(No Model.) 2 Sheets—Sheet 1.

S. T. RICHARDSON.

CONSTRUCTION OF VESSELS.

No. 456,849. Patented July 28, 1891.

Fig. 1.

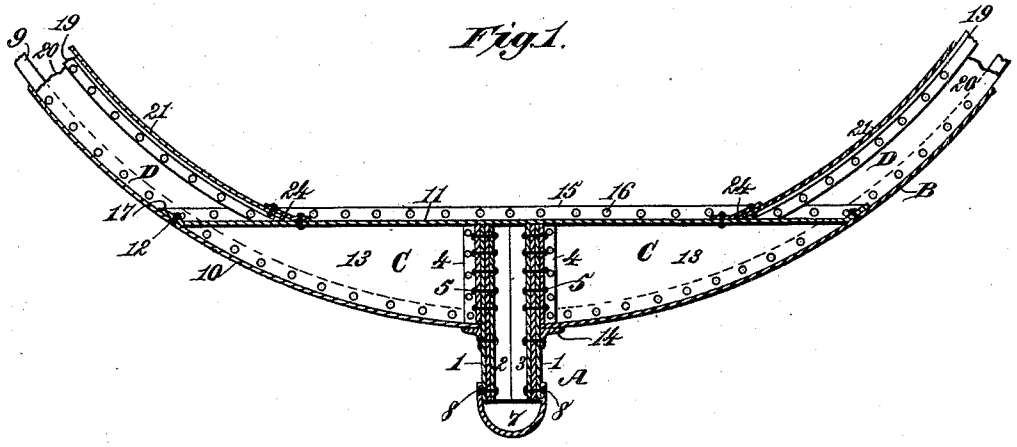
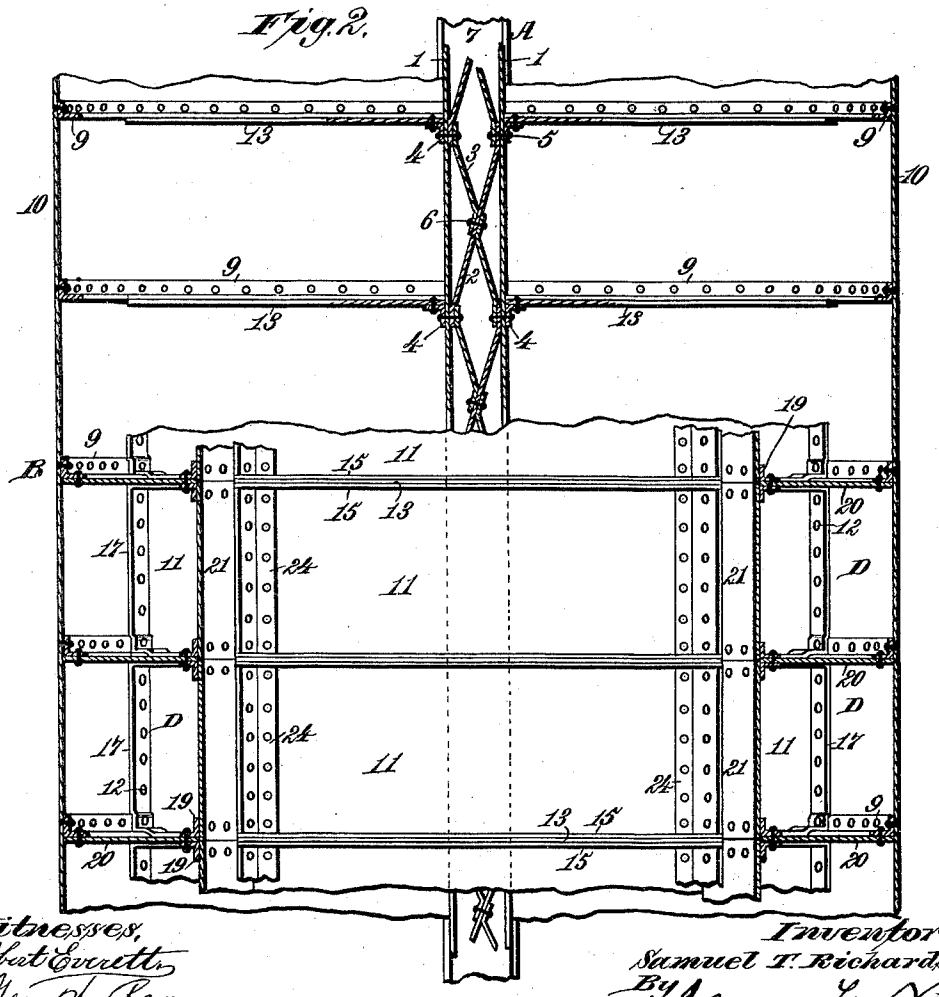


Fig. 2.



