

**BATTLESHIPS "IDAHO" AND "MISSISSIPPI."**

The "Idaho" and "Mississippi" are sister battleships that were authorized by act of Congress March 3, 1903, which specified that the ships were to have the highest combination of speed, defensive armor, battery power, and coal endurance compatible with a displacement of 13,000 tons. The design of these ships was promptly taken up by the Bureau of Construction, and on May 27 the Chief Constructor presented to the Board on Construction five different scale designs for these vessels. On June 10, 1903, the Department adopted the report of the Board, which gave a preference to the design which is shown in the accompanying illustration, and the contract for the two vessels was ultimately let to the Cramp & Sons Company, of Philadelphia, where the vessels are now under construction.

Although we are not familiar with the features of the alternative designs which were submitted to the Board on Construction, it is evident that in the selection of the accepted design the Board was influenced by the desire to make the two ships conform, as far as possible, to the 16,000-ton battleships of the "Connecticut" class, to which they have been compared in language, more expressive than nautical, as "smaller editions." A difference of 3,000 tons in the displacement of two battleships is a large one, of course, and involves considerable sacrifice. If the reader will compare this illustration with views and detailed descriptions that we have given of the 16,000-ton "Connecticut," he will recognize at once most of the changes in battery and general appearance that have been made. In the first place, the length on the waterline has been reduced from 450 to 375 feet; the beam is about the same, 76 feet 10 inches for the "Connecticut" and 77 feet for the "Idaho;" and the respective drafts are 24 feet 6 inches for the "Connecticut" and 24 feet 8 inches for the "Idaho." From this comparison it looks as though the under-water body of the "Idaho" must be somewhat finer than that of the larger ship. A large saving has been made in the engine and boiler-room weights, the designed indicated horse-power being reduced from 16,500 in the "Connecticut" to 10,000 in the "Idaho." With this, there is a corresponding reduction in the space given up to the coal bunkers, the "Connecticut" carrying a maximum of 2,200 tons as against 1,750 tons on the "Idaho"; but, on the other hand, there is a marked gain in the steaming radius at 10 knots per hour, the smaller vessel being able to steam 5,775 knots as against 5,275 for the "Connecticut." The estimated speed on trial, however, of the "Idaho" is but 17 knots, or one knot less than that of the big ship.

A further reduction of weights, a very large one in itself, is gained in the lowering of the quarter deck. In the "Connecticut," the upper deck is continuous from stem to stern; in the "Idaho," it extends from the bow to the after end of the central broadside battery, at which point the freeboard is reduced by about 8 feet, or from say 21 to 13 feet. While there is a considerable loss of accommodation, this cutting down of the topsides is accomplished with a very considerable lowering of weights, and a consequent increase in stability. There is, however, a loss of "command" for the after pair of 12-inch guns. Still another reduction has been made in the absence of the mainmast, the new ships carrying only a foremast, as is the case with the "Oregon" class. A reduction has been made in the armament, which includes the removal of four 7-inch guns, eight 3-inch guns, six 3-pounders, and four 1-pounders. Not only is the weight of these twenty-two guns removed, but also the weight of their mounts, ammunition hoists, and large stores of ammunition.

The battery consists of four 12-inch guns, eight 8-inch guns, eight 7-inch, twelve 3-inch, twelve 3-pounders, eight 1-pounders, two 3-inch field guns, two machine guns, and six Colt automatic guns. The 12-inch guns are carried above two main barbettes, protected with armor varying from 10 inches to 6 inches in thickness, the turret armor varying from 12 inches to 8 inches in thickness, the thinner armor of the barbets being used in the lower portions, where the barbets are protected by the armor plating of the ship. The 8-inch guns are carried in four barbette turrets at the four quarters of the ship, the turret armor being 6½ and 6 inches in thickness, and the barbette armor 6 inches and 4 inches in thickness, while that of the sub-barbets, or that portion which lies behind the 7-inch protection of the ship's side armor, is 3¾ inches in thickness. Eight 7-inch guns are carried in a central broadside battery, which is protected by 7 inches of armor, and they are mounted in recessed ports with semicircular shields that fit closely the port openings. One and one-half inch transverse armor walls, or screens, project from the ship's side between each pair of guns, for the purpose of localizing the effects of bursting shell. The dozen 3-inch guns are mounted as follows: two forward in the bow in sponsons, four upon the upper deck, in broadside between the 8-inch gun turrets. On the superstructure deck are four more guns, two forward and two aft, while the remaining two are carried at each end of the main bridge. The three-pounders and machine guns are distributed through the bridges and in the tops. Two 18-inch Whitehead

