SCIENTIFIC AMERICAN

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THE ITALIA.

This week we illustrate this celebrated Italian armorclad, a vessel which, says *Engineering*, has aroused more interest in naval circles than any other war ship since the French La Gloire was the means of introducing armor plating as a method of defense for first-class ocean-going war vessels.

The Italia and her sister ship the Lepanto were commenced about ten years ago. In design they were an immense step on anything that had preceded them. One cannot help admiring the courage of the Italian naval authorities in laying down these two vast and costly ships, comprising so much in their design that was open to criticism and necessarily involving features of doubtful advantage. This reproach, however, may be brought against all modern war ships, for the absolute data we have to go upon in the present day is of so meager a character that no one can pronounce with any degree of certainty what would be the practical fighting value of any particular class of design. Until the world sees a great naval war every one is entitled to an opinion, and hence the vast gulf that divides the doctrines of our most renowned professors.

The Italia was built at Castellamare, on the Bay of Naples, and the Lepanto at Leghorn. It will be remembered that in 1877 the Italian parliament sanctioned what may truly be described as a spirited naval policy. It was decided to build sixteen battle ships of the first class, ten of the second class, and twenty cruisers. Italy had then afloat the powerful armorclad Duilio, and her sister ship, the Dandolo, was being pushed forward at Spezia. These are iron ships, each 10,400 tons, of the Inflexible type, having turrets placed in a similar position to those of the latter vessel, while the ends depend on subdivision and on an armored deck for protection from fatal damage. The Italian vessels were commenced before the Inflexible, and, therefore, cannot in any way be said to have been copies of the English ship. In them external armor is placed on a citadel 107 feet in length, and descending for about 6 feet below the water line. This central distance of 107 feet is the only part of the ship's side which is protected by vertical exterior armor. A design based on these lines soon attracted hostile criticisms from Sir Edward Reed, who, during the construction of the vessels, expressed his opinion that they were exposed "beyond all doubt and question" to speedy destruction, and that the Italians "were pursuing a totally wrong course likely to result in disaster."

In spite of the strictures of our ex-chief constructor, the Italians not only followed up their plan of design undaunted, refusing to put outside armor on the ends of their ships, but actually had the temerity to abandon outside protection altogether—a step which must have fairly taken their critic's breath away. The result is the Italia and the wonderful ships of the same class which have followed her.

The following are some of the particulars of design of the Italia and Lepanto:

	ft.	in.
Length between perpendiculars	400	6
Breadth of beam at water line	73	9
Breadth of beam at upper deck	65	6
Draught of water forward	26	6
Draught of water aft	30	6
Draught of water mean	28	0
Area of immersed midship section	1,770 sq. ft.	
Displacement at load draught	13,480 tons.	
	ft.	in.
Length of armored tower on fore and aft line	88	6
Breadth of armored tower across ship (extreme)	72	3
Length of armored tower *per se*	96	0
Breadth of armored tower	52	9
Distance of stem from armored tower	170	0
Thickness of side of tower, including armor	3	3
Thickness of armor on tower	0	21
Thickness of armor on breastwork	0	18
Height of center of heavy guns above water line	32	8
Height of top of tower above water line	30	0
Height of upper deck above water line, forward	25	0
Height of upper deck above water line, aft	23	0
Height of upper deck above water line, amidships	22	6
Height between upper deck and battery deck	7	9
Height between battery and second deck	7	9
Height between second and armored deck	7	6
Depth lower deck below water line, amidships, sides	5	6
Depth of hold under lower deck	21	0
Extension of ram beyond forward perpendicular	6	4
Distance of point of ram below water line	8	6

Machinery.

