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S. STUART.

CONSTRUCTION OF SHIPS.

No. 538,800. Patented May 7, 1895.

Fig. 1.

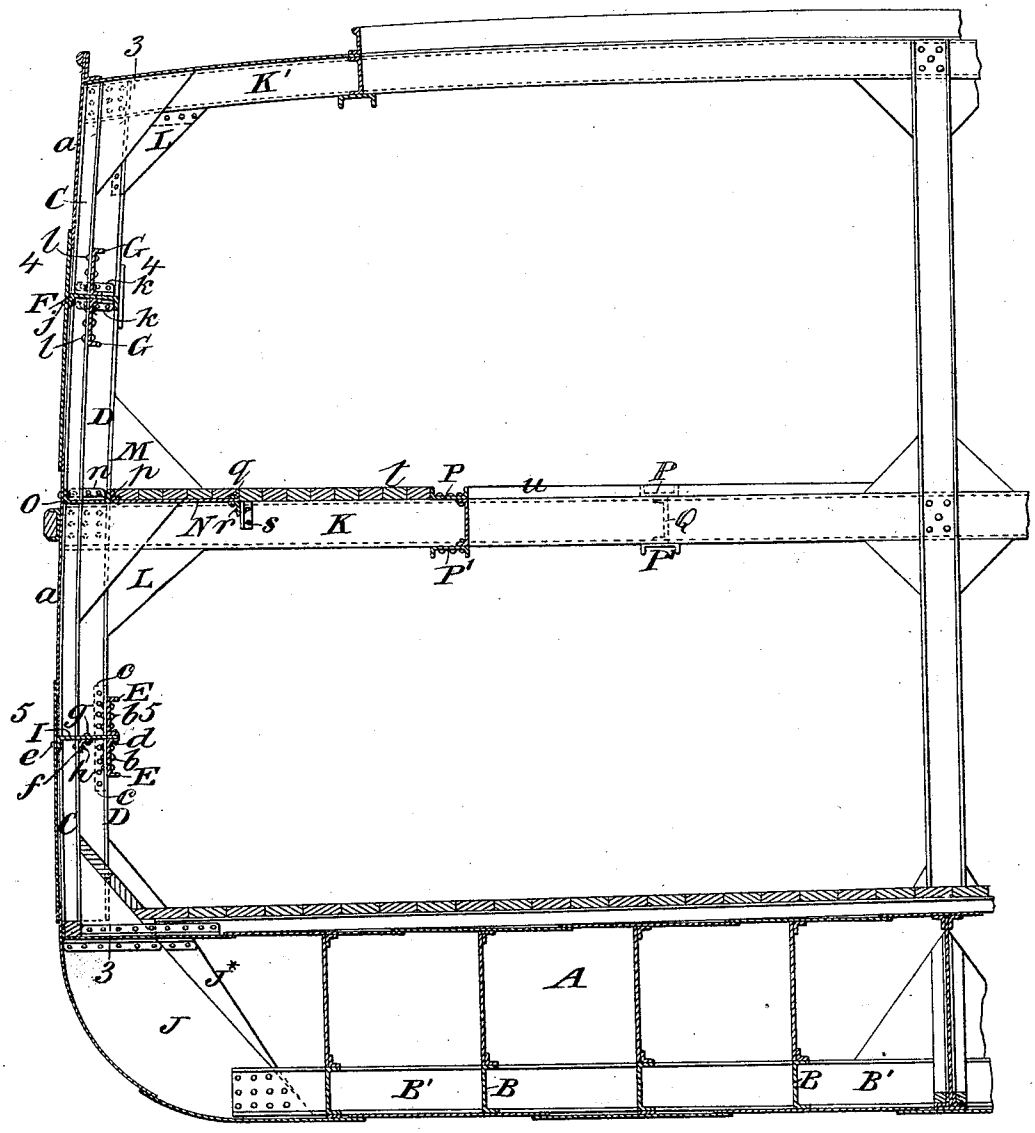

Fig. 2.