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(No Model.) 2 Sheets—Sheet 2.

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Fig. 3.

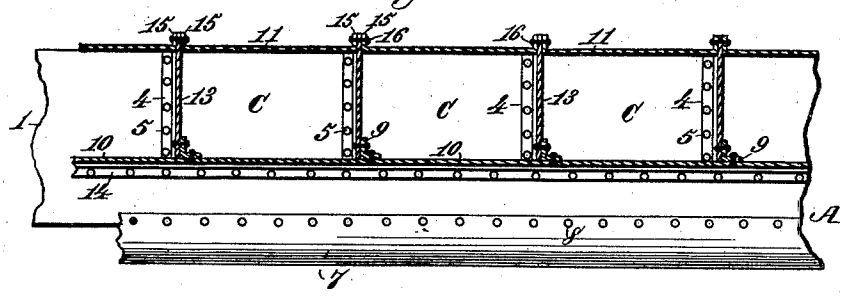


Fig. 5.

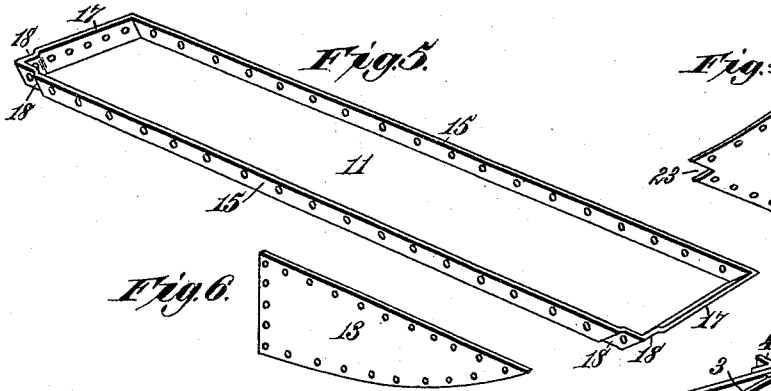


Fig. 4.

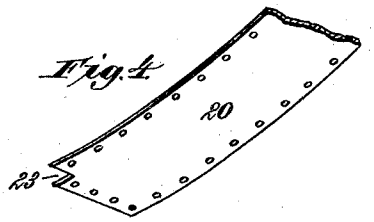


Fig. 6.

Fig. 7.

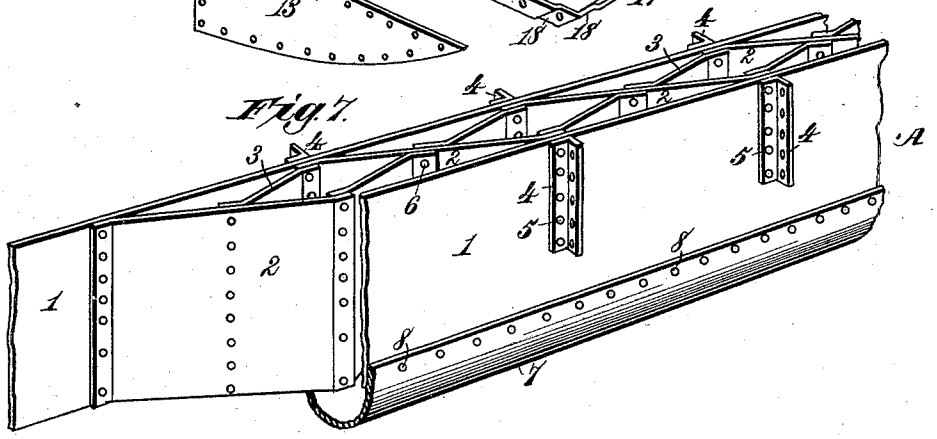
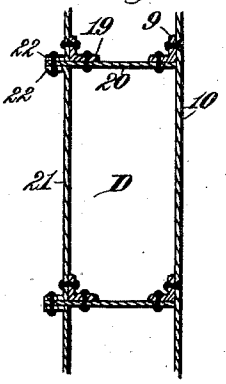


Fig. 8.



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UNITED STATES PATENT OFFICE.

SAMUEL T. RICHARDSON, OF BALTIMORE, MARYLAND, ASSIGNOR TO THE RICHARDSON ENGINE AND STEAMSHIP COMPANY, OF SAME PLACE.