torpedo discharge tubes complete the armament of these very formidable vessels. The ships are protected at the waterline by a continuous belt of armor (and, by the way, all the heavier armor is of the cemented Krupp steel type), which is 9 inches in thickness at the top and 7 inches at the bottom in way of the machinery spaces, and this armor reduces toward the ends of the ship successively to 7 inches, 5 inches, and 4 inches in thickness. The ship's side from the main belt to the main deck is protected, for nearly two-thirds of the ship's length amidships, by a wall of 7 inches of armor, and there are athwartship bulkheads also 7 inches in thickness.

Now, although we consider it unfortunate that Congress should have limited the size of these two particular ships to 13,000 tons, preferring to have seen them of the same displacement and identical in all the features of speed, armor, and armament with the vessels of the "Connecticut" class that are now authorized or under construction, it must be admitted that the Bureau of Construction has turned out a most excellent design on a limited displacement; for the armor protection and the battery power of the "Idaho" and "Mississippi" are, we consider, fully equal to that of any of the largest of the foreign battleships that are at present being built. For their size they are the most effective battleships in the United States navy.

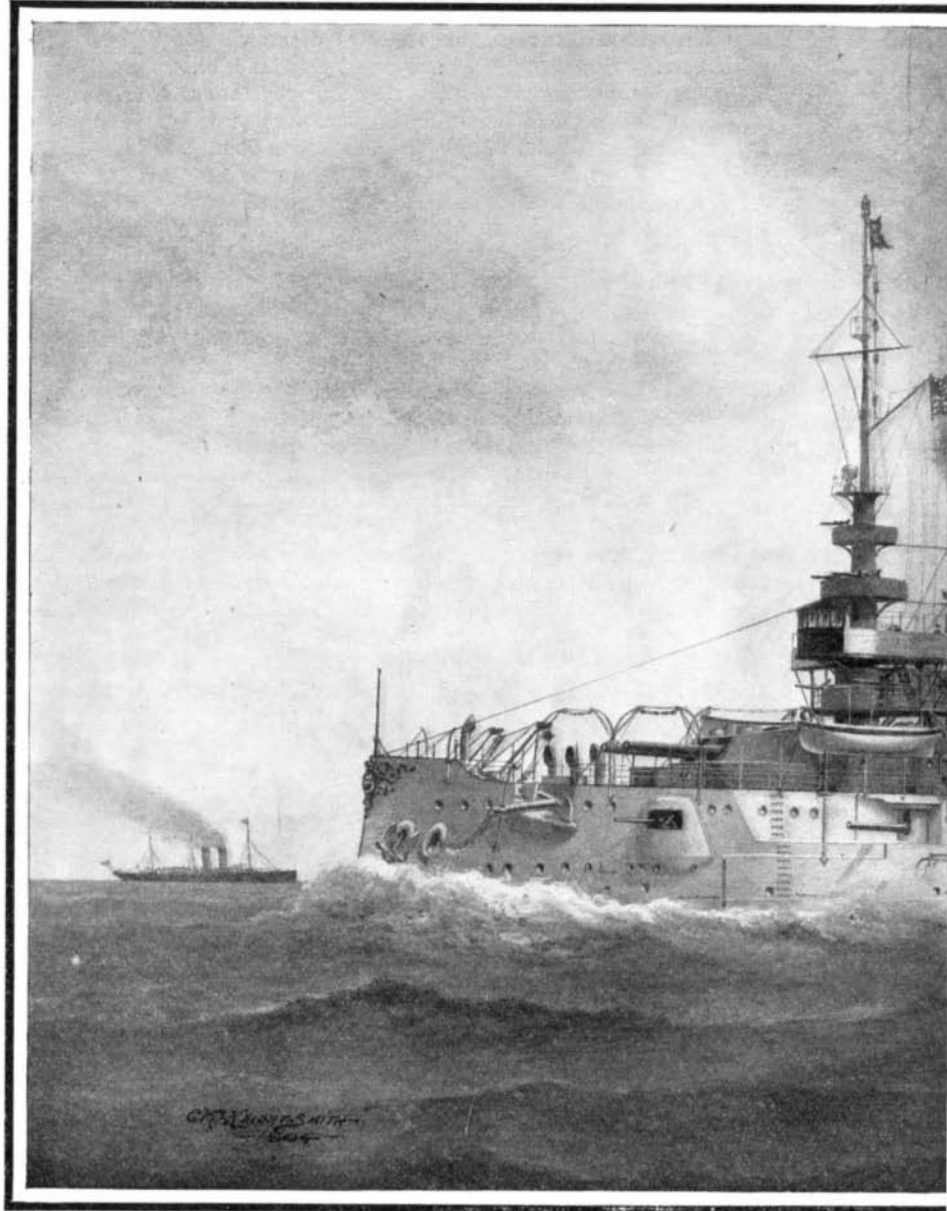
**THE MODERN BATTLESHIP WITHIN AND WITHOUT.**

