A. E. FORD.

COLLAPSIBLE BOAT.

APPLICATION FILED AUG. 11, 1919.

1,333,109.

Patented Mar. 9, 1920.

3 SHEETS—SHEET 1.

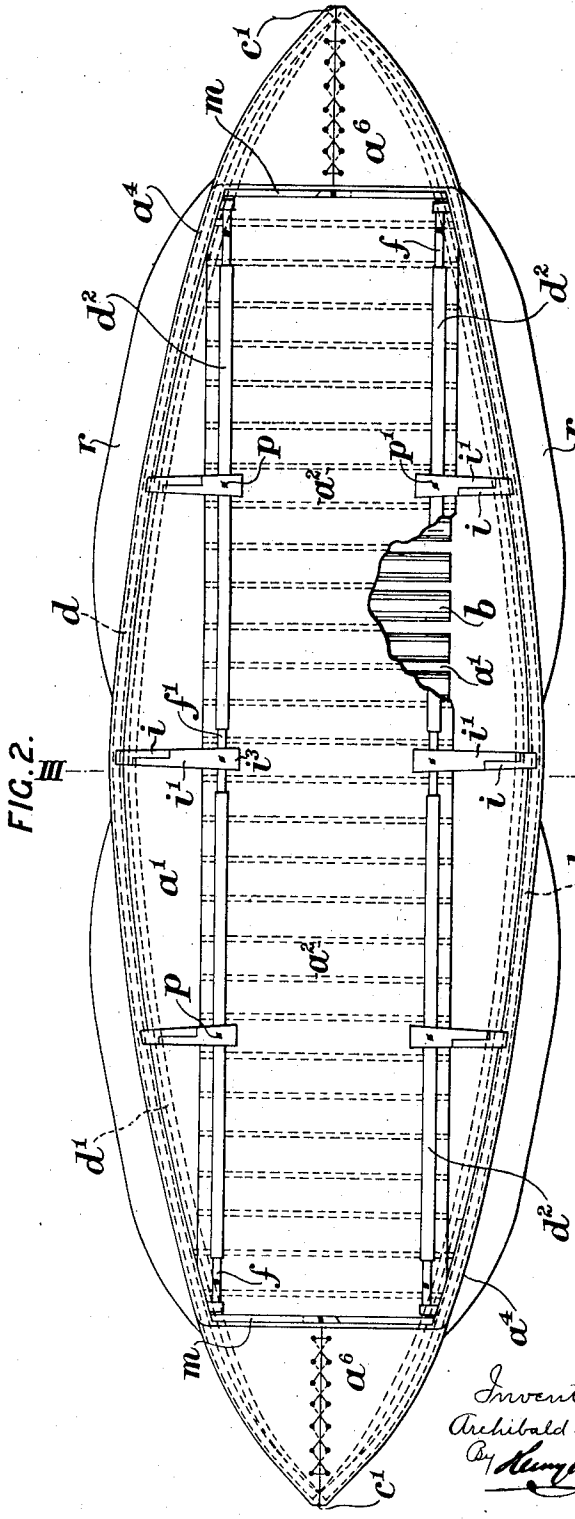


FIG. 2.

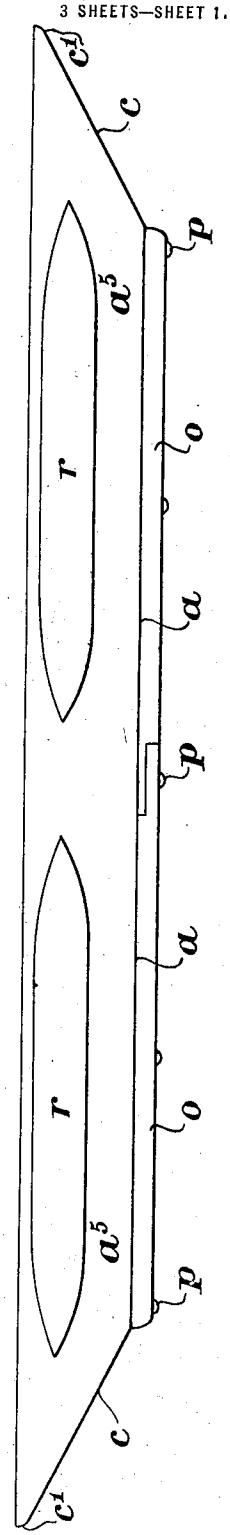


FIG. 1.

