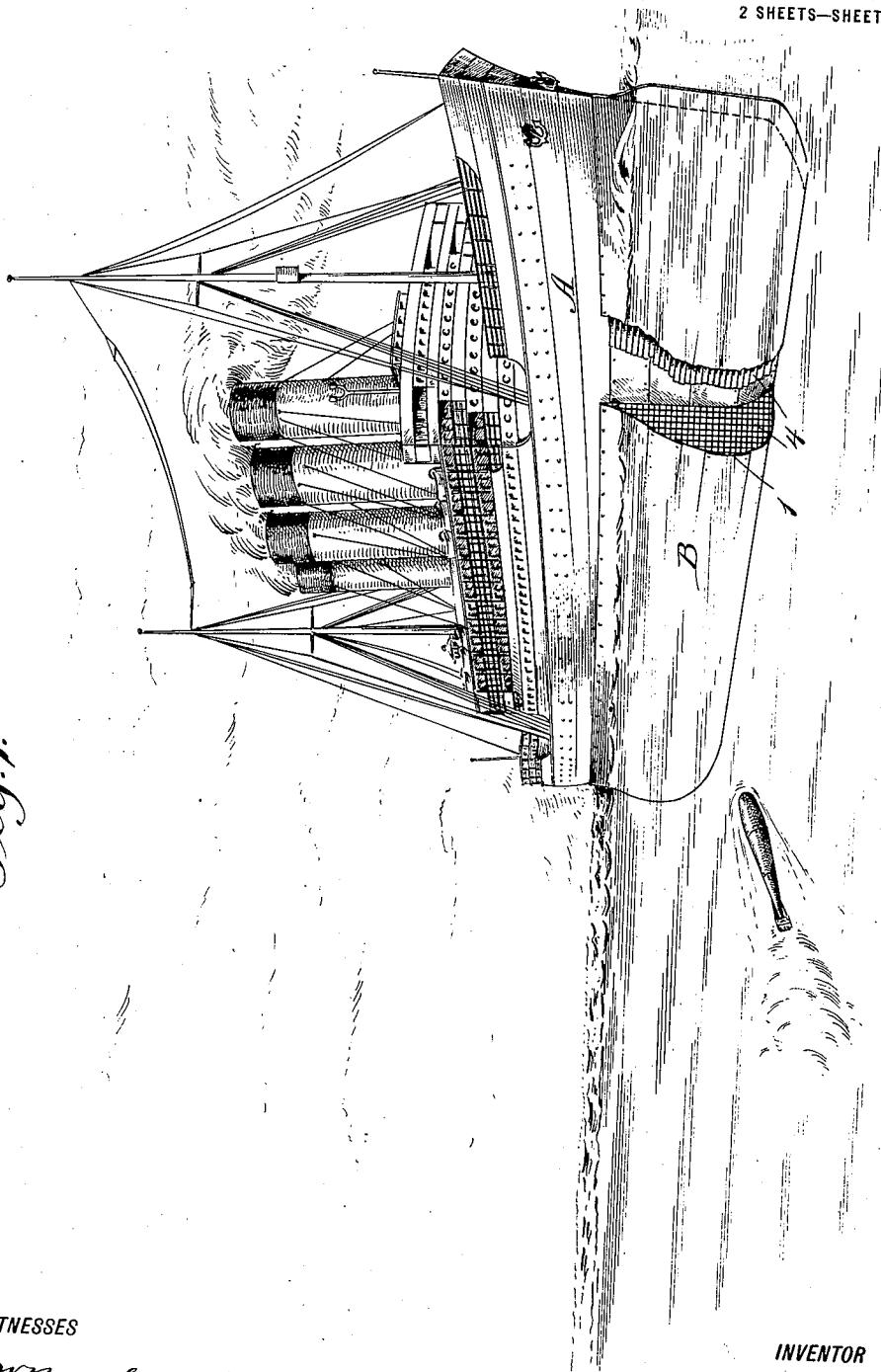


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SHIP PROTECTION AGAINST SUBMARINE EXPLOSIONS,  
APPLICATION FILED DEC. 7, 1916.

1,237,883.

Patented Aug. 21, 1917.

2 SHEETS—SHEET 1.



*Fig. 1.*

WITNESSES

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2 SHEETS—SHEET 2.