On the cover of the present issue we present a striking illustration of the "Louisiana," the latest and largest of the United States battleships, with Admiral Farragut's famous "Hartford" introduced in the offing, to show the changes wrought in the past forty years. In the accompanying cut is shown in detail the interior of the "Louisiana." The ship carries four 12-inch, eight 8-inch, twelve 7-inch guns and a numerous battery of smaller pieces. She has a 12-inch belt, a 3-inch protective deck, and excellent protection for her batteries. Her speed is 18 knots. She is a sister ship to the "Connecticut," which was fully described in our issue of October 1, 1904.

The story of the complicated character of the interior of a modern battleship is one that has grown somewhat stale in the telling, and it is not the fault of the magazine writer and the occasional correspondent of Sunday supplements, if the general public is not satisfied that a great battleship or cruiser is complicated beyond the power of words to express.

In saying that the battleship is complicated we must be careful to remember that complication does not imply confusion; and that in all the practicable achieve-

ments of engineering, it would be difficult, if not impossible, to find a structure which, in spite of the many parts of which it is made up and the enormous elaboration of detail that it manifests, is really so harmoniously proportioned, or is better fitted to the ends for which it was designed. There are some subjects of which an illustration will tell more in five minutes

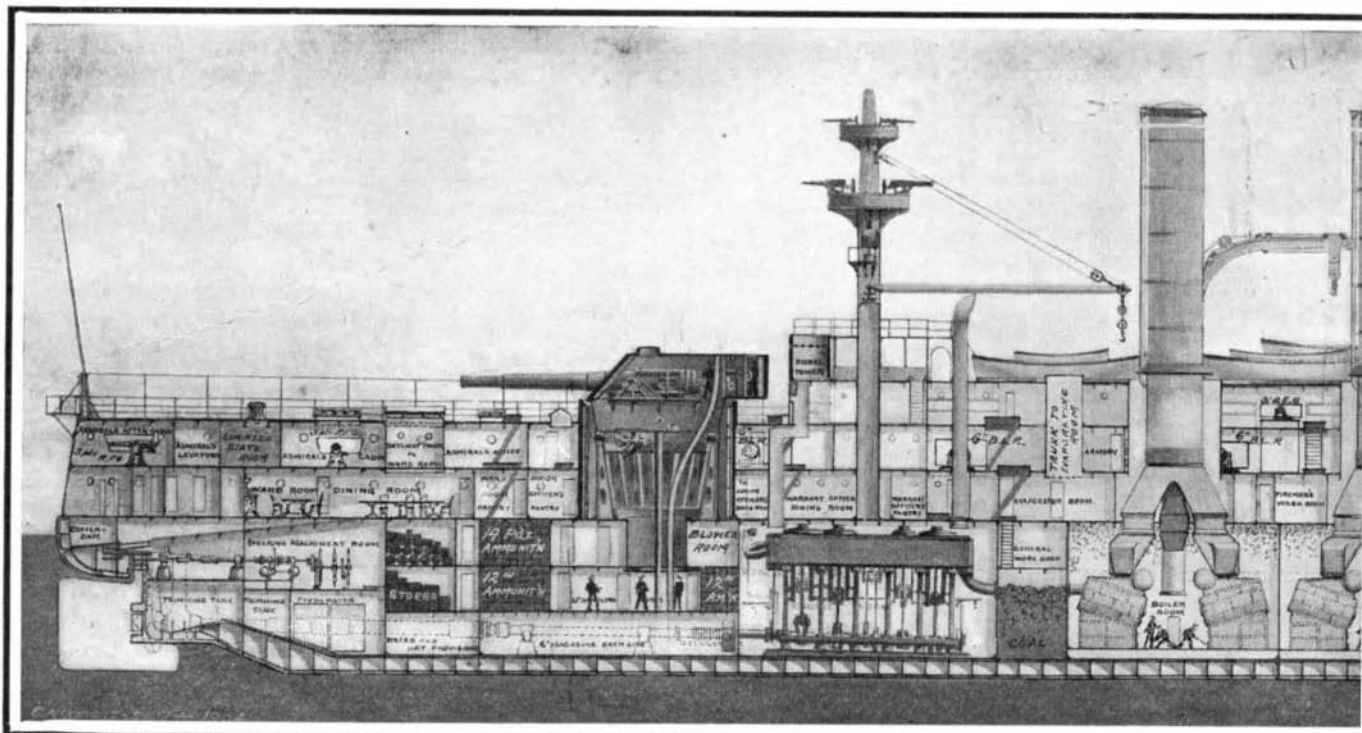


**Displacement, 13,000 tons. Speed, 17 knots. Coal Supply, 1,750 tons. Armor: Belt, 9 inches thick. Four 12-inch, eight 8-inch, eight 7-inch, twelve 3-inch, twenty**

**NEW BATTLESHIPS "IDAHO" AND "MISSISSIPPI,"**

than tongue or pen can explain in an hour; and in presenting the accompanying view of the interior of one of the latest battleships of the United States navy, we shall not attempt to give any elaborate description of the vessel, but will leave it to the diagram to tell its own story.

