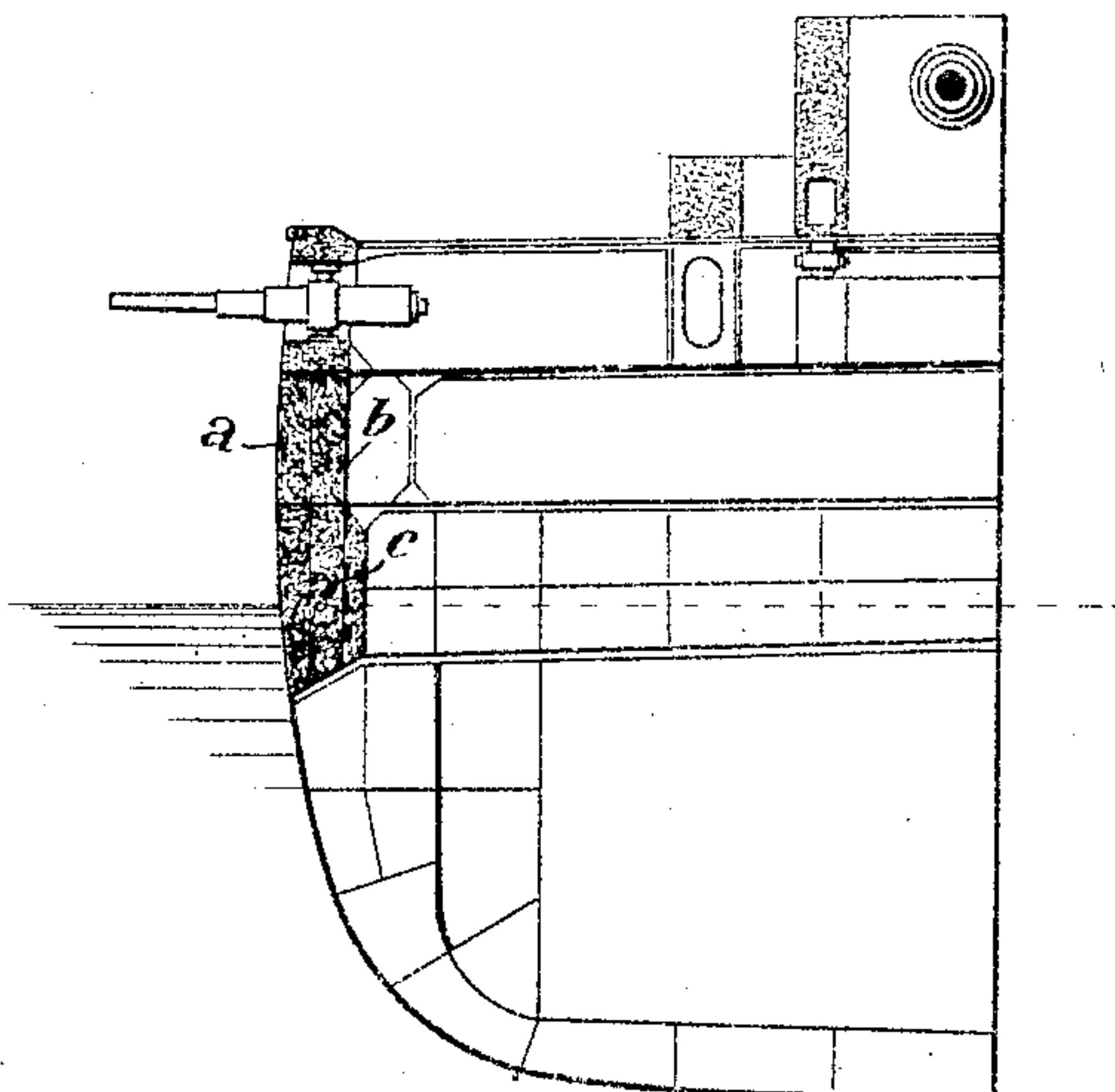


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 BATTLESHIP PROTECTION BY MEANS OF CONCRETE.  
 APPLICATION FILED MAY 4, 1907.