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FIG. 3.

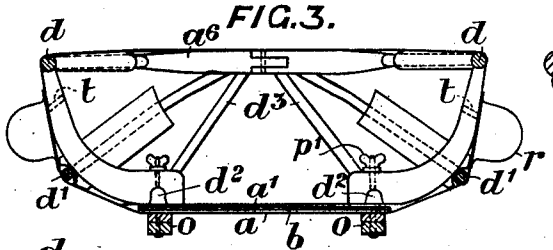


FIG. 5.

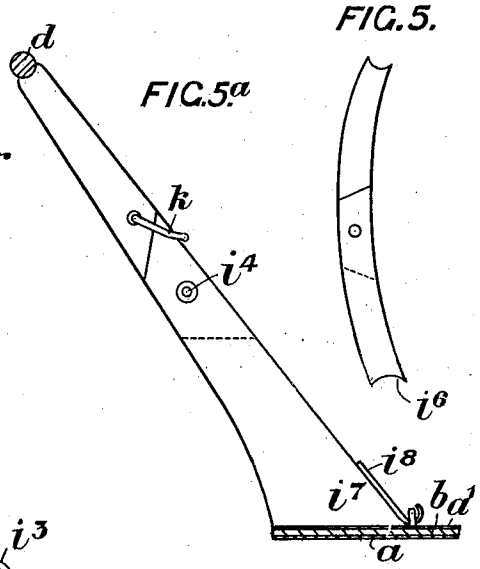


FIG. 5a

FIG. 4.

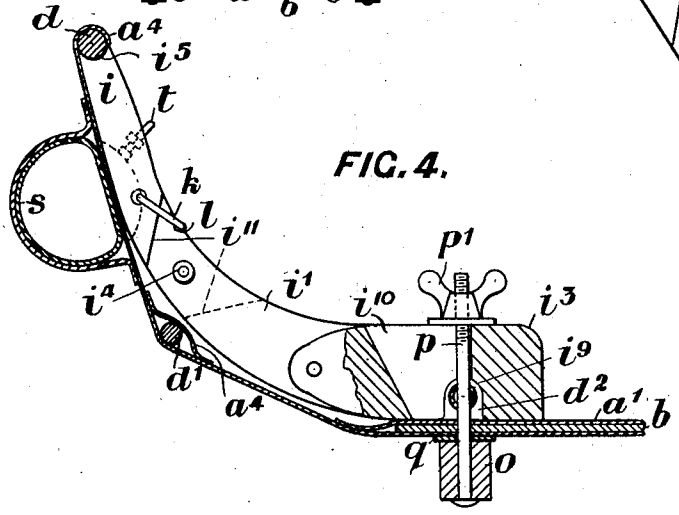


FIG. 9.



FIG. 10.

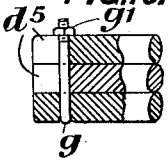


FIG. 6.

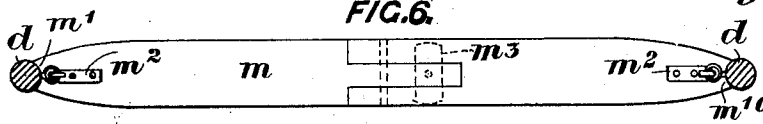


FIG. 7.

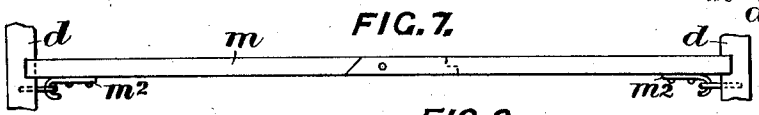


FIG. 11.



FIG. 12.

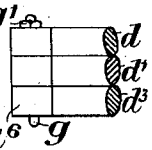


FIG. 8.

