J. REID.

SHIP CONSTRUCTION.

APPLICATION FILED MAR. 11, 1909. RENEWED JAN. 26, 1911.

986,861.

Patented Mar. 14, 1911.

2 SHEETS—SHEET 1.

Fig. 1.

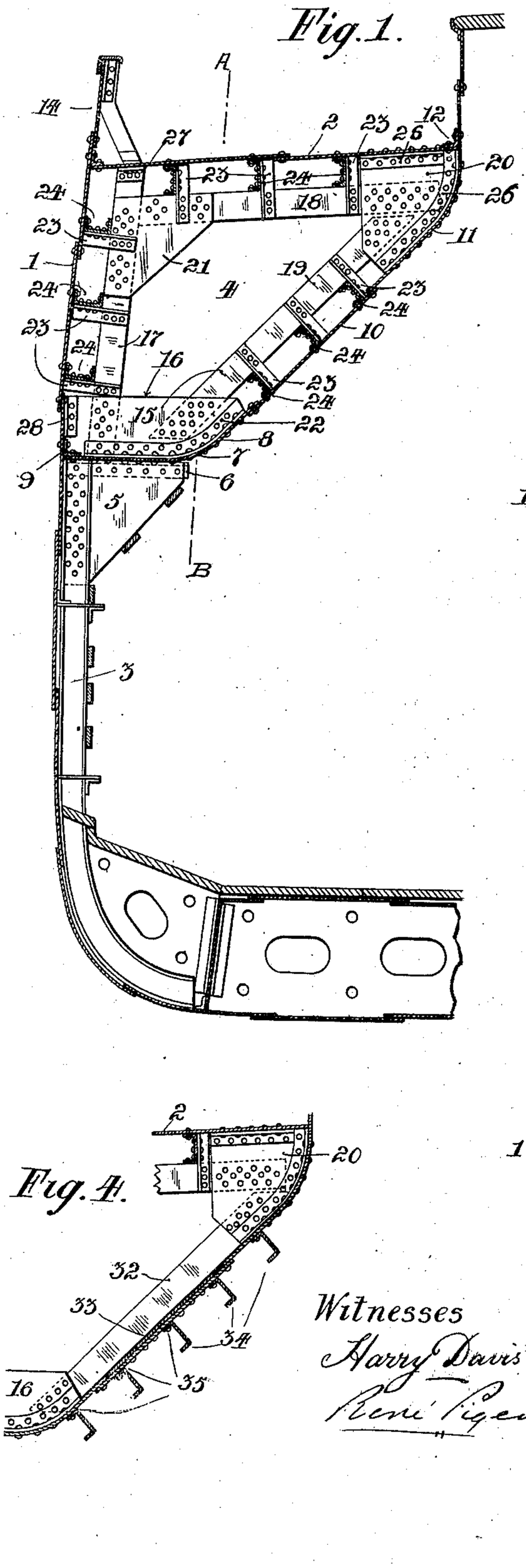

Fig. 2.

