No. 817,227. PATENTED APR. 10, 1906.

W. A. DOBSON.

ANTITORPEDO CONSTRUCTION FOR MEN-OF-WAR VESSELS.

APPLICATION FILED NOV. 7, 1904.

5 SHEETS—SHEET 1.

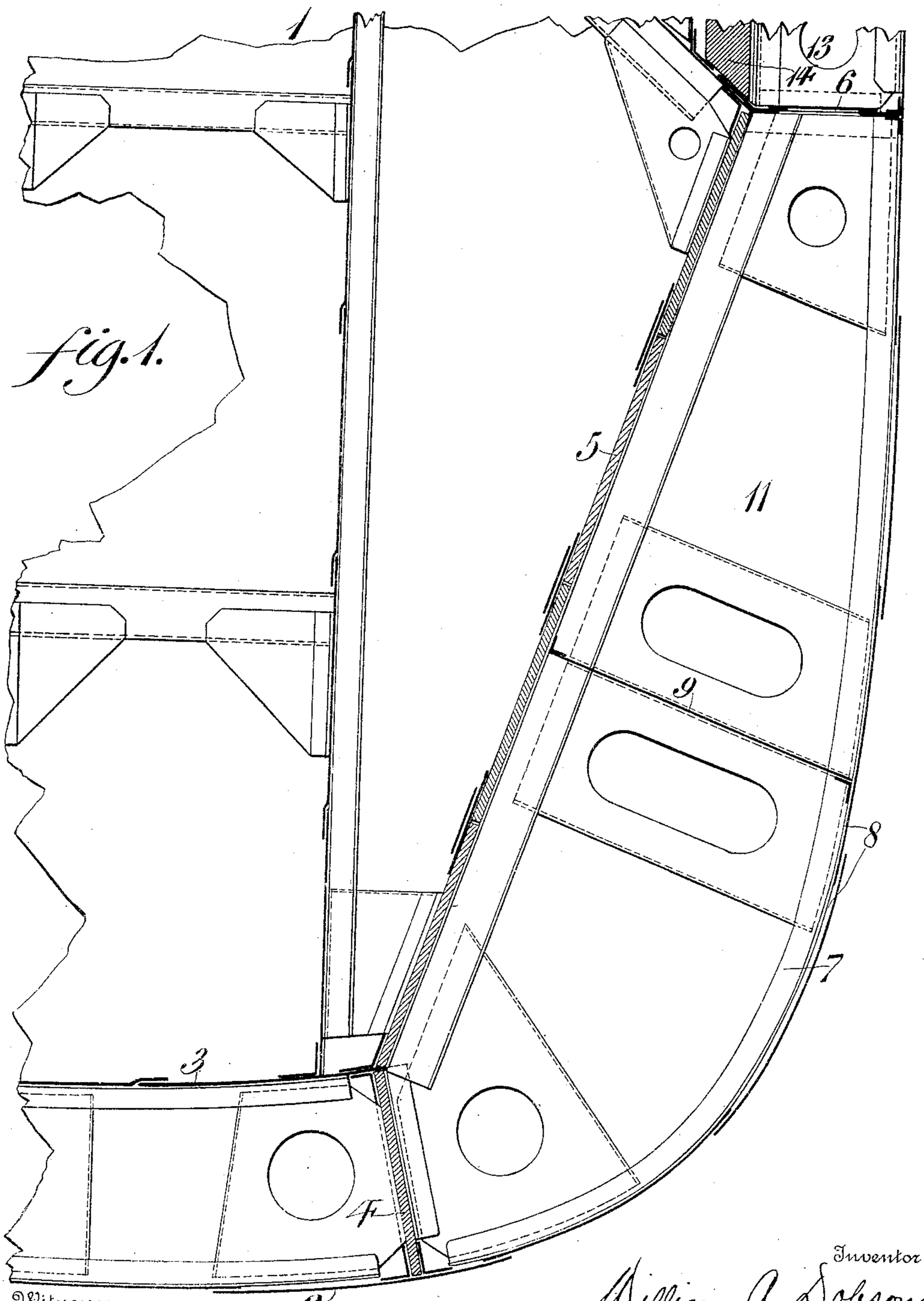

fig. 1.

