

N. SOLIANI.

SHIP.

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999,410.

Patented Aug. 1, 1911.

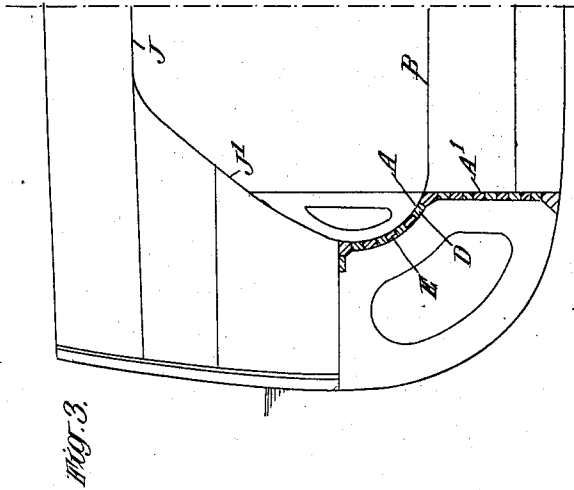


Fig. 3.

Fig. 4.

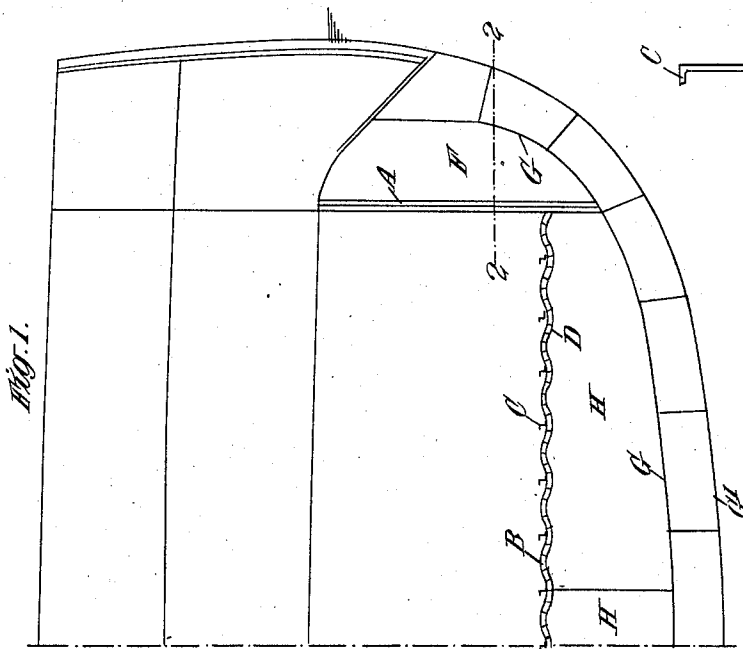
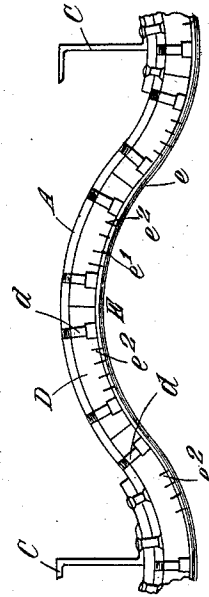


Fig. 1.

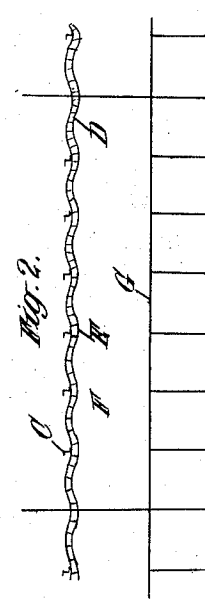


Fig. 2.

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# UNITED STATES PATENT OFFICE.

NABOR SOLIANI, OF SESTRI Ponente, NEAR GENOA, ITALY.

SHIP.

999,410.

Specification of Letters Patent.

Patented Aug. 1, 1911.