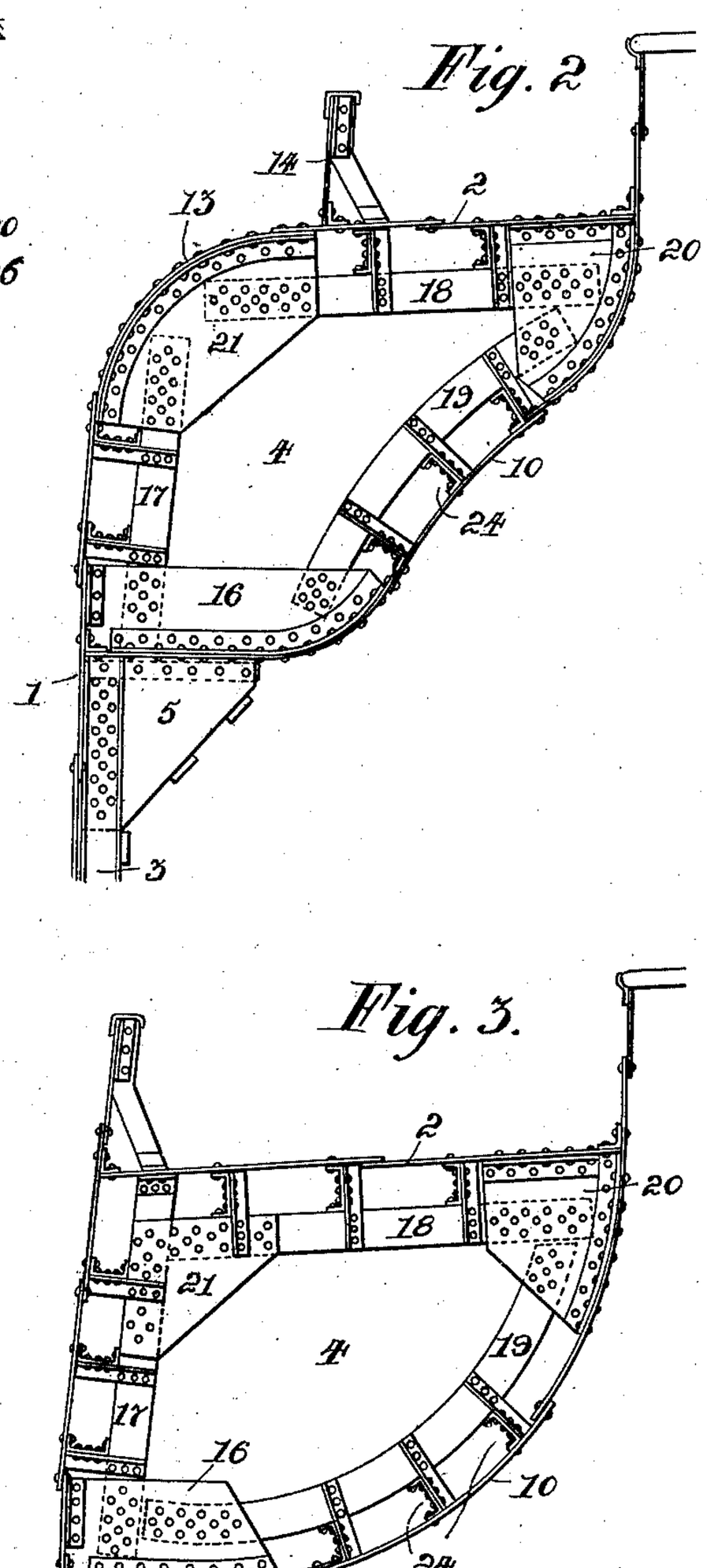

Fig. 3.

Fig. 4.

Witnesses

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2 SHEETS—SHEET 2.

Fig. 5.