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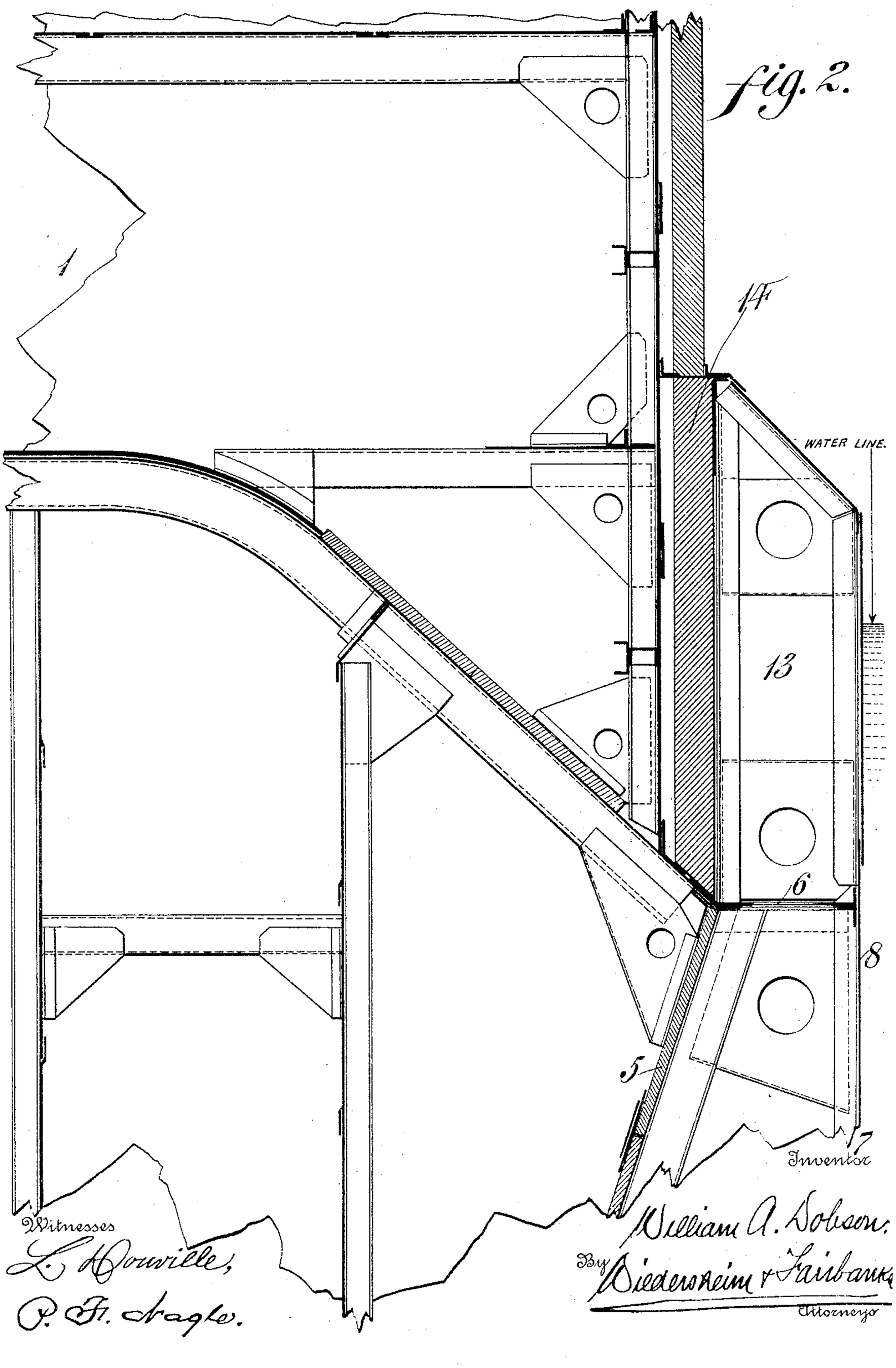

fig. 2.