Number of engines	4 sets	
Number of cylinders	12	
Number of propellers	2	
Diameter of propellers	19	6
Number of boilers	26	
Number of furnaces (three to each boiler)	78	
Total grate area	1,521 sq. ft.	
	ft.	in.
Length of ship, fore and aft, occupied by engines, coal, and boilers	250	0

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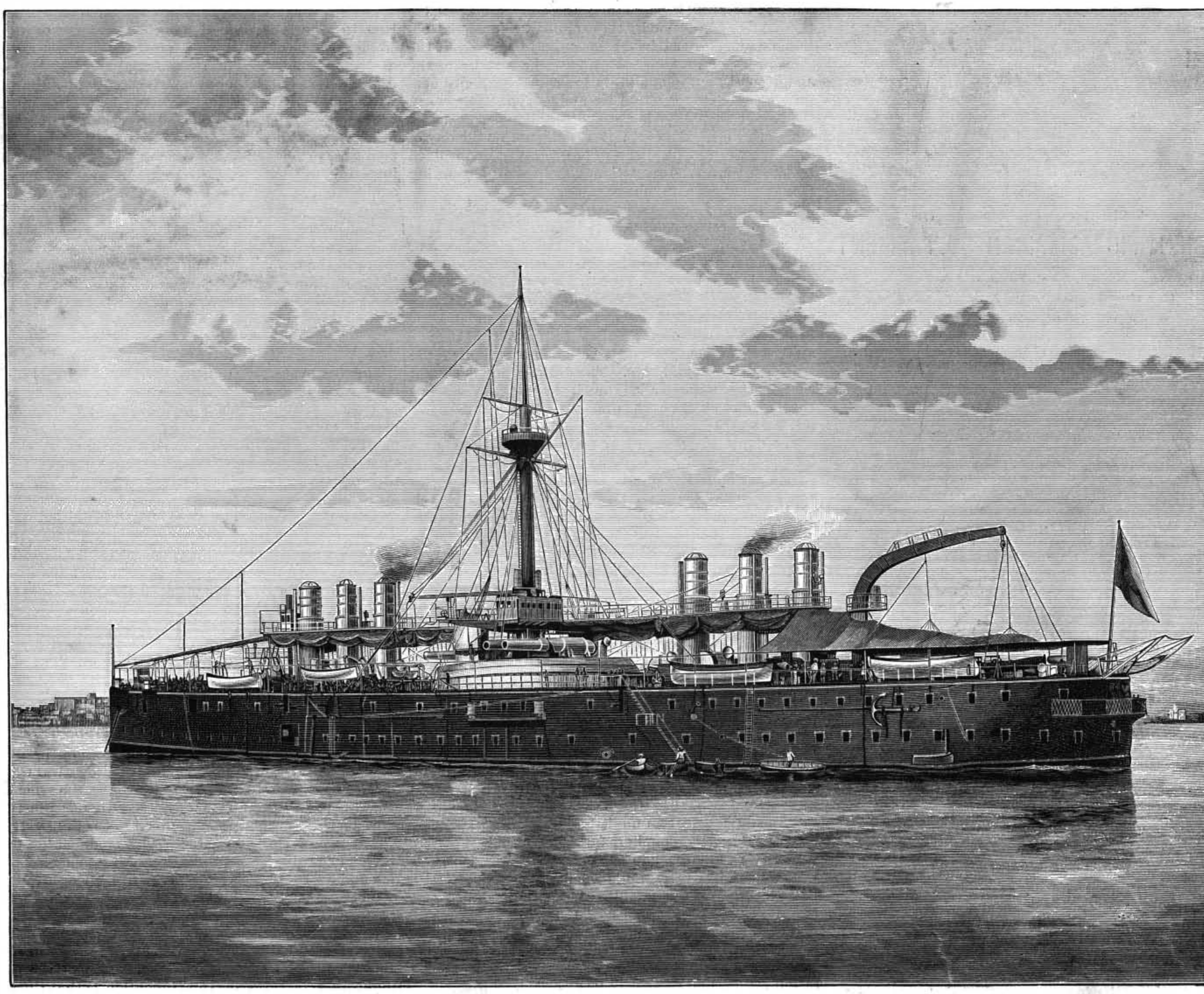


THE ITALIAN IRONCLAD ITALIA.

THE ITALIA.