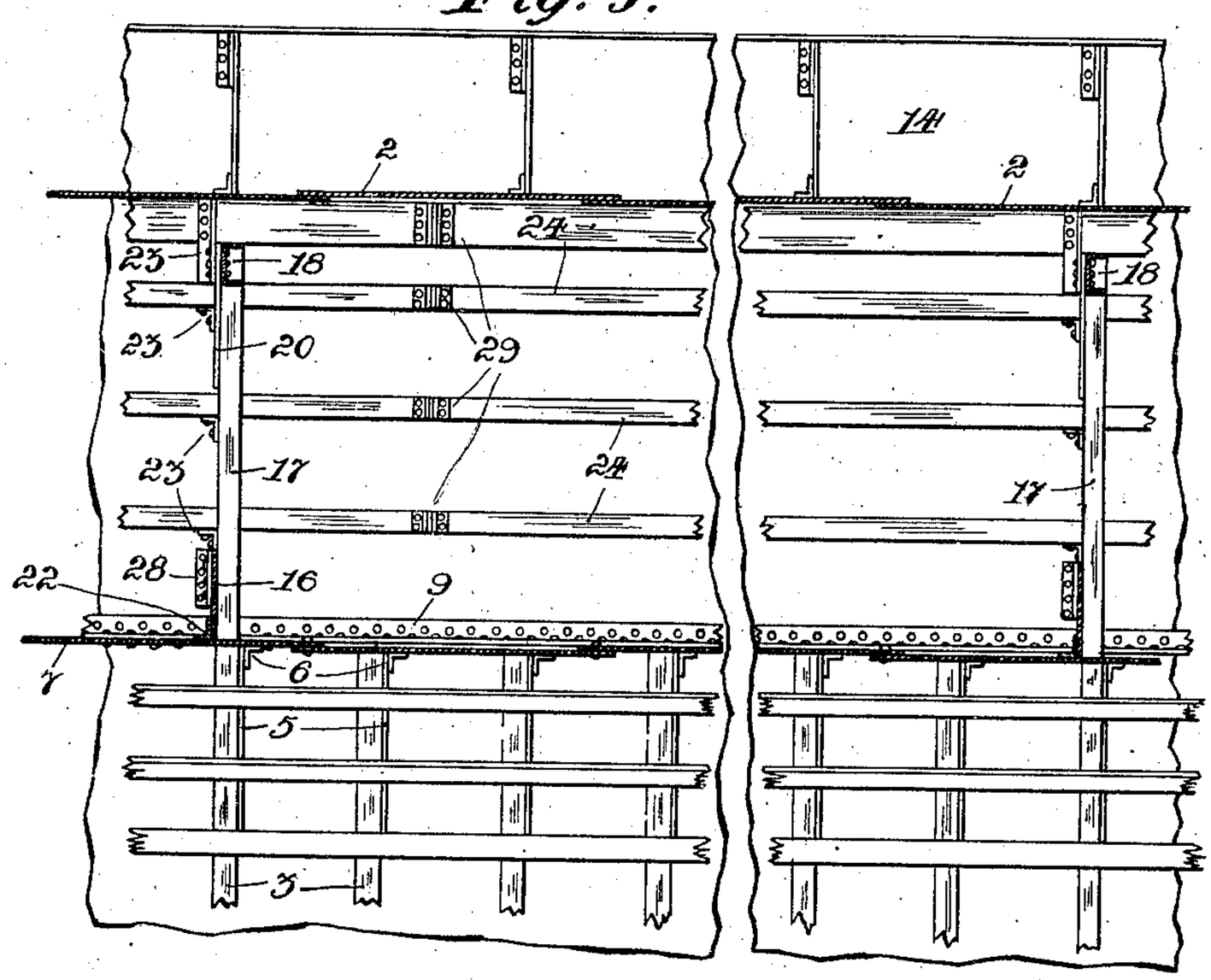
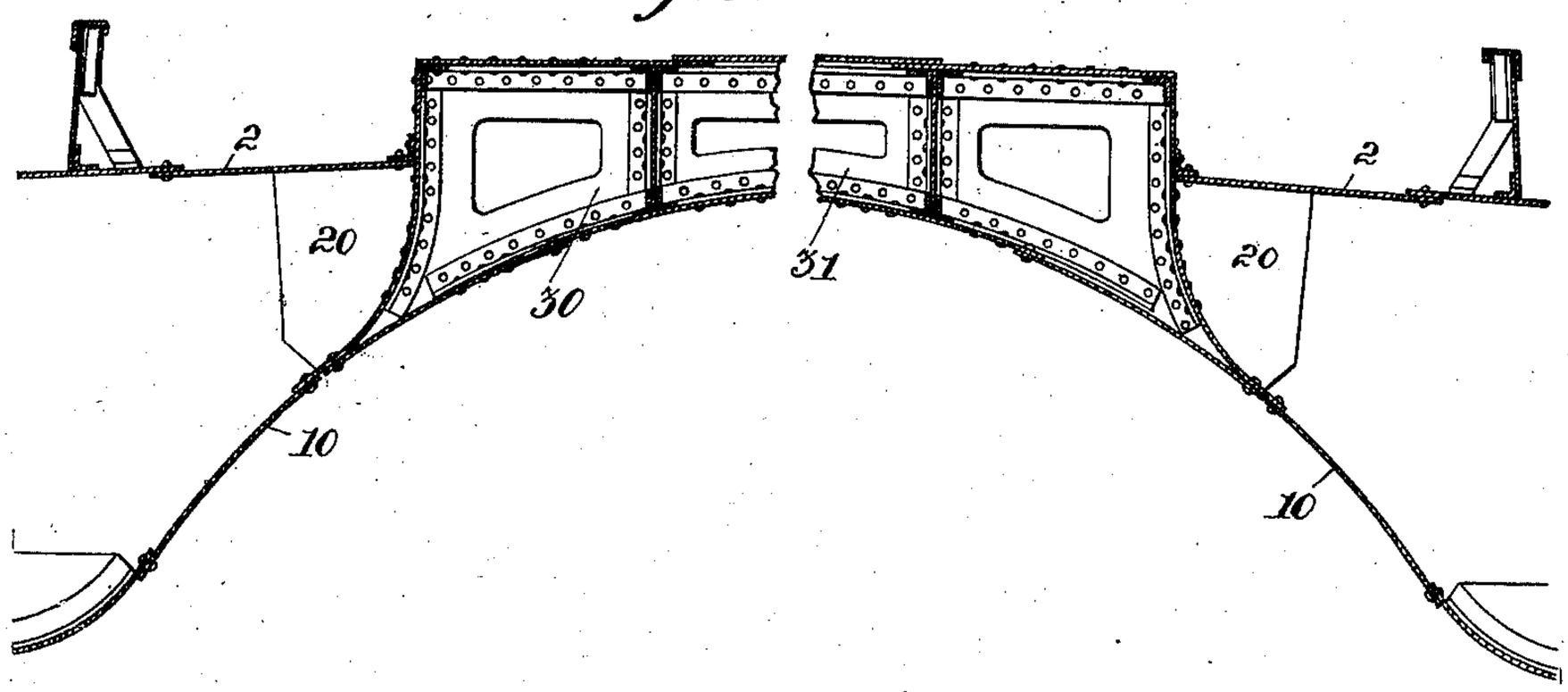


