May 21, 1946. E. MOXHAM, JR 2,400,771

HULL CONSTRUCTION FOR SURFACE BOATS AND SHIPS

Filed May 1, 1945 4 Sheets-Sheet 1

Fig. 1.

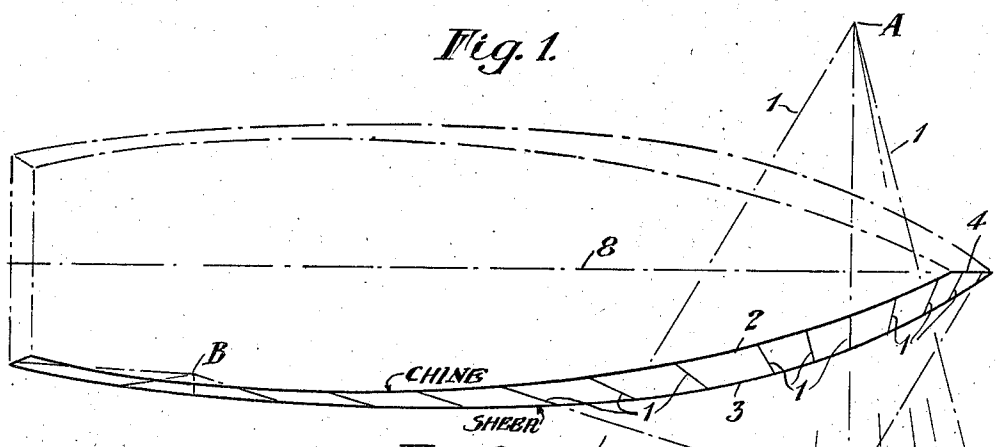


Fig. 2.

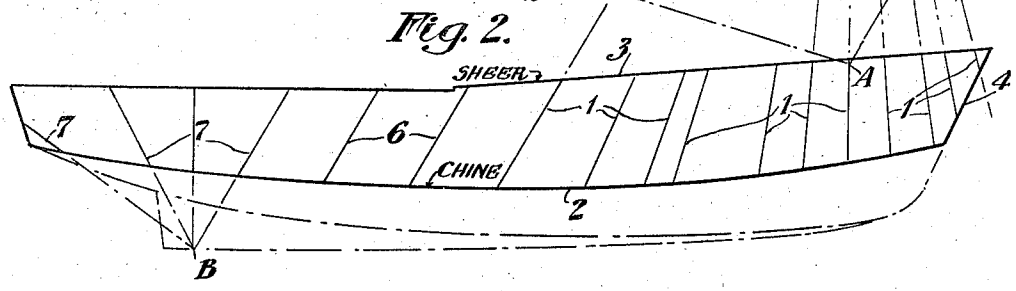


Fig. 3.

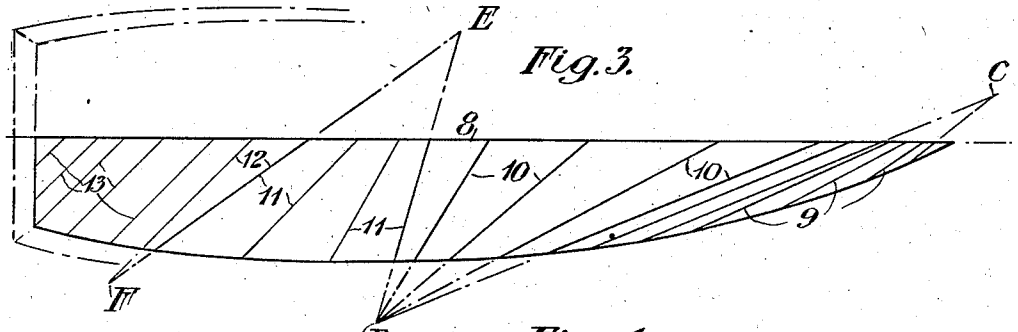
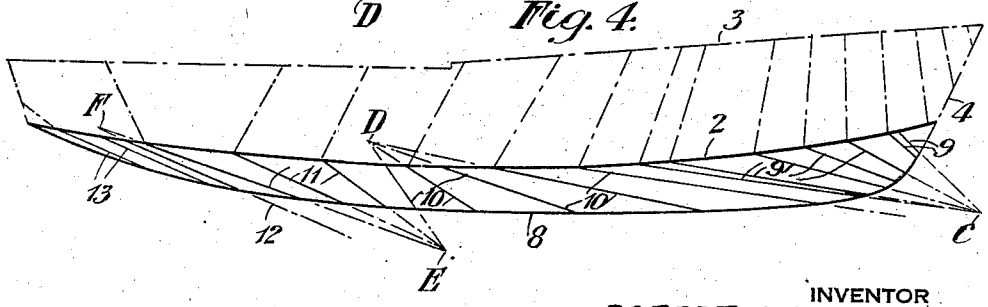