CONSTRUCTION OF VESSELS.

SPECIFICATION forming part of Letters Patent No. 456,849, dated July 28, 1891.

Application filed December 18, 1890. Serial No. 375,135. (No model.)

To all whom it may concern:

Be it known that I, SAMUEL T. RICHARDSON, a citizen of the United States, residing at Baltimore, State of Maryland, have invented new and useful Improvements in Construction of Ships and other Vessels, of which the following is a specification.

My invention relates to the construction of ships and other vessels wholly or in part of iron or of steel, and has for its principal object the strengthening and bracing of the keel and adjacent parts of the hull in such a manner as to counteract vertical, transverse, and torsional strain and prevent their usual disastrous effects in the joints and framing of a vessel.

In order to obviate some of the chief difficulties and imperfections in the ordinary construction of iron ships and provide simple, economical, and effective means for strongly connecting the parts of the keel and hull my invention comprises a ship or other vessel in which the keel is built up of parallel vertical plates and interposed diagonal bracing-plates, all securely bolted together to withstand strain from any direction; and it also consists in the several features of construction and relative arrangement and combinations of parts in the keel-deck and hull-framing and coverings, whereby a number of separate water-tight compartments are provided both above and below the keel-deck, while at the same time the hull is effectively strengthened and braced against the effects of strain.

In the annexed drawings, illustrating the invention, Figure 1 is a vertical transverse section of a portion of a ship embodying my improvements in the construction of the keel and adjacent parts of the hull. Fig. 2 is a sectional plan of the same. Fig. 3 shows the keel in side elevation and a portion of the hull in section. Fig. 4 is a view of a partition-plate that forms part of the water-tight compartment above the keel-deck. Fig. 5 is a view of one of the keel-deck plates. Fig. 6 is a view of one of the partition-plates that form part of the water-tight compartments below the keel-deck. Fig. 7 is a perspective detail showing the manner of constructing the keel. Fig. 8 is a horizontal section through a portion of the inner and outer framings, the skin, the lining, and the transverse partition-plates of the upper water-tight compartments, and shows how said partition-plates may be connected with the flanged ends of the lining-plates.

In carrying my invention into effect I construct the keel A, as shown in Figs. 1, 2, and 7, from metallic plates 1, that are placed vertically at a suitable distance apart, and which are securely connected and braced by an intermediate system of long diagonally-placed bracing-plates 2 and similar shorter plates 3, all of which, as shown in Figs. 1 and 7, are of the same width as the outer parallel keel-plates 1, and extend therewith from top to bottom of the keel. As represented in Figs. 2 and 7, the plates 2 are extended diagonally between the parallel plates 1 and have their ends bent or flanged at a sufficient angle to facilitate attachment to the outer keel-plates. The shorter plates 3 are extended diagonally between the ends and centers of adjacent plates 2, and in like manner have their ends bent or flanged at suitable angles to enable them to be firmly bolted or riveted to the longer plates. It will thus be seen that the intersecting plates 2 and 3 afford a firm internal bracing for the keel from top to bottom. On the outer surfaces of the parallel keel-plates 1 at their upper portions are placed a series of vertical angle-irons 4, which are located in line with the ends of the diagonally-arranged bracing-plates 2 and 3, and together therewith are securely fastened to the parallel plates 1 by bolts 5, that extend through all of said parts, while the short bracing-plates 3 are secured to the central portions of the long bracing-plates 2 by bolts 6, as shown in Fig. 2. The bottom of the hollow metallic keel A is closed by a metallic trough-shaped plate or plates 7, securely fastened by bolts 8, Figs. 1, 3, and 7, to the lower portion of the outer parallel keel-plates.

The ship's hull B comprises an outer framing of suitably-curved angle-irons 9, the metallic skin 10, bolted or riveted to said angle-irons, the flanged or dished keel-deck plates 11, extended transversely between the opposite angle-irons 9, immediately above and

resting horizontally on the keel and having their flanged ends secured to the skin 10 by bolts 12, and the vertical wings or transverse partitions 13, extended below the keel-deck and bolted to and between the angle-irons 4 and 9, as shown in Figs. 1 and 2, and with their upper portions bolted between the side flanges of the keel-deck plates 11, as shown in Fig. 3.

The vertical plates or partitions 13, as shown in Fig. 6, are of segmental shape to conform to the configuration of the bottom and bilge of the vessel. Besides assisting to brace the keel and shell of the vessel, these plates 13 serve as partitions to divide the space below the keel-deck on each side of the keel into a series of water-tight compartments C, that add materially to the buoyancy of the vessel.