(*Continued from first page.*)

The estimated weights of the hull, armor, etc., were given approximately as follows:

	Tons.
Hull	5,000
Armor of armored deck	1,200
Armor of citadel	900
Armor of ammunition shaft	246
Armor of chimneys	552
Total weight of armor	2,898
Teak backing	114
The total weight of the machinery is about	2,200

The armament consists of four 43 cm. (110 ton) R. L. R. guns supplied by Armstrongs. There are eight 15 cm. (6 in.) Armstrong breechloaders. Six of these are carried on the upper deck, two being respectively bow and stern chasers. There are six smailer quick-firing guns of 57 mm. caliber.

There are machine guns, comprising twenty-two Hotchkiss and quick-firing guns for the boats and landing parties. There will also be a number of Maxim guns.

There are four torpedo ports arranged on the broadside, two ahead and two astern.

The two sets of engines for driving each of the Italia's twin screws have each three cylinders of equal size arranged in line on the shafting. At full speed they all take steam direct from the boiler, but in ordinary working the foremost cylinder of each set alone takes steam from the boiler, and exhausts into the other two cylinders. There are thus six cylinders to each propeller. The engines are placed amidships, the boilers being placed fourteen before and twelve abaft them. The shafting runs under the after boilers. It is this unusual arrangement of the boilers which gives the vessel the somewhat peculiar appearance due to the position of the six chimneys, which it will be seen by our engraving are placed in two groups of three each before and abaft the barbettes. The latter are placed *en echelon*, and each one carries two of the monster 100-ton guns. The barbettes are contained] in an armored casemate, which is supported by the unarmored structure of the ship, a point in design that has raised many adverse comments from naval critics in this country. The space thus inclosed is entered from below through an armored shaft, which leads below water to the space between the forward and after sets of engines. This armored tube serves as an ammunition shaft. The bases of the chimneys in each group are also protected by armored belts. The plated deck completes the armored protection of the ship. This deck extends from stem to stern, the armor being of steel, and 3 in. thick. The body plan of the ship shows this deck in a uniform curve extending from side to side. Where it springs from the skin of the vessel it is about 5 ft. 6 in. below water line, and at its highest part it is about 1 ft. 6 in. below the level of the water. These figures are those which were allowed for in the design, but we believe, as a matter of practice, the Italia, like so many other war ships, has accumulated weight during construction, so that the deck is more submerged still. It is this under-water arrangement of the armored deck that has been so unfavorably criticised, and it may be noted that in the succeeding ships, Re Umberto, Sicilia, and Sardegna, the crown of the deck has been raised considerably above the water level, so as to conform more nearly to the arrangement followed in our own smaller protected ships of the Mersey type.

Steel is largely used in the construction of this vessel, and when we remember that she was commenced ten years ago, we feel we have another reason to admire the courage and prescience of her designer. The bottom is sheathed with wood. The double bottom has 3 ft. 3 in. between the two skins in the midship part. There are two longitudinal water tight bulkheads, extending fore and aft for 254 ft. Altogether the hull is divided into 53 vertical divisions, these being split up again horizontally by the four decks. Cork stuffing is extensively used in the side compartments. Six feet above the water line is a deck of ordinary plating covered with wood; and above this is the battery deck, having a height of 14 ft. above the water line. Again, 7 ft. 9 in. above this is the upper deck, which supports the casemate containing the big guns mounted *en barbette*. The great height at which the Italia carries her guns is a very strong point in favor of her design, such an element being to a war ship of the present day, when armored decks form so important an element of defense, very much what length of reach is to a boxer. High speed is another and perhaps the most important advantage that was aimed at as a counterbalancing advantage in dispensing with side armor. The under-water shape of the Italia is very beautiful, and in looking at her model one is forcibly reminded of a remark of our present director of naval construction, Mr. W. H. White, that however unsightly modern war ships are to view afloat, some of the most beautiful forms ever produced by the naval architect were hidden from sight below the water line of the ungainly superstructures. It was hoped that the Italia would steam 18 knots, and this was all but got on her trial, the speed we believe that was registered being as stated 17·8 knots. The power developed by the engines was considerably short of the contract. It was expected to get 18,000 indicated horse power, but there was a very large falling off from this. There was, it is said, a difficulty in getting air down to the furnaces, and the necessary amount of coal could not be burnt. Alterations and improvements are now in course of consideration, and no doubt will lead to an increase in the power developed.