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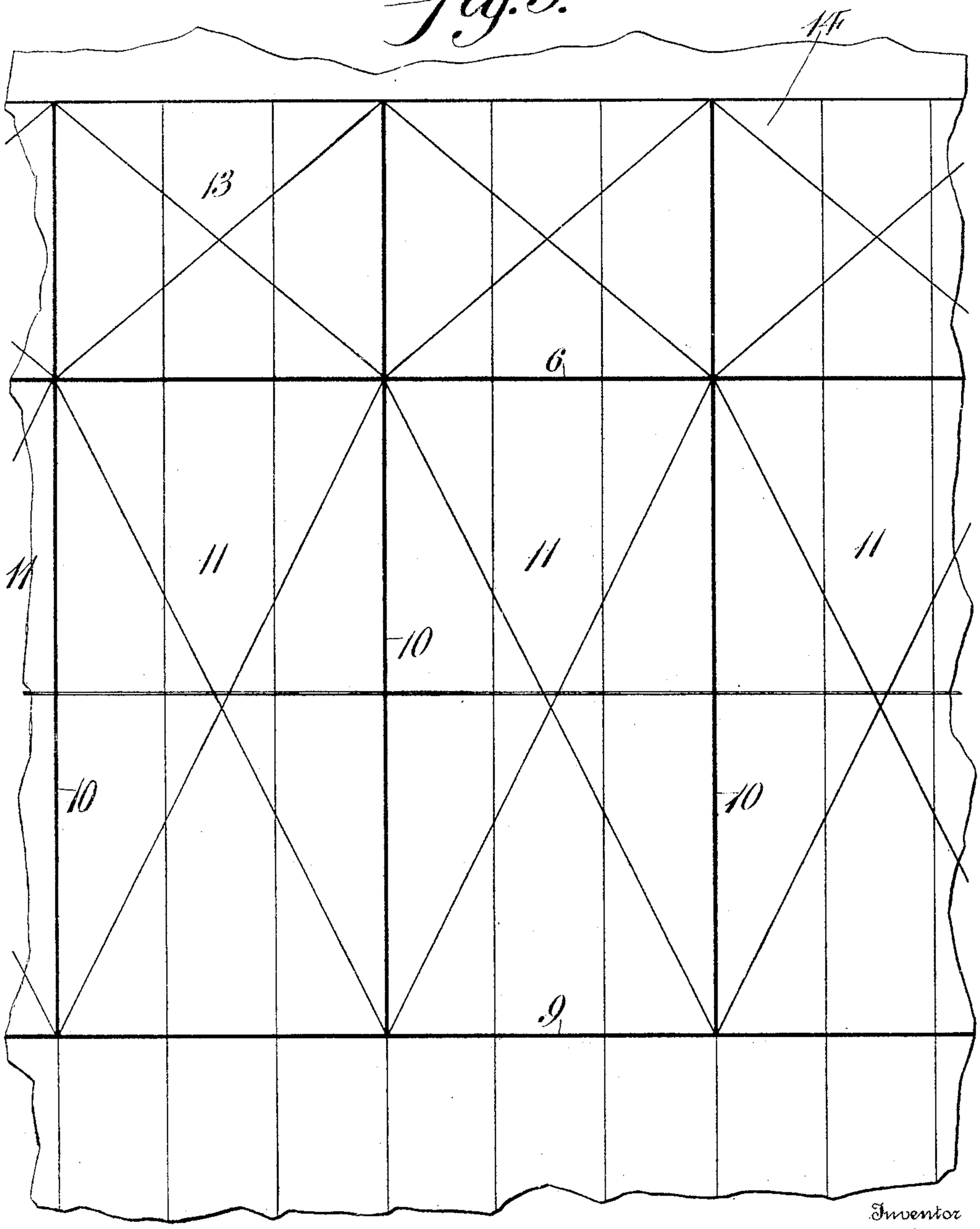
5 SHEETS--SHEET 3.

Fig. 3.