The drawing is what is known as an inboard profile; that is to say, it is a vertical, central, longitudinal section through the whole length of the ship. The huge structure of which we thus obtain an interior view, is a little under 450 feet in length from the extreme tip of the ram to the end of the rudder. The foundation of the whole is the keel, which is nothing more nor less than a deep plate girder, 3 feet 6 inches in



**LONGITUDINAL SECTION THROUGH THE BATTLESHIP "LOUISIANA," S**

depth, extending from the inboard end of the ram structure to the rudder post. Bisecting it at every 4 feet of its length occurs one of the plate girder frames or ribs, which extend athwartship, and run up to the under edge of the armor shelf, where they are reduced to a depth of say from 12 to 18 inches, the frames extending up the sides of the ship to the level of the

compartments, measuring  $3\frac{1}{2}$  feet in depth by 4 feet in length by about 6 feet in width. These compartments are absolutely watertight. Above the inner floor or platform the central portion of the vessel is taken up by the magazines, boiler rooms, and engine rooms. These, because of their vast importance, are known as the ship's vitals, and great care is taken to protect them

against the entrance of heavy projectiles of the enemy, and, as far as may be, against the attack of the still more deadly torpedo. The engines and boilers are so proportioned as to height that they do not extend above the waterline; and to protect them from plunging shot, or from the entrance of the fragments of heavy, high-explosive shells, bursting within the ship above the waterline, a steel deck, 2 to 3 inches in thickness, known as the protective deck, extends at about the level of the waterline over the whole of the vitals, and is continued in a gently curving slope to the ram forward and to the stem aft. In the vessel here shown this steel deck is  $1\frac{1}{2}$  inches thick on the flat and 3 inches thick on the slopes.