To each side of the keel, immediately below and in contact with the skin 10, are bolted or riveted a series of longitudinally-arranged angle-irons 14, as shown in Figs. 1 and 3, to make a close joint and strengthen the connection of the parts.

The flanged or dished keel-deck plates 11 are of the oblong form (shown in Figs. 1 and 5,) and preferably of sufficient length to extend across the vessel from side to side. The upturned side flanges 15 of the plates 11 are made vertical and parallel to closely embrace the upper portions of the transverse vertical partition-plates 13, that are secured between the side flanges of adjoining plates by bolts or rivets 16, which also connect the several keel-deck plates. At the ends of the keel-deck plates 11 are oblique flanges 17 to connect with the skin and outer framing of curved angle-irons 9, to which said plates are securely bolted or riveted. The flanged plates 11 may be formed with recesses 18 at suitable points to more readily fit the angle-irons 9, to which they are secured, and enable the end flanges 17 of said plates to assist in supporting the skin of the vessel, which may be bolted or riveted thereto, as shown in Figs. 1 and 2.

The keel-deck plates 11 may support an inner framing of curved or inclined angle-irons 19, which are connected with and braced by vertical segmental partition-plates 20, that are located between and securely bolted or riveted to the outer and inner framings of angle-irons 9 and 19, as shown in Figs. 1 and 2. The lower ends of these plates 20 are also secured between the side flanges 15 of the keel-deck plates. The partition-plates 20, Fig. 4, are of a shape to conform to the curvature or inclination of the angle-irons 9 and 19, and besides assisting to brace the hull they serve to divide the space between the skin 10 and lining 21 into a series of water-tight compartments D, Figs. 1 and 8.

The lining 21 or inner shell of the vessel may consist of unflanged plates bolted to the inner framing of angle-irons 19, as shown in Fig. 2, or, as shown in Fig. 8, the lining-plates 21 may be provided with inwardly-turned end flanges 22, between which the inner portions or edges of the partition-plates 20 can be extended and secured. By this construction the application of bolts for securing the parts is greatly facilitated and the joints are readily accessible for calking. If necessary, the partition-plates 20 can be provided at suitable points with jogs or notches 23, Fig. 4, to assist in fitting them in place. The joints between the keel-deck plates 11 and lining-plates 21 are closed by angle-irons 24, Figs. 1 and 2, bolted or riveted to said plates.

It will be observed that by constructing, arranging, and connecting the several parts of the keel and hull in the manner described all the joints that require calking are readily accessible. By providing the internal sheathing or lining plates 21 with flanged ends 22, to which the inner portions of the partition-plates 20 are secured, as shown in Fig. 8, the outside work can be done and calked inside and out independent of the inside work, and the latter can be done at the same time and independent of the outside, or either can be done and securely calked independent of the other, which is an important feature in building ships of this class.

With two sets of framing composed of the angle-irons 9 and 19, one set for attachment of the outside plating or skin 10, and the other for the internal sheathing or lining 21, the strength of the structure is greatly increased and provision made for a large number of independent water-tight compartments on each side of the vessel, by which the risk of sinking is largely diminished in the event of rupture from the effects of collision or strain.

The arrangement of the inner framing 19 and lining 21, in connection with the keel-deck plates 11, partition-plates 20, and the outer framing 9, and lower partition-plates 13, secured to the keel, affords a secure and efficient bracing against vertical, lateral, and torsional strain of the vessel and its keel, while the construction of the keel, as described, and the manner in which it is connected with the bottom and sides of the vessel secure it against vertical and transverse strain and add largely to its strength. The attainment of these results is very much facilitated by the construction and arrangement of the diagonally-placed bracing-plates 2 and 3, located between and secured to the parallel keel-plates 1, and extended therewith from top to bottom of the keel, the strength of which is also enhanced by the inverted-arch form of the trough-shaped plates 7, secured to and closing the bottom of the keel. By this construction, also, the keel becomes a water-tight compartment, and with the independent or separate compartments C and D adds to the buoyancy of the vessel.

What I claim, and desire to secure by Letters Patent, is—

1. In a ship or other vessel, the combina-

tion, with parallel vertical keel-plates, of diagonally-arranged bracing-plates located between and secured to the parallel keel-plates and extended therewith from top to bottom of the keel, substantially as described.

2. In a ship or other vessel, the combination, with parallel vertical keel-plates, of diagonally-arranged bracing-plates located between and secured to the parallel keel-plates and extended therewith from top to bottom of said parallel plates, and a trough-shaped plate secured to the opposite parallel keel-plates and forming the bottom of the keel, substantially as described.