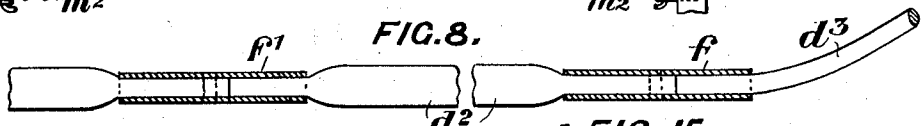


FIG. 15.

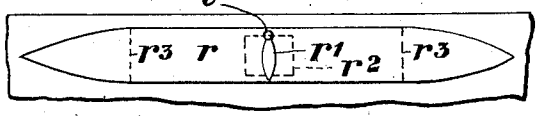


FIG. 13.

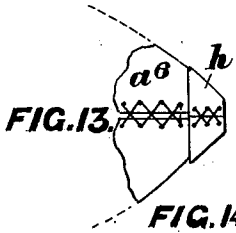


FIG. 16.

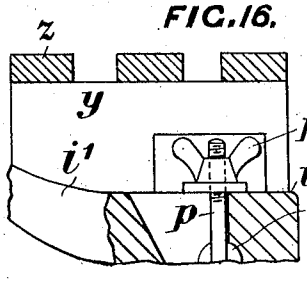
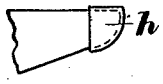


FIG. 14.



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3 SHEETS—SHEET 3.

FIG. 17.

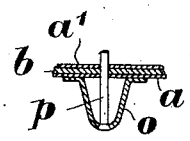


FIG. 18.

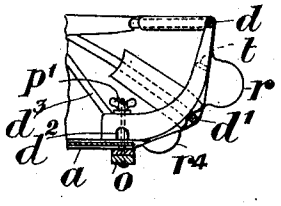


FIG. 19.

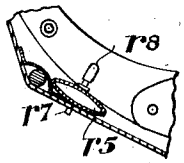


FIG. 20.

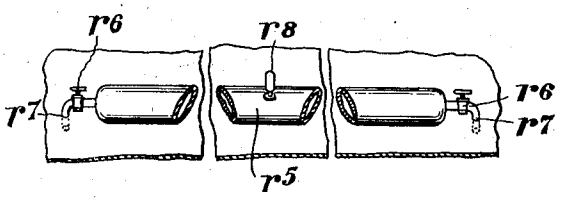
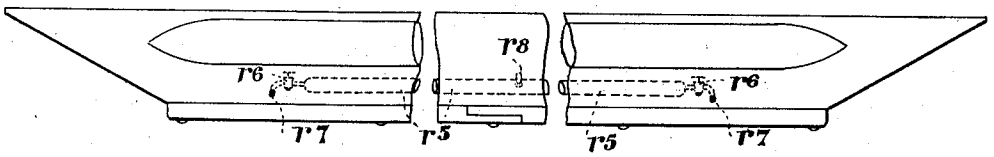


FIG. 21.



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UNITED STATES PATENT OFFICE.

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COLLAPSIBLE BOAT.

1,333,109. Specification of Letters Patent. Patented Mar. 9, 1920.

Application filed August 11, 1919. Serial No. 316,865.

To all whom it may concern:

Be it known that I, ARCHIBALD EDWARD FORD, a subject of the King of Great Britain, residing at London, England, have invented certain new and useful Improvements in Collapsible Boats, of which the following is a specification.

This invention relates to improvements in and connected with collapsible or folding boats of the kind comprising a flexible skin, usually of waterproof fabric, which is distended to the proper shape and stiffened and made seaworthy by means of longitudinal stiffeners, cross battens or stretchers, and side struts. All these members are capable of being readily inserted into place and engagement when erecting the craft and of being as readily disengaged and removed when dismantling and collapsing the craft after use.

