E. W. SERRELL.
Armor for Vessels.

No. 210,811. Patented Dec. 10, 1878.

Fig. 2.

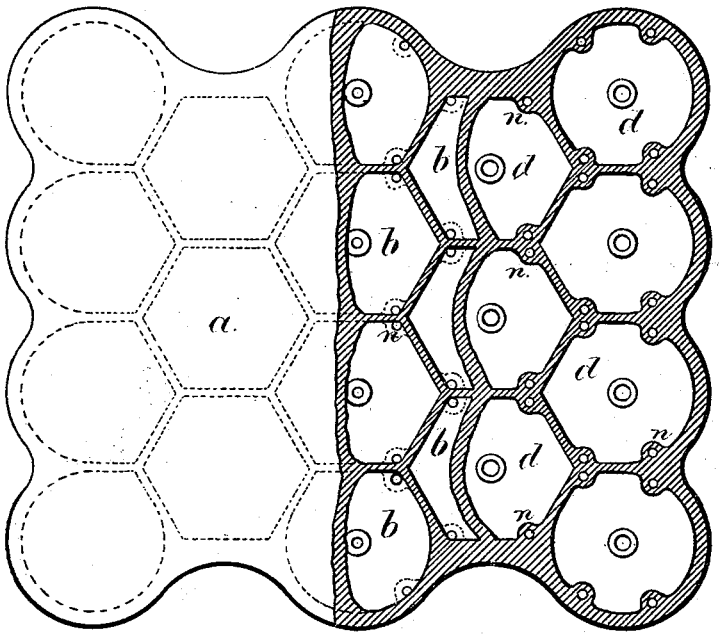


Fig. 1.

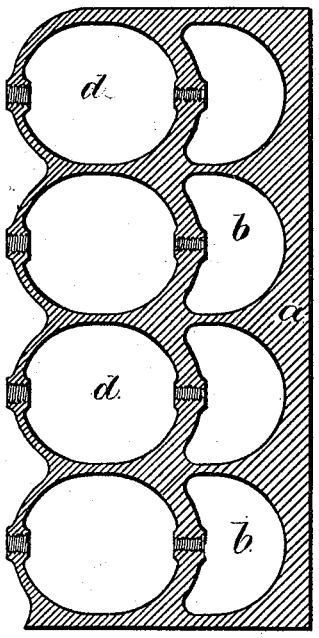
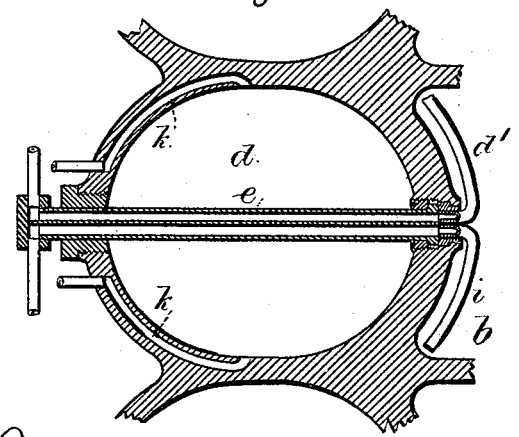


Fig. 3.



Witnesses.
Chas. W. Ramsay
Wm. A. Brown

Inventor
Edward W. Serrell

UNITED STATES PATENT OFFICE.

EDWARD W. SERRELL, OF CASTLETON, NEW YORK.

IMPROVEMENT IN ARMORS FOR VESSELS.

Specification forming part of Letters Patent No. **210,811**, dated December 10, 1878; application filed October 7, 1878.

To all whom it may concern:

Be it known that I, EDWARD W. SERRELL, of Castleton, in the county of Richmond and State of New York, have invented an Improvement in Armors for Vessels of War, Fortifications, &c., of which the following is a specification:

The object of this invention is to obtain great strength to resist the impact of projectiles without the great weight heretofore inseparable from such armor. It is a recognized fact that the armor now employed for vessels of war is too heavy to admit of safety in seagoing vessels, and it is too light in proportion to the blows that have to be resisted.

Efforts have been made to employ both water and air in connection with the armor-plates upon vessels; but such fluids have not been within the armor-plates themselves, but only as an intervening medium between the armor and the vessel.

My invention consists in a cellular armor in which the metal (preferably steel) is so disposed as to resist the impact of the projectile, and the cells are filled with water, or other non-elastic fluid, and closed, and of such a shape that the blow from the projectile will not permanently alter the shape of the cell, and the force will be dispersed in all directions by the liquid filling the cells, thus rendering harmless the blow from the projectile.