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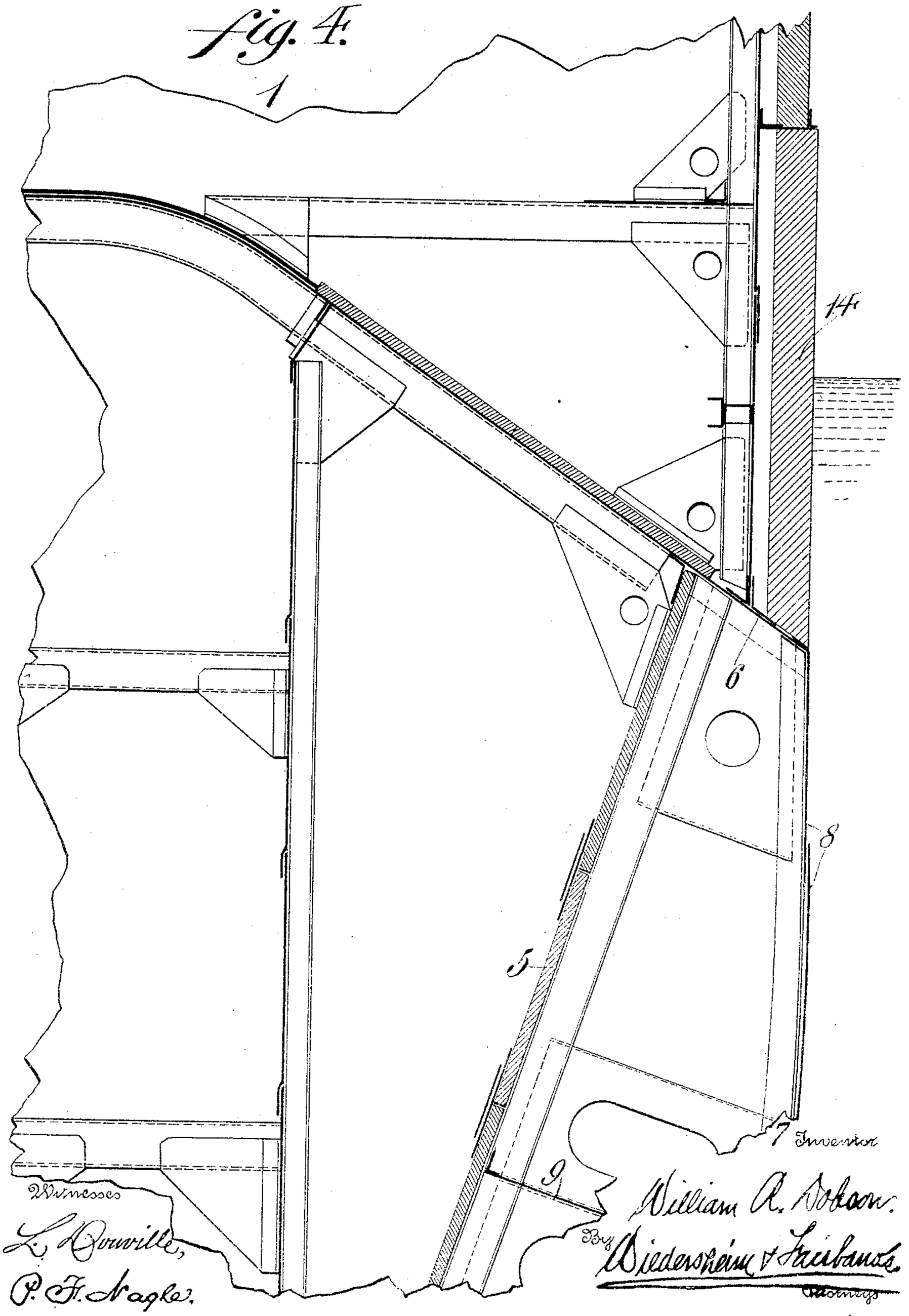
5 SHEETS—SHEET 4.

Fig. 4.



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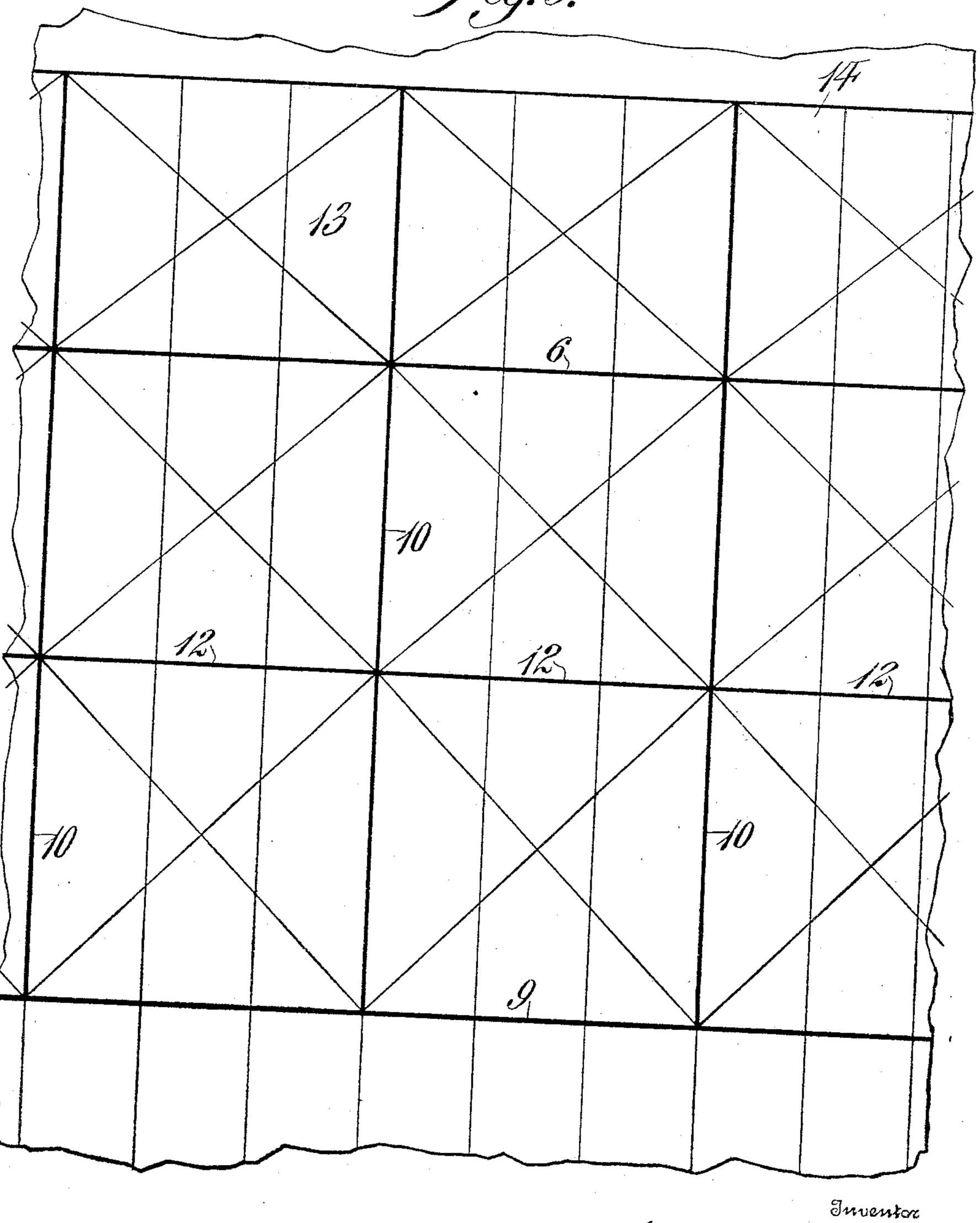
5 SHEETS—SHEET 5.