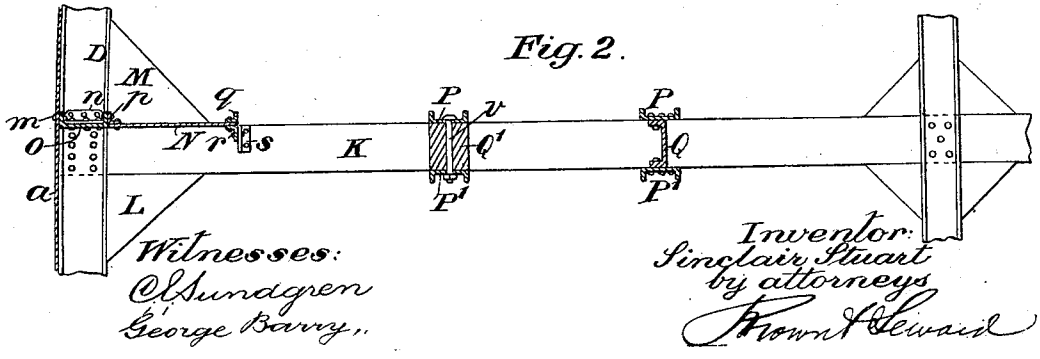

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Fig. 3

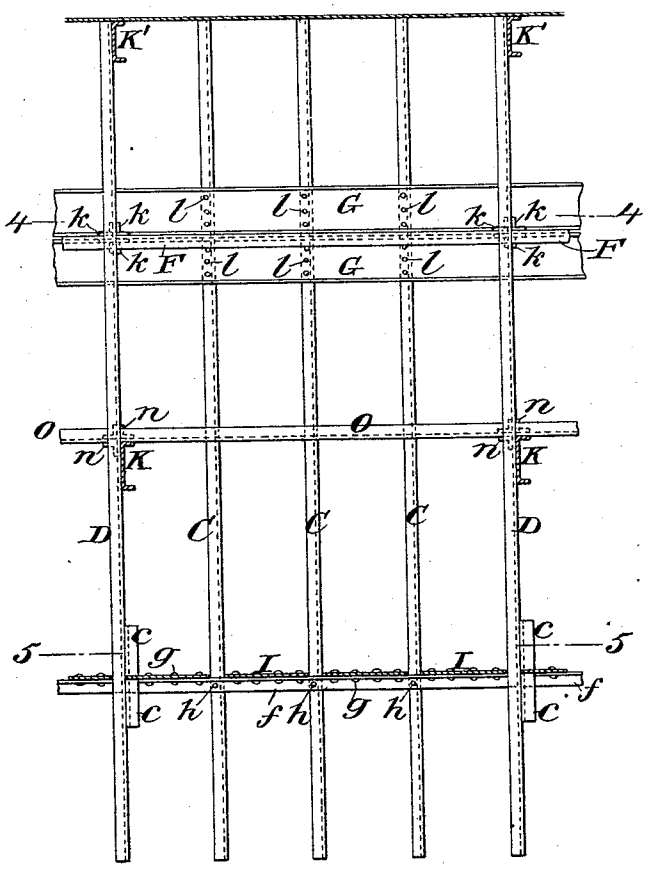


Fig. 4.

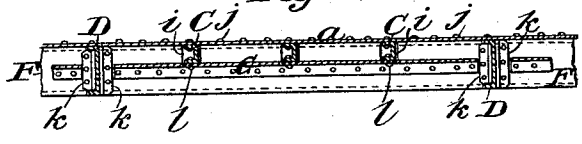
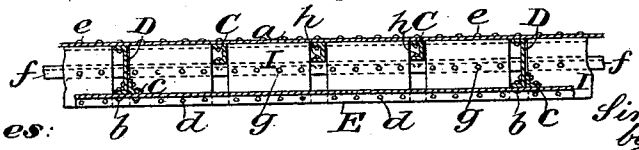


Fig. 5.



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(No Model.) 3 Sheets—Sheet 3.

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Fig. 6.

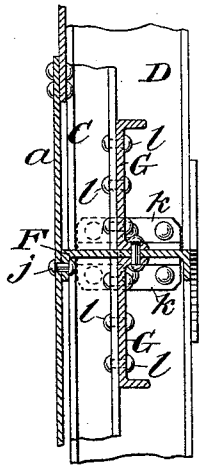
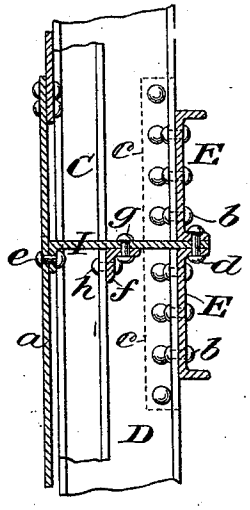


Fig. 7.



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UNITED STATES PATENT OFFICE.

SINCLAIR STUART, OF PLAINFIELD, NEW JERSEY.

CONSTRUCTION OF SHIPS.

SPECIFICATION forming part of Letters Patent No. 538,800, dated May 7, 1895.