Fig. 4.



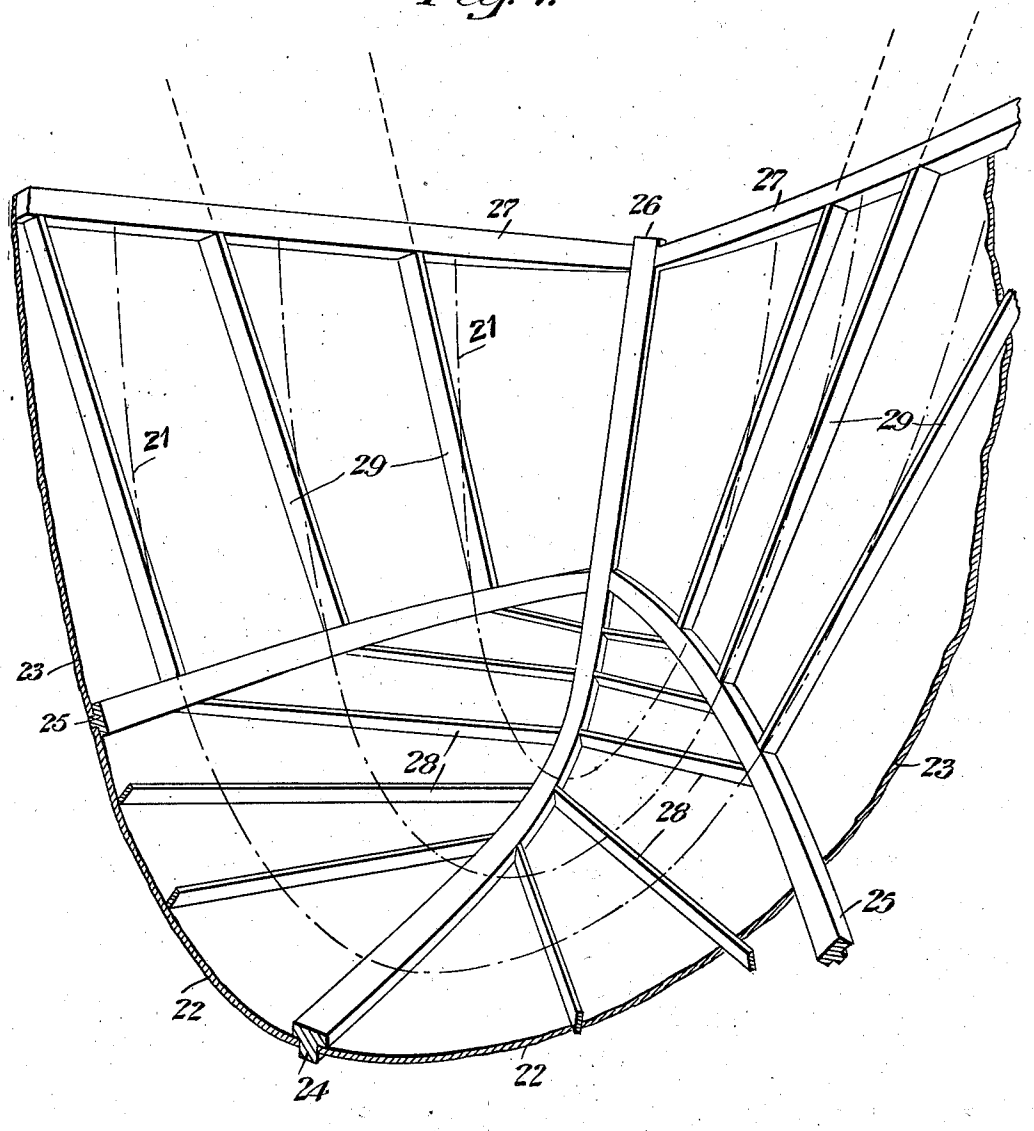
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HULL CONSTRUCTION FOR SURFACE BOATS AND SHIPS