Fig. 5.



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UNITED STATES PATENT OFFICE.

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ANTITORPEDO CONSTRUCTION FOR MEN-OF-WAR VESSELS.

No. 817,227. Specification of Letters Patent. Patented April 10, 1906.

Application filed November 7, 1904. Serial No. 231,629.

To all whom it may concern:

Be it known that I, WILLIAM A. DOBSON, a citizen of the United States, residing in the city and county of Philadelphia, State of Pennsylvania, have invented a new and useful Antitorpedo Construction for Men-of-War Vessels, of which the following is a specification.

My invention consists of a new and useful antitorpedo construction for vessels which is designed to prevent piercing or destruction of the hull proper of the vessel.

It further consists in forming an armored bulkhead internally of the outer hull of the vessel so constructed as to cause the energy of explosives to follow the line of the least resistance, which will be outside of the main hull.

It further consists of forming an outer hull of suitable material to stand the ordinary stresses and which is adapted to crumple up under the effect of explosives.

It further consists in dividing the space between armored bulkhead and the outer hull into water-tight divisions.

The motion of the vessel with respect to the position of the mines or direction of motion of the torpedo with respect to a vessel is almost always horizontal. In my invention I aim to avoid destructive effects of explosion upon a surface normal to this horizontal—that is, perpendicular, or nearly so—by diverting the products of explosion from the main hull of the vessel.

A further object of my invention is to so place the surface causing the explosion of the mine or torpedo as to leave a variant distance between this surface and the hull of the vessel, the distance being greater with greater depth beneath the surface.

A further object is to provide for the explosive gases a path of less resistance than that of the water, which shall be outside the main hull—that is, the armor of the vessel.

A further object is to form an outer casing, sheet, or surface which is to make contact with the mine or torpedo and cause an explosion thereof.

A further object is to reduce the resistance to explosion outside of the main hull and to provide a place both above and below the point of explosion for the expansion of the explosive gases in order to reduce the force of the explosives. In the case of an explosion at the limiting-surface of such an outer hull as I have shown the gaseous products of the explosion are projected within the outer hull at high velocity and under great pressure, but through a relatively small orifice. Under the well-known laws applying to gases the force varies inversely with the volume. Since the distance between the outer hull and body or main hull of the vessel is considerable and since this distance varies with the depth below the surface, and hence with the surrounding (opposing) water-pressure, the force of the explosion against the main hull is very much reduced and the pressure is distributed over a large area, the pressure varying inversely and the area varying with the opposing water-pressure. If the explosion took place in the open air, its effect upon the body of the vessel would be light, and it is this water-pressure which holds the explosive gases, as it were, to their work. There is great advantage, therefore, in increasing the distance from the point of explosion to the hull and in correspondingly increasing the area affected with the distance below the water-line. Inasmuch as the main hull in my invention is inclined with reference to the perpendicular and is preferably inclined inwardly and downwardly, the swell of the outer hull to accomplish this variation of distance below the water-line coöperates or combines with the downward and inward slope of the main hull to produce an outer shell approximating the usual hull shape.