Fig. 3.

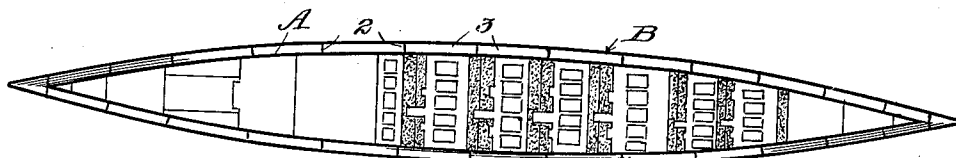


Fig. 4.

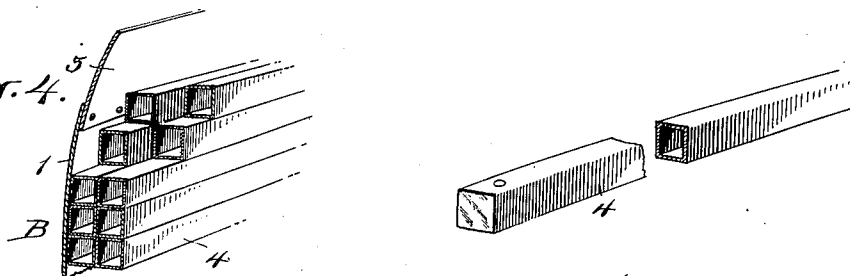
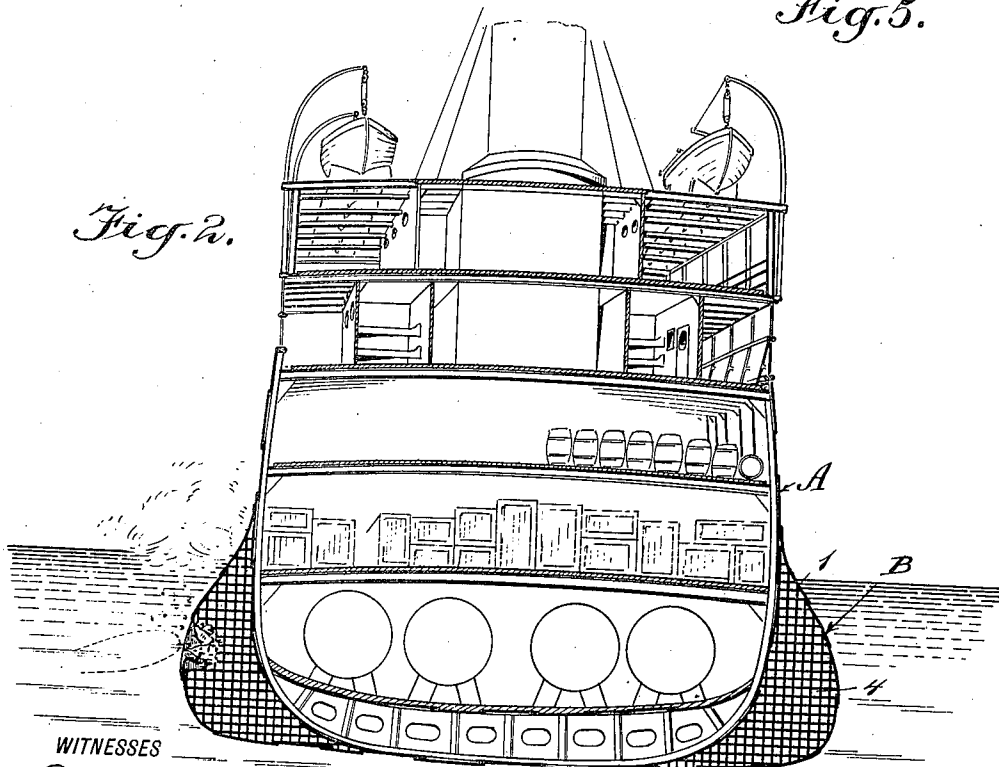


Fig. 5.

Fig. 2.



WITNESSES

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# UNITED STATES PATENT OFFICE.

GIOVANNI EMANUELE ELIA, OF TURIN, ITALY.

SHIP PROTECTION AGAINST SUBMARINE EXPLOSIONS.

1,237,883.

Specification of Letters Patent.

Patented Aug. 21, 1917.

