads, both monitors and cruisers, are indispensable, there is in such a Navy as ours, room and ample scope for squadrons of unarmoured ships, a scope which is rapidly increasing and converting what is undoubtedly desirable into what is absolutely necessary. Naval warfare thus has not only increased the difficulty and cost of coast defence, but it has done nothing to diminish the terms on which it has to be waged afloat. In fact, we are left with this conviction, that an unarmoured Navy is as much a necessity now as it was in the days of Nelson.

To understand the absolute necessity of a powerful unarmoured fleet, the civil war in America furnishes the most prominent example. Then every available ship of war was employed on strictly military service, and merchant vessels were left virtually unprotected. The result was that the Federal States saw with dismay destruction committed by the *Sumter* and *Alabama*, which they were powerless to avert. What was done, then, was what might occur again: ironclads employed on coast defence, an unarmoured fleet either powerless or decayed, and a mercantile marine exposed to depredations by an enemy whose source of strength and evidence of superiority consisted in the possession of a few moderately powerful unarmoured ships. What was found and admitted, though tardily and with halfheartedness in this country, was that *Alabamas*, or swift unarmoured vessels, are an important factor in naval war. They would exercise the function of protecting our own merchantmen and attacking the enemy's, and would, in performing this most important service, be doing what ironclads would be unfit for, or be incapable of doing. Dr. Boynton, an American, in writing of his Navy during this war, says: "Let one of these enormous sea-racers take in a full supply of coal, and then, using her engines only when absolutely necessary, cross the ocean under sail, and place herself on one of the highways of British commerce, prepared then to use steam or sail as might best suit her purpose; who can measure the havoc she would make? Suppose thirty such were scattered over the seas, how long would the merchant marine of England remain afloat? Such are the formidable weapons by which Great Britain, by her unfriendly and deceitful course, has prepared against herself whenever the occasion comes."

In the face of such facts as these, what have we done? and in what state is the Navy at the present moment to meet such a contingency as this?

Since 1860, when ironclad construction became a necessity, we may be said to have added on the frigates which were then in existence. Since that date, with the exception of the *Inconstant* and her three or four sister vessels, there have been no additions to the large unarmoured class of vessels, though great numbers of sloops, corvettes, gun vessels, and gunboats have been added. But, as Mr. Goschen said two years ago, it was melancholy to reflect that, as regards our unarmoured fleet, so far from having kept up to the standard, the rate of construction had barely kept pace with the waste.

Coming now to the unarmoured vessels of importance which have been added to the

Navy, the *Inconstant* hold the first place. The idea of building swift frigates, in which speed was the first object, did not originate with the *Inconstant*. The *Orlando* is an order of frigate built expressly for speed, her lines being drawn exceptionally fine. It was not long, however, before it was discovered that these fine built wooden vessels could not stand the wear and tear of the engines which were put into them. They were shattered in no time, and were practically a failure. The Americans had, however, built one of these fast vessels, the *Wampanoag*, but instead of wood, it was built of iron, with a casing of wood. The *Inconstant* was framed on this model, and it has proved, in every way, a perfect success. The magnificent engines supplied to her have shown that under, of course, exceptionally favourable circumstances, a speed of seventeen knots, or nearly twenty miles, can be obtained from her. In the construction of this vessel, the American designs were kept closely in view, except that she was built as a frigate instead of as a corvette. The Committee on Ships' Designs report that in her construction, "the object aimed at was to combine good sailing with the very highest steaming power." Her armament was chosen so as to be superior to that of any vessel of equivalent speed. In fact, she was constructed so as to fulfill, as nearly as and successfully as possible, Dr. Boynton's idea of the vessels which were to swoop on and destroy British merchantmen. The *Inconstant* having proved a success, it was thought that vessels might be constructed on a similar principle, but of much smaller dimensions. The *Volage* and *Active* were, therefore, commenced. They are corvettes with a measurement, each, of 2322 tons, or about half that of the *Inconstant*, and a nominal engine power of 600 against the latter's 1000. The armament, however, of these corvettes, was much weaker than that of the *Inconstant*, their guns being carried on the upper deck only. They consist of six 6½ ton guns, two on each side of the quarter deck, and one on each side forward of the funnel, with a 64-pounder pivot on the top gallant forecabin, and another of the same calibre on her poop. Comparing this armament with that of the *Inconstant* it is perceptibly deficient. It is, indeed, only equal in strength to the upper deck armament of the *Inconstant*, and, having no main deck battery, she has nothing to compare with the larger vessels' ten 12 ton guns. While, however, in general, these three corvettes may fairly be described as miniature *Inconstants*, there are points of difference worth notice. Their rudders are of the ordinary form, hung on a fixed after stern post, instead of having "balance" rudders like the *Inconstant*. How far this is an advantage or not it would be difficult to settle in a few words. The "balance" rudder is ingenious, but difficult to work under circumstances, and, though strongly upheld by theoretical shipbuilders, finds small favour with practical men. In the *Hercules*, it may be remarked, incidentally, that by an ingenious contrivance, the "balance rudder" is made to act like an ordinary rudder when necessary. These corvettes are well fitted up, and provided each with four watertight bulkheads. Experience has not proved favourable to these small vessels. In spite of their speed and power, they are not swift enough to get out of the way of heavier armed vessels, and they cannot stand the strain of the powerful engines they are made to carry.