Now, the space below the protective deck is divided up by a large number of transverse, water-tight bulkheads of steel plating, there being nineteen of these bulkheads altogether. They extend from the inner shell of the vessel to the under side of the protective deck. They are riveted perfectly water-tight, communication from compartment to compartment being by water-tight doors. Forward in the bow are the trimming tanks, used to assist in bringing the vessel to an even keel. Then abaft of the collision bulkhead are bread and dry provision stores, and the construction stores. In the next compartment, which is divided into three decks, we have on the floor of the ship a storeroom for torpedo gear, submarine mines, etc. Above this is the under-water torpedo room, and immediately below the protective deck are kept the paymaster's stores and life preservers. In the next

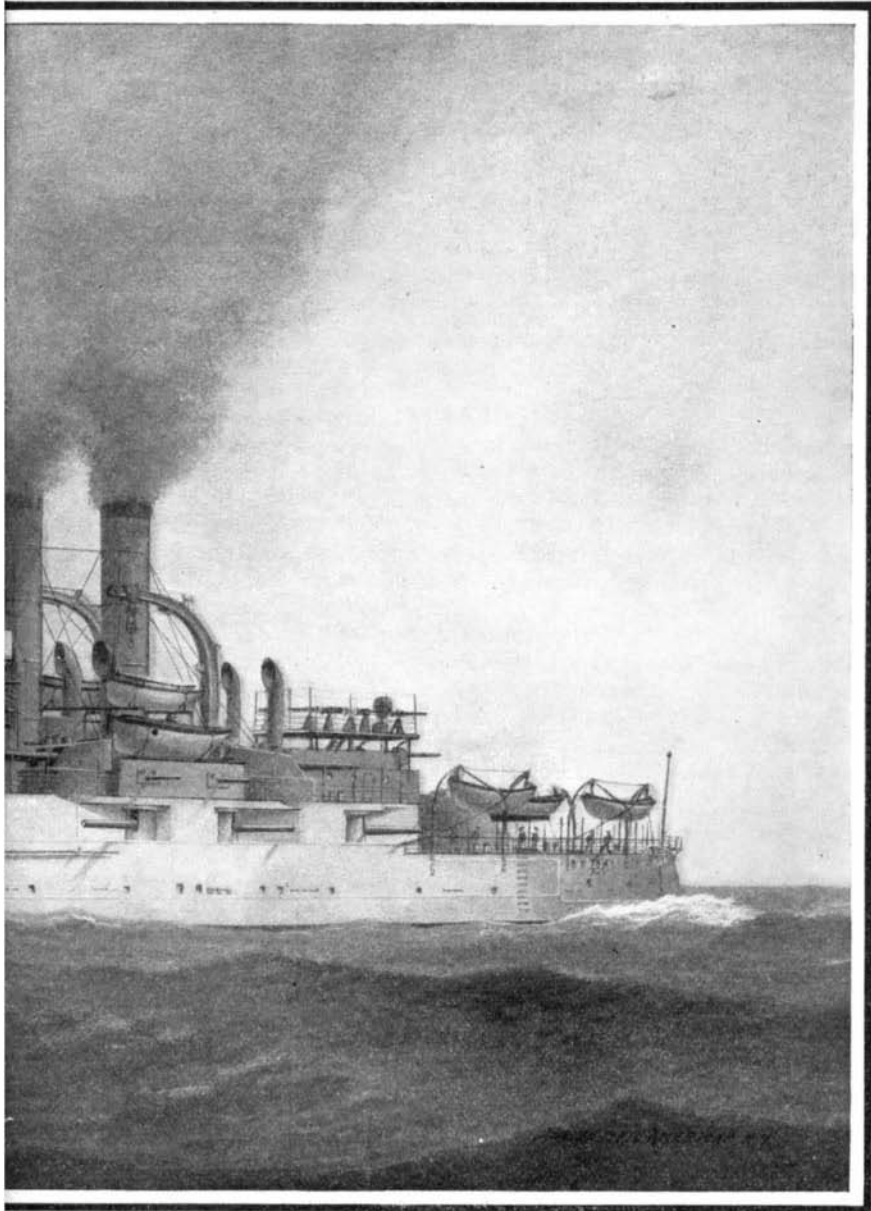
compartment, below on the platform, are the anchor gear and chain lockers, and above this the navigator's stores. Passing through the next bulkhead we come to the vitals of the ship proper, with the 6-inch gun magazines on the floor, the 12-inch magazines and handling rooms on the deck above, and above this the 14-pounder ammunition and blower rooms. Above the magazines, and resting on the protective deck, is the barbette of the forward pair of 12-inch guns, the armor and its relative thickness being shown by heavy, black lines; while in front of the barbette the heavy sloping black line indicates the athwartship sloping bulkhead, placed there to prevent raking projectiles from passing through the entire structure of the ship.

