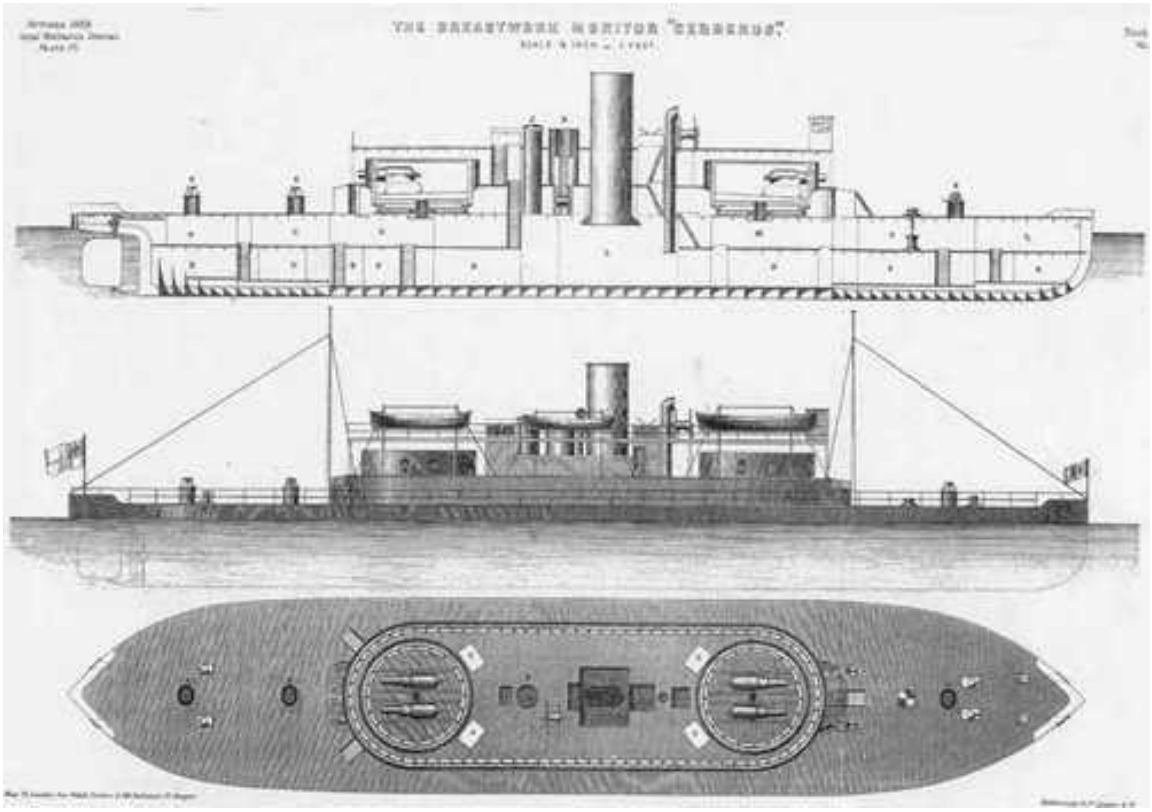
HMVS CERBERUS:



The Breastwork Monitor Cerberus.

British Monitors vs American Monitors.

THE BREASTWORK MONITOR CERBERUS.

(Illustrated by Plate X.)

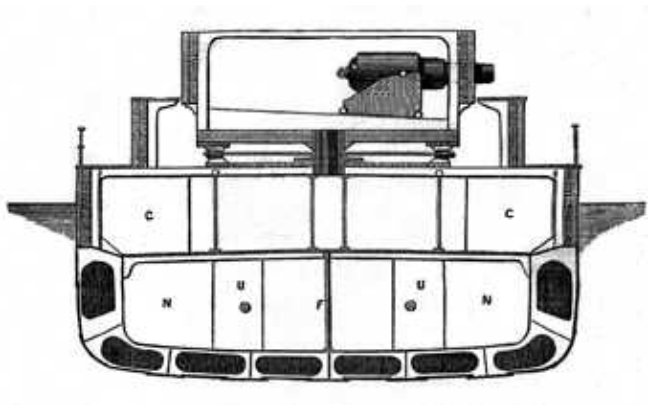
The Practical Mechanics Journal, October 1, 1869.

