

Modern Battleships Can Stand Heavy Bombing Without Sinking

Inside Of Battleship Is Mass Of Steel, Carefully Fabricated To Perfect Balance

Editor's note—This is the second of a series of articles written on ship building by Harry H. Hall, a former shipbuilder.

Before going further into the description of the building of a ship, let us endeavor to get a little conception of what a ship is, what she looks like inside the steel walls of her outer shell, or hull.

As we mentioned last week, there are two distinct general types of ships: those designed and constructed for naval service, and those for commercial purposes, and for pleasure craft.

At the top of the first classification is the battleship, at the top of the other are the much larger merchant passenger ships of the Queen Mary and Normandie type, ship about one thousand feet long and more than 83,000 registered tons.

Right here let us explain this question of ship's tonnage as we shall have to speak of it many times in these articles, and it is rather a confusing subject, akin to speaking of miles and kilometers as a measure of distance. Naval ships are spoken of as being of so many tons "displacement." This signifies just what the word means, i. e., the number of tons of water displaced by the weight of the ship when immersed to her normal depth. In the case of the battleship this is only changed by the amount of coal, oil fuel, ammunition, or other supplies used, or renewed. In the case of the merchant ship her displacement equals the weight of the ship when light, or unloaded; and it equals this weight of the ship plus the weight of the cargo, when loaded. Under all circumstances the weight of the ship equals the weight of the water displaced, so long as the ship floats. When the weight of the ship is greater than this weight of displaced water the insurance companies are notified, because she has gone to the bottom. A vessel is held balanced between two forces—that of her weight, which is the downward force tending to sink it, and that of the upward pressure of the water, which exerted against her, bulk tends to force her out of the water.

Merchant ships are usually spoken of in terms of net or gross tonnage. Gross tonnage is the entire interior capacity of the ship measure in terms of a ton per 100 cubic feet. Net tonnage is this gross tonnage less the space used for engines and boilers, offices and crew, gear and stores, and other space which is utilized by the ship. It represents what the ship has to sell for cargo and passengers. It forms the basis for all charters for the carrying of freight. It is the space which constitutes her earning capacity. Another name for this space is "Registered Tonnage."

As we said above, the battleship heads one class of ships and the thousand foot passenger ship heads the other. As these two descend the scale of each classification they almost reach a common point. While the merchant ship more nearly carries her

general type of construction all the way through, the naval ship changes materially. She begins to lose weight, strength of construction, and offensive and protective ability as she passes down through the classes of heavy and light cruisers, known as battle and scout cruisers, gun boats, destroyers, etc. They, however, usually increase in speed, and cruising radius as they get lighter. As they go down through fleet auxiliary classes their construction becomes practically the same as that of a merchant ship.

Picture the battleship "Maryland" if you can. I can, for I helped build her. She is a mass of steel displacing 37,500 tons of water. She is 624 feet long, 97 feet 3 1/2 inch extreme breadth, sinks below the surface of the water 30 feet 6 inches. The power plant in her engine rooms drives this mass through the water at a speed of 21.07 miles, about 24.25 land miles, per hour. She carries eight 16 inch guns, firing a broadside weighing 16,800 pounds, and a secondary battery of twelve 5-inch guns delivering a weight of steel of 756 pounds, a combined weight of projectiles of about eight and three-quarter tons. These shells hurtle through the air at a speed of more than two thousand feet per second and hitting, with the large ones, a target twenty miles away, a target unseen, but struck by mathematical calculation and precision reports from the tiny plane high in the air "spotting" for the fire control officers in a room deep in the interior of the ship.

In order to construct a ship that can either withstand the force of the recoil from these guns, or to resist the blow delivered by them, the vessel must be built with strength to the extreme range of human ability. A graphic illustration as to how far guns have gone since the days when "Old Ironsides" got the best of the "Guericke," on the 19th of August, 1812, to the modern "Maryland" is shown between the weight of the "Constitution's" broadside of 684 pounds, against that of the "Maryland" of 17,556 pounds. In just such a proportion has strength and size increased.

Roughly speaking the armored part of a modern battleship resembles an oblong box. Unlike the lighter protection of the remaining parts, this heavy armored "box" extends from a transverse bulkhead well forward, connected by two longitudinal belts along each side, with a like transverse bulkhead well aft. Inside of this armored section are placed the vital elements of the ship, her power plant, her magazines and fire control systems, etc. On top of this belt of encompassing armor are decks of heavy protective resisting steel; below are decks of steel and a heavy double-bottom. Across the entire ship from bow to stern extending from the bottom to well above the water line, are many water tight bulkheads, while others break up these sections fore and aft. The doors of all these can be closed instantly, and at one time, by pushing a button, or throwing a switch on the bridge, thus localizing any water that may come in through a hole in the side, to a very small section of the hull.