Now the object of the present invention is to provide a boat of this description of stouter build than heretofore which is simple in its construction, and not difficult to erect or dismantle, which is lighter than boats of similar capacity heretofore constructed, and which, when dismantled, may be rolled up so as to occupy little space. A further object is to provide stiffeners and struts of such character and construction that they afford considerable stiffness and strength and nevertheless are capable of being packed into a small space when the craft is dismantled. Yet another object of these improvements is to impart an increased flotation capacity to boats of this character and also to enable the said flotation capacity to be varied at will if desired. The said flotation means may also be employed for assisting in the distending or stretching of the skin and making the latter taut on its stiffeners and struts. All these objects may be attained without making the structure complicated or of an expensive nature.

According to this invention, the transverse stiffness is largely attained by means of a skin furnished with transverse slats or battens fastened to the bottom in parallel relation. With such a bottom, the skin or hull may be rolled up in the fore and aft direction after the fashion of a roll slat blind. That portion of the skin or hull forming the bottom is advantageously made of a double layer or thickness which is sewn so as to form transverse tubular pockets. Or a double fabric with such transverse pockets may be woven. The slats or battens are inserted into such pockets which may be closed at the ends by longitudinal seams along the bottom or by other suitable means. Bilge keels may be secured along the bottom, as for example by bolting lengths of suitable material to the lower longitudinal stiffeners, the bolts passing through the bottom and, if desired, through the battens aforesaid.

The skin or hull has suitable side extensions or flaps at either the stem or stern, or at both, which flaps may be folded over so that their edges meet in the middle and may be fastened or laced together. In this way, one end, or both ends, of the boat may be provided with a sort of deck.

The converging ends of the stiffeners may be fastened together by means of U-bolts or wires. In the case of three sets of stiffeners being used, namely, bottom, intermediate and gunwale stiffeners, the bottom stiffeners may be grooved or notched to seat upon the bent portions of the wires at the angles and the intermediate and gunwale stiffeners may be perforated or slotted to receive the limbs of the U-bolts.

To increase the flotation capacity, rigidity and stability of the boats, the skin may be formed along the sides at one or more places with inflatable tubular pockets, or with tubular pockets adapted to receive an inflatable tube. If the struts are erected in position when the tubes are deflated, it will be seen that inflation will decrease the depth of the sides so that the bottom and gunwale stiffeners will be pulled toward one another and be forced to tightly engage the struts.

If more than one inflatable tube is used on the side the draft of the boat will be varied according to the number of tubes inflated.

In order that this invention may be readily understood, reference is made to the accompanying drawings, in which:—

Figure 1 is a side elevation of a boat constructed according to this invention.

Fig. 2 is a plan of Fig. 1.

Fig. 3 is a vertical section on the line III—III of Fig. 2.

Fig. 4 is a part sectional side elevation of an intermediate strut to a larger scale.

Fig. 5 is an elevation of one of the end struts.

Fig. 5ª is an elevation of a modified form of end strut.

Figs. 6 and 7 are respectively an elevation and plan of an end stretcher.

Fig. 8 is an elevation of the joint in one of the bottom longitudinal stiffeners.

Fig. 9 is a cross section of the assembled stiffeners and the means for securing their ends together and

Fig. 10 is a longitudinal section of same.

Figs. 11 and 12 are views corresponding with Figs. 9 and 10, respectively, of a modified arrangement.

Fig. 13 is a plan, and Fig. 14 an elevation of the pointed end of a boat having a hinged cap fitted thereto.

Fig. 15 is an elevation, as seen from the inside of the boat of an inflatable pocket and means thereon for enabling the inflatable tube to be inserted.

Fig. 16 is a section illustrating a fitting of suitable seats at the sides of the boat.

Fig. 17 is a view showing in cross section a modified form of the bilge keels.

Fig. 18 is a fragmentary view, on the same lines as Fig. 3, indicating a second inflatable tube arranged near the bottom of the boat.

Figs. 19 and 20 are respectively transverse and longitudinal sectional views illustrative of the application of water ballast tubes at the bottom of the boat, and

Fig. 21 is a view on similar lines to Fig. 1, but showing the ballast tubes of Figs. 19 and 20.