A further object is to divert the explosive gases and products of the explosion from the body of the vessel by producing a path of less resistance than that of the water or of the hull and by either (selecting) this path entirely clear of the vessel by its initial direction or causing the explosives to be guided from the hull of the vessel at the limits of this path of less resistance, top and bottom, by angular plates or armored shelves.

It further consists of novel details of construction, all as will be hereinafter fully set forth.

Figure 1 represents a vertical sectional view of a portion of a hull of a vessel, showing the outer hull and the armored bulkhead. Fig. 2 represents a vertical sectional view of a portion of a vessel, showing the coffer-dam in position and with respect to the armored plate. Fig. 3 represents a vertical sectional view showing the water-tight divisions into which the outer hull may be divided. Fig. 4 represents a vertical sectional view of a portion of a vessel, showing a portion of the

outer hull and the coffer-dam omitted. Fig. 5 represents a vertical sectional view showing the water-tight compartments or divisions different from that shown in Fig. 3.

Similar numerals of reference indicate corresponding parts in the figures.

Referring to the drawings, in order to protect vessels from torpedoes, mines, and other explosives I desire to so construct the same that the effect or energy of the high explosive will be caused to follow the line of the least resistance, and my invention, broadly, therefore is for this purpose, and while I have shown in the drawings certain features and a certain construction it is to be understood at the outset that I do not desire to be limited to the construction and arrangements shown, but, as stated above, my invention is for the protection of the vessels by leading off or directing the energy of the high explosives and preventing injury to the hull proper. To this end, therefore, I employ armor of sufficient or suitable thickness and so placed as to resist the energy of explosives, which armor is extended from the margin-plate to the protective deck, and that exteriorly of this armor is constructed an outer or exterior hull with the regular contour of the ship's bottom, the said exterior hull being of sufficient strength to withstand the stresses brought to bear upon it by the action of the sea or the local stresses, but is formed in such a manner and of such material as to crumple up under effect of explosive, the parts being so arranged that the stresses and strains will be carried substantially from the margin-plate through the armored bulkhead to the armor or armor-plate. If desired, above the protective deck I may employ a coffer-dam which continues to a point above the load water-line and which is carried sufficiently high to secure against loss of stability.

1 designates a vessel which is constructed in any desired manner with a suitable interior construction and of any suitable material and formed to stand necessary loads or stress usual in such cases.

2 designates the outer bottom, and 3 the inner bottom, of the vessel, which form what is known as the "double bottom," the same being provided with suitable armor, as desired, and extending longitudinally of the said double bottom is the margin-plate 4, which is of the usual construction now employed in vessels of war and is formed of armor of sufficient thickness to resist the energy from high explosives. 5 designates an armored bulkhead which extends from the said margin-plate 4 to the protective deck or extension 6, said bulkhead being constructed of armor of any desired thickness which is adapted to withstand the energy of high explosives from a torpedo or mine exploded at the outer hull, it being seen that the said armored bulkhead is practically a continuation of the margin-plate of the double bottom and forms a component part of the structure between said margin-plate and the protective deck. The said bulkhead is formed in suitable lengths for construction and may be suitably strapped in order to take its full share of the stresses and strains brought to bear upon the structure, and, if desired, the armor may be supported and stiffened by a frame, as shown in the drawings.

7 designates the outer hull, which extends from the margin-plate to the protective deck, and is of any suitable contour and formed of such material in character and strength as to withstand the strain brought to bear upon it by the action of the sea, as well as the local stresses usual in constructions of this character. The said hull can be formed with suitable plates 8 and is adapted to crumple up under the action of effect of explosives; but being of lighter construction than the armored bulkhead the energy of the explosive will be caused to follow the line of the least resistance—as, for example, upwardly outside of the main armored bulkhead.

If desired, the space formed between the outer hull and the armored bulkhead may be divided longitudinally by a plate 9, which is suitably situated and connected with the supporting part in any convenient or desired manner, so that the said outer hull may be formed with upper and lower spaces, the advantages of which are evident, for should the outer hull be struck at a point either above or below said plate 9 the other of the compartments will not be necessarily destroyed. In addition vertical plates 10 may extend from the plate 9 to the protective deck 6 or from the plate 9 to the margin-plate 4 or they may extend from the margin-plate to the armored shelf, thus dividing the space in the outer hull into vertical compartments 11, as best understood from Fig. 3, so that should the outer hull be pierced at any one of the compartments it will not necessarily follow that more than one of these compartments will be opened to the water. Thus the effect of the explosive is localized. I may further subdivide the compartments 11 by a longitudinally-extending plate 12, as best seen in Fig. 5, so that any desired number of cellular spaces may be formed, either vertically or horizontally, in the outer hull, each of the dividing-plates being adapted to receive its share of the stress and strain and at the same time being adapted to minimize the harmful effect of the explosive.

