W. ROWLINSON.

ARMOR PLATING FOR SHIPS, FORTS AND LIKE STRUCTURES.

No. 194,053. Patented Aug. 14, 1877.

FIG. 1.

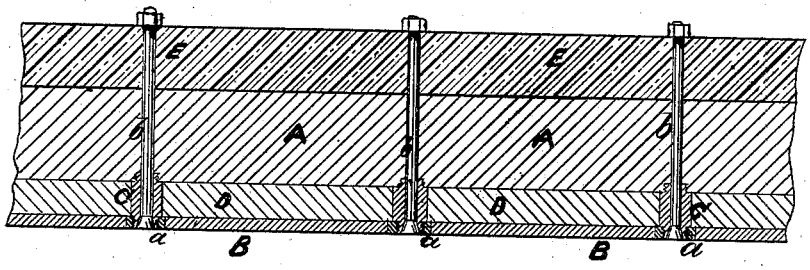


FIG. 2.

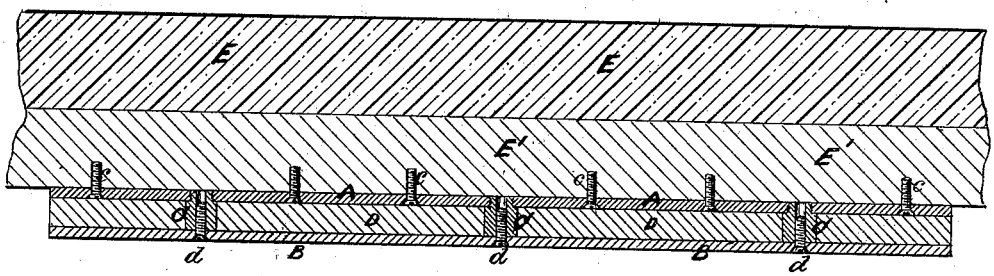
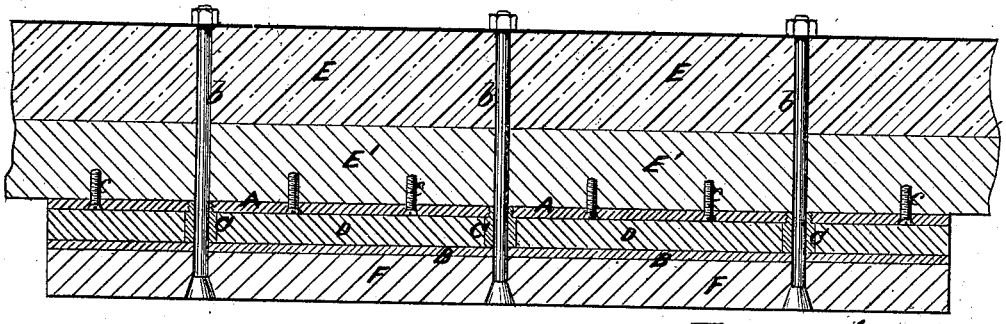


FIG. 3.



Inventor

William Rowlinson

by A. Pollok

his atty.

Witnesses:

Allen Johnston,

Aug. A. Nicholson.

UNITED STATES PATENT OFFICE.

WILLIAM ROWLINSON, OF FALLBARROW, WINDERMERE, ENGLAND.

IMPROVEMENT IN ARMOR-PLATING FOR SHIPS, FORTS, AND LIKE STRUCTURES.

Specification forming part of Letters Patent No. **194,053**, dated August 14, 1877; application filed June 18, 1877.

To all whom it may concern:

Be it known that I, WILLIAM ROWLINSON, of Fallbarrow, Windermere, in the county of Westmoreland, England, engineer, have invented Improvements in the Construction of Armor-Plates, of which the following is a specification:

My said invention relates to an improved construction of armor-plates for ships, forts, and other like vessels or structures; and consists in casting an intermediate layer of hard metal—such, for example, as hematite or other hard cast-iron or cast-steel—between a wrought-iron inner plate and an outer sheet of malleable metal, either iron or steel, such outer sheet and the inner plate being connected together previous to the introduction of the molten metal by means of wrought-iron tubes, cores, or distance-pieces, so as, when the intermediate cast metal has solidified, to afford greater facility for boring for the purpose of fitting the permanent bolts, and for the application of the latter.

The mode of connecting the outer sheet to the inner plate, and the relative thickness of the several layers, and also the total thickness of the compound armor-plate, may be varied according to the object to be attained and the degree of resistance which the compound plate is required to offer to projectiles.