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*To all whom it may concern:*

Be it known that I, NABOR SOLIANI, a subject of the King of Italy, residing at Sestri Ponente, near Genoa, in the Kingdom of Italy, have invented certain new and useful Improvements in Ships, of which the following is a specification.

This invention relates to ships used in naval warfare and more particularly to battleships and has for its chief object to improve the construction thereof with a view to rendering the same less liable to be vitally injured by the effects of submarine explosion occasioned for example by a torpedo striking the ship, or by the latter coming into contact with a submarine mine.

It has hitherto been proposed to reduce the damaging effect of these explosions upon the ship's hull, by constructing the latter with an inner and outer skin divided into compartments by longitudinal and transverse bulkheads, and to further protect the vital parts of the ship, such for example, as the engines, boilers and magazines, by strong protective water-tight bulkheads, and platforms, respectively arranged to extend longitudinally within the hull along the sides and bottom of the said vital parts. These bulkheads and platforms have usually been built up of a metal structure comprising flat plates strengthened by strong scantlings riveted thereto, and such metal structure is open to the following objections:—Flat metal plates are the least adapted to withstand any transverse pressure, with the result that the scantlings employed for strengthening such plates have to be made stronger and heavier. Moreover any metallic structure built up solely of plates and frames riveted together, will after being subjected to the effects of an explosion, leak badly through the seams at the lines of rivets, with the result that the beneficial effects of the protective structure will to a great extent be lost.

With a view to overcoming the above mentioned objections, instead of forming the protective bulkheads and platforms of a metallic structure consisting solely of flat plates strengthened by heavy scantlings, I employ plates having corrugated or otherwise curved or bent surfaces so arranged as to impart greater strength and stiffness to the plates, and I support the overlapping ends of such plates by stiffeners arranged in

line with such overlapping portions, and combine with the aforesaid metallic structure means for maintaining the same in a watertight condition after the riveted joints have been strained by the effects of a submarine explosion.

In applying the aforesaid structure to a ship's hull I so arrange the structure that not only the side protective bulkheads are kept as far as possible away from the ship's sides, but the protective platform is also kept as far as possible away from the ship's bottom for which purpose the boilers may be raised so as to occupy a position about twelve feet above the external bottom keel plating.

In order that the said invention may be clearly understood and readily carried into effect the same is described more fully with reference to the accompanying drawings, in which:—

Figure 1 is a transverse section of part of a battleship constructed in accordance with this invention. Fig. 2 is a horizontal section taken on line 2, 2, of Fig. 1. Fig. 3 is a transverse section of part of a battleship showing a modified construction designed with a view to reducing the size of the protective bulkheads to a minimum. Fig. 4 is a detached view of the leakage preventing device drawn to a larger scale.

A represents the protective bulkhead, B the platform and C the stiffeners.

In the arrangement shown in Figs. 1 and 2 the protective bulkhead A is composed of a number of strong undulated steel plates extending the depth of the bulkhead and having their adjacent ends arranged to overlap. These overlapping portions are riveted together and are strengthened by the aforesaid stiffeners C which are riveted or bolted to the inner surface of the plates along their overlapping portions. By this arrangement the line of riveting occurs only where the strong supporting stiffeners are situated, the intervening portions of the plates being whole and free from joints. Outside the steel plating is fitted a wood lining D which is bolted to the said plating by bolts *d* and may be composed of planks suitably calked. Incasing the outer surface of this lining is the device E for preventing leakage of water through the riveted joints when the latter have been strained in the manner above referred to. This device may com-

prise many layers *e* of canvas treated with white or red lead, or with other suitable substance and retained in place by an external lining of zinc or galvanized steel sheeting *e'* secured to the wood lining by nails *e''* some of which may pass through the canvas only. If desired india rubber sheets, or felt sheets or other similar flexible material may be used for preventing the above mentioned leakage.