Application filed December 7, 1916. Serial No. 135,676.

*To all whom it may concern:*

Be it known that I, GIOVANNI EMANUELE ELIA, a subject of the King of Italy, and a resident of Turin, Italy, have invented a new and Improved Ship Protection Against Submarine Explosions, of which the following is a full, clear, and exact description.

This invention relates to a hull construction especially designed for protection against torpedoes and submarine mines, and the invention has for its general objects to provide a protective shell around the hull of a ship from stem to stern and along both sides in order to prevent destruction of the hull proper by the explosion of a torpedo or mine, the space between the shell and the hull containing a vacuum so that when the shell is punctured the high pressure and temperatures produced by the explosion can be accommodated by the vacuum space, so that the force against the hull is considerably diminished.

A more specific object of the invention is to provide means in the protective shell whereby the space therein is divided into compartments and the compartments subdivided into small chambers that contain the vacuum, and which are so arranged that no water or air is left, the chambers being preferably square or other tubes which fit compactly together.

With such objects in view, and others which will appear as the description proceeds, the invention comprises various novel features of construction and arrangement of parts which will be set forth with particularity in the following description and claims appended hereto.

In the accompanying drawings, which illustrate one embodiment of the invention and wherein similar characters of reference indicate corresponding parts in all the views,

Figure 1 is a perspective view of a ship having the improved protective structure, a portion thereof being broken away to illustrate the details;

Fig. 2 is a transverse section of the ship;

Fig. 3 is a section of the ship on a reduced scale and on the water line level;

Fig. 4 is a fragmentary perspective view showing the vacuum-containing chambers of the protective structure; and

Fig. 5 is a perspective view of one of the vacuum chambers or tubes.

In the present instance the invention is

shown applied to an ordinary merchant ship, but it is to be understood that it is intended for naval boats as well. The hull A of the ship is of usual construction and the protective structure B is applied to the exterior of the hull without any material change in the design thereof. The protective structure comprises a shell 1 which extends along both sides of the hull from stem to stern, as clearly shown in Fig. 3, and as shown in Fig. 2 it covers the sides from the bottom of the hull to a line suitably above the water level, whereby the sides of the hull will be protected against explosions from torpedoes and submarine mines. The space inclosed by the shell 1 is preferably divided into compartments by bulkheads 2, as indicated in Fig. 3, and preferably the compartments are separated completely from each other. Within each compartment 3 are tubes 4 which are hermetically sealed after the air has been removed, and these tubes are preferably square, except adjacent the shell and the hull, where the tubes may be triangular. By constructing the tubes of the cross-section shown, the entire space inclosed by the shell can be filled without leaving air or water spaces. The tubes are preferably of metal and they may serve in a measure to withstand the external pressure on the shell. The thickness of the belt of vacuum cells of which the protective structure may be considered as composed, depends upon the weight of the explosive charge likely to be encountered.

When a submarine mine or torpedo explodes, a great volume of gas at very high pressure and temperature is generated. Consequently when the protective structure is struck by such an explosive agency, the cells are disrupted and a large vacuum chamber is opened, into which the gas can expand, thereby reducing immensely the temperature and pressure against the main hull of the ship, making it less liable to damage.

From the foregoing description taken in connection with the accompanying drawings, the advantages of the construction and method of operation will be readily understood by those skilled in the art to which the invention appertains, and while I have described the principle of operation, together with the structure which I now consider to be the best embodiment thereof, I desire to have it understood that the structure shown

is merely illustrative and that such changes may be made when desired as fall within the scope of the appended claims.

Having thus described my invention, I claim as new and desire to secure by Letters Patent:

1. A combination of a ship hull with a protection structure therefor, comprising a shell attached to the outside of the hull, a plurality of vacuum containers independent from each other and filling the space between the hull and shell, whereby the air is crowded out of the intervening space.

2. The combination of a ship hull, with a protective structure therefor comprising a shell attached to the outside of the hull, and bulkheads dividing the shell into compartments, a plurality of independent vacuum containers filling each compartment.

3. The combination of a ship hull, with a protective structure therefor comprising a shell attached to the outside of the hull, bulkheads dividing the shell into compartments, and vacuum-containing tubes filling the space of each compartment.

GIOVANNI EMANUELE ELIA.