To Builders and All Who Contemplate Building.

A large number of the builders in the United States and Canada keep on file, not only for their own benefit, but for the use of their customers, all the numbers of the ARCHITECTS AND BUILDERS EDITION of the SCIENTIFIC AMERICAN, which they are pleased to show to persons contemplating building, and they find their business has been promoted by so doing. From the working plans so fully given in this publication, after the design for the elevation or style of the house has been selected, builders are enabled to give a close estimate of the cost of construction. But most persons contemplating the building of a house or stable for their own use derive both pleasure and considerable saving, sometimes, by carefully considering at their leisure, and by their fireside, various designs and plans which may come before them. To enable a person to come to a wise conclusion in such an important matter as building a home for his family, he will be wise if he brings the subject before his entire household, and studies carefully over in the domestic circle the many plans he should provide for their consideration. It will not only afford great pleasure to the entire family to be considered in the matter, but good suggestions will come from it, and mistakes will be less likely to occur in the selection of the plans and in the construction of the building. By all means consult the wife and grown-up daughters, if so fortunate as to have them, and to this end everybody who contemplates building is advised to provide himself with a complete file of the ARCHITECTS AND BUILDERS EDITION of the SCIENTIFIC AMERICAN—31 numbers already published—and then he will have at hand not only the best material to select his design for a house from, but he will also find it useful and profitable to refer to while the building is being constructed.

In this connection we assert, without fear of contradiction, that every number of the ARCHITECTS AND BUILDERS EDITION of this paper which has been published contains useful and important information for every one about to build, and facts not obtainable elsewhere. And if the possessor of the last issue or any other single number which has happened to fall into his hands does not find the design for a house, stable, store, or other structure he contemplates building that suits his fancy or the estimate of the cost is too great, he will be very sure to find in some one of the other thirty numbers something that will suit both his fancy and purse. Hundreds of dwellings have been erected on the plans that have appeared in this publication, and every one who contemplates building, or who wishes to alter, improve, extend, or add to existing buildings, whether wings, porches, bay windows, or attic rooms, should not fail to provide himself with a complete set of the ARCHITECT AND BUILDER, which is published on the first of each month, at the office of the SCIENTIFIC AMERICAN, 361 Broadway. Single numbers by mail 25 cents, and in paper covers $2.50 a volume of six numbers, also for sale by all newsdealers.

A New Life Boat.

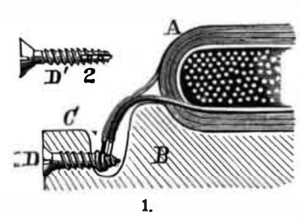
Some interesting experiments were made recently at St. George's dock, Liverpool, with a new life boat, the invention of Messrs. Gray and Hughes, and built by Mr. R. R. Gray, at his works at the Queen's dock. The boat is 16 feet in length, with a beam of 5 feet 6 inches, and 2 feet 6 inches in depth. She is built of galvanized steel sheets, and is in 20 watertight compartments. When not in use, she can be transformed into a deck seat. When in this form, directly she is lowered, or in any way touches the water, she folds together, and is kept in position by a clip at each end of the boat, which is at once screwed up. The boat will hold from twenty-five to thirty passengers, and has life lines outside her bulwarks, which will assist as many more in keeping afloat. She will carry over four tons dead weight. The watertight compartments are so built that they can be used for storing food, etc. The life boat can also be fitted with two masts, and has eight life buoys, which can be instantly detached and thrown overboard. Experiments were made to illustrate the *modus operandi* of putting her into the water, in this case by means of a crane, which lowered the boat into the water. Immediately on touching the water, the boat was transformed from a deck seat into a life boat fully equipped for a voyage. Several people then got in, and were rowed about the dock, after which she was hoisted up and resumed her position as a deck seat. It is stated that the boat can be put into the water in any position, but will always right herself.—*Iron.*

Correspondence.