Immediately to the rear of the forward barbette is seen the conning tower, with the heavily armored tube which protects the telephones, electric wires, voice tubes, etc., that pass from the tower down below the protective deck. In the next compartment, aft of the magazines, are the dynamo rooms; and then between the next two bulkheads is placed an athwartship coal bunker. A similar coal bunker extends athwartship on the other side of the boiler rooms; and it must be understood that at the side of the boiler rooms are the wing bunkers which run aft for the whole length of the boiler rooms and engine rooms. The boiler installation on this particular ship is entirely of the water-tube type, and it consists of twenty-four units arranged in six separate water-tight compartments, three on each side of the center line of the vessel. Aft of the boiler rooms comes the athwartship coal bunker above referred to, and then in two separate water-tight compartments are the twin-screw engines. Aft of the engines in another compartment is contained a complete set of magazines similar to that beneath the forward barbette, and above them, resting on the protective deck, is the after barbette and turret, with its pair of 12-inch guns. Aft of the magazines come more compartments, devoted to stores. In the next compartment, down on the platform, are the fresh-water tanks and two trimming tanks, and on the deck above, below the protective deck, are, first, the steering-machinery room, and then the steering-gear room, each being in a separate water-tight compartment. This completes the description of the space below the protective deck.

The protective deck is known more generally among seamen as the berth deck. Above that, at a distance of about  $8\frac{1}{2}$  feet, comes the main deck, and  $8\frac{1}{2}$  feet above that the upper deck, while amidships, between the two main turrets, is the superstructure, the deck of which is known as the superstructure or boat deck. The berth deck and main deck are devoted to the living accommodations of the officers and crew, the crew being amidships and forward, and the officers aft. The berth deck, as its name would indicate, is largely devoted to the berthing and general living accommodation of the crew. Here are also to be found, in the wake of the forward gun turrets, on one side the sick bay, and on the other side the refrigerating room and ice machine. Aft of that, on the port side, are the sick bay, lavatory, dispensary, machinists' quarters, ordnance workshop and blowers; while on the starboard side are the petty officers' quarters, the laundry, and the drying-room. Then, in the wake of the boiler-rooms, on each side of the ship, are coal bunkers which add their protection to that of the side armor of the vessel. In the center of the ship are washrooms for the crew and firemen. Aft of the coal bunkers on this deck come the officers' quarters. On both sides of the ship are the staterooms of the junior officers, and the wardroom staterooms, while between them is a large wardroom and dining-room with its pantry. The extreme aft portion of the berth deck is taken up by officers' lavatories, etc.

On the main deck above, forward, is more berthing accommodation for the crew, also shower baths and lavatories, while amidships are found the various galleys for the crew and the officers, arranged between the base of the smokestacks, while amidships in the wings of the vessel is more berthing space for the crew. Aft on the main deck the space is given up largely to accommodations for the senior officers and for the admiral, which, by the way, give one an impression more of commodiousness than of rich or extravagant furnishing. Forward, above the conning tower, are the pilothouse, chartroom and the room of the commanding officer. In the particular ship shown, the heavier guns are mounted on the upper deck, two 12-inch guns in a turret forward and two aft, and eight 8-inch guns in four armored turrets, two on each broadside amidships. The intermediate battery of twelve 6-inch guns is mounted on the main deck, the guns firing through casemates. On this deck are also eight 3-inch guns, four forward and four aft; there are also four 3-inch guns, mounted in broadside on the upper deck, within the superstructure. The new method of emplacing guns on our warships, by which it is possible to swing the guns around until their muzzles are flush with the side of the ship, has the good effect of leaving the side of the ship free from projecting objects when the vessel is in harbor, and of leaving the living spaces of the crew but very slightly obstructed.—Reprinted from "Scientific American Reference Book" of 1905.