In the accompanying sheet of drawings, which I shall now proceed to describe, I have shown, by way of example, two modes of carrying out my said invention.

Figure 1 of my drawings represents a section of the backing of a ship with my compound armor-plate applied thereto according to one modification. Figs. 2 and 3 are similar views illustrating another modification.

Referring to Fig. 1, A is a wrought-iron inner plate, and B an outer sheet of malleable metal, either iron or steel, which are connected together, so as to leave an intermediate space between them, by wrought-iron tubes, cores, or distance-pieces C, screwed into the plate A, and secured to the sheet B by nuts *a* or otherwise. Into this intermediate space I introduce molten iron of a hard and strong but fragile quality, or molten steel of a similar character, until the space, or such portion thereof as may be desired, is filled therewith, such cast metal forming an intermediate layer, D, between the plate A and the sheet B. When the cast metal has solidified, the bore of the tubes C, which are thus cast in, may, if necessary, be enlarged, and holes are bored through the plate A for the passage of the bolts *b*, by which the compound plate is secured to the backing E of the ship.

The plates may, if required, be embedded in suitable cement, which will prevent the corrosion of the metals taking place.

In the example hereinbefore described it has been assumed that the compound plate is applied in its finished condition to the backing E of the vessel. The inner plate A and outer sheet B, connected together by the tubes, cores, or distance-pieces C, may, however, be first attached to the backing E, and the intermediate layer D of hard fragile metal be subsequently cast between them.

This arrangement is illustrated in Figs. 2 and 3 of my drawings, Fig. 2 representing a section of a portion of the backing of a ship with my compound armor-plate in course of construction; and Fig. 3, a similar view, showing the plate in its finished condition permanently attached to the side of the ship.

E is the timber backing, and E′ is a layer of malleable metal, either iron or steel, attached thereto, and which may be used or dispensed with, as desired. Upon this layer E′ (or upon the backing E, when the layer E′ is not employed) I place the inner plates A, of wrought-iron, which I secure by screws *c*, or otherwise, and I attach to such inner plates A a suitable number of wrought-iron tubes, cores, or distance-pieces, C, by screwing the same thereinto, or in any other convenient manner. I next place, so that it shall bear upon the outer ends of the tubes, cores, or distance-pieces C, the outer sheet B, of malleable metal, either iron or steel, the same being constructed in suitable lengths, and temporarily secured to the structure in course of formation by screws *d*, screwed into the tubes, cores, or distance-pieces C. Into the intermediate space comprised between the plates A and the sheet B, which is heated by a blast of hot air or otherwise, I introduce molten iron of a hard and strong but fragile quality, or molten steel of a similar character, until the

space, or such portion thereof as may be desired, is filled therewith, such cast metal forming an intermediate layer, D, between the plates A and the sheet B, the power of adherence of which may be increased by forming the contiguous surfaces with corresponding grooves and projections.

When additional thickness is required I may place on the sheet B an outer layer, F, Fig. 3, of malleable metal, either iron or steel, and secure the whole to the vessel by nuts and bolts *b*, the screws *d* having either been removed previously to the application of the layer F, or subsequently bored out in the operation of preparing the holes for the reception of the permanent bolts *b*. When the layers E′ and F are not used the thickness of the inner plates A and the outer sheet B may be increased, the compound plate being permanently attached to the vessel, in a manner similar to that hereinbefore described.

Should the strength or resistance to be offered by the armor-plate render it necessary, the compound plate may be built up of a greater number of layers, by the alternation with malleable layers of layers of hard fragile metal, cast in the manner hereinbefore described, the object of my said invention being to provide a layer or layers of a hard metal which shall resist the complete perforation of the plates by the projectile, and extend its fracture in a lateral direction, such hard layer or layers being still maintained in position after fracture, with its or their powers of resistance practically unimpaired.

The invention is also applicable to existing vessels provided with double plates, by removing the outer layer and reattaching it with distance-pieces interposed so as to leave the requisite intermediate space for the introduction of the molten hard metal.

I claim—

Compound armor-plates constructed substantially as herein shown, and for the purposes set forth—that is to say, the combination of two or more malleable-iron or steel plates, connected together by malleable-iron tubes, cores, or distance-pieces, with an intermediate body of a strong, hard, and essentially brittle metal cast in between said plates, substantially as shown and herein set forth.

In witness whereof I have signed my name to this my specification in the presence of two subscribing witnesses.

WILLIAM ROWLINSON.

Witnesses:

ROBT. FAWCETT,
122 *West Derby Road, Liverpool.*

EDWARD HAIG,
7 *Newbie Terrace, Belmont Road, Liverpool.*