Filed May 1, 1945 4 Sheets-Sheet 3

Fig. 7.



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HULL CONSTRUCTION FOR SURFACE BOATS AND SHIPS

Filed May 1, 1945 4 Sheets-Sheet 2

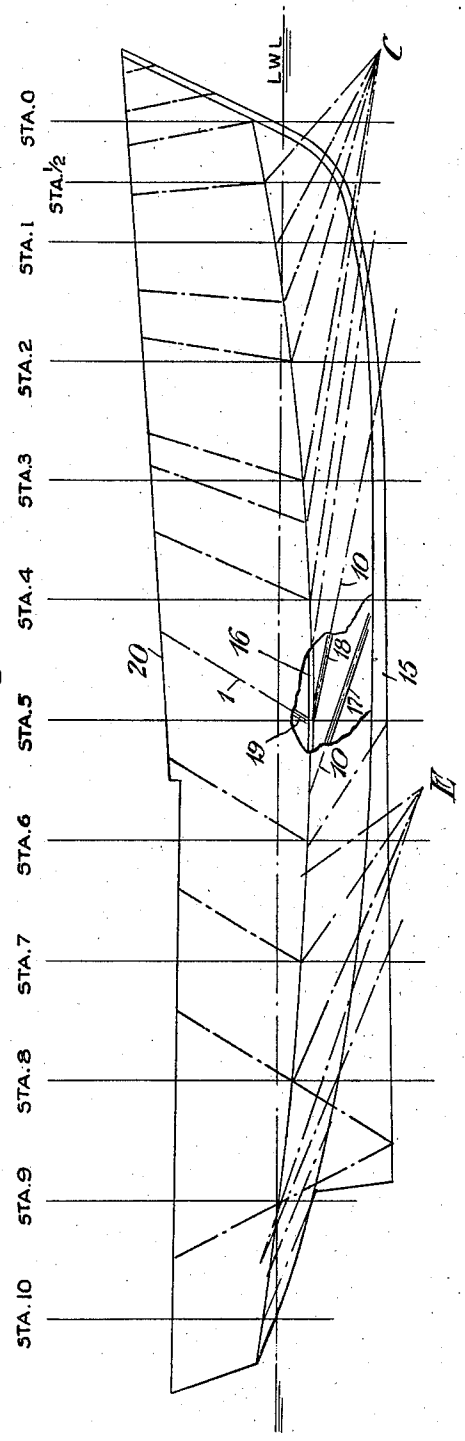


Fig. 5.

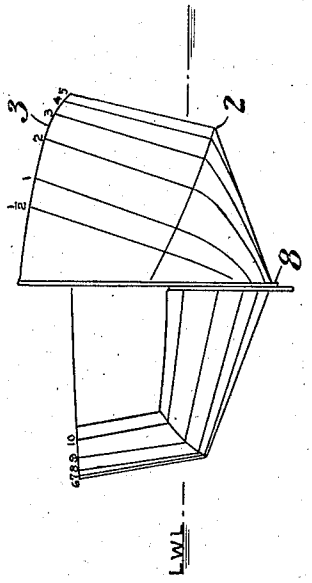


Fig. 6.