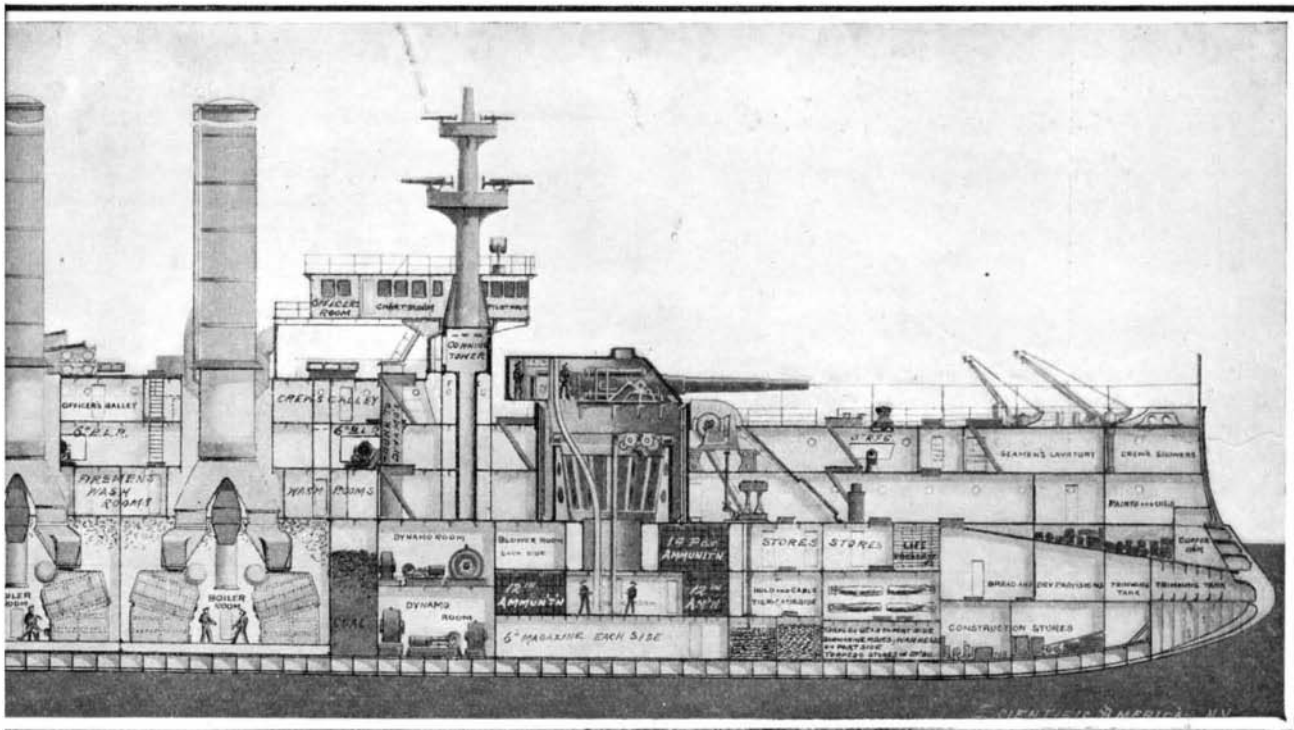
According to the recently published statistics of the Milan Association of Silk Manufacturers and Merchants, there are at the present time 1,065 silk spinning mills in Italy. Of this number 346 are silk throwing factories, with 705,262 spindles at work, and 49,050 idle; 165 silk weaving factories, with 9,703 hand looms at work and 159 idle; and 7,459 machine looms at work and five idle. Silk manufactories are found in nearly every part of Italy, but the principal centers are in the provinces of Piedmont, Venice, and Lombardy. Machine looms are to be found only in Piedmont and Lombardy.



4 inches; Deck,  $2\frac{1}{2}$  inches; Main turrets, 12 inches; Secondary turrets,  $6\frac{1}{2}$  inches. **Armament:** smaller guns. **Torpedo Tubes,** 2 submerged.

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upper deck. On the outside of these frames is riveted the outer plating of the ship, and upon the inside of the frames, extending as high up as the under side of the waterline belt, say 4 or 5 feet below the waterline, is riveted an inner shell of plating. The space between the outer and inner plating is divided up by the frames into transverse water-tight chambers 4 feet in width, and every one of these spaces is subdivided by seven or eight longitudinal plate girders which are built into the double bottom, as it is called, parallel with the keel and extending, most of them, the entire length from stem to stern. Consequently it will be seen that the space between the outer and inner shells of the ship's bottom is divided into a great number of



**SHOWING THE INTERNAL ARRANGEMENTS OF A MODERN WARSHIP.**