Above the protective deck 6 I preferably desire to employ a coffer-dam construction 13 the outer walls of which conform in contour to the hull of the vessel, or, if desired, the outer hull may be continued with the regular contour to above the low-water line, so as to form between the side armor 14 and said outer hull coffer-dams, such as 13, the latter to be

filled with a water-excluding material as a protection to the buoyancy from the effect of gun-fire, said coffer-dams being so constructed that access can be had to the outer case of the armor 14 when the water-excluding material is removed. The said armor 14 is constructed of any desired thickness, and in the design shown in Fig. 2 it extends from a point substantially above the armored bulkhead 5, so that the margin-plate, the armored bulkhead, and the armor form a practical continuation of each other with the outer hull and coffer-dam protecting the same. It will of course be understood that the armor and the armored bulkhead as well as the margin-plate may be formed of material of any desired thickness, and while I have shown in the drawings the armor 14 considerably thicker than the armored bulkhead the thickness may be reversed or all may be of the same thickness. It will be further understood that the coffer-dam or outer wall thereof is to be made in suitable lengths and that the entire structure described may be suitably strapped and supported and stiffened by framing as may be found necessary.

In the construction seen in Fig. 4 I have omitted the coffer-dam 13, and in place of continuing the walls of the outer hull above the protective deck 6 I have placed the armor 14 in such a position that the same forms a practical continuation of the contour of the outer hull, the effect of the said outer hull, however, being the same as previously described, and the energy of the explosive will be directed in the same manner outside of the bulkhead or inner hull.

From the above it will be evident that I have a construction which forms sufficient protection from torpedoes, mines, &c., the energy of which is caused to be dissipated in a direction of the least resistance and that by providing the space between the outer hull and the armored bulkhead into cellular water-tight compartments the effect of the high explosive is minimized.

I may, if desired, also fill the water-tight compartments with suitable water-excluding material, as in the case of a coffer-dam.

It will be apparent that my present invention is differentiated from devices wherein merely two layers of plates have been employed with a space between them, whereby a projectile may pass through the first plate without injury, but upon reaching the second plate, the protecting-cap having been destroyed, the point will be smashed on said second plate and the projectile prevented from battering the same, since in my present device one object of my novel structure is to so slope the armored bulkhead that products of the explosion are directed clear of the body of the vessel at all points and distributed and dissipated in large measure even before they leave the surface of the armored bulkhead. My invention is for the same reason clearly differentiated from prior devices wherein a plurality of air-tight metal boxes are employed or wherein outer and inner linings of strongly-compressed cotton or other fiber are used for the purpose of wasting the battering force of the projectile. My invention is also clearly differentiated from prior devices wherein water-tight compartments have been used filled with air, liquids, or solid matter, as cork or corn-pith, for the purpose of weakening the effect of the exterior explosions upon the real protective armor-lining inside of and behind them. It will be further apparent to those skilled in the art that among the advantages which may be enumerated from my present invention are the following:

First. The slope of the armored bulkhead is such that the direction of the projectile or of the movement of the vessel toward the mine, and hence the greatest force for explosion, is not normal to the surface of the armored bulkhead.

Second. The armored shelf is not in the body of the vessel, for which reason the force of a projectile normal to its surface is not so injurious to the vessel, while at the same time the shelf protects the bottom of the vessel.

Third. In one form of my invention the direction of slope of the armored bulkhead and its position are such that the products of the explosion are directed clear of the body of the vessel at all points.

Fourth. The material of the outer hull is much lighter than the material of the inner hull or armored bulkhead, resulting in practical absence of projected destructive fragments of the outer hull as a result of the explosion. The only damage to the main hull is from the explosive effect of the projectile itself and its flying fragments, and,

Fifth. The variation in distance of the outer hull from the armored bulkhead compensates for the greater distance of the explosion under the surface of the water. This will be clear, because if the explosion took place at the surface of the water there would be a line of normal light resistance toward the surface, the explosive gases being guided away from the vessel upon one hand by its relatively unyielding armor and by the water upon the other hand, owing to its comparative incompressibility. If the explosion took place slightly below the surface of the water, there would be a slight layer of the water above, tending to confine the explosion more against the comparatively incompressible medium (water) below and against the almost absolutely incompressible armored surface of the vessel upon the other hand, resulting in greater damage unless an air-space be provided between, and the greater the depth the greater the distance required

between the outer hull and the armored bulkhead in order to compensate for the resistance of the body of water between the point of the explosion and the surface of the water.