Fig. 6.



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UNITED STATES PATENT OFFICE.

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SHIP CONSTRUCTION.

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Application filed March 11, 1909, Serial No. 482,679. Renewed January 26, 1911. Serial No. 604,874.

To all whom it may concern:

Be it known that I, JOHN REID, resident of 41 Park Row, in the city of New York, in the State of New York, in the United States of America, a subject of the King of Great Britain, have invented certain new and useful Improvements in Ship Construction; and I do hereby declare that the following is a full, clear, and exact description of the same.

The invention relates to improvements in ships, as described in the following specification and illustrated in the accompanying drawings that form part of the same.

The invention consists essentially in the novel arrangement and construction whereby the walls of the topside ballast tanks are reinforced throughout the length of said tanks by longitudinal girders, said girders being stiffened at intervals by internal webs.

In certain types of ships there are what are known as topside ballast tanks, in which water or other liquid ballast is carried. These ballast tanks are now generally of the form of longitudinal prisms of approximately tri-angular cross section and arranged one on each side of the vessel's center line, said tanks occupying the corners in the vessel section formed by the junction of the side plating and upper deck, or where two decks are fitted, of side plating and main deck. It is admitted that such triangular water tight spaces with their inner plating and bracket framing aid materially in the transverse sectional strength of the vessel, but as usually constructed with their framing disposed almost exclusively in a transverse plane, the longitudinal strength of the vessel is not proportionately benefited. This is particularly the case where, in vessels suitable for the ore and coal trade, the area of deck plating available for longitudinal strength is greatly reduced by numerous and very large hatch openings, upon which the commercial success of the vessel greatly depends, owing to the necessity for rapid loading by chutes and unloading by grabs.

The objects of the invention are to so dispose the topside ballast tank framing and so improve its sectional form as to materially increase the longitudinal strength of the vessel's topsides and provide a construction, which will lend itself readily to the use of heavy cross struts or ties, to prevent transverse "breathing" or "working" and enable the greatest possible hatch area to be arranged for.

In the drawings, Figure 1 is a cross sectional view of one side of the ship showing a portion of the deck and of the bottom and one of the topside ballast tanks. Fig. 2 is a cross sectional view of a topside ballast tank showing a slight modification in the shape thereof. Fig. 3 is a cross sectional view of another form of tank. Fig. 4 is a sectional detail showing the girders outside the tank. Fig. 5 is a sectional view on the line A—B in Fig. 1, showing the arrangement of the longitudinal girders and internal webs and showing the length thereof broken away in the middle and the deck plating in section. Fig. 6 is a cross sectional view of the ship broken away in the center showing the cross girders and struts between the hatch ways extending from one topside ballast tank to the other.