In one suitable construction, and as shown in Figs. 1 to 3, the boat is made flat bottomed and pointed at the stem and stern. The flat bottom is of double fabric $a\,a'$ with transverse seams a^2 to produce parallel pockets into which are inserted slats or battens b, the latter being retained in place by sewing over the longitudinal edges of the bottom or by other suitable means. The bow and stern are similarly fashioned sloping bottom portion c extending upward from the bottom proper to the point c' of the stem and stern. There are three longitudinal stiffeners $d\,d'$ and d^2 on each side which are inserted into tubular pockets a^4. The bottom stiffeners d^2 may be formed of main or middle lengths of ash, of greater depth than breadth in cross section, see Fig. 4, and of end lengths of cane d^3, see Fig. 8 connected with the reduced ends of the ash lengths by a metal joint sleeve f. The ash may be in several lengths joined by sleeves f'. These canes d^3 have the desired slope or curvature to form the desired shapes at the bow and stern. The intermediate stiffeners d' may be wholly of cane and, if desired, in several lengths fitted together after the manner of a fishing rod. The upper or gunwale stiffeners d may be formed wholly of cane or of intermediate lengths of cane and end lengths of ash of similar cross section to the ash lengths of the bottom stiffeners d^2, and these lengths may be joined by suitable disconnectible joints similar to those seen in Fig. 8. Or the upper or gunwale stiffeners may be formed of intermediate lengths of ash and end lengths of cane. The end portions of these stiffeners are suitably shaped, sloped or curved so as to be convergent and conform with the pointed ends of the boat as will be understood by comparing Figs. 2, 3 and 8. Near the ends, and as shown in Figs. 9 and 10, the parts d^3 of the bottom stiffeners are formed with notches and perforations and the intermediate and upper stiffeners $d'\ d$ are formed with slots d^5 for the reception of the limbs of a U-bolt g which may be of stout wire. Or all of the stiffeners $d\ d'\ d^3$ may be simply perforated, as seen in Figs. 11 and 12, and the perforated ends may be strengthened by brass or other ferrules or caps d^6. This bolt g is applied to the convergent ends so that its bends or angles at the bottom engage recesses of the ends d^3 of the bottom stiffeners and the limbs of the bolt pass through the slots or holes in the stiffeners $d'\ d$, suitable nuts g' being screwed on the bolts g and down on to the ends of the gunwale stiffeners d to hold all secure.

The end portions a^5 of the skin or hull are formed of or fitted with side extensions or flaps a^6 which are brought together over the gunwale stiffeners d and sewn or laced together along the middle so as to provide decked-in portions at the bow and stern. Just below the points at the stem and stern there may be hinged caps or pockets h, Figs. 13 and 14 made of fabric, the hinge connecting them to the skin or hull being merely a suitably sewn connection. These caps or pockets h are turned up over the convergent ends of the stiffeners $d\ d'\ d^3$ in order to receive the latter. The caps may be tightened and fastened by lacing or other suitable means.

The struts, as shown in Figs. 2, 3 and 4 are formed of two hingedly connected portions $i\ i'$. The struts of the end pairs may be made as seen in Fig. 5, with a notched foot i^6 for engaging on the joint tube f of the bottom stiffener, or, as seen in Fig. 5ª, the end struts may be formed with a wide foot i^7 and be inclined so that the foot i^7 stands on a batten on the inner side of the bottom stiffener. A hook i^8 may be secured to the foot i^7 and be adapted for engaging an eye screwed to a batten b for holding the foot in the correct position. The intermediate struts, as seen in Fig. 4 are curved and have horizontal foot portions i^3 formed with a recess i^9 for engaging, resting upon,

or taking over the longitudinal stiffeners d^2. The foot portions i^3 may also rest upon the battens. The strut portions i i' are halved where hingedly connected at i^4 and formed so that when turned to extend the strut, the parts i i' butt against one another at i^{11} and the upper portion i can be turned no farther. A bail k pivoted to the upper portion i folds down into a notch l in the other or lower portion i' and prevents collapse of the strut or other known fastening means may be employed for a similar purpose. The upper extremity i^5 of each strut is recessed or forked so as to fit against or engage the gunwale stiffener d. The bottom and gunwale stiffeners d^2 d^3 and d are strutted in this manner fore and aft and amidships and the gunwale stiffeners d may be suitably braced and distended near the bow by stretchers m see Figs. 6 and 7, recessed at their ends m' to engage the stiffeners d and furnished with hooks m^2 hooking into eyes of the stiffeners d for the purpose of preventing the distance between these stiffeners from being increased. The stretchers m, in two hingedly connected portions, have a button m^3 for locking the hinge joint. Amidships, the bottom stiffeners d^2 d^3 may have the ends of cords secured thereto and these cords may be passed upwardly over or through holes in the upper ends of the middle struts.