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HULL CONSTRUCTION FOR SURFACE BOATS AND SHIPS

Filed May 1, 1945 4 Sheets-Sheet 4

Fig. 8.

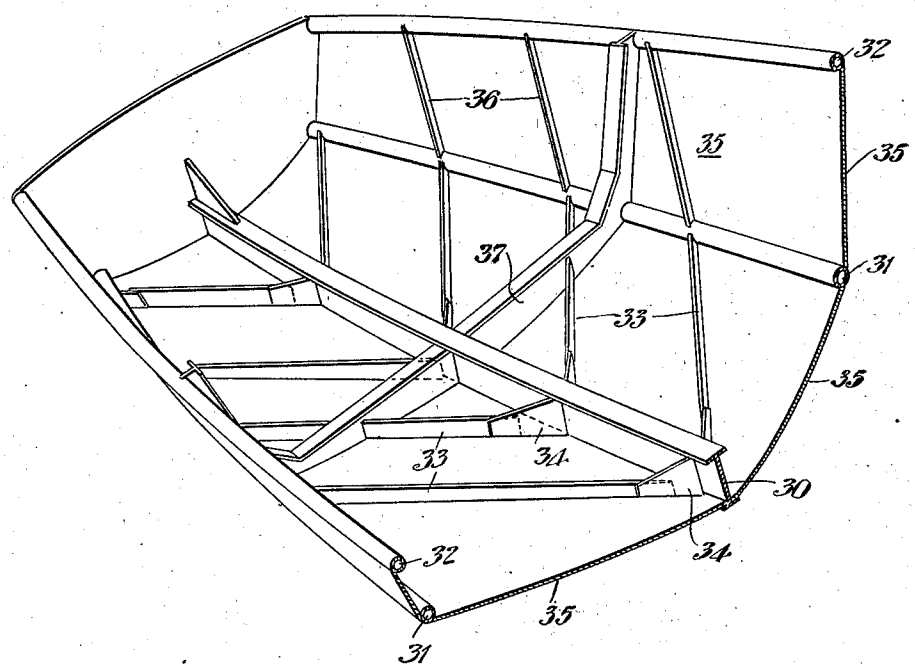


Fig. 9.

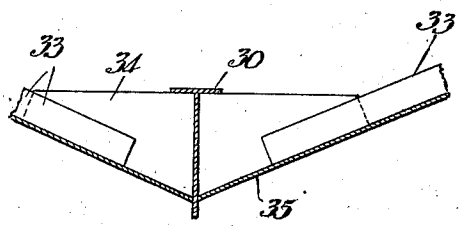
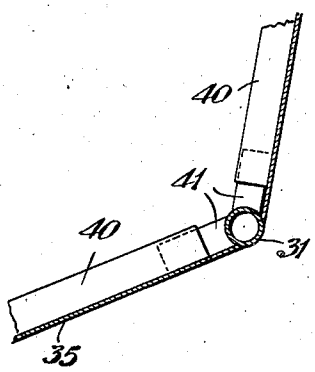


Fig. 10.



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HULL CONSTRUCTION FOR SURFACE BOATS AND SHIPS

Egbert Moxham, Jr., Brunswick, Ga.

Application May 1, 1945, Serial No. 591,248

11 Claims. (Cl. 114—65)

This invention relates to hulls and has for its object the provision of an improved hull construction for surface boats and ships. More particularly, the invention is concerned with the supporting structure, such as the frame or stiffening members for hulls, and aims to provide such a construction and arrangement of the frame members with respect to the shape of the shell of the hull that the frame members can be absolutely straight and in supporting engagement with substantial length portions of the shell, even at those places such as the bow where there are pronounced curves.