Like numerals of reference indicate corresponding parts in each figure.

Referring to the drawings, 1 is the hull or shell plating of the ship. 2 is the deck thereof, and 3 the ordinary transverse framing of said hull which is arranged in any suitable way and here shown with the vertical transverse frames and stringers as is now usual. The ordinary transverse framing 3 is cut at the lower margin of the ballast tank 4 and to the head of each of said transverse frames, a large plate bracket 5 is securely riveted, said plate bracket having an angle bar or flange 6 on the top side thereof.

7 is the foundation plate of the ballast tank 4 supported on the brackets 5 and curved or flanged upwardly at its inner side 8. 9 is an angle bar extending longitudinally with the ship and securing said foundation plate 7 to the shell plating 1 and insuring a water-tight connection, said angle bar and shell plating and the foundation plate being securely riveted as usual in ship construction.

10 is the inner plating of the ballast tank 4 shown in Fig. 1 as extending in a straight line to the upper inner plate 11, said plate 11 being curved or flanged and projecting upwardly above the deck and rigidly secured to said deck by the angle bar 12, these

parts being riveted as customary. The upward extension of said plate 11 forms a part of the coaming of the hatch ways. In Fig. 2, said inner plating is formed in an easy concave curve and in Fig. 3, said inner plating is formed in a convex curve, said change in formation of said inner plating being modifications of the style shown in Fig. 1 and being particularly suitable in the construction of some types of ships. Further, in Fig. 2 the topmost corner of the ballast tank 4 is shown as rounded off at 13 in place of the sharp corner shown in Fig. 1. If the bulwarks are fitted the bulwark 14 is brought in and extends up from the deck 2 at the inmost end of the said curved corner 13.

15 are internal webs formed of the plate bracket 16 at the lowermost end, the vertical pieces 17, the horizontal pieces 18 and the obliquely extending pieces 19, said oblique pieces extending from the plate brackets 16 to the plates 20, which connect the upper end of said oblique pieces to the inner end of the horizontal pieces 18, said horizontal pieces at their outermost end being joined to the upper portion of the vertical pieces 17 by means of the plate 21, all these parts being securely riveted where joined. 22 are angle bars following the curve of the foundation plates 7 and having one section thereof securely riveted to said foundation plates, the other section being securely riveted to the plate brackets 16. 23 are angle bars having one of their sections rigidly secured to the said vertical, horizontal and oblique pieces of the internal web 15 and arranged along said pieces at intervals, said angle bars 23 extending laterally beyond said internal web to the shell plating 1, the deck 2 and the inner plating 10. 24 are longitudinal girders here shown in the form of channel irons, though they may be made of any suitable section said girders being rigidly secured by rivets to the other sections of the angle bars 23 where said sections extend beyond the internal web 15. 25 are angle bars following the curve of the upper plates 11 and rigidly secured to said upper plates 11 and said plates 20. 26 are angle bars rigidly secured to the deck 2 and to said plates 20.

27 are angle bars securing the topmost end of the vertical pieces 17 to the deck 2.

28 are angle bars securing the plate brackets 16 to the shell plating 1.

The internal webs 15 are arranged at intervals throughout the length of the said ballast tanks 4, probably about every sixteen or twenty feet, so that a very rigid reinforcing web is provided inside of said ballast tank to act as a support or reinforcement for longitudinal channels supporting the plating. The longitudinal girders 24 are, of course, joined at intervals as shown in Fig. 5, where the joints 29 are shown by suitably arranged butt straps.

30 are transverse girders preferably arranged in alinement with any of the internal webs 15 and extending across the ship from ballast tank to ballast tank between the hatch ways of the ship, said girders 30 being formed as usual in ship construction by plates joined by angle irons and either arranged to form a transverse box girder 31 as shown in Fig. 6, simply extending across the ship between said hatch ways, or if desirable said transverse girders may in themselves form sides to a transverse water tank for ballast purposes. The lower sides to said transverse girders 30 are preferably arranged to extend from below the curve of the upper plates 11, thus being a continuation of the oblique or curved portion of the said inner plating of the ballast tanks 4, consequently forming very strong ties from side to side of the ship and producing a thoroughly rigid construction. The importance of this rigid construction cannot be too strongly emphasized in view of the numerous large hatch ways in vessels employed in the ore and coal trade, this advantage having already been mentioned in the foregoing description, though in the explanation of the details it will be much better understood, as the particular style of reinforcing framing used in the ballast tanks, allows an exceptionally rigid form of tying the ship together between the hatches, said ties practically extending from the outer shell plating on one side to the outer shell plating on the other. It is not, of course, absolutely necessary to have these ties only where an internal web 15 occurs, but in the best construction, certainly a very large proportion of said transverse girders will be in alinement with said internal webs.