3. In a ship or other vessel, a keel composed of parallel vertical plates arranged at a distance apart and forming the sides of the keel, diagonally-arranged and intersecting bracing-plates located between and secured to the parallel keel-plates and to each other, and a plate secured to the opposite parallel keel-plates and forming the bottom of the keel, substantially as described.

4. In a ship or other vessel, the combination of parallel vertical keel-plates arranged at a distance apart and forming the sides of the keel, diagonally-arranged bracing-plates located between and secured to the parallel keel-plates, a plate secured to the opposite parallel keel-plates and forming the bottom of the keel, a series of curved angle-irons secured to the keel and forming the outer framing of the vessel, and a keel-deck composed of a number of plates resting horizontally on the keel and having their outer ends secured to the said framing of angle-irons, substantially as described.

5. In a ship or other vessel, the combination of vertical parallel keel-plates forming the sides of the keel, diagonally-arranged bracing-plates located between and secured to the opposite parallel keel-plates, a series of curved angle-irons secured to the keel and forming the outer framing of the vessel, a keel-deck composed of a number of plates resting horizontally on the keel and having their outer ends secured to said framing of angle-irons, a skin or plating secured to said framing and keel-deck, and a number of vertical transverse partition-plates connected with said angle-irons, keel-deck, and keel and dividing the space below the keel-deck into a series of separate water-tight compartments, substantially as described.

6. In a ship or other vessel, the combination, with the keel and an outer framing of curved angle-irons, of the flanged keel-deck plates resting horizontally on the keel and having their outer portions secured to said angle-irons and a number of vertical transverse partition-plates connected with the keel and angle-irons below the keel-deck and having their upper portions secured between the side flanges of adjoining keel-deck plates, substantially as described.

7. In a ship or other vessel, the combination, with the keel, an outer framing of curved angle-irons connected with the keel, and a skin or plating secured to said angle-irons, of the flanged keel-deck plates resting horizontally on the keel and having their flanged ends secured to the skin and outer framing of angle-irons, a number of vertical transverse partition-plates connected with the keel and angle-irons below the keel-deck and having their upper portions secured between the side flanges of adjoining keel-deck plates, an inner framing of angle-irons supported on the keel-deck plates and secured to the side flanges thereof, a lining or plating secured to said inner framing, and a number of transverse partition-plates located between and secured to the inner and outer framings of angle-irons above the keel-deck, substantially as described.

8. In a ship or other vessel, the combination of the keel, the outer framing of angle-irons, the skin or plating secured to said angle-irons, the flanged keel-deck plates having their ends secured to said framing and skin, the inner framing of angle-irons supported on and secured to the keel-deck, the lining or plating secured to said inner framing, and vertical transverse partitions located between and secured to the keel, the keel-deck, and the inner and outer framings and forming therewith a series of water-tight compartments below the keel-deck and another series of water-tight compartments above said deck, substantially as described.

9. In a ship or other vessel, the combination of vertical parallel keel-plates, diagonally-arranged bracing-plates located between and secured to said parallel keel-plates and extended vertically therewith from top to bottom of the keel, a series of parallel vertical angle-irons secured to the parallel outer keel-plates in line with the ends of the interposed bracing-plates, a series of curved angle-irons bolted to said vertical angle-irons and forming the outer framing of the vessel, and the keel-deck plates resting on the keel and having their ends secured to said outer framing, substantially as described.

10. In a ship or other vessel, the combination, with the keel and the keel-deck plates, of an outer framing of angle-irons secured to said keel and keel-deck plates, the skin or plating secured to said keel-deck and framing, and a series of longitudinally-arranged angle-irons secured to the keel below and in contact with the skin, substantially as described.

11. In a ship or other vessel, the combination of the keel, the keel-deck, the inner and outer framings of angle-irons, a number of vertical transverse partition-plates located between and secured to said angle-irons above the keel-deck, and a lining secured to the inner framing and composed of plates having flanged ends to embrace the inward extended portions of the partition-plates and secured thereto, substantially as described.

12. In a ship or other vessel, the combina-

tion of the keel, the flanged keel-deck plates, the inner and outer framings of angle-irons, the partition-plates, the skin, the lining, and a series of angle-irons for closing the joints between the keel-deck plates and lining-plates, substantially as described.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

SAMUEL T. RICHARDSON.

Witnesses:
JAMES L. NORRIS,
A. H. NORRIS.