In accordance with my invention, I arrange the frames in such positions that they embrace or coincide with the generatrices of a cone or of a cylinder that also embrace substantial length portions of the shell. The shell of my improved hull has a developable shape; that is, it is shaped by the generatrices of a cone or of a cylinder, or both, and each of the straight frame members is located to embrace, or be in coincident contact with, a generatrix of the shell at a place where a supporting or reenforcing member is necessary. By an appropriate selection of the shell shape and the location of the generatrices, for example, in the case of a cone, the location of the apex and the selection of its directrix, I may have substantial lengths of the generatrices coinciding with the shell. I may employ any desired number of suitably spaced and perfectly straight frame members to provide the amount of stiffness or reenforcement necessary. The invention is especially applicable to the curved portions of the hull at the bow, to the curved deck, to the inclined convex sections of a V-bottom, to the sides, and to the stern of transom and cruiser sterned hulls and the like. The invention may advantageously be applied, for example, in the construction of small boats such as V-bottom boats with chine. The straight frame members may not only be in engagement with substantial length portions of the shell but also connected to other supporting structures of the hull. For example, the frame members may be connected at their ends to the keel, the chine, the sheer clamps, bulk heads, deck girders and the like.

One of the advantages of the invention is that it makes available for the frame or stiffening members various kinds of stock material in straight form, such as timbers, metal bars, channels, angles, pipes and the like and standard interconnecting fittings. Another advantage is that the frame members can be applied to the shell before it is shaped and before its assembly to the hull. These and other novel features of the invention will be better understood after considering the following description taken in conjunction with the accompanying drawing, in which:

Figs. 1 to 4, inclusive, illustrate a boat having a V-bottom hull with chine;

Fig. 1 is a view from below showing the development of the topside;

Fig. 2 is a side view showing the development of the topside;

Fig. 3 is a view from below showing the development of the bottom;

Fig. 4 is a side view showing the development of the bottom;

Fig. 5 is a side view of the boat of Figs. 1 to 4 illustrating the location of frame members;

Fig. 6 is a composite front and rear view at the stations indicated;

Fig. 7 is a view from the inside of the bow of a boat having the type of hull shown in Figs. 1 to 6 illustrating the location of straight frame members on the shell;

Fig. 8 is a view of the inside of the stern of a boat illustrating one form of construction;

Fig. 9 is a fragmentary view of a part of the boat of Fig. 8, and

Fig. 10 illustrates a form of chine construction with connecting clips and stiffening members.

Figs. 1 to 4 illustrate the development of the hull of a V-bottom boat with the generatrices of cones and cylinders. The general shape of the hull is first determined, based upon the requirements of the hull, and then the final shape is developed so as to embrace or coincide, where desired, with the generatrices of cones or cylinders or both. By a system of trial and error, the apexes of the cones and their directrices, and the axes and directrices of the cylinders are selected so as to provide lines of generation which determine the ultimate shape of the hull. Even for those portions of the hull having pronounced curves, the generatrices embrace substantial length portions of the hull. As illustrated in Figs. 1 and 2, the cone having its apex at A is so proportioned and arranged that the generatrices 1 embrace or develop the shape of the topside of the bow. This conformation of the hull to the generatrices of said cone develops the topside of the hull between the chine line 2, the sheer line 3 and the stem 4. The section of the topside amidships is similarly developed by using the generatrices 6 of a cylinder. The choice of a cylinder was determined by the relative flatness

of the hull. The topside of the hull at the stern is similarly developed by the generatrices 7 of the cone having its apex at B.

Figs. 3 and 4 illustrate the development of the V-bottom which is that portion of the hull generally defined by the chine line 2 to the stem 4 and the keel line 8. The bow portion of the bottom is developed by forming the hull to coincide with the generatrices 9 of the cone having its apex at C and by the generatrices 10 of the cone having its apex at D. The bottom in the vicinity of the stern is developed by shaping the hull to conform to the generatrices 11 of the cone having its apex at E, by the generatrices 12 of the cone having its apex at F, and by the generatrices 13 of a cylinder.