Bilge keels o o are fitted one along each side of the bottom a. These may consist of lengths of wood, as shown in Figs. 1, 3 and 4 or of suitable material such as sheet metal formed of channel section or the like as shown for example in Fig. 17. These bilge keels o o as clearly shown in Fig. 4 are fastened by bolts p passed upwardly through holes in the keel o, bottom a and bottom stiffeners d^2 and struts i^3, wing nuts p' being screwed on the upper ends of such bolts p and watertight washers q being introduced where necessary to prevent leakage through such holes. If desired, the holes in the bilge keels o o and the lower stiffeners may be reinforced by small brass tubes, or liners. The foot portions i^3 of the struts i i' may be slotted at i^{10} where the bolts p pass through to permit of the hinging movements of the parts i' in extending or collapsing the strut.

Between the intermediate and gunwale stiffeners d d', the skin or hull fabric a^5 is formed on each side of the boat, with a longitudinal pocket or pockets r. A slit r' Fig. 15 may be formed in these pockets r on the inner side of the boat, to permit of the insertion of an inflatable rubber tube s and if desired, the opening at the slit may be laced up after the insertion of the tube s which is inflatable through one of the ordinary type valve connections t. A flap r^2 Fig. 15 may be provided for tucking into the pocket at the slit r' for affording protection to the tube at that place. Slits shown in dotted lines at r^3 may be provided near the ends of the pockets for facilitating the pulling through and arranging of the end portions of the tubes and these slits also may be provided with flaps as will be readily understood. The act of inflating the tubes s contracts the sides a^5 of the boat in depth and consequently draws the bottom and gunwale stiffeners d^2 d^3 and d hard against the struts i. Also, the inflation of the tubes s may be utilized for bringing about tensioning of the bracing cords and hinged struts above referred to, particularly if the skin be made capable of taking a bulge inwardly where such cords are situated so that the inflated portion pressing against them increases the tension thereof.

The immersion of the boat or its draft may be varied by having a second inflatable tube r^4, Fig. 18 in the skin nearer the bottom and inflating such tube or not as desired. Or as shown in Figs. 19, 20 and 21 there may be one or more interior canvas tubes or cylinders r^5 formed near the bottom and this or these may be fitted at the ends with valves r^6 in water pipes r^7 and with air valves r^8 near the middle. By opening the valves r^6 and pumping in air, water will be expelled and the draft of the boat lessened but by opening the air valve and permitting air to escape, water enters the tube or cylinder and increases the draft.

As seen in Fig. 16, chocks y may be placed upon the strut portions i^3, being formed with recesses to take over the wing nuts p', and slats z secured to these chocks provide side seats in the boats. End seats may be provided by placing similar chocks on suitable battens and securing slats in these chocks.

To dismantle and fold the boat, the ballast bags or tubes are emptied in manner aforesaid, the inflated tubes s are deflated, and the caps h and the flaps a^6 at the ends of the boat are unlaced. The struts i and stretchers m may now be disengaged, folded and also stowed. The U-bolts q are withdrawn from the stiffeners d d' d^3 and the latter are withdrawn from the pockets, the lengths being disconnected from one another and the whole stowed away into a small bag or the like. Prior to the removal of the bottom stiffeners, the wing nuts p' are removed from the bolts p which secure the bilge keels o o and the bolts and bilge keels are conveniently stowed with the stiffeners. The sides of the boat are now folded over the bottom and the whole fabric structure may be rolled up from one end to the other, the slats or battens b of the bottom freely permitting such rolling to take place and making the roll stiff and port-

able. The loose frame members may be stowed in a bag as aforesaid, and the skin may be covered with a long rowing mat and secured by straps.