Application filed February 9, 1895. Serial No. 537,746. (No model.)

To all whom it may concern:

Be it known that I, SINCLAIR STUART, of Plainfield, in the county of Union and State of New Jersey, have invented a new and useful Improvement in the Construction of Ships or other Vessels, of which the following is a specification.

This invention relates to ships and other navigable vessels constructed wholly or principally of steel or iron, and it consists in certain combinations of parts herein described whereby great strength and stability are obtained at comparatively small cost and little weight and without interfering with carrying capacity.

I will first describe my improvement in detail with reference to the accompanying drawings and afterward point out its novelty in claims.

Figure 1 represents a transverse vertical section of parts of one side and of the bottom of a vessel embodying my improvement; Fig. 2, a transverse vertical sectional view representing parts of the side framing and one of the deck-beams and connected parts, illustrating a modification of the construction shown in Fig. 1. Fig. 3 represents a vertical section taken in the line 3 3 of Fig. 1, showing the interior of the side wall of the vessel; Fig. 4, a longitudinal section taken in the line 4 4 of Figs. 1 and 3; Fig. 5, a horizontal section on the line 5 5 of Figs. 1 and 3. Figs. 6 and 7 represent views, on a larger scale, of certain portions of Fig. 1.

Similar letters of reference designate corresponding parts in all the figures.

The vessel represented in Fig. 1 has in its bottom a water ballast tank A, but that is immaterial to my invention. The floor framing is represented as composed of longitudinal channels B and intercostal transverse channels B′. The side framing is composed of upright main frames C and D of channel steel or iron, longitudinal channel stringers E, and longitudinal channels F, G, O. The upright channel frames, or as they are commonly termed channels, are united respectively with the floor channels by brackets J J* within the bilge.

The upright channels C are like the upright frames of channel steel heretofore used in the side framing of vessels, but those D are much wider than and may be at least twice as wide as C, as may be understood by reference to Figs. 1, 4, and 5, and project farther inward from the outside plating *a* of the vessel, the webs of all the said upright frames or channels being arranged transversely to the vessel. The said frames or channels C D are or may be all at equal distances apart as shown in Figs. 3, 4, and 5, but the wider ones D which I call "web frames" and which constitute an important element of my improvement, are not so numerous, intervening only at intervals between series of two or more of the ordinary or narrower channels C, as shown in Figs. 4 and 5.

The longitudinal channel stringers E E which may run continuously the whole or any part of the length of the vessel without interruption, are represented as arranged at some distance above the lower deck of the vessel. They are placed with the backs of their webs against the inner flanges of the web frames D, as shown in Figs. 1 and 7, and their webs are riveted as shown at *b* in Figs. 5 and 7, to the inner flanges of said frames D. The said longitudinal channels E are further secured to the web frames D by upright angle clips *c* which are riveted to the said channels E and to the web frames D as shown in Figs. 1 and 5. In Figs. 1 and 7 there are shown two of the continuous longitudinal channels E arranged one above the other so near together as only to leave room between them for the longitudinal angle plates I which are intercostal to the frames C D extending from one to another as shown in Fig. 5. The inner edges of these angle plates I are riveted as shown at *d* in Figs. 1, 5 and 7, between the adjacent flanges of the longitudinal channels E, and their outer flanges are riveted to the plating *a* as shown at *e* in Figs. 1 and 7. The said plates are further secured to the upright frames C by angle strips *f* (see Figs. 1, 3, 5 and 7) which extend all the way between the web frames D and are riveted to the said plates I as shown at *g*, and to the inner flanges of the frames C as shown at *h*.

The longitudinal channels F which are represented as arranged between the intermediate and upper decks, are of a width corresponding with that of the web frames D and have their webs arranged approximately hori-

zontal. They are of a length to extend from one web frame D to the next one and they are notched, as shown at *i* in Fig. 4, at the intervention of the web frames C in order that the plating may be riveted as shown at *j* in Figs. 1 and 6 to their outer flanges. They are fastened at their ends to the web frames D by means of angle clips *k* which are riveted to them and to the said web frames as may be understood by reference to Figs. 1, 4 and 6. The channels G which are intercostal to the web frames and of which there is one above and one below each of the channels F, are placed with the backs of their webs against the inner flanges of the frames C and riveted to said flanges as indicated at *l* in Figs. 1 and 3.