After having adjusted the hull to its final shape by development with the generatrices as just described, the required number of absolutely straight supporting or stiffening members are so arranged and placed inside the shell as to coincide at suitably spaced intervals and for substantial lengths with certain of the aforementioned generatrices. It will be understood that several orders of construction may be followed: With the location of the various stiffening or frame members, forming in the aggregate the skeleton of the hull, determined as described above, the members may be set up as the frame work upon which the shell is erected, or the shell may be set up in the shape described above and the members placed inside in order to coincide with the locations determined, or the members may be affixed to the shell and the entire subassembly erected to conform to the shape of the hull as determined above.

Fig. 5 illustrates a hull embodying the developed shape of the boat in Figs. 1 to 4. In this illustration the hull is divided longitudinally along the vertical planes, identified as STA 0 to STA 10, which, as is customary, means stations from 0 to 10. Fig. 6 is a composite of bow and stern views of the hull of Fig. 5, the half at the left being views from the stern forward at the stations indicated, and the part at the right being views from the bow rearward at the stations indicated.

The cutout shell portion of Fig. 5 shows the keel 15, the chine 16, and frame members 17 and 18 which are in coincident engagement with the generatrices 10. These frame members or stiffeners are used in the reenforcement of the bottom. It will be apparent that these members are absolutely straight and are connected at their extremities to the chine and to the keel. The frame member 19 is in coincident engagement with the generatrix 1, is absolutely straight, and is connected at its extremities to the chine and to the sheer clamp 20. It is understood, of course, that any desired number of similarly constructed and arranged stiffening or frame members may be employed, each embracing a generatrix of the hull.

Fig. 7 is a fragmentary view of the bow of a hull embodying the invention with a hull comprising a bottom shell 22 and top side shell 23 formed as described in connection with Figs. 1 to 4, and frames or stiffening members coinciding with various generatrices as described in connection with Fig. 5. The hull of Fig. 7 comprises a keel 24, chines 25, stem 26, sheer clamps 27, straight frame members 28 for the bottom and straight frame members 29 for the topside. The broken lines 21 show the approximate station locations of such boats and illustrate the shape of the bent frames employed in the usual construction of similarly shaped hulls.

Fig. 8 is a view of the stern portion of a boat embodying the invention in which the keel 30 is formed of a T-bar with a slight curve, chines 31 and sheer clamps 32 both formed of ordinary pipe. Fig. 8 illustrates certain advantages in a construction embodying the invention in which ordinary stock straight material may be used to form much of the supporting structure of a steel boat, the hull of which has a curved or sloped configuration. The frame members 33 are ordinary flat straight stock formed of metal bars, angles or channels, connected to the chines at one end and to flat floors 34 at the other end. The floors are of flat plate stock engaging the frames and are suitably connected to the keel 30. The manner in which the frames 33 are connected by the floors 34 to the T-bar 30 is better illustrated in Fig. 9. In this construction, where the shell 35 is of metal and the members 30, 33 and 34 are also of metal, the interconnections are secured together, as by welding, riveting or the like. The frame members 33 and 36 may also be connected to the chines 31, as by welding. Fig. 8 also illustrates the manner in which the usual type of web frame 37 may be used in cooperation with the straight frame members of the invention. Transverse bulkheads are used in similar manner.

The hull of the invention illustrated in Figs. 8 to 10 has a shell 35 formed of metal; however, other shell material may be used. The shell portion of the V-shaped bottom is fastened to the web of the T-bar 30 and is also welded to the pipe chines 31. The topside of the shell is welded to the pipe chines 31 and to the pipe 32 which forms the sheer clamp.

Fig. 10 illustrates a modified form of connecting the straight frame members or stiffeners 40 by means of clips 41 to the pipe chine 31. In this form of the invention, the clips are short sections of bars welded to the pipe chine and to the frame members 40 which are bars of slightly larger size.