The completion of the *Cerberus*, an armour−plated monitor, intended for the defence of Melbourne, built by the Palmer Co. of Jarrow−on−Tyne from the designs of Mr. E. J. Reed, C.B., the Chief Constructor of the Navy, affords us a favourable opportunity of presenting our readers with some detailed information respecting that ship, as well as with a few general remarks respecting the class of monitors of which she is the first example. The accompanying plate and wood engraving illustrate the principal features connected with the structure, stowage, armament &c. of this vessel, and, with the numerous references attached, will prove worthy of a careful study, as they show how the novel conditions of the design have been met, and indicate the general character of the arrangements in our other breastwork monitors. There are now five of these vessels building in this country, two being intended for the defence of Bombay, and being constructed for the Indian Government, while the remaining three will constitute the first monitors added to our own Navy. Of the Bombay monitors, one, the *Magdala*, is a sister ship to the *Cerberus*; the other, the *Abyssinia*, is a rather smaller but similar vessel. The monitors for our Navy are larger and very much stronger than the *Cerberus*, but they are identical in type with that vessel. One of them, the *Glatton*, is a single−turreted ship, and is the only turret−ship we possess which is thus constructed; the other two, the *Thunderer* and *Devastation*, are the sea−going monitors, the design of which elicited such a lively discussion on the passing of the Navy estimates for this year. As it is impossible, within the limits of a single article, to give descriptions of all these vessels, we shall principally confine our remarks to the *Cerberus*, making only incidental references to the others.

At the outset, however, it may be well to call attention to the fact, that the BREASTWORK type of monitor is, on the whole, very different from the American type introduced by Mr. Ericsson. There are, it is true, many points of similarity; notably, the small height of upper deck above water, the almost flush character of the decks before and abaft the turrets by which the full command of the horizon with the turret guns is secured, and the overhanging stern by which the rudder is protected. The means by which the ventilation of the ship is performed, the general arrangement of the hold, and the means of propulsion, are also similar in the two types; and it is only fair to the Americans to admit that the improved arrangements in these respects of our monitors are, in a great measure, the result of the experience they have had in their monitors during actual service. But, while there is this similaiity in some respects, there are, as we have said, many important differences between our monitors and the American. Chief among these stands the so−called "breastwork" arrangement, which is fully illustrated by the sections and plan of the *Cerberus*. On reference to these, it will be seen that in the central part of the upper deck a space is enclosed by an armoured wall, or breastwork, between 6 and 7 feet high. The space thus enclosed is in length about half the length of the vessel, and is about three−fourths her breadth. In it are placed the turrets, the funnel, the air or ventilating shaft, and the principal hatchways over the boiler space &c. Upon the top of the breastwork a complete deck is built, and is strongly plated; thus protecting from depressed or dropping fire the interior of this part of the ship, and particularly the turret engines, the turret beds, the steering, wheel and other important fittings placeed within the breastwork upon the upper de proper, as shown upon the plan of upper deck of the *Cerberus*. All the principal openings, where water would be likely to enter when the ship is in a sea−way, are thus brought up to a height of ten or eleven feet above water, and the turret guns are carried eleven or twelve feet above water, notwithstanding the lowness of the freeboard. In fact, the only openings in the upper deck outslde the breastwork are those made for the skylights, over the spaces in which the officers and men are quartered (marked sss in the engravings); and these openings are protected by strong armour−plate coamings, to which armour−covers, or battle−plates, are fitted, so that they can be closed at sea or in action. The only openings into the interior of the ship are practically, therefore, those in the breastwork deck; and this deck would probably be clear of water except in very heavy weather. In such weather the openings in this deck can be closed, as they are fitted with water−tight trunks, or casings, and then the hurricane or flying−deck that stretches along over the turrets

would be used, access being gained to it by means of water−tight ladder−ways, as shown in the longitudinal section. of the *Cerberus*. It will be seen also that the steeering−wheel ordinarily employed is placed on the hurricane deck, and the officer in charge would direct the navigation from this deck also, except in action, when he would take his station in the armoured pilot−tower, and the ship would be steered by means of the wheel placed just below within the breastwork space.