The cells are provided with supply and discharge pipes in such a manner that all air will be permitted to pass away, and the cells can be emptied when the vessel is not in action, and the cells dried by the admission of heated air. Furthermore, the inner surfaces of the cells can be rendered water-proof by oil or varnish, introduced when dry.

In the drawing, Figure 1 is a section of the armor vertically; and Fig. 2 is an elevation of the face, partially in section.

The cellular armor has a metal face, *a*, which is flat or curved, according to the position where the same is to be used; as my invention is available as armor-plating for turrets, or for the sides of vessels, and the armor is of a total thickness adapted to the ultimate strain to which it may be exposed.

The armor is cellular and provided with one, two, or more ranges of cells. I have shown two such ranges of cells, the range *b* having cells that are nearly hemispherical, and the range *d* having cells that are nearly spherical. The metal partitions between these cells are to be proportioned in thickness to the strain to which they are exposed, and the weight of metal is lessened by arranging the cells in the positions shown in Fig. 2, so that the sides of the cells shall be hexagonal and the divisions flat, or nearly so.

It will be evident that when each cell is filled with confined water, or other non-compressible liquid, any blow upon the surface cannot penetrate the metal without displacing the water, and that the concussion upon the face of one cell is distributed upon the entire interior surface of such cell. Therefore, if that cell cannot change its shape permanently, the blow of the projectile will be resisted; hence the metal only requires to be of sufficient thickness to resist the punching action of the shot when thus backed up. And it will also be apparent that the compressing action upon the water in one cell tends to expand that cell, and the pressure is taken upon the walls thereof and transferred to the adjacent cells; and in this manner one cell supports another, and the elasticity of the metal allows the concussion to be thus distributed and rendered harmless, so long as the concussion and pressure of the water do not exceed the ultimate tensile strength of the metal employed.

It will be evident that the armor-plates may be made in sections of greater or less size, and that each section will be preferably cast in one piece. However, the parts may be of wrought metal, properly riveted or welded together, or the surface may be of steel and the cells of gun-metal, cast upon the steel while in a sufficiently-heated condition.

The water or other liquid is supplied by suitable pipes to the cells, so as to insure the entire filling of each cell and the separation of one from the other.

I have shown in Fig. 3 the tubes as introduced at the center of the cells, and provided with pipes *d'* and *i*, that are turned up and down within the cells; and the central pipe, *e*, is made with two water-ways, communicating with the respective pipes *d'* and *i*; or the water-ways may be in the cast metal, as shown at *k*,

and separate tubes lead to the respective cells; or there may be tubes laid in the mold and the metal cast around the same, and in that case such tubes or holes bored in the metal may be at the angles of the partitions of the cells; as seen at *n n*, and by arranging these as shown in Fig. 2 the tubes for each cell are separate. In all instances the tubes at the back of the armor should be provided with cocks or gates, and the tubes be connected in such a manner that water or other liquid may be pumped through them until the cells are entirely full; or ranges or tiers of these cells may be filled at places that are exposed, and other cells may remain empty, the pipes and cocks being arranged so as to allow of this being done.

In cases where this improved armor-plate is employed for revolving turrets, the pipes for supplying or discharging water should be led to the vertical axis and provided with swivel-joints.

The armor-plates may be attached to the vessel in any desired manner, according to the character of the other parts of said vessel, and the tubes for the supply and discharge of water, and the cocks and valves thereof, should be protected from injury, and the cocks should be below water-line and connected with the main supply and discharge pipes and pumps, so as to be operated with rapidity. It will generally be preferable to exhaust the air and allow the water to rush into the vacuum.

I claim as my invention—

1. An armor-plate containing ranges of separate cells in the metal of the armor-plate itself, in combination with means for entirely filling each cell with water or other liquid, confining the same within such cell, or allowing the withdrawal of such liquid, substantially as set forth.

2. The cellular armor-plates provided with two ranges of cells in the metal of the armor, the outer range being nearly hemispherical and the inner range being nearly spherical at the ends, and with hexagonal partitions between the cells in the respective ranges, substantially as set forth.

Signed by me this 16th day of April, A. D. 1878.

EDWARD W. SERRELL.

Witnesses:

CHAS. W. RAMSAY,

WM. H. BROWN.