It will be apparent that the invention greatly simplifies the construction of boats by making it possible to use various unshaped stock material that is absolutely straight for forming a large part of the supporting or reenforcing structure and that other straight parts may be employed in combination therewith that are easily bent to shape. Another important advantage in the construction of the invention is that it permits the straight unshaped members to be attached to the shell before it is formed or laid over the molds to the shape of the hull.

I claim:

1. The improvement in hull construction for surface boats and ships which comprises a hull including curved shell sections shaped to coincide with the generatrices of at least one cone, and straight frame members in engagement with the shell which are arranged to coincide with the generatrices of the cone.

2. The improvement in hull construction for surface boats and ships which comprises a hull including curved shell sections shaped to coincide with the generatrices of at least one cone, other curved shell sections shaped to coincide with the generatrices of at least one cylinder, and straight frame members in engagement with the shell, some of the frame members being arranged to coincide with the generatrices of the cone and

other frame members being arranged to coincide with the generatrices of the cylinder.

3. The improvement in hull construction for surface boats and ships which comprises a shell including curved portions of the bow shaped to coincide with the generatrices of several cones, and straight frame members in engagement with the shell arranged to coincide with said generatrices.

4. The improvement in hull construction for surface boats and ships which comprises a V-bottom boat having a shell, a keel, a chine and sheer clamp, the bow portions of the shell being curved and shaped to coincide with the generatrices of several cones, a plurality of straight frame members connected to the keel and to the chine, and a plurality of other straight frame members connected to the chine and the sheer clamp, said frame members being in contact with the shell and arranged to coincide with said generatrices.

5. The improvement in hull construction for surface boats and ships which comprises a hull having one or more structural members including a transverse bulkhead, one or more longitudinal members including a keel, chines and sheer clamps, a curved shell section shaped to coincide with the generatrices of at least one cone, and a plurality of straight frame members connected to said structural members which are in contact with the shell and arranged to coincide with said generatrices.

6. The improvement in hull construction for surface boats and ships which comprises a hull formed of curved shell sections shaped to coincide with the generatrices of at least one cylinder, and a plurality of straight frame members in engagement with the shell which are arranged to coincide with the generatrices of the cylinder.

7. The improvement in hull construction for surface boats and ships which comprises a hull having at least one structural member including a bulkhead and a frame, a curved shell section shaped to coincide with the generatrices of at least one cylinder, and a plurality of straight frame members in engagement with the shell which are arranged to coincide with the generatrices of the cylinder and to connect with the structural members.

8. The improvement in hull construction for surface boats and ships which comprises a hull having structural members including bulkheads, frames, chines, sheer clamps and a keel, curved shell sections shaped to coincide with the generatrices of at least one cone and at least one cylinder, and a plurality of straight frame members in engagement with the shell, some of the frame members being arranged to coincide with the generatrices of the cone, and other frame members being arranged to coincide with the generatrices of the cylinder, each of said straight frame members having one end connected to one of said structural members.

9. The improvement in hull construction for surface boats and ships which comprises a plurality of structural members, at least one curved shell section shaped to embrace the generatrix of a cone, a plurality of straight frame members each connected at its ends to the structural members and in coincident engagement with a generatrix of the cone.

10. The improvement in hull construction for surface boats and ships which comprises a plurality of structural members, at least one curved shell section shaped to embrace the generatrix of a cylinder, a plurality of straight frame members each connected at its ends to the structural members and in coincident engagement with a generatrix of the cylinder.

11. The improvement in hull construction for surface boats and ships which comprises a plurality of structural members, at least one curved shell section shaped to embrace the generatrix of a cone, a plurality of straight frame members each connected at its ends to the structural members and in coincident engagement with a generatrix of the cone, at least one curved shell section shaped to embrace the generatrix of a cylinder, and a plurality of other straight frame members each connected at its ends to the structural members and in coincident engagement with a generatrix of the cylinder.

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