It will also be apparent that while I have shown in the present embodiment of my invention preferred forms of structure wherein my invention can be carried out I may embody the principle of the same in other forms of equivalent structures.

I make use of the construction hereinabove described in carrying out my new process or method of protection of vessels, which I will now describe. I employ a method whereby the effect or energy of the explosive will be caused or directed to follow a line of low resistance which is exterior to the main hull, so that piercing or destruction of the latter is lessened. I employ a main armor of sufficient thickness and so placed as to resist the distributed energy of the explosives, the armor being considered the main hull of the vessel, and exterior thereto I provide a hull here integral with the vessel with a suitable contour for a ship's bottom, the said exterior or outer hull being of sufficient strength to withstand the stresses brought to bear upon it by the action of the sea or local stresses, but formed in such a manner and of such material as to crumple up under the effect of explosives. In the drawings I have shown the armor as downwardly and inwardly sloping, so that the force of an explosion will not be normal to it, owing to the relative direction of movement of the armor-surface and the explosive, and the products of the explosion will be thus inclined along the armor-surface exterior of the ship. From the above it will be seen that the said hull may be formed in any suitable manner and of any suitable material and may be provided with suitable armored plates, provided that they are adapted to crumple up under the action or effect of explosives, it being understood that the said hull must be of lighter construction than the armored bulkhead and that therefore the energy of the explosive will be caused to follow the line of the least resistance—as, for example, upwardly outside of the main armored bulkhead. By this means I form a path of less resistance to explosives than that of the bulkhead, and this path is external to the main plane thereof. It will be further noticed that the other hull is so constructed with respect to the bulkhead that the distance between them varies with the distance below the water-line, and it will be further noticed that the armored bulkhead is situated at an angle with the direction of the relative movement of the vessel and the explosives.

It will be evident that various changes may be made by those skilled in the art which will come within the scope of my invention, and I do not, therefore, desire to be limited in every instance to the exact construction herein shown and described.

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

1. In a device of the character described, a downwardly and inwardly sloping armored bulkhead and means for directing the force of an explosive along it.

2. In a device of the character described, a downwardly and inwardly extending armored bulkhead and an exterior hull forming, between it and the bulkhead, a path of less resistance to explosives than that of the bulkhead, the direction of which path is external to the main plane of the bulkhead.

3. In a device of the character described, an armored hull and an external hull of lighter material whose distance from the armored hull varies with the distance below the water-line.

4. In a device of the character described, a light external hull of ordinary shape and an internal armored hull of such shape that the distance between the hulls differs with the distance below the water-line.

5. In a device of the character described, a plurality of hulls extending at different angles and forming a path for explosives between them, one of said hulls being armored.

6. In a device of the character described, an outer hull of sufficient strength to withstand ordinary stresses and explode a projectile and an inner armored hull at an angle thereto.

7. In a device of the character described, the combination of an armored bulkhead at an angle to the direction of relative movement of the vessel and an explosive and an outer hull at an angle to the bulkhead.

8. The method of protecting vessels from explosives which consists in providing for the gases of explosion, a space of such dimensions between the armor and the hull of the vessel, as will permit a substantial expansion of said gases whereby the force of explosion against the armor is materially diminished.

9. The method of protecting vessels from explosives which consists in providing a space of less resistance than the water and of such dimensions as to permit substantial expansion of the gases for the distribution of the gaseous products of explosion between the outer hull and the armor of the vessel.

10. The method of protecting vessels from explosives which consists in providing for the explosive gases, a path of less resistance than the armor and surrounding water of such dimensions as to permit substantial expansion of the gases, the direction of which is exterior to the main plane of the armor.

11. The method of protecting vessels from explosives which consists in providing for the explosive gases a path of less resistance than that of the armor or surrounding water, of

such dimensions as to permit substantial expansion of the gases, the plane of direction of which path is at an angle to the vertical.

12. The method of protecting vessels from explosives which consists in causing the impact for exploding the projectile to occur beyond the plane of the main hull of the vessel and forming a path of low resistance between the main hull and the point of impact which path is of such dimensions as to permit substantial expansion of the gases.

13. The method of protecting vessels from explosives, which consists in causing the explosion to occur at a substantial distance from the main armor and in making the resistance to the explosive gases lower than that of the water between the point of explosion and a considerable area of the armor in order that the force of the explosion may be instantly distributed over a large area of armor.

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