I claim:—

1. A collapsible boat comprising a flexible skin distensible to the desired boat shape, upper and lower longitudinal stiffeners engaged with said skin, upright struts engaged between upper and lower stiffeners and a plurality of slats engaged with said skin in parallel relation with one another and adapted for forming a roll-up bottom for the boat substantially as set forth.

2. A collapsible boat comprising a flexible skin distensible to the desired boat shape by means of longitudinal stiffeners and upright struts, the said skin at the bottom portion of the boat being furnished with a plurality of parallel slats suitably spaced on said bottom and adapted for imparting a roll-up character to the said skin while affording the desired transverse rigidity to the boat bottom when the skin is distended, substantially as set forth.

3. A collapsible boat comprising a flexible skin distensible to the desired boat shape by means of longitudinal stiffeners and upright struts, the said skin at the bottom portion of the boat being furnished with a plurality of transverse pockets each containing a cross slat whereby the bottom is of a roll-up character substantially as set forth.

4. A collapsible boat comprising a flexible skin distensible to the desired boat shape by means of longitudinal stiffeners and upright struts, the skin at the portion forming the bottom of the boat being composed of a double layer of fabric having the two layers connected transversely along parallel spaced lines thereby forming parallel pockets for the reception of slats adapted for imparting the necessary transverse stiffness to the bottom of the boat when in use and for imparting a roll-up character to the bottom when the boat is not in use substantially as set forth.

5. A collapsible boat comprising in combination a flexible skin adapted for receiving and retaining longitudinal upper and lower stiffeners, a plurality of parallel cross slats engaged with the skin in the bottom portion of the boat the ends of said slats extending beyond the lines along which the lower longitudinal stiffeners are engaged with said skin, and upright struts adapted to be stepped on said lower stiffeners and adapted for engaging and supporting the upper stiffeners, substantially as set forth.

6. A collapsible boat comprising a flexible skin distensible to the desired boat shape by means of upper and lower longitudinal stiffeners the bottom of the boat being stiffened transversely by a parallel disposition of cross slats engaged with said skin and longitudinally by lower stiffeners composed of disconnectible lengths of different materials substantially as set forth.

7. A collapsible boat comprising a flexible skin, gunwale stiffeners engaged with the upper part of said skin, bottom stiffeners engaged with said skin and disposed longitudinally of the boat, said bottom stiffeners being composed of disconnectible lengths of different materials and different cross sections, transverse bottom stiffeners comprising a plurality of slats engaged with said skin in parallel disposition along the bottom of the boat the ends of said slats underlying said bottom stiffeners, and upright struts stepped on said bottom stiffeners and adapted for engaging and supporting said gunwale stiffeners, substantially as set forth.

8. A collapsible boat comprising a flexible skin, gunwale stiffeners engaged with the upper part of said skin, bottom stiffeners engaged with the portion of the skin forming the bottom of the boat and formed mainly of disconnectible lengths of wood the end portions being formed of lengths of cane disconnectible from the main wood lengths, transverse stiffeners comprising a plurality of cross slats engaged in parallel disposition with the said bottom portion and having their ends underlying the bottom longitudinal stiffeners, and upright struts stepped on said bottom stiffeners and adapted for engaging and supporting said gunwale stiffeners, substantially as set forth.

9. A collapsible boat comprising a flexible skin, gunwale stiffeners engaged with the upper part of said skin, bottom stiffeners engaged with the portion of the skin forming the bottom of the boat and formed of disconnectible lengths, transverse bottom stiffeners comprising a plurality of parallel slats engaged with the said bottom portion, struts between said gunwale stiffeners and said bottom stiffeners, and bilge keels on the outer side of said skin, said bilge keels being fastened through said skin to the bottom longitudinal stiffeners, substantially as set forth.