The protective platforms B are similarly constructed to the side bulkheads with the exception that the part of the platform which comes underneath the boilers is provided with a layer of cement, or other suitable insulating material laid over the platform between the stiffeners C, and a layer of asbestos, or other suitable material is interposed between the steel plating and the wood lining, this arrangement being provided to prevent overheating of the platform and burning of the wood lining.

To augment the resisting power of the protective bulkheads A when the ship is in action the side bunkers F between such bulkheads and the inner skin G are filled with coal and are flooded with water nearly up to the top, and are kept closed as long as the ship remains in action, during which time the coal contained in the transverse bunkers is used. In like manner, the space between the inner skin G and outer skin G' underneath the boilers, engines and magazines, is preferably kept full or partially full of water, and the space H underneath the platform may also be fitted with tanks filled with water, or other substance which will reduce the violence of a submarine explosion.

The above described protective bulkheads are preferably arranged to extend over the whole length of the ship, or to include at least the boilers, engines and magazines. The protective platforms may also extend the whole length of the ship, or if desired, they can be limited to the forward part thereof with a view to obtaining economy of weight. The boiler bearers are preferably arranged to be independent of the platform, so that any deformation of the latter due to an explosion will not affect such bearers.

In the modified arrangement shown in Fig. 3 the protective deck J is so arranged that its converging portion J' terminates in the protective bulkhead A which is curved and forms a continuation of the protective deck and also of the protective platform B, thereby constituting a complete continuous strong inner shell protecting all the vital parts of the ship. The lower part A' of the protective bulkhead may be straight and may extend more or less vertically below the aforesaid platform to the bottom of the ship as shown in the drawing.

By arranging the protective deck in the

manner above described the strengthened part of the bulkhead which protects the boiler rooms and magazines can be reduced to a minimum.

In the arrangement last described the curved portion only of the bulkhead need be corrugated or be otherwise curved or shaped, and be provided with the wood lining D and the leakage preventing device E as this portion is the more important and more liable to torpedo attack, but if desired the said improvements may also be applied to the straight portion A' of the bulkhead which extends below the protective platform B. The latter may consist of flat plates, or of plates formed with the aforesaid corrugated or otherwise curved or bent surfaces, and be provided with means for preventing leakage in the manner above described. The aforesaid platform may be supported by straight longitudinal beams attached to transverse bulkheads or by arched transverse beams, or by both combined, to keep the platform as much as possible independent of the bottom structure of the ship. The platform may also be kept independent of the boiler bearers in the manner above described.

What I claim and desire to secure by Letters Patent of the United States is:—

1. In a ship's hull, the combination of protective bulkheads and platforms extending longitudinally within the hull along the sides and bottom thereof and comprising bent plates riveted together, and means for maintaining the riveted joints in a watertight condition after the said joints have been strained by the effects of a submarine explosion.

2. In a ship's hull, the combination of protective bulkheads and platforms extending longitudinally within the hull along the sides and bottom thereof and comprising undulated plates riveted together, and a leakage preventing device extending outside the protective bulkheads and platforms.

3. In a ship's hull, the combination of protective bulkheads and platforms extending longitudinally within the hull along the sides and bottom thereof and comprising bent plates riveted together, stiffeners extending along the riveted joints of the plates, and a leakage preventing device extending outside the protective bulkheads and platforms.

4. In a ship's hull, the combination of protective bulkheads and platforms extending longitudinally within the hull along the sides and bottom thereof and at a considerable distance therefrom, the said bulkheads comprising a number of plates, the adjacent edges of which overlap and are riveted together, each of the said plates being curved in such a manner as to present an increased resistance to lateral pressure,

and stiffeners secured to the inner surface of the plates along their overlapping portions.

5 In a ship's hull, the combination of protective bulkheads and platforms with a leakage preventing device comprising a wood lining situated outside the metal plating, a flexible waterproofing material incas-

ing the wood lining and retained in place thereon by metal sheeting.

In testimony whereof I affix my signature in presence of two witnesses.

NABOR SOLIANI.

Witnesses:

ANGELO BORAGUJO,  
C. A. FERRARI.

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Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."

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