The American vessels have hurricane−decks, but no breastwork, or deck corresponding to the breastwork deck. In them the turrets stand upon the upper deck itself, being carried by a central spindle, which passes down through the deck, and the junction of the turret−base with the deck is consequently only three or four feet out of the water. Separate protection has also to be given to the bases of the funnels and air−shafts, since, if these were shot away, water might pour into the hold through the openings, and sink the ship; and to all the openings in the low deck armour−covers, or battle−plates, have to be fitted, the ship's safety depending, in a great measure, on the water−tightness of these covers as the fate of the *Weehawken*, showed. In short, all these openings are at a height of three or four feet only above the water, instead of being ten or eleven feet, as in our breastwork monitors, and the liability to loss is thus greatly increased. Besides this; the turret guns are much nearer the water in an American than in a breastwork monitor−a matter of the highest importance when the fighing efficiency of a ship is being discussed; and Mr. Fox, the Assistant−Secretary of the Navy, has drawn attention to this, feature of American monitors in his report on the Trans−Atlantic voyage of the *Miantonomoh*. In weather when the *Cerberus* and ships of the same class would be perfectly capable of fighting their guns, it is affirmed that the American monitors would be powerless, owing to the sea washing over the turret ports and preventing their being opened or turned to windward. As compared to the American plan, therefore, it is submitted that the breastwork system gives both greater safety and increased fighting efficiency in a sea−way, and is on that account much superior. It may, however, occur to some of our readers, that this superiority has been purchased by using much greater weights of armour than would be used in the American vessels; and there is no doubt that at first sight this appears probable. A closer examination shows that this is not the case, and that, the weights,of armour and, deck−plating required by the two plans are as nearly as possible identical. From a discusson that took place at the Institution of Civil Engineers some time ago on "Ships of War" (introduced by Mr. Bourne), it appears that Mr. Reed had gone carefully into this aspect of the subject before finally adopting the breastwork system; and it is quite possible to see, in a general way, why this system does not require greater weights of armour than the American, or Ericsson, system. As we have said above, in an American monitor the bases of the funnels and ventilating shafts, and the hatchways require to be separately protected, while the turrets have to be armoured from roof to base. In the English plan only the part of the turrets showing above the breastwork require to be armoured, and the breastwork protects all the other parts just enumerated, besides which the position of the upper deck, enclosed by the breastwok does not require to be plated over; and the plating on the breastwork deck need not be as strong, or as heavy, as plating for the same area on the upper deck would have to be made in order to give equal protection. These are some of the principal causes which, it is alleged, prevent the continuous breastwork from requiring a greater weight of armour than would be used if the American system were followed.



We must now pass on to the *Cerberus*. Her principal dimensions are :−Length between perpendiculars, 225 feet; breadth 45 feet; draught of water, 15 feet 6 inches; tonnage, 2,107 tons B. 0. M. She has twin screws driven by independent engines having a collective power of 2500 horse−power nominal, working up to about six times. Her estimated speed was 8 knots, but there is good reason for anticipating from her performance on her voyage round from Newcastle to Chatham that this speed will be exceeded. Her upper deck is 3 feet above the water, and her side is amoured down to a depth of 4 feet below water. The side armour above water is 8−inch, that below water 6−inch, and the teak backing 9 and ll−inch, the skin plating being 11¼−inch. Although of such moderate dimensions this vessel carries thicker armour than any of our iron−clads yet commissioned,

except the *Hercules*. On the breastwork most of the armour is 8−inch, but in wake of the turrets 9−inch armour is employed. On the turrets there is 9−inch and 10−inch armour, the greater thickness being used at the ports. Each turret carries two 18−ton guns throwing 400−lb. shot, and it is supplied with two engines (TT in the plan) for turning it; turning gear to be worked by hand is also fitted, so that either manual or steam power can be applied. Every point on the horizon is commanded by the turret guns; and this is a feature which is considered essential in all our monitors, even the *Glatton* with her single turret having command of the full circle of training. This uninteruppted command of the horizon is, or should be, viewed, as highly important, if not the ruling principle in the arrangements of a ship carrying a turret armament; but, as we have shown receently in speaking of "Sea−going Turret Ships," it is almost, if not qulte impossible to secure such a command in a full−rigged ship. The monitors, we need hardly say, have no masts, rigging, or sails, so that no hindrances to the fire of the guns exist, and the gain in this respect undoubtedly more than counterbalances the disadvantages resulting from the absence of sail−power. The Admirallty have in their recent sea−going monitors, the *Thunderer* and *Devastation*, signalised their opinion on this matter, and their supporters affirm that their opponents on this course, both in the House of Commons and elsewhere, have failed to meet the arguments advanced in favour of the substitution of an extremely large coal supply in these vessels for sail−power. No doubt many of the reasons stated for retaining sail−power in war ships are unanswerable when supplied to *cruisers*, but these vessels, although sea−going, are not intended for cruising. Their mission will probably be to proceed to the Mediterranean, or across the Atlantic, there fight a battle, and then return; or to lie in wait off some of our naval stations, such as Gibraltar, within easy reach of large coal supplies, and be prepared to meet any enemy. For such services the monitor type of ship, trusting entirely, to her steam−power, is alleged to be undoubtedly superior to any full−rigged ship, whether armed on the broadside or turret principle.