Improvement on Simple Electric Motor.

To the Editor of the Scientific American:

Referring to your article on "How to Make a Simple Motor," in SCIENTIFIC AMERICAN SUPPLEMENT, No. 641, the method of joining the ends of the armature coils to the screws forming the commutator can, I think, be improved in this way. See Figs. 1 and 2.



The wood, B, being turned away so that the inner ends of the screws, D, are clear, then by a file or hack saw a slit could be cut in the screws, which would admit the ends of the armature wires. Now, both wires and screws being well tinned, if placed in position a drop of solder and a hot iron will complete the connection. As the screws will wear and burn, they will have to be replaced, and by a hot iron this can be readily accomplished without injury to the wires, as they do not have to be bent or scraped in any way. J. T. WHITNEY,

Assistant in Physics, Ohio State University.

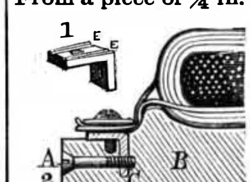
Columbus, O., April 24, 1888.

[The improvement suggested is undoubtedly practical, and may be adopted to advantage by those desiring to make a motor of the kind referred to; but it involves the use of a hack saw and soldering iron in addition to the tools required in the construction of the motor as originally described. The motor was designed to be made with common tools, such as may be found in almost every dwelling house. If one has an engine lathe and a full complement of metal and wood-working tools, the construction of an electric motor becomes an entirely different matter. In such a case a motor might be made in the regular way more readily, perhaps, than in the manner suggested. It is our purpose to publish a full description of a "regularly made" electric motor in the near future.—EDS.]

A Commutator for the Simple Electric Motor.

To the Editor of the Scientific American:

As I am interested in making the simple electric motor described in No. 11 of the SCIENTIFIC AMERICAN, I will describe my method for making the commutator. The parts are few and easily made by all those who have small screw-cutting tools, and will afford a more certain means of connection than to place the armature wires in the wood and trust to a sure contact between the wires and the wood screws. From a piece of ¼ in. sheet brass, or any other suitable



material, cut 12 L-shaped pieces, 7-16 in. each way (Fig. 1). Next fit each piece into the wooden hub in place of the holes for the armature wires, taking care that each piece is embedded almost entire in the wood (Fig. 2). Drill the 12 holes in place of the wood screws, through the piece of brass, from the end of the hub, and pass a lap through.

Procure 12 brass rivets, A (with washers), of sufficient length to reach from end of hub to L, cut threads on each one and fit into the hub, passing through the L (Fig. 2).

Drill and tap each L on its upper surface for a machine screw and washer, D, cutting a small groove, E, at the edge of each for the wires from the coils. Place the armature wires under the washer and fasten with the screw in the order described in the description of the motor. GRANT J. THOMAS.

[The remarks in connection with the letter of Prof. Whitney will apply in this case.—EDS.]

The Age of the Stars.

A very interesting address delivered at the annual public session of the five academies of France, October 25, 1887, by M. Jannsen, the director of the observatory at Meudon, France, is published in the December numbers of *Ciel et Terre* and the January and February numbers of *L'Astronomie*. The principal thought is that the idea of evolution may be applied to the stars as well as to terrestrial things. The stars are not fixed and eternal, but are subject to change and time. They have a beginning, a period of activity, a decline, and an end. By recent advances in the study of celestial physics, especially with the spectroscope, we are enabled to know something of the actual condition and relative age of some of the stars. We may assume that the age of stars, other things being equal, will depend upon their temperature, and that their temperatures are higher in proportion as their spectra are richer in violet rays. The majority of the stars which are visible to the naked eye are white or bluish, and therefore at a high temperature; but many are yellow or orange, like our sun, showing that they have passed their youth, while others are from dark orange to dark red, showing that their sidereal evolution is far advanced. —*Sidereal Messenger.*