It will be seen from the above description that the internal webs 15 are placed at suitable intervals in the ballast tanks and vertically arranged, the vertical pieces of said webs being parallel with the outer shell plating, the horizontal pieces with the deck plating and the oblique pieces with the inner plating of the said tanks, while the longitudinal girders preferably formed of channel irons or bulb angles are spaced around said internal webs preferably two feet to two and one-half feet apart forming a longitudinal frame to which the shell plating, the inner plating and the deck are securely attached, thus the continuity of the longitudinal strength is maintained.

It may be advisable in some constructions to have the ballast tanks in cross section of substantially tri-angular form, which will mean sharp corners at the connections of inner, outer and deck platings. It is preferable, however, where the vessel is large and

the compression and tensile strains due to the vessel's movement in a sea-way are correspondingly high, to take advantage of the well known fact that a curved plate has much greater resistance to longitudinal strains, especially under compression than a flat one. This advantage is utilized in the formation of ballast tanks by connecting the deck plate and the outer or shell plating by heavy curved plates, such as shown in Fig. 2, the inner edge of the foundation plate being shown as curved in each instance as well as the upper plates of the inner plating.

The difference of the shape in the inner platings in Figs. 1, 2 and 3 has been already explained, but other modifications may be made, such as corrugations or reverse curves or with any combination of these curves.

In this invention, with a minimum weight of material in the side ballast tanks, sufficient strength longitudinally is obtained to resist tensile and compression strains on said topsides as the vessel crosses waves and "hogs" or "sags" thereon, and in this construction there is also, with a minimum weight of material, provision against distorting or racking strains tending to throw the ballast tank plating and framing out of shape transversely.

The arrangement of ties or transverse girders has already been commented on, but it will of course be understood that a pair or more of such deep plate beams may be used preferably following the transverse curvature of the inner plating of the ballast tanks, so that there may be no break in the continuity in the material under transverse strains on said girders or cross ties.

In Fig. 4 a modification is shown of the arrangement of longitudinal girders and in this figure, 32 is the oblique piece of the said internal web, said oblique piece being in the form of an angle bar having its section 33 abutting the inner surface of the inner plating 10. 34 are channel irons forming the longitudinal girders having their end sections 35 securely riveted through the inner plating to the section 33 of the angle bar 32. These girders 34 being arranged at intervals outside the inner plating and extending longitudinally throughout the length of the ballast tanks. The shape of the said longitudinal girders 34 is, of course, not limited to that of the channel iron and may be made in many shapes according to the form specified in building. Further, it may be said that without departing from the spirit of the invention, the longitudinal girders may be arranged differently in respect to the deck plating and outer shell plating than as described hereinbefore, the salient features being the arrangement of the said longitudinal girders inside or outside the walls of said tanks and the securing of said girders rigidly to said deck plating, outer shell plating and inner plating and to suitable stiffening means in the form of a frame or web suitably arranged at intervals throughout the length of said girders.

What I claim as my invention is:

1. In ship construction, a hull or outer shell plating, a deck plating, an inner plating extending from said deck plating to said outer shell plating and forming at each side thereof topside ballast tanks transverse framing terminating immediately below said ballast tanks, longitudinal girders extending along the inside of the walls of said ballast tanks and means for stiffening and supporting said longitudinal girders at intervals throughout the length of said ballast tanks.

2. In ship construction, a hull or outer shell plating, a deck plating, inner plating extending from said deck plating to said outer shell plating and forming topside ballast tanks transverse framing terminating immediately below said ballast tanks, longitudinal girders extending along the inside walls of said ballast tanks, and internal webs arranged at intervals throughout the length of said ballast tanks and rigidly secured to said longitudinal girders and supporting the same in position.