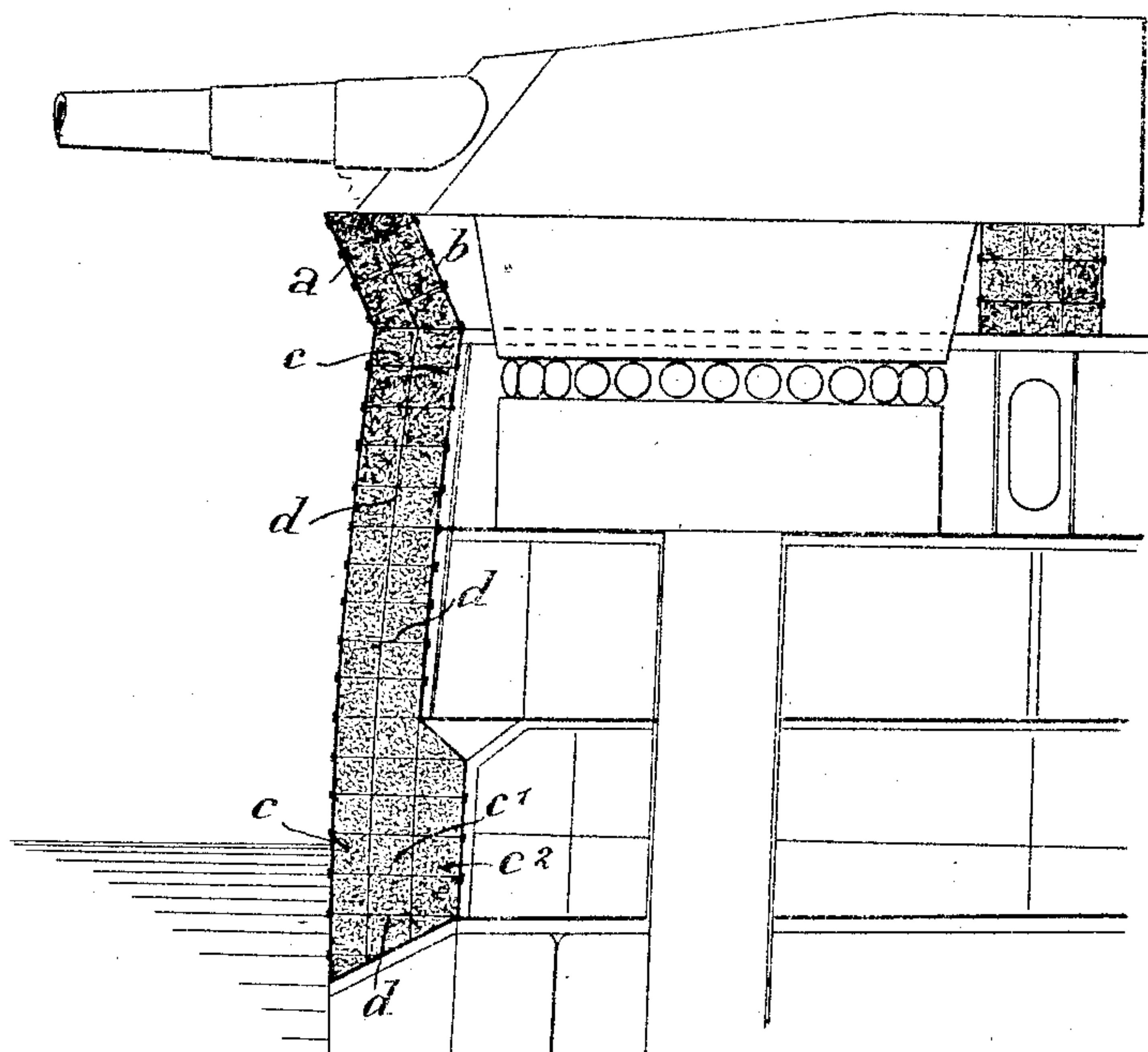
906,846.