K K′ are the deck beams of channel steel riveted to the web frames D and further fastened to the said frames by brackets L M. Directly upon the beams K of the intermediate deck close to the inner flanges of the web frames D, are arranged continuous stringer plates N (see Figs. 1 and 2) which may be of any suitable width and may run the whole or any portion of the length of the vessel. Even with these stringer plates N there are arranged between the adjacent web frames D, intercostal channel stringers O, which are notched where the narrower frames C intervene in the same manner as the channels F as shown at *i* in Fig. 4. These stringers O are fastened at their ends to the web frames D by angle clips *n* riveted to the said channels and frames as shown in Figs. 1 and 2.

Along the edges of the stringer plates N which are close to the web frames D, there are riveted angle bars *p* which are also riveted to the inner flanges of the intercostal channels O. The inner edges of the stringer plates N are stiffened with angle strips *q r* riveted to them above and below and the angle strips *r* below are fastened to the deck beams by riveted angle clips *s*. The combination of the web frames D, continuous stringer plates N and intercostal stringers O, are in lieu of and dispense with quarter stanchions and thereby I obtain free open cargo space for trimming cargo, coal, &c., in bulk. In a vessel having an intermediate deck as illustrated in Fig. 1, the deck planking *t* may be laid over the stringer plates; but such plates may be used in vessels in which there is no intermediate deck as in the example shown in Fig. 2, wherein channel beams K which take the place of deck beams are used only as transverse braces to the hull.

P P′ are channel stringers of which there may be any desired number arranged lengthwise of the vessel above and below the deck beams or bracing beams K. These stringers may run continuously through the whole or any portion of the length of the vessel except between the points at which the hatchways intervene where they will be interrupted and terminate at the hatchway frame or coaming *u*. When the deck planking *t* is laid as shown in Fig. 1, the channel stringers P above the beams K constitute water ways. Both the upper stringers P and the under ones P′ constitute ties between the beams. Between the upper and lower stringers P P′, I place thrust braces Q or Q′ extending from one beam K to the next one of the same deck or series. The thrust brace Q in Fig. 1 is represented as of channel form and riveted to the stringers P P′, but that Q′ in Fig. 2, is represented as of timber and bolted to the ties P P′ by bolts *v* running through it and the ties. The said htrust braces Q Q′, it will be understood, abut against the beams K at opposite points in front and rear thereof and so form practically continuous thrust braces.

What I claim as my invention is—

1. The combination in a ship or other vessel, of narrower upright channel frames C, wider upright channel frames D interposed at intervals between the said narrower channel frames, and a continuous longitudinal channel E riveted through its web to the inner flanges of said wider channel frames, substantially as herein described.

2. The combination in a ship or other vessel, of the narrower upright channel frames C, the wider upright channel frames D interposed at intervals between the said narrower channel frames, the two continuous longitudinal channels E E arranged one above the other and riveted through their webs to the inner flanges of said wider frames, the angle plates I interposed and riveted between the said longitudinal channels E, in the spaces between the narrower channel frames C, and the angle strips *f* arranged lengthwise between the said wider channel frames D and riveted to the inner flanges of the narrower channel frames C, substantially as herein set forth.

3. The combination in a ship or other vessel, of the narrower upright main frames C of channel form, the wider upright main frames D of channel form arranged at intervals between the said narrower frames C, the horizontal channels F corresponding in width with the said wider frames D arranged lengthwise intercostally between the latter and notched for the reception of the said narrower frames C, the longitudinal channels G G arranged intercostally between the frames D above and below said horizontal channels F and riveted to the latter channels and to the narrower frames C, and the angle clips *k* fastening the said channels F to the wider frames D, substantially as herein set forth.

4. The combination in a ship or other vessel, of the narrower upright channel frames C, the wider upright channel frames D interposed at intervals between the said narrower channel frames, the transverse beams K fastened to said wider channel frames, the horizontal channels O corresponding in width with said wider channel frames arranged lengthwise intercostally to the latter and fastened thereto, and the longitudinal stringer-plates

N fastened to said wider channel frames D, to said beams K and to said horizontal channels O, substantially as herein set forth.

5. The combination in a ship or other vessel, of transverse channel beams, channel stringers arranged lengthwise of the vessel through any part of the length thereof directly above the said beams and riveted through their webs to the latter, and thrust braces abutting between said beams below said stringers and fastened to said stringers, substantially as herein set forth.

6. The combination in a ship or other vessel, of transverse channel beams, channel tie stringers arranged lengthwise of the vessel through the whole or any portion of the length thereof above and below said beams and fastened thereto, and thrust braces interposed between said tie stringers and abutting between said beams, substantially as herein set forth.

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Witnesses:
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