3. In ship construction, a hull or outer shell plating, a deck plating, inner plating extending from said deck plating in suitable curves to said outer plating and forming with said outer plating and deck plating topside ballast tanks transverse framing terminating immediately below said ballast tanks, a plurality of longitudinal girders extending along the inside walls of said ballast tanks, and a plurality of internal webs rigidly secured to said girders and to the walls of said ballast tanks and arranged at intervals therealong.

4. In ship construction, a hull or outer shell plating, deck plating, inner plating formed of foundation plates extending inwardly from the outer shell plating and curved upwardly, upper plates extending downwardly from the deck plating and intermediate plates joining said upper and foundation plates, said inner plating forming, with said deck and outer plating, top side ballast tanks transverse framing terminating immediately below said ballast tanks, a plurality of longitudinal girders arranged along the inside walls of said ballast tanks, internal webs rigidly secured to the inside walls of said ballast tanks at intervals throughout the length thereof, and angle bars rigidly securing said internal webs to said longitudinal girders.

5. In ship construction, the combination with the hull, deck and connecting plating forming topside ballast tanks and transverse framing terminating immediately below said

tanks, of longitudinal girders of angle formation extending along the inside walls of said ballast tanks, internal webs formed of vertical, horizontal, oblique pieces and plates, said pieces being substantially parallel with the inside walls of said ballast tanks and rigidly secured thereto through said plates, and angle bars rigidly securing said pieces to said longitudinal girders.

6. In ship construction, the combination with the hull, deck and connecting plating forming topside ballast tanks and transverse framing terminating immediately below said ballast tanks, of longitudinal girders of angle formation extending along the inside walls of said ballast tank, internal webs formed of a plate bracket at the lower end and vertical horizontal and oblique pieces extending therefrom and joined by plates at the corners thereof, angle bars joining said webs to the inside walls of said ballast tanks and angle bars rigidly secured to said webs and extending laterally therefrom and rigidly secured by their extending portions to said longitudinal girders.

7. In a device of the class described, in combination, a pair of topside ballast tanks arranged at each side of the ship formed of an outer plating comprising the outer shell plating and deck plating suitably joined at the top-most corner and an inner plating extending from said deck plating to said outer plating in suitable curves, a plurality of longitudinal girders and a plurality of internal webs arranged at intervals therealong and joined thereto forming an interior framing for reinforcing said plating, means for joining said framing to said plating, and brackets arranged beneath said inner plating and rigidly secured thereto and to the outer plating framing below said ballast tanks.

8. In a device of the class described, in combination, a pair of topside ballast tanks formed of the deck plating, the outer shell plating and inner plating joining said deck plating and outer shell plating and extending therebetween in suitable curves, a plurality of girders longitudinally arranged and a plurality of internal webs reinforcing and stiffening said longitudinal girder construction at intervals and forming a framing, said internal webs being rigidly secured to the inside walls of said ballast tanks, and transverse girders extending from the inner plating on one side in substantially the same curves to the inner plating of the other side in alinement with a pair of the internal webs and forming a tie across said ship between the hatch ways thereof.

9. In a device of the class described, in combination, a pair of topside ballast tanks formed of the deck plating, the outer shell plating and inner plating joining said deck plating and outer shell plating and extending therebetween in a plurality of curves, and means for stiffening or reinforcing the said plate construction of said tanks therewithin.

10. In a device of the class described, the combination with the topside ballast tanks and transverse framing terminating immediately below said tanks, of a plurality of longitudinal girders extending along the walls of said ballast tanks and rigidly secured thereto, and stiffening means rigidly secured to said girders at intervals throughout the length thereof.

11. In a device of the class described, the combination with the topside ballast tanks and transverse framing terminating immediately below said tanks, of a plurality of longitudinal girders extending along the walls of said ballast tanks and rigidly secured thereto, and internal webs rigidly secured to the walls of said tanks and to said longitudinal girders and arranged at intervals throughout the length of said tanks.

Signed at the city and district of Montreal, Province of Quebec, in the Dominion of Canada, this eighth day of March, 1909.

JOHN REID.

Witnesses:
G. H. TRESIDDER,
P. SHEE.