ln the *Cerberus*, her upper deck and breastwork deck are strongly plated, the one with 1½−inch plating and the other with 1−inch. In some of the larger monitors, such as the *Glatton* and *Thunderer*, 2, 2½ or even 3−inch deck plating has been adopted; but these thicknesses are of course, associated with much stronger side armour and backing, 12 or 14 inches of armour, and l8 or 20 inches of backing. Proportionally to the strength of the side, therefore, the deck plating of the *Cerberus* is about as strong as that of the other ships. The care which has been given to strengthening the decks of these monitors has been well bestowed, for the war with the Southern States in America proved that the decks were the weakest part of their earlier monitors, and in the American ships deck−plating of much greater strength has been employed.

With respect to the structural arrangements of the *Cerberus* very little need be said, except that they afford one of the best examples of the application of the bracket−frame system, which, since its introduction under Mr. Reed's directions into the hull of the *Bellerophon*, has been gradually improved and perfected. The cross section of the *Cerberus* indicates these arrangements very fairly, and shows how the vessel's safety and strength are increased by the complete double bottom that rises on each side to the height of the armour. By this means, as long as the inner skin remains intact, no water can enter the hold; and while in all iron ships the plan is very valuable, in low−decked monitors it is especially important, since the margin of buoyancy is so small. Besides this provision the *Cerberus* has the usual water−tight bulkheads and partitions in the hold, by which her safety is still further increased. These bulk−heads extend up to the upper deck, and their positions are indicated on the longitudinal section.

