

# SCIENTIFIC AMERICAN

[Entered at the Post Office of New York, N. Y., as Second Class Matter. Copyrighted, 1888, by Munn & Co.]

A WEEKLY JOURNAL OF PRACTICAL INFORMATION, ART, SCIENCE, MECHANICS, CHEMISTRY, AND MANUFACTURES.

Vol. LIX.—No. 5.  
ESTABLISHED 1846.

NEW YORK, AUGUST 4, 1888.

\$3.00 A YEAR.  
WEEKLY.

## THE ITALIAN WAR SHIP ITALIA.

In our paper for May 26 last we gave an engraving of the gigantic Italian war ship Italia. We now present an illustration showing how her great guns are arranged, for which, and the following particulars, we are indebted to *Engineering*:

Length between perpendiculars.....	ft. in.	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.	
Length of armored tower on fore and aft line.....	ft. in.	88 6
Breadth of armored tower across ship (extreme).....		72 6
Length of armored tower <i>per se</i> .....		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 ft. in.
Diameter of propellers.....	19 6
Number of boilers.....	26
Number of furnaces (three to each boiler).....	78
Total grate area.....	1,521 sq. ft.
Length of ship, fore and aft, occupied by engines, coal, and boilers.....	250 0

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

Hull.....	Tons.	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.....	2,858	
Teak backing.....	114	
The total weight of the machinery is about.....	2,200	

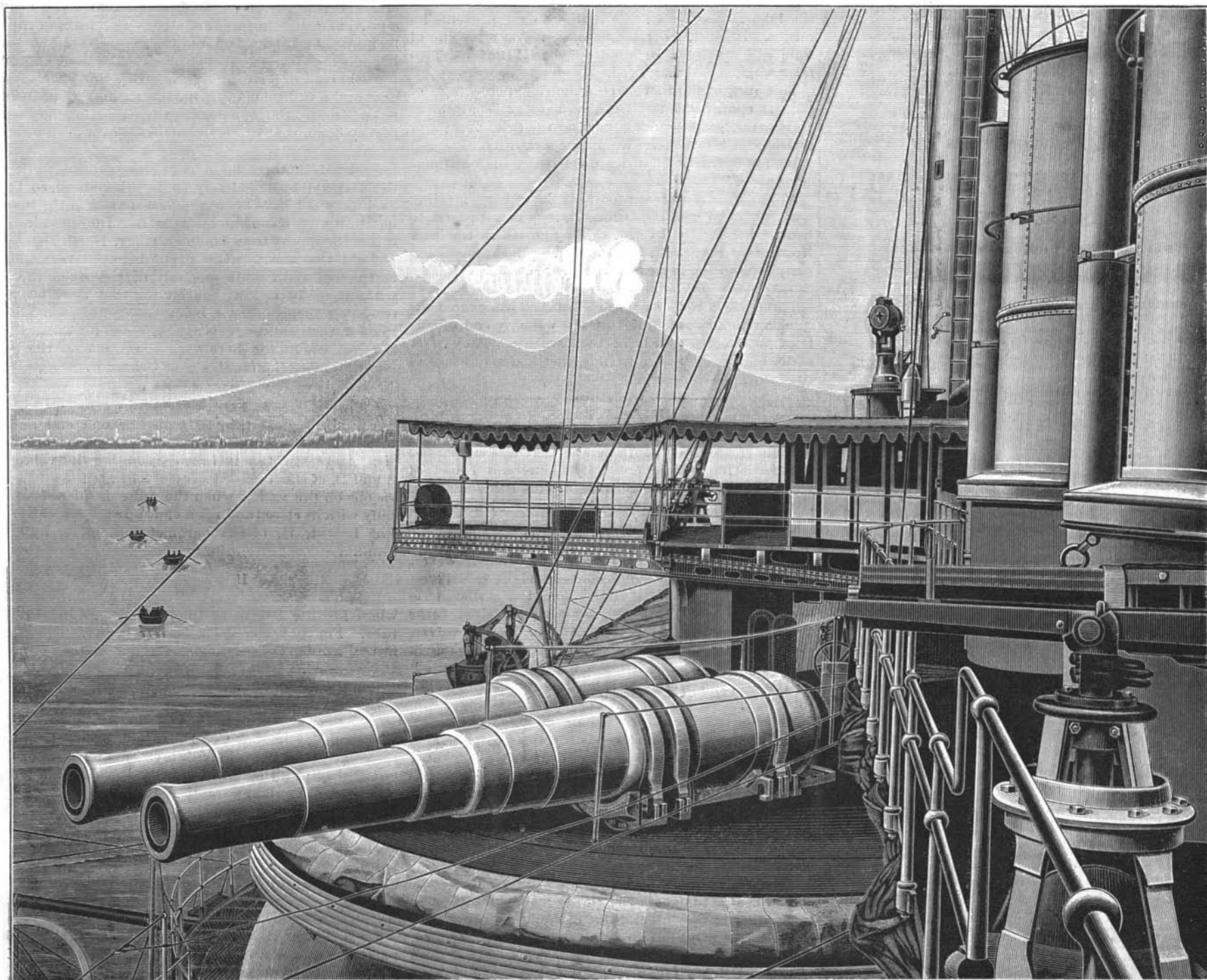
The armament consists of four 43 cm. (110 ton) R. L. R. guns supplied by Armstrongs. There are eight 15 cm. (6 in.) Armstrong breechloaders. Six of these are carried on the upper deck, two being respectively bow and stern chasers. There are six smaller quick-firing guns of 57 mm. caliber.

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.

## Remarkable Tunnels.

Among the great tunnels which have been excavated, says a writer in *Scribner's Magazine*, the St. Gothard is the most remarkable. It is  $9\frac{1}{4}$  miles long, with a section  $26\frac{1}{2}$  feet wide by  $19\frac{1}{2}$  feet high. The work on this tunnel was continuous, and it required  $9\frac{1}{4}$  years for its completion. The Mont Cenis tunnel,  $8\frac{1}{2}$  miles in length, was completed in twelve years. The Hoosac tunnel,  $4\frac{1}{4}$  miles in length, 26 feet wide and  $21\frac{1}{2}$  feet high, was not prosecuted continuously; it was completed in 1876. These tunnels are notable chiefly on account of their great length; there are others of more moderate extent which have peculiar features; one is unique. This tunnel is a portion of the St. Gothard railway, and not very far distant from the great tunnel referred to above. In the descent of the mountain it was absolutely necessary to secure a longer distance than a straight line or an ordinary curve would give. The line was therefore doubly curved upon itself. It enters the mountain at a high elevation, describes a circle through the rock, and, constantly descending, reappears under itself at the side; still descending, it enters the mountain at another point and continues in another circular tunnel until it finally emerges again, under itself, but at a comparatively short horizontal distance from its first entry, having gained the required descent by a continued grade through the tunnels.



THE ITALIAN WAR SHIP ITALIA.