Since then the *Raleigh*, *Shah*, *Brodicea*, and *Bacchante* have been constructed to carry out the same ideas in slightly modified forms as experience suggested. But, in the two

new vessels, the *Iris* and *Mercury*, which are to be laid down this year, and in which steel is to be the prominent feature, it is expected we shall not only have found our way to the swiftest and most powerfully armed despatch vessels afloat, but have strengthened materially our unarmoured fleet. Independently of these vessels, strenuous efforts are being made to strengthen the Navy in the smaller and less important classes of unarmoured vessels, but these can only be regarded as efforts to supply the larger gaps made by the wear and tear or waste of recent years. The serious attitude of the Government in regard to unarmoured vessels is marked by its increasing the Navy Estimates by half a million sterling for this purpose; and the explanation of its appropriation in detail on Monday evening, we expect not only with interest, but anxiety.

### The Institution of Naval Architects.

Seldom has the hall of the Society of Arts presented a more animated appearance than it did on Thursday morning when the Institution of Naval Architects commenced its annual meetings. The usefulness of this Institution seems to increase yearly, and the number of papers set down for the present session is so great, and they bear upon questions of such importance, that the period of three days is not found sufficient for their discussion, and it is now decided to resume some of the debates at a future date.

The meetings were opened with an inaugural address from the President, Lord Hampton, in which reference was made to the Merchant Shipping Bill now before Parliament, and to a general consideration of the subject set down for discussion during the meetings. The first paper was by Mr. N. Barnaby, Director of Construction to the Admiralty, and was upon "Ships of War." Perhaps no paper read before the Institution was ever received with more applause, nor has any contained more distinct marks of originality, both as regards the idea expressed and the mode of expressing them.

Mr. Barnaby said:—

The circumstances and conditions of naval warfare stand as follows:—(1.) Looking at the relative distance within which the gun, the torpedo, and the ram are operative, and the risk of failure in striking with them, the gun occupies the first place, and the ram the last, as instruments of naval warfare. (2.) From this it follows that ships built only for ramming forego the use of two more important weapons. That a ship built wholly for torpedo service is better than a ram, but is still superior to one built for service with guns only. The advantages of combinations of these weapons follow the same rule. (3.) That while the gun is on the whole the superior weapon, it can be resisted more easily than either of the others. If it were as difficult to resist the effects of the blow of the torpedo or the ram, naval warfare would cease to be practicable. (4.) The growth of resistance to the gun encourages further increase in the power of the gun, and there appears at first sight to be no limit to this increase. The limit will probably be found in the cost of putting the gun afloat with proper protection for it and proper speed. The cost will be reckoned in view of the exposure of each such gun to loss by the power of the ram and the torpedo, when they can be brought within the proper range of their operations. (5.) The torpedo can be made, within the proper range of its operations, irresistible. (6.) If the blows of the torpedo are to remain irresistible when fairly delivered, it remains to be considered in what manner and to what extent the attack can