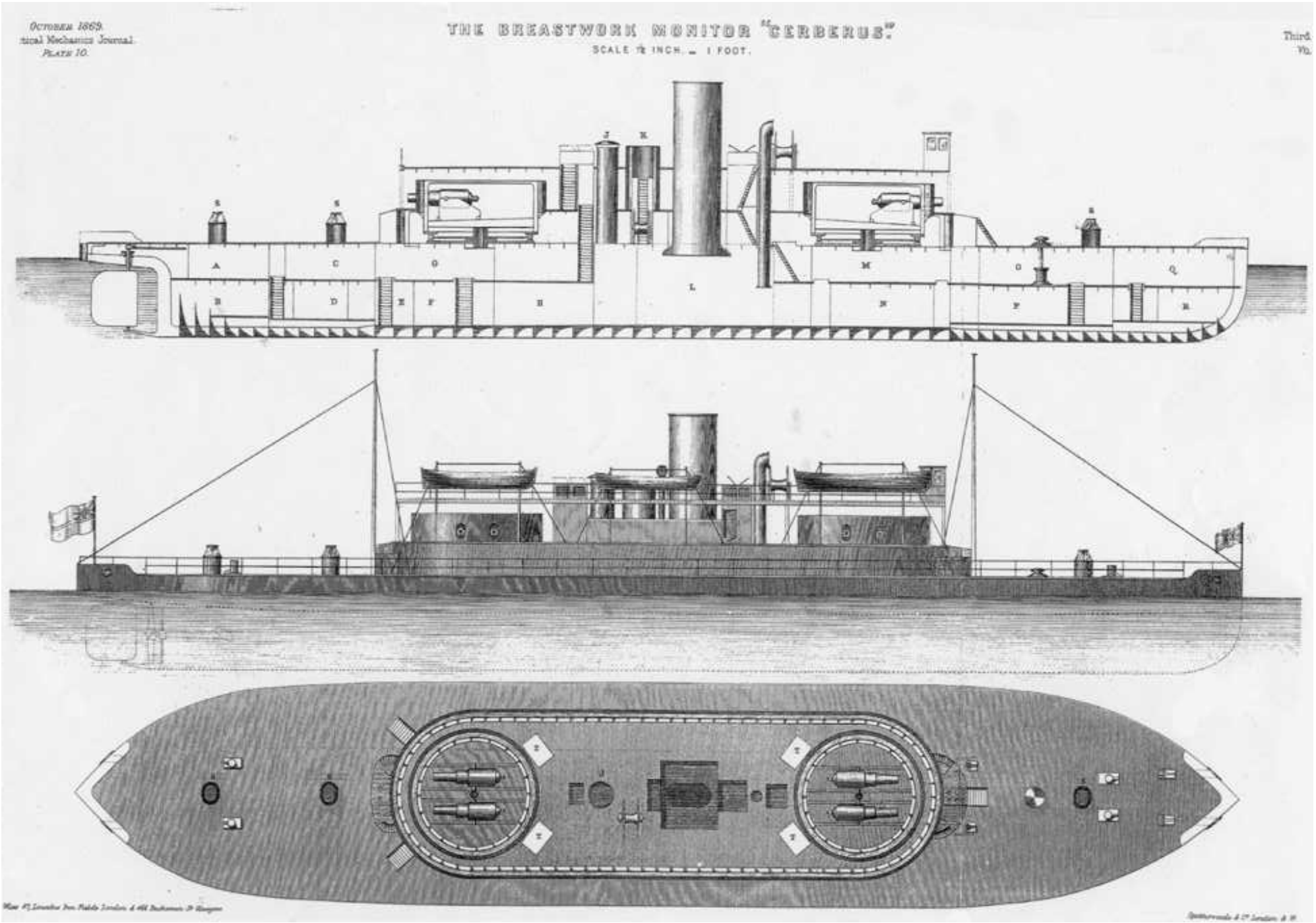
Many difficulties must obviously have been encountered in arranging the subdivisions, stowage &c., of this new class of ship, and in securing comfortable and healthy quarters for the crew. The ventilation is, of course, artificial; blowing fans worked by auxiliary engines being employed to distribute to all parts of the ship, through suitable channels, the fresh air that enters through the ventilating shaft (J in the engravings). The vitiated air escapes mainly through the turrets when the ship is in fighting or sea−going trim; under other circumstances it would also find exit up the sky−lights, ladder−ways &c. Great care has been bestowed upon the drainage and pumping arrangements, and indeed upon the fittings generally; and, so far as one can judge from what is known of the American monitors, there is no reason to doubt that the various and special requirements of the ship have been satisfatorily met. It must be acknowledged that the Americans have taught us a great deal of what we know about, monitors, and we have doubtless profited by both their successes and their failures, so that it might be supposed that our vessels

October 1869.
tical Mechanics Journal.
Plate 10.

THE BREASTWORK MONITOR "CERBERUS."

SCALE ⅛ INCH. = 1 FOOT.

Third.
Vo.



would in some respects be superior to their American predecessors. Some advocates of the American type of monitor, however think it incapable of improvement, and consider everything but unqualified praise to be equivalent to denial of its merit. In view of what has been said there can be little doubt that this type is both capable of being improved upon, and the advocates of the present designs allege that it has given place to a better type already in our Navy, since these breastwork monitors are equally capable of being adapted to fighting in shallow waters as the American ships, and are far more efficient when fighting−power at sea is required. While recognising American claims to the introduction of the monitor model, therefore,we may repeat the assertion made by many that English naval architects have very much improved upon it. Mr. Reed has been assumed to be exclusively devoted to the broadside system, but by introducing these breastwork monitors he has ably initiated the attempt at once to secure fighting efficiency, lowness free−board, and a turret armament, and, it may be hoped, effected more of real value than any of the thick−and−thin advocates of the turret system, if given wholly their own way.

In the engravings A represents the captain's cabin; B the bread room; C the ward room; D the spirit room and captain's stores ; E the shot room ; F engineers' stores; G cabins; H the engine room; J the ventilating shaft; K the pilot house; L the stoke hole ; M cabins, bath rooms &c. ; N N magazines and shell rooms; o berth for crew; P water and provisions; Q sick bay; R warrant officers stores; sss armour−plated skylights ; T T T T engines for working the turrets; and u u the shaft tunnels. The plate engraving is drawn to a scale of 1/16th of an inch to a foot; the wood engraving, which is a section through the centre of after−turret, to a rather larger scale.

---

typed by Cherylle Thurling 2003