The earlier form of armor belt, along the sides from a few feet below the water line, to a few feet above,

A 12-Ounce Baby Grows Up



Two years ago this little girl weighed 12 ounces at birth and was known as the "world's tiniest baby". Now Jacqueline Jean Benson, of Chicago, weighs 24 pounds and is as strong and healthy as any girl of her age.

One Bid

WASHINGTON.—Pan-American Airways submitted the only bid for normal service from Baltimore to Hamilton, Bermuda to the Postoffice Department recently. Its bid was \$90001 per pound for a specific load up to 800 pounds per trip and a rate of \$400005 per pound for loads more than 800 pounds. Under such a bid, if the Airways handle 100,000 pounds of mail per year, the revenue will be only \$1.

\$30,000 For Smile

WICHITA, Kan.—Charging that because of injuries received in an automobile accident, her 3-year-old daughter, Charlotte, "never will be able to smile again," Mrs. E. M. Shafer asked \$30,000 damages from C. G. Hilligoss, whose car was involved in the accident.

Carol, King of Rumania

"It is my government. The day I am not satisfied with its conduct, I will require a change."

was to use plates of great thickness, weighing almost fifty tons each. More modern methods follow the law that it is harder to penetrate three pieces of metal, say of 6-inch, 3-inch and 1-inch thickness each, placed a little distance apart, than it is to pierce one piece of 10-inch steel. This is because the projectile has on three separate times to overcome the initial spring and resistance offered by the sheets of metal, and the force of the blow is greatly reduced. Because of this fact the newer ships have a much lighter outside armor belt, inside of which are two or three parallel belts much lighter still, separated from each other by considerable space, and kept apart by heavy frames and cofferdam bulkheads, each section made watertight from the others. These spaces are utilized for storage. This system is more defensive, and has reduced to weight so that heavier protective decks to guard against air attack can be used, and heavier guns up to 16-inch can be carried without increasing the ship's displacement.

Above the upper protective deck rise the turrets of heaviest armor steel, inside of which are placed the guns of the main battery, two or three to the turret. These turrets are double decked, one forward and the other aft, and extend below the water line in part, so as to afford protection to the ammunition hoists, to power lines and fire control communication systems. These turrets revolve so as to allow the guns to be trained from a point or so forward or abaft the beam on each side and around the horizontal arc forward or aft of the these two broadside points. The vertical movements, of the guns are obtained by raising or lowering their own muzzles. These two movements are so finely adjusted and poised that they are accomplished to a fraction of an inch, smoothly, without sound, with speed, and the power to do this is under such control that a man can move all these hundreds of tons of steel by the turning of a small brass wheel for turret control, and another for gun control.

The parts of the hull outside of this armored section are more lightly protected and give form to the ship and accommodation for less vital parts of her equipment, yet strong enough through their connection with keel plates, and bulkheads and decks to make the whole structure of the battleship the most powerful one in the world of man's achievement.

Bombs to Germany

PHILADELPHIA.—A cargo of aerial bombs, the first of an order which will total 2,500 tons, was loaded aboard the German steamship Crefeld, for shipment to Germany for reshipment, the final destination unnamed.

Former Kaiser of Germany still in exile at Dorn, but his lot is much more comfortable than that of many who were ruined in health and body because of his attempt to conquer the world.

Human Bones in Tree

LONDON.—When a man sawed through an old tree, which had fallen through old age, he found the skeletons of four human beings. Apparently, the bones had been placed within a cavity scooped out of the tree between sixty and one hundred years ago, and the panel, used to close the cavity, had become completely regrafted on the trunk.

Prepare for Flood

KNOXVILLE, Tenn.—In order to provide reservoir capacity to control spring floods in the Tennessee Valley, the TVA has begun to lower the giant lake behind its \$36,600,000 Norris Dam on the Clinch river. Excess rainfall is stored in the dam basin and gradually released, preventing the usual flood damage.

No Bird Hunting Will Be Allowed On Sundays In N.C.

According to G. C. Platt, county refuge and special game protector, at a recent meeting of the State Board of Conservation and Development held in Raleigh, it was voted to prohibit the hunting or taking of game birds or animals on Sunday in North Carolina.

This regulation will become effective on Sunday, February 6. Violation of this board regulation will be considered a misdemeanor and Sunday hunting will be strictly outlawed in the state.

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