10. A collapsible boat comprising a flexible skin, gunwale stiffeners engaged with the upper part of said skin, bottom longitudinal stiffeners engaged with the skin along the portion forming the bottom of the boat, bottom transverse stiffeners comprising a plurality of slats engaged in parallel relation with the said bottom portion, and struts between the gunwale and bottom longitudinal stiffeners said struts being in hingedly connected portions butted against one another near the joint and fitted with locking means adapted for preventing the folding of said struts from the extended position substantially as set forth.

11. A collapsible boat comprising a flexi-

ble skin, gunwale stiffeners engaged with the upper part of said skin, bottom longitudinal stiffeners engaged with the skin along the portion forming the bottom of the boat, bottom transverse stiffeners comprising a plurality of slats engaged in parallel relation with the said bottom portion, struts between the gunwale and bottom longitudinal stiffeners, stretchers between the end portions of the gunwale stiffeners, and extensions on the skin at the ends of the boat, said extensions being adapted to be folded over and connected together to form a sort of deck and pockets for containing the convergent ends of the longitudinal stiffeners substantially as set forth.

12. A collapsible boat comprising a flexible skin, gunwale stiffeners engaged with the upper part of said skin, bottom longitudinal stiffeners engaged with the skin along the portion forming the bottom of the boat, bottom transverse stiffeners comprising a plurality of slats engaged in parallel relation with the said bottom portion, struts between the gunwale and bottom longitudinal stiffeners, stretchers between the end portions of the gunwale stiffeners, and flaps of approximately triangular formation at the ends of the boat and on either side said flaps being adapted for folding over the boat and to have their contiguous longitudinal edges laced together substantially as set forth.

13. A collapsible boat comprising a flexible skin fitted with means for the reception and engagement of upper and lower longitudinal stiffeners and with transverse parallel pockets for the reception of transverse floor slats, the said skin having end flaps of approximately triangular shape adapted for the formation of a sort of deck at each end of the boat and with end hinged caps adapted for being turned up over the convergent ends of the longitudinal stiffeners when the skin is distended by such stiffeners for the erection of the boat substantially as set forth.

14. A collapsible boat comprising a flexible skin, gunwale stiffeners engaged with the upper portion of said skin, bottom longitudinal stiffeners engaged with the skin along the portion forming the bottom of the boat, bottom transverse stiffeners comprising a plurality of slats engaged in parallel relation with the said bottom portion, struts between the gunwale and bottom longitudinal stiffeners, and U-shaped connections adapted for securing together the assemblage of convergent ends of said longitudinal stiffeners, substantially as set forth.

15. A collapsible boat comprising a flexible skin, gunwale stiffeners engaged with the upper portion of said skin, bottom longitudinal stiffeners engaged with the skin along the portion forming the bottom of the boat, bottom transverse stiffeners comprising a plurality of slats engaged in parallel relation with the said bottom portion, struts between the gunwale and bottom longitudinal stiffeners, and inflatable chambers on said skin between the bottom portion and the gunwale the inflation of said chambers being adapted for increasing the flotation capacity of the boat and also for reducing the height or depth of the sides whereby the longitudinal stiffeners are caused to engage tightly with the struts substantially as set forth.

16. A collapsible boat comprising a flexible skin, gunwale stiffeners engaged with the upper portion of the skin, bottom longitudinal stiffeners engaged with the skin along the portion forming the bottom of the boat, bottom transverse stiffeners comprising a plurality of slats engaged in parallel relation with the said portion, struts between the gunwale and bottom longitudinal stiffeners, inflatable chambers on said skin between the bottom portion and the gunwale, and water ballast chambers in the bottom portion of said skin said ballast chambers being fitted with inflation valve connections whereby air may be pumped into said chambers for the expulsion of water ballast substantially as set forth.

17. A collapsible boat comprising a flexible skin, gunwale intermediate and bottom longitudinal stiffeners engaged therewith, struts stepped on said bottom stiffeners and engaging with and supporting said gunwale stiffeners said struts being disposed on the inner side of said intermediate stiffeners, keel members alined with said bottom stiffeners and secured by bolts passing through said bottom stiffeners and the foot portion of said struts, and transverse slats engaged with the skin along the bottom of the boat the ends of said slats being clamped between said keel members and said bottom stiffeners substantially as set forth.

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