Patented Dec. 15, 1908.

*Fig. 1*



*Fig. 2*



Witnesses:  
 L. W. Staaden.  
*[Signature]*

Inventor:  
 Lorenzo d'Adda,  
 by *[Signature]*  
 atty.

# UNITED STATES PATENT OFFICE.

LORENZO D'ADDA, OF TURIN, ITALY.

## BATTLESHIP PROTECTION BY MEANS OF CONCRETE.

No. 906,846.

Specification of Letters Patent.

Patented Dec. 15, 1908.

Application filed May 4, 1907. Serial No. 371,930.

*To all whom it may concern:*

Be it known that I, LORENZO D'ADDA, subject of the King of Italy, residing in Turin, Italy, have invented certain new and useful  
5 Improvements in Battleship Protection by Means of Concrete, of which the following is a specification.

The object of my present invention is to provide a battleship protection the main feature of which is its consisting of concrete and being applied to all those parts of the vessel which now are ironclad. (Steel armored or armor plates.)

My said invention has been illustrated by  
15 way of example in one form in the annexed drawing where—

Figure 1 shows a partial section of a ship with the present invention applied thereto, and Fig. 2 on larger scale an analogous partial section.

According to my present invention concrete —c— is placed between a metal plate —a— and another practically parallel interior metal plate —b— so as to be closed  
25 and compressed between two iron or steel walls of variable thickness which on impact of a projectile prevent deformation of concrete. The said two metal walls are preferably reinforced by metal ribs or transverse ties not shown in the drawing, thus  
30 providing a strong framework or skeleton embedded in and forming one body with the concrete mass. The concrete may be cast into the shape of monoliths or blocks coated  
35 or not with steel. A concrete layer may also be used to protect the armor-plated commander's bridge within the limits of weight practically admissible. As the use of concrete involves the necessity of providing a  
40 maximum resistance with a minimum weight, the raw materials for the preparation of concrete must be so chosen as to warrant the best results. My battleship protecting concrete therefore comprises in variable proportions hydraulic lime, cements, Portland  
45 cements, puzzuolenas,—calcareous sands and silicious sands,—gravel and stone fragments.

A highly shot resisting and preferred mixture comprises very fine Portland cement,  
50 silicious sand, river stones, minute or fractured calcareous stone. These ingredients may be combined together in varying proportions according to the degree of resistance proposed.

A very high resistance may be obtained  
55 with the following preferred composition:

Portland cement	-----	1 vol.
Silicious river sand	-----	1½ vol.
Calcareous stone fragments	-----	4 vol.

60

By increasing the proportion of cement and correspondingly diminishing that of sand and scale a yet harder and more resistant concrete may be obtained, but its specific weight also will be proportionally  
65 increased,—so that it will be seen that an excessively hard concrete is not always the most suitable concrete for my present purpose.

A preferred form and main feature of my  
70 present invention is a method of applying the concrete in layers of progressively increasing hardness. Suppose the armor has a thickness of 1½ m. of concrete, I subdivide this into two or more vertical zones —c—,  
75 —c'—, —c''—, separated from each other by metal plates or wire network —d— between which concrete of different degrees of hardness is filled in, so that the hardest and heaviest layer will be in contact with the  
80 outer metal wall of the armor and the other zones are formed with concrete layers of a hardness and a weight progressively decreasing towards the interior metal wall of the armor,—thus being applied to my concrete  
85 armors the very principle of progressive case hardening used for steel armors.

Having now fully described my said invention and the manner in which the same is to be performed, what I claim and desire to  
90 secure by Letters Patent of the United States of America is:—

An armor comprising an outer metal wall, an inner metal wall, a plurality of intermediate partitions, concrete layers between  
95 the said partitions and the partitions and the said walls, of a hardness progressively increasing from said interior metal wall to the said outer metal wall.

In testimony whereof I have affixed my  
100 signature in presence of two witnesses.

LORENZO D'ADDA.

Witnesses:

LUIGI NEYNE